

Key to genera

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Main key

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|----|---|---|
| 1. | Marine, on the red alga <i>Dilsea carnosa</i> ; sp 105-118 x 2.5-3 μm | <i>Mycaureola</i> p. 257 |
| - | Terrestrial, rarely limnic, on wood, herbs, leaves, mosses, soil, fungi, etc.; sp shorter | 2 |
| 2. | Frb cyphelloid | Key A p. 40 |
| - | Frb not cyphelloid | 3 |
| 3. | Hymenium as tubes | Key B p. 41 |
| - | Hymenium as gills or wrinkles, less often smooth | 4 |
| 4. | Cap minute and globose; on branches and needles of <i>Cryptomeria japonica</i> | <i>Physalacria</i> p. 260 |
| - | Cap and habitat different | 5 |
| 5. | Frb sequestrate with non-expanding cap | <i>Chlorophyllum agaricoides</i> p. 531 |
| - | Frb with expanding cap | 6 |
| 6. | Sp deposit white, whitish, yellowish, yellow, pale lilac or very pale pinkish | Key C p. 42 |
| - | Sp pinkish, greenish, brown or blackish | 7 |
| 7. | Sp deposit pink, brownish pink or greenish | 8 |
| - | Sp deposit brown to black | 9 |
| 8. | Sp deposit pink or brownish pink | Key D p. 55 |
| - | Sp deposit greenish | Key E p. 56 |
| 9. | Sp deposit pale to vivid or dull brown | Key F p. 56 |
| - | Sp deposit very dark brown, dark purplish brown or black | Key G p. 60 |

Key A: Frb cyphelloid

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|----|--|--|
| 1. | With thousands of crowded, individual tubules hanging from a common fleshy, tongue- or kidney-shaped stroma with contracted base or a short stem | <i>Fistulina</i> p. 250 |
| - | Common stroma absent or thin | 2 |
| 2. | Sp ornamented or angular | 3 |
| - | Sp smooth, not angular | 5 |
| 3. | Sp 5-5.5 x 4.5-5 μm, subglobose to angular, hyaline | <i>Resupinatus griseopallidus</i> p. 325 |
| - | Sp ≥ 6.5 μm long, broadly ellipsoid to ellipsoid, brownish | 4 |
| 4. | Sp 8-10 x 6.5-8.5 μm; clamps present; on epiphytic mosses and hepatics on bark of living hardwood | <i>Chromocyphella</i> p. 862 |
| - | Sp 6.5-9 x 3.5-5.5 μm; clamps absent; on herbaceous stems, ferns, twigs of hardwood, etc. | <i>Pellidiscus</i> p. 907 |
| 5. | Sp brown | <i>Episphaeria</i> p. 868 |
| - | Sp hyaline | 6 |
| 6. | Frb without marginal hairs | 7 |
| - | Frb with marginal hairs, sometimes entirely hairy on the outer surface | 9 |

7. Hymenial cystidia subulate; sp 4-5 x 2.5-3 *Cyphellostereum* p. 68
 - Hymenial cystidia absent; sp $\geq 5.5 \mu\text{m}$ long, $\geq 4 \mu\text{m}$ broad 8
8. Clamps present; hyphae in pielipellis without incrusting pigment; on mosses *Rimbachia* p. 239
 - Clamps absent; hyphae in epicutis with incrusting pigment; on mosses or other plant debris *Arrhenia retiruga* p. 228
9. Marginal hairs incrustated 10
 - Marginal hairs smooth or only slightly incrustated 14
10. Hair apex distinctly tapering, sometimes with a smooth, whip-like appendix *Flagelloscypha* p. 244
 - Hair apex cylindrical or widened, incrustated, without a whip-like appendix 11
11. Sp subglobose *Resupinatus* p. 324
 - Sp distinctly elongate 12
12. Sp $\geq 7 \mu\text{m}$ broad *Lachnella* p. 247
 - Sp $\leq 4 \mu\text{m}$ broad 13
13. On old fern petioles or dead leaves *Flagelloscypha* p. 244
 - On decorticated branches *Calathella* p. 244
14. Frb seated on a very conspicuous white subiculum with fimbriate margin *Porotheleum* p. 286
 - Subiculum absent or rather inconspicuous 15
15. Outside and hairs golden brown to dull brown 16
 - Outside white, cream or yellow; hairs hyaline 18
16. At base of the fern *Matteuccia*; sp fusiform to narrowly pip-shaped *Woldmaria* p. 249
 - On wood, stems or other organic debris; sp globose to subglobose, ellipsoid, cylindrical or allantoid 17
17. Sp 16-21 μm in diam., globose to subglobose; on *Abies* *Cyphella* p. 275
 - Sp $< 10 \mu\text{m}$ broad, ellipsoid, cylindrical or allantoid; on wood, stems or other organic debris *Merismodes* p. 248
18. Frb tubular, $< 0.5 \text{ mm}$ broad *Henningsomyces* p. 281
 - Frb cup- to funnel- or disc-shaped, $> 1 \text{ mm}$ broad 19
19. Hymenium ochraceous to brown; on *Populus* branches *Schizophyllum amplum* p. 251
 - Hymenium white, cream or yellow; habitat mostly different 20
20. Hairs with capitate apex *Cellypha* p. 274
 - Hairs with cylindrical apex, often branched *Calypotella* p. 264

Key B: Hymenium as tubes

1. On culms of grasses; frb very thin-fleshed *Campanella* p. 287
 - On soil, wood or frb of *Scleroderma*; frb \pm thick-fleshed 2
2. Frb with a lateral, short stem or contracted base; on *Quercus* or *Castanea* *Fistulina* p. 250
 - Stem \pm central; on soil or coniferous wood 3
3. Veil present, forming a ring or ring zone on the stem or appendiculate at cap margin 4
 - Veil absent 5
4. Cap dry, greyish to blackish; with *Fagus* or *Quercus*; sp globose, reticulate *Strobilomyces* p. 174

- Cap slimy *and/or* with yellowish colours; with *Pinus*, *Larix* or *Pseudotsuga*; sp
± fusiform, smooth *Suillus* p. 154
- 5. Tube layer deeply decurrent, not easy to separate from cap; with *Alnus* *Gyrodon* p. 160
- Tube layer narrowly to broadly adnate or short decurrent, mostly easy to separate
from the cap; with deciduous or coniferous hosts 6
- 6. Saprotrophic on stumps or roots of conifers *Buchwaldoboletus* p. 168
- Mycorrhizal with deciduous trees or conifers or on frb of *Scleroderma* 7
- 7. Pores orange red to red 8
- Pores white, yellow, greenish, salmon, pinkish, cinnamon, rust-coloured or dull brown 9
- 8. Both tubes and pores red *Rubinoboletus* p. 173
- Pores orange red to red; tubes yellow *Boletus* p. 163
- 9. Sp deposit straw to yellow or ochraceous; tubes and pores remaining white to
lemon (but may turn blue when handled or on exposure); stem flesh with irre-
gular cavities *Gyroporus* p. 159
- Sp deposit ochraceous buff, olivaceous brown, pink to vinaceous or pale brown to
dark brown; tubes and pores darker, at least with age; stem flesh hardly with cavities 10
- 10. Stem scaly over entire length *Leccinum* p. 169
- Stem ± smooth, reticulate or with small dots 11
- 11. Stem with a ± fine and sharply delimited net in the upper part 12
- Stem ± smooth, dotted or wrinkled in a pattern suggesting a net structure 13
- 12. Stem net white or at least paler than the background; sp deposit olive brown;
tubes and pores whitish or yellow, becoming ± greenish olive *Boletus* p. 163
- Stem net brown, darker than the background; sp deposit pink to vinaceous;
tubes and pores whitish, becoming salmon or vinaceous pink *Tylopilus* p. 174
- 13. Taste bitter; tubes and pores cinnamon to rust-coloured, already when young;
flesh in stem base bright yellow *Chalciporus* p. 169
- Taste mild; tubes and pores yellow, greenish or dull brown; flesh not bright
yellow in stem base (but the flesh may be entirely yellowish) 14
- 14. Cap viscid to slimy, smooth to slightly scaly 15
- Cap dry and velvety 17
- 15. Pores pale yellow when young, blueing when touched *Xerocomus badius* p. 176
- Pores more dull coloured when young *or* not blueing when touched 16
- 16. Cap with pinkish-reddish tinges; on rich soil with *Fagus* and *Quercus* *Aureoboletus* p. 163
- Cap without pinkish-reddish tinges; with *Pinus* *Suillus* p. 154
- 17. Cap and stem hazel, sepia to snuff brown; sp deposit dark brown *Porphyrellus* p. 173
- At least stem with paler colours; sp deposit ochraceous buff, olive
yellow, olive brown or greyish brown 18
- 18. All parts of frb strongly and immediately turning bluish when touched; stem
> 10 mm broad *Boletus* p. 163
- Frb not turning bluish, or only pores and flesh turning conspicuously bluish;
stem often narrower 19
- 19. Pores at first quite dark olivaceous brown, then paler yellow brown *Suillus variegatus* p. 156
- Pores at first yellow or yellowish, with age often ± olive brown *Xerocomus* p. 174

Key C: Sp deposit white, whitish, very pale pinkish, yellowish or yellow

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| 1. | Flesh or stem with milky juice | 2 |
| - | Without milky juice | 3 |
| 2. | Stem thin and hollow; sp smooth, amyloid | <i>Mycena</i> p. 352 |
| - | Stem ± massive with crumbling flesh; sp with amyloid ornamentation | <i>Lactarius</i> p. 82 |
| 3. | Flesh crumbling; stem > 5 mm broad; sp with amyloid ornamentation; flesh with spherocysts | <i>Russula</i> p. 107 |
| - | Flesh fibrillose; stem thinner; sp with or without amyloid ornamentation; flesh without spherocysts | 4 |
| 4. | Gills free or attached to a collarium; stem present | 5 |
| - | Gills emarginate, adnexed, adnate, decurrent, reduced or absent; stem present or absent | 31 |
| 5. | Universal veil membranous in young frb | 6 |
| - | Universal veil pulverulent, floccose, cortina-like or absent | 7 |
| 6. | Sp 2.5-6 µm wide | <i>Floccularia</i> p. 514 |
| - | Sp 6-11 µm wide | <i>Amanita</i> p. 326 |
| 7. | On cones | 8 |
| - | On other substrates | 9 |
| 8. | Stem pubescent; sp amyloid | <i>Baeospora</i> p. 274 |
| - | Stem smooth or pruinose; sp without iodine reactions | 10 |
| 9. | Stem white, buff to brown; with pleurocystidia | <i>Strobilurus</i> p. 261 |
| - | Stem blackish in mature frb; without pleurocystidia | <i>Gymnopus androsaceus</i> p. 295 |
| 10. | Veil absent | 11 |
| - | Veil membranous, slimy, pulverulent or cortina-like, forming a ring or ring zone on the stem or a denticulate cap margin | 20 |
| 11. | With a strong smell of cucumber, fish or linseed oil; with lanceolate, 40-110 µm long pleurocystidia | <i>Macrocyttidia</i> p. 312 |
| - | Smell different; pleurocystidia different or absent | 12 |
| 12. | Cap with ± appressed brown hairs | <i>Crinipellis</i> p. 288 |
| - | Cap without brown hairs | 13 |
| 13. | Cap without radial structure; pileipellis a trichoderm, a hymeniderm, a paraderm or an epithelium | 14 |
| - | Cap with radial structure; pileipellis a cutis or a clavicutis | 16 |
| 14. | Sp < 5 µm long, often dextrinoid | <i>Pseudobaeospora celluloderma</i> p. 515 |
| - | Sp 5-14 µm long, without iodine reactions | 15 |
| 15. | Smell strong like garlic | <i>Mycetinis</i> p. 305 |
| - | Smell different or indistinct | <i>Marasmius</i> p. 288 |
| 16. | At least a certain percentage of sp dextrinoid at maturity, at least from deposits | 17 |
| - | Sp without iodine reactions | 18 |
| 17. | Cap 1-15 mm | <i>Pseudobaeospora</i> p. 515 |
| - | Cap 25-160 mm | <i>Rhodocollybia</i> p. 307 |
| 18. | Pileipellis a trichoderm | <i>Hygrocybe</i> p. 194 |
| - | Pileipellis a clavicutis | 19 |

19.	Sp amyloid	<i>Mycena</i> p. 352
-	Sp without iodine reactions	<i>Gymnopus</i> p. 295
20.	Stem with a prominent, moveable, often double ring; stem 3-30 mm broad, with ± bulbous base	21
-	Ring absent or attached to the stem; stem often narrower, mostly without a bulbous base	23
21.	Stem densely floccose to scaly, often in a zigzag pattern	<i>Macrolepiota</i> p. 554
-	Stem ± smooth	22
22.	Flesh in cap and stem turning yellowish when bruised; clamps absent	<i>Leucoagaricus nympharum</i> p. 551
-	Flesh in cap and stem unchanged or turning reddish when bruised; clamps present, at least at base of the basidia	<i>Macrolepiota</i> p. 554
23.	Cap sticky to slimy; pileipellis an ixocutis or an ixohymeniderm	24
-	Cap dry; pileipellis not an ixocutis or an ixohymeniderm	25
24.	Cheilo- and pleurocystidia absent; gill trama divergent	<i>Limacella</i> p. 332
-	Cystidia present; gill trama regular	<i>Chamaemyces</i> p. 530
25.	Pileipellis with erect rows of spherical cells (an epithelium)	26
-	Pileipellis different	28
26.	Clamps absent	<i>Leucocoprinus</i> p. 553
-	Clamps present	27
27.	Cap with pulverulent covering	<i>Cystolepiota</i> p. 533
-	Cap surface with small, often pointed scales	<i>Echinoderma</i> p. 535
28.	Cap margin radially sulcate	<i>Leucocoprinus</i> p. 553
-	Cap margin not radially sulcate	29
29.	Clamps present	<i>Lepiota</i> p. 538
-	Clamps absent	30
30.	Cap and lower part of stem with a purplish to porphyry fibrillose- woolly covering; ring absent	<i>Lepiota fuscovinacea</i> p. 542
-	Cap without a purplish to porphyraceous fibrillose-woolly covering <i>or</i> ring distinct	<i>Leucoagaricus</i> p. 548
31(4)	Stem with a floccose to membranous ring or a pronounced ring-zone	32
-	Stem without a ring or a pronounced ring-zone <i>or</i> stem absent	47
32.	On wood	33
-	On soil	38
33.	Cap and stem slimy	<i>Oudemansiella</i> p. 260
-	Cap and stem dry to sticky	34
34.	Gills deeply decurrent	<i>Pleurotus</i> p. 321
-	Gills adnate, adnexed, emarginate to short decurrent	35
35.	Cap and lower part of stem with 2-4 mm long, pointed and projecting scales; sp amyloid	<i>Leucopholiota</i> p. 514
-	Cap and stem smooth or with different scales; sp dextrinoid or without iodine reactions	36
36.	Sp 5-6.5 × 2.5-3 μm	<i>Lentinula</i> p. 302
-	Sp on av > 6.5 μm long	37

37. Frb leathery to woody tough; sp 3-5 μm broad; causing a brown rot
Neolentinus lepideus p. 76
 Frb rather soft; sp 4.5-7.5 μm broad; causing a white rot
Armillaria p. 252
38. Cap with a granulose covering (lens!), often \pm veined underneath this covering
Cystoderma p. 510
 - Cap smooth, radially fibrillose or finely scaly 39
39. Young frb with a membranous universal veil 40
 - Universal veil floccose, cortina-like or slimy 41
40. Sp 2.5-6 μm wide
Floccularia p. 514
 - Sp 6-11 μm wide
Amanita p. 326
41. Gills deeply decurrent; sp amyloid
Catathelasma p. 429
 Gills adnate, adnexed, emarginate to short decurrent; sp with or without
 iodine reactions 42
42. Frb whitish; sp \pm finely echinulate
Tricholomella p. 509
 - Frb coloured; sp smooth 43
43. Sp amyloid or dextrinoid
Squamanita p. 516
 - Sp without iodine reactions 44
44. Frb arising from a common, yellow-buff bulb; smell fruity-aromatic;
 cap greyish or vinaceous
Squamanita odorata p. 517
 - Frb not arising from a yellow-buff bulb; cap variously coloured 45
45. Stem with a conspicuous basal bulb (habitually like a *Phlegmacium*);
 sp ellipsoid to amygdaloid
Leucocortinarius p. 817
 - Stem tapering, cylindrical, clavate or \pm bulbous; sp subglobose to ellipsoid 46
46. Ectomycorrhizal, on soil, often fasciculate; smell farinaceous or
 aromatic
Tricholoma p. 413
 - Saprotrophic, on wood, sometimes on soil covered wood, roots,
 etc., often fasciculate; smell indistinct
Armillaria p. 252
- 47⁽³¹⁾ On wood, stems or roots of herbs, grasses, sedges, etc. 48
 - On soil, turf, mosses, debris, compost, faeces, other fungi, etc. 129
48. Stem distinctly eccentric, lateral or absent 49
 - Stem \pm central 66
49. 'Gills' split longitudinally
Schizophyllum commune p. 251
 - Gills not split longitudinally 50
50. Veil covering the gills when young 51
 - Veil absent 52
51. Frb \pm bell-shaped, dorsally attached
Tectella p. 390
 - Frb \pm tricholomatoid
Lentinula p. 302
52. Gills vein-like or absent 53
 - True gills present 54
53. On deciduous wood; sp c. 1 μm broad
Plicaturopsis p. 187
 - On leaves and stems of monocotyledons, usually in wet places; sp
 $\geq 3.5 \mu\text{m}$ broad
Gloiocephala p. 256
54. Sp amyloid; hymenium sharply delimited from the stem 55
 - Sp dextrinoid or without iodine reactions; hymenium not sharply delimited

	from the stem	57
55.	Gill edge serrate	<i>Lentinellus</i> p. 78
-	Gill edge entire	56
56.	Cap 30-100 mm; gills cream to yellow	<i>Sarcomyxa</i> p. 240
-	Cap 5-30 mm; gills whitish, cream, buff, pale vinaceous to ± violet	<i>Panellus</i> p. 387
57.	Cap with up to 250 µm long, seta-like hairs; sp dextrinoid	<i>Chaetocalathus</i> p. 288
-	Cap without seta-like hairs; sp without iodine reactions	58
58.	Sp globose, subglobose to broadly ellipsoid, $Q_{av} \leq 1.3$	59
-	Sp ellipsoid to cylindrical, $Q_{av} \geq 1.4$	62
59.	Frb > 15 mm wide	60
-	Frb < 15 mm wide	61
60.	Frb white; stem lateral or absent; on coniferous wood	<i>Pleurocybella</i> p. 243
-	Frb yellow to orange brown; stem ± eccentric; on deciduous wood	<i>Omphalotus</i> p. 306
61.	Cap white; cheilocystidia 30-70 µm long	<i>Cheimonophyllum</i> p. 275
-	Cap buff, grey to blackish; cheilocystidia 15-30 µm long	<i>Resupinatus</i> p. 324
62.	With incrustated cheilocystidia (metuloids) often intermixed with thin-walled, capitata cystidia	<i>Hohenbuehelia</i> p. 313
-	Cystidia different or missing	63
63.	Gills edge serrate; smell strong of aniseed	<i>Lentinus suavissimus</i> p. 73
-	Gills edge entire; smell not strong of aniseed	64
64.	Cap 3-8 mm; on dead wood of <i>Pseudotsuga menziesii</i>	<i>Marasmiellus lateralis</i> p. 303
-	Cap larger; mostly on different substrates	65
65.	Frb with lilac colours when young; with thick-walled pleurocystidia	<i>Panus</i> p. 73
-	Frb without lilac colours; without pleurocystidia	<i>Pleurotus</i> p. 321
66(47)	Pileipellis a clavicutis, hymeniderm, paraderm or an epithelium, with or without an ixocutis, with or without scattered, brown setae; cap smooth or finely granulose, without hyphal structures (lens!)	67
-	Pileipellis a cutis or a trichoderm with or without an ixocutis; cap tomentose or with a radial structure (lens!), sometimes imbedded in slime	81
67.	Cap surface finely granulose; pileipellis a paraderm or an epithelium	68
-	Cap surface not granulose; pileipellis a clavicutis or a hymeniderm with or without an ixocutis	69
68.	Cap > 5 mm wide, white or coloured	<i>Cystoderma</i> p. 510
-	Cap < 5 mm wide, white	<i>Mycena</i> p. 352
69.	Stem slimy	70
-	Stem dry	71
70.	Pileipellis a hymeniderm; stem with a thick slime coat; on thin woody substrates like <i>Calluna</i> , <i>Vaccinium</i> , <i>Rubus</i> , etc.	<i>Roridomyces</i> p. 390
-	Pileipellis a cutis or a clavicutis; stem dry or with a thin slime coat; on all kinds of wood	<i>Mycena</i> p. 352
71.	Pileipellis a (ixo)clavicutis; cap surface often rather tough	72
-	Pileipellis a (ixo)hymeniderm, possibly with scattered, brown setae; cap surface normally not tough	76

72. Frb whitish; stem 2-15 mm broad *Ossicaulis* p. 506
 - Some parts of frb coloured *or* stem thinner 73
73. Stem densely velvety, blackish towards base *Flammulina* p. 254
 - Stem not densely velvety, not blackish towards base 74
74. Sp amyloid *Mycena* p. 352
 - Sp without iodine reactions 75
75. Stem base typically surrounded by mycelial felt or hyphal cords; gills well defined and hardly anastomosing *Gymnopus* p. 295
 - Stem base without mycelial felt or hyphal cords; gills well defined or reduced and vein-like, sometimes strongly anastomosing *Marasmiellus*, p. 302
76. Sp globose to subglobose 77
 - Sp ellipsoid to dacryoid 78
77. Sp 6-9.5 x 4-9 μm ; cheilocystidia rather thin-walled; cap 3-30 mm wide *Mycenella* p. 257
 - Sp 8-21 x 7-14 μm ; cheilocystidia mostly thick-walled; cap (5-)10-140 mm wide *Xerula* p. 262
78. Sp $\geq 9 \mu\text{m}$ broad *Xerula radicata* p. 263
 - Sp $< 9 \mu\text{m}$ broad 79
79. Smell strong like garlic *Mycetinis* p. 305
 - Smell not strong like garlic 80
80. Stem rooting to rhizomes of the fern *Pteridium* *Rhizomarasmius* p. 260
 - Not associated with *Pteridium* *Marasmius* p. 288
- 81⁽⁶⁶⁾ Gills reduced, forming low veins or totally absent 82
 - Gills well developed 83
82. Sp without iodine reactions *Hemimycena* p. 265
 - Sp amyloid *Delicatula* p. 277
83. Gills adnate to adnexed, sometimes with a decurrent tooth 84
 - Gills emarginate, arcuate to decurrent 96
84. Cap radially breaking into pointed, appressed to projecting scales 85
 - Cap without such scales 87
85. Stem < 2 mm broad *Crinipellis* p. 288
 - Stem 5-35 mm broad 86
86. Flesh white; with universal veil forming white to buff-coloured scales *Lentinula* p. 302
 - Flesh yellow; without universal veil; on conifers *Tricholomopsis* p. 334
87. Stem 6-30 mm broad, basally with one or few, 0.5-2 mm thick, white rhizomorphs *Megacollybia* p. 285
 - Stem narrower *or* without thick rhizomorphs 88
88. Sp with amyloid warts; stem 5-20 mm wide *Melanoleuca* p. 347
 - Sp smooth; stem up to 8(-12) mm wide 89
89. Gills olive yellow; cheilocystidia absent *Callistosporium* p. 430
 - Gills with different colours, rarely bright yellow; cheilocystidia absent or present 90
90. Pleurocystidia present 91
 - Pleurocystidia absent 93

91.	Sp without iodine reactions; cap whitish	<i>Hemimycena</i> p. 265
-	Sp amyloid <i>or</i> cap darker	92
92.	Pleurocystidia typically 60-100(-160) μm long, clavate to lageniform	<i>Hydropus</i> p. 282
-	Pleurocystidia less conspicuous, mostly with different shape	<i>Mycena</i> p. 352
93.	Sp weakly to distinctly amyloid	94
-	Sp without iodine reactions	95
94.	On wood; frb coloured	<i>Clitocybula</i> p. 277
-	On herbaceous stems; frb white	<i>Resinomyцена</i> p. 389
95.	Frb fragile, mostly whitish	<i>Hemimycena</i> p. 265
-	Frb rather tough, \pm coloured	<i>Marasmiellus</i> p. 302
96(83)	Gills emarginate	97
-	Gills arcuate to decurrent	105
97.	Cap radially breaking into pointed, appressed to projecting scales	<i>Tricholomopsis</i> p. 334
-	Cap without such scales	98
98.	Stem densely velvety, blackish towards base	<i>Flammulina</i> p. 254
-	Stem not densely velvety, not blackish towards base	99
99.	Sp with amyloid warts	<i>Melanoleuca</i> p. 347
-	Sp smooth	100
100.	Sp amyloid	101
-	Sp without iodine reactions	102
101.	Pleurocystidia absent; cap white, buff to greyish	<i>Clitocybula</i> p. 277
-	Pleurocystidia mostly present; colours often different	<i>Mycena</i> p. 352
102.	Cheilocystidia present	<i>Hemimycena</i> p. 265
-	Cheilocystidia absent	103
103.	Gills olive yellow; clamps absent	<i>Callistosporium</i> p. 430
-	Gills with other colours; clamps present	104
104.	Stem base with one or a few, 0.5-2 mm thick, white rhizomorphs; sp 6-10 μm long	<i>Megacollybia</i> p. 285
-	Stem base without thick rhizomorphs; sp 3.5-6.5 μm long	<i>Hypsizygos</i> p. 497
105.	Sp weakly to strongly amyloid	106
-	Sp without iodine reactions	110
106.	Cystidia absent; frb medium sized to rather large; cap strongly depressed <i>or</i> not	<i>Pseudoclitocybe</i> p. 238
-	Cheilo- <i>or</i> pleurocystidia present; frb often small to medium sized; cap not strongly depressed	107
107.	Stem with an orange-brown to reddish brown basal tomentum; cap buff to vivid brown, rarely dull brown	<i>Xeromphalina</i> p. 240
-	Stem without brown basal tomentum; cap often with other colours	108
108.	Gills pale with dark brown edge	<i>Hydropus marginellus</i> p. 284
-	Gill edge not dark brown	109
109.	With resinous pileocystidia	<i>Resinomyцена</i> p. 389
-	Without resinous pileocystidia	<i>Mycena</i> p. 352
110.	Frb rather tough; cap flesh with <i>or</i> without a gelatinous layer	111

- Frb fragile; cap flesh without a gelatinous layer 118
- 111. Smell strong of aniseed *Lentinus suavissimus* p. 73
- Smell absent or different 112
- 112. Flesh yellow *Omphalotus* p. 306
- Flesh white or whitish 113
- 113. Cystidia absent; cap smooth *Pleurotus* p. 321
- Cheilocystidia present; cap smooth or ± scaly 114
- 114. Upper part of flesh gelatinous; cap smooth or tomentose; with
cystidia as incrustated metuloids *Hohenbuehelia* p. 313
- Flesh not gelatinous; cap smooth or scaly; without metuloids 115
- 115. Stem 0.2-1.5 mm broad; mostly on twigs or woody herbaceous stems
Marasmiellus p. 302
- Stem > 1.5 mm broad; on wood 116
- 116. Frb when young with lilac colours; gills forked and anastomosing *Panus* p. 73
- Frb without lilac colours; gills normal 117
- 117. Causing a brown rot; stem 6-40 mm wide *Neolentinus* p. 76
- Causing a white rot; stem 2-10 mm wide *Lentinus tigrinus* p. 73
- 118. Stem with greenish or bluish colours; gills ± pale violet blue *Chromosera* p. 191
- Stem and gills with other colours 119
- 119. Gills yellow to orange; sp deposit white, pale yellow to pinkish 120
- Gills white, greyish to brownish; sp deposit whitish 122
- 120. Sp metachromatic; basidia 1-2-spored; smell aromatic or farinaceous *Haasiella* p. 192
- Sp not metachromatic; basidia mostly 4-spored; smell absent or herb-like 121
- 121. Clamps present; stem flesh sarcodimitic; cap finely scaly towards
the centre *Gerronema xanthophyllum* p. 280
- Clamps absent; flesh not sarcodimitic; cap ± smooth *Chrysomphalina* p. 191
- 122. Clamps absent 123
- Clamps present 124
- 123. Cheilocystidia absent *Chrysomphalina grossula* p. 192
- Cystidia present *Mycena* p. 352
- 124. Gills regularly dichotomously forked; frb with orange colours; pilei-
pellis a trichoderm *Hygrophoropsis* p. 151
- Gills not or irregularly forked; frb mostly without orange colours;
pileipellis a cutis 125
- 125. Cystidia absent; frb small to large 126
- Cheilo- or pleurocystidia present; frb mostly small, relatively long stemmed
and slender 127
- 126. Stem < 8 mm wide *Clitocybe* p. 392
- Stem ≥ 8 mm wide *Hypsizygus* p. 497
- 127. Cap whitish *Hemimycena* p. 265
- Cap darker 128
- 128. Cap with deeply depressed centre to funnel-shaped, dark grey brown
to blackish *Arrhenia epichysium* p. 230

- Cap not deeply depressed, paler or with more bright colours *Mycena* p. 352
- 129(47) On frb of *Russula* or *Lactarius*, may arise from sclerotia or become powdery from clamydospores 130
- Not on frb of basidiomycetes or sclerotia; without clamydospores 134
- 130. Arising from sclerotia 131
- Without sclerotia 132
- 131. Stem bearing short side branches with conidiophores *Dendrocollybia* p. 404
- Stem without side branches *Collybia* p. 403
- 132. Cap strongly fibrillose-scaly *Squamanita* p. 516
- Cap smooth, finely fibrillose or powdery 133
- 133. Clamydospores formed on cap or gills; frb whitish to greyish or brownish *Asterophora* p. 495
- Clamydospores absent; frb whitish *Collybia cirrata* p. 403
- 134. Sp amyloid or with amyloid warts 135
- Sp dextrinoid or without iodine reactions 150
- 135. Sp ornamented 136
- Sp smooth 138
- 136. Sp with an ornamented inner wall and a smooth outer wall, 6-12 μm wide, \pm globose; frb \pm mycenoid *Fayodia* p. 278
- Sp with one ornamented outer wall, 3-6.5 μm wide, globose to ellipsoid; frb \pm clitocyboid to tricholomatoid 137
- 137. Clamps present; frb mostly \pm clitocyboid *Leucopaxillus* p. 409
- Clamps absent; frb collybioid to tricholomatoid *Melanoleuca* p. 347
- 138. Cap with a granulose covering (lens!), often \pm veined underneath this covering *Cystoderma* p. 510
- Cap without a granulose covering 139
- 139. Pleurocystidia present 140
- Pleurocystidia absent 143
- 140. Pleurocystidia 60-170 μm long *Hydropus* p. 282
- Pleurocystidia 20-90 μm long 141
- 141. Stem with an orange-brown to reddish brown basal tomentum; cap buff to vivid brown, rarely dull brown *Xeromphalina* p. 240
- Stem without brown basal tomentum; cap often with other colours 142
- 142. Cap umbilicate, dark brown *Myxomphalia* p. 285
- Cap with different shape or paler *Mycena* p. 352
- 143. Gills reduced, forming low veins *Delicatula* p. 277
- Gills well developed 144
- 144. Frb tricholomatoid with a \pm convex cap; gills \pm emarginate 145
- Frb clitocyboid or omphalinoid, cap depressed *and/or* gills decurrent 147
- 145. Stem brownish yellow in basal part, greyish in upper part *Squamanita contortipes* p. 518
- Stem not notably bicoloured 146
- 146. Pileipellis a cutis to a trichoderm; cap under lens with a radiating structure;

- stem 5-35 mm broad *Porpoloma* p. 412
- Pileipellis a hymeniderm to a paraderm; cap under lens without a radiating structure; stem 1-10 mm broad *Dermoloma* p. 404
147. Sp ± fusiform; gills regularly dichotomously forked *Cantharellula* p. 234
- Sp subglobose to ellipsoid; gills not regularly dichotomously forked 148
148. Stem 20-70 mm broad; frb white to pale cream *Leucopaxillus* p. 409
- Stem 2-10 mm broad; frb coloured 149
149. Clamps absent; cap centre deeply depressed, rather dark and dull brown *Pseudoclitocybe* p. 238
- Clamps present; cap convex to slightly depressed and paler *Pseudoomphalina* p. 238
- 150(134) Pileipellis a clavicutis, a hymeniderm, a paraderm or an epithelium, with or without an ixocutis, possibly with scattered, brown setae; cap smooth and without a radial structure (lens!) 151
- Pileipellis a cutis or a trichoderm with or without an ixocutis; cap tomentose or with radial hyphae (lens!), sometimes imbedded in slime 168
151. Stem in lower part with granulose to floccose remnants of veil 152
- Stem smooth to hairy, without floccose veil remnants 153
152. Stem 0.2-2.2 mm broad *Flammulaster* p. 778
- Stem 3-7 mm broad *Cystodermella* p. 512
153. Pileipellis a clavicutis 154
- Pileipellis a hymeniderm, a paraderm or an epithelium 157
154. Stem thin and black, almost like a horsetail hair *Gymnopus androsaceus* p. 295
- Stem different 155
155. Sp 3-5 µm long *Pseudobaeospora* p. 515
- Sp > 6 µm long 156
156. Sp globose to subglobose; stem pruinose *Mycenella* p. 257
- Sp ellipsoid, dacryoid, fusiform to cylindrical *or* stem not pruinose *Mycena* p. 352
157. Pileipellis a paraderm or an epithelium *Dermoloma* p. 404
- Pileipellis a hymeniderm 158
158. Veil absent; smell farinaceous *Dermoloma* p. 404
- Veil present, but often fugacious; smell different 159
159. Sp on av > 8 µm broad; stem rooting *Xerula* p. 262
- Sp ≤ 8 µm broad; stem mostly not rooting 160
160. Sp globose; gills with conspicuous, 40-70 µm long pleurocystidia *Mycenella* p. 257
- Sp different *or* pleurocystidia small or absent 161
161. Gills adnexed 162
- Gills emarginate to decurrent 165
162. Frb violaceous *Pseudobaeospora* p. 515
- Frb whitish, brownish to greyish 163
163. On rhizomes of the fern *Pteridium* *Rhizomarasmius* p. 260
- In different habitats 164
164. Smell strong of garlic *or* associated with *Dryas* *Mycetinis* p. 305
- Smell different or indistinct; not associated with *Dryas* *Marasmius* p. 288

165. Gills \pm decurrent, often rather thick and fleshy; basidia
25-55 μm long *Camarophylloopsis* p. 188
- Gills emarginate, mostly thin; basidia often shorter 166
166. Frb revivable after drying out *Marasmius* p. 288
- Frb not revivable 167
167. Sp 2-3 μm broad; cap often with bright colours *Rugosomyces* p. 506
- Sp 3-5 μm broad; cap greyish to brownish *Dermoloma* p. 404
- 168(150) Sp ornamented ($\times 1000$) or stellate 169
- Sp smooth 177
169. Sp stellate *Hygroaster* p. 193
- Sp ornamented 170
170. Cheilocystidia present 171
- Cheilocystidia absent 172
171. Sp 2.5-5.5 μm broad, \pm ellipsoid *Gamundia* p. 279
- Sp 6-15 μm broad, globose, subglobose or ellipsoid *Laccaria* p. 658
172. Partial veil cortina-like, present in young frb; frb white *Tricholomella* p. 509
- Veil absent; frb coloured 173
173. Sp 6-15 μm broad *Laccaria* p. 658
- Sp 2.5-5.5(-6.5) μm broad 174
174. Clamps absent *Gerhardtia* p. 496
- Clamps present 175
175. Cap 2-25 mm broad, rather dark brown; stem 0.5-4 mm broad;
sp 6-8 \times 4-6.5 μm *Lyophyllum tylicolor* p. 502
- Cap broader, mostly with different colours; stem thicker; sp often narrower 176
176. Flesh and gills turning bluish to blackish when bruised *Lyophyllum leucophaeatum* p. 498
- Flesh and gills not changing when bruised *Lepista* p. 405
177. Gills absent; frb \pm funnel-shaped *Cotylidia* p. 66
- Gills present; frb variously shaped 178
178. Frb omphalinoid, clitocyboid to crepidotoid; gills mostly strongly decurrent 179
- Frb tricholomatoid, marasmiod, collybioid to mycenoid; gills adnexed,
adnate, emarginate to short decurrent 200
179. Gills regularly dichotomously forked; gills white to orange *Hygrophoropsis* p. 151
- Gills not or irregularly forked; gills mostly with different colours 180
180. Pleurocystidia thick-walled, as apically incrustated metuloids *Faerberia* p. 72
- Without such pleurocystidia 181
181. Basidia long and slender, generally 6-9 times as long as broad; gills
thick and waxy; cap often with bright colours or slimy 182
- Basidia mostly rather broad; gills thin or thick; cap mostly whitish,
greyish or brownish, not slimy 183
182. In forests and parks forming ectomycorrhiza with trees; gill trama
divergent; cap mostly white, rose, buff, brown to blackish *Hygrophorus* p. 212
- Mostly in grassland, not directly associated with trees; gill trama
regular to irregular; cap white, brown to grey or with brighter colours *Hygrocybe* p. 194

183. Clamps absent 184
 - Clamps present 188
184. Lichenized with greyish green lobes or green granules of thallus at base of the frb *Lichenomphalia* p. 223
 - Not lichenized 185
185. Gills forked and intervenose/ anastomosing 186
 - Gills normal 187
186. Gills whitish; stem 19-60 x 0.5-4 mm *Cantharellopsis* p. 66
 - Gills pale buff to pale brown; stem 7-20 x 1-2 mm *Arrhenia rickenii* p. 232
187. On liverworts, rarely on mosses *Loreleia* p. 68
 - On soil under *Nothofagus* *Gerronema minutum* p. 280
188. Frb pale pink *Contumyces* p. 66
 Frb with different colours 189
189. Frb small and white; stem 0.1-2 mm broad; cheilocystidia present or absent *Hemimycena* p. 265
 - Frb with different colours or with thicker stem; cheilocystidia mostly absent 190
190. Cap and stem minutely pubescent by protruding cystidia (lens!); with mosses or liverworts, probably parasitic 191
 - Cap smooth, stem smooth, rarely pubescent; habitat different 192
191. With the liverwort *Blasia pusilla* *Blasiphalia* p. 65
 - With mosses *Rickenella* p. 69
192. Stem 4-70 mm broad 193
 - Stem 0.5-4(-6) mm broad 195
193. Stem conspicuously clavate and soft fleshed; gill trama irregular *Ampulloclitocybe* p. 190
 - Stem not conspicuously clavate and soft fleshed; gill trama regular 194
194. Sp ± dactyoid; cap becoming funnel-shaped, velvety to finely scaly, not hygrophorous *Infundibulicybe* p. 310
 - Sp subglobose, ellipsoid to fusiform or cylindrical; cap convex to depressed, smooth to finely scaly, hygrophorous or not *Clitocybe* p. 392
195. Cap ± pale brown, smooth; frb growing on/ in *Sphagnum* *Gyroflexus* p. 68
 - Cap or habitat different 196
196. Hymenophore ± veined *Arrhenia* p. 226
 - Hymenophore of gills 197
197. On debris in forests or grassland; frb whitish to greyish; smell often distinct *Clitocybe* p. 392
 - Mostly on naked soil, mosses or lichens; frb brownish to brownish grey; smell ± indistinct 198
198. Cap scaly *Arrhenia* p. 226
 - Cap smooth 199
199. Cap and stem ± reddish brown or yellowish brown; gills distinctly paler *Omphalina* p. 235
 - Cap and stem more dull coloured, greyish brown to blackish; gills only slightly paler *Arrhenia* p. 226
- 200(178) Gills distant; with one or few, 1-2 mm thick rhizomorphs at the base *Megacollybia* p. 285

-	Gills not distant <i>or</i> rhizomorphs absent	201
201.	Cap viscid to slimy	202
-	Cap dry	206
202.	Gills thin, medium spaced to crowded, \pm emarginate	<i>Tricholoma</i> p. 413
-	Gills rather thick, \pm distant, narrowly to broadly adnate or short decurrent	203
206.	Stem viscid	204
-	Stem dry	205
204.	Stem viscid over entire length	<i>Hygrocybe</i> p. 194
-	Stem top dry	<i>Hygrophorus</i> p. 212
205.	Entire frb with yellow, orange or red colours	<i>Hygrocybe</i> p. 194
-	At least gills or stem whitish or more dull coloured	<i>Hygrophorus</i> p. 212
206.	Cap buff yellow to yellowish brown with brown scales at centre; in peat bogs	<i>Armillaria ectypa</i> p. 252
-	Cap scales absent or concolorous with background; habitat mostly different	207
207.	Basidia with siderophilous granulation	208
-	Basidia without siderophilous granulation	210
208.	Gills very crowded, yellow, bruising red or whitish and unchanged	<i>Calocybe</i> p. 496
-	Gills crowded to medium spaced, whitish to cream, greyish or brownish, unchanged or turning bluish or blackish, less often turning orange when bruised	209
209.	Cap and often stem with bright colours: pinkish, bluish, yellowish or purplish brown	<i>Rugosomyces</i> p. 506
-	Cap and stem with dull colours; greyish to brownish, less often whitish	<i>Lyophyllum</i> p. 498
210.	Stem bearing short side branches with conidiophores	<i>Dendrocollybia</i> p. 404
-	Stem without side branches	211
211.	Sp on av < 6 μ m long	212
-	Sp on av > 6 μ m long	219
212.	Gills and flesh yellow	213
-	Gills and flesh whitish, greyish or brownish	214
213.	Stem 2-7 mm broad	<i>Callistosporium</i> p. 430
-	Stem > 7 mm broad	<i>Tricholoma</i> p. 413
214.	Gills broadly adnate to short decurrent	215
-	Gills narrowly adnate, adnexed or emarginate	216
215.	Sp globose or subglobose; smell indistinct; clamps absent	<i>Camarophyllopsis schulzeri</i> p. 188
-	Sp mostly distinctly elongate, rarely subglobose; smell mostly distinct, farinaceous, aromatic or like aniseed or cumarin; clamps present	<i>Clitocybe</i> p. 392
216.	Cap 1-20 mm	217
-	Cap > 20 mm	218
217.	Sp \leq 4.5 μ m long; frb pale buff or violet	<i>Pseudobaeospora</i> p. 515
-	Sp \geq 4.5 μ m long; frb whitish	<i>Collybia</i> p. 403
218.	Cap whitish with red spots <i>and/or</i> gills serrate	<i>Rhodocollybia</i> p. 307
-	Cap not whitish with red spots; gills not serrate	<i>Tricholoma</i> p. 413

219. Basidia long and slender, generally 6-9 times as long as broad; gills thick and waxy; cap often with bright colours or slimy 220
 - Basidia mostly rather broad; gills thin or thick; cap mostly whitish, greyish or brownish, not slimy 221
220. In forests and parks forming ectomycorrhiza with trees; gill trama divergent; cap mostly white, rose, buff, brown to blackish *Hygrophorus* p. 212
 - Mostly in grassland, not directly associated with trees; gill trama regular to irregular; cap white, brown to grey or with brighter colours *Hygrocybe* p. 194
221. At least a certain part of sp dextrinoid at maturity *Rhodocollybia* p. 307
 - Sp without iodine reactions 222
222. Gills buff yellow to yellow 223
 - Gills white, buff, greyish, brownish, bluish or pinkish 224
223. Smell gas-like or farinaceous; stem > 5 mm broad *Tricholoma* p. 413
 - Smell indistinct or faintly fruity; stem 2-7 mm broad *Callistosporium* p. 430
224. Gills broadly adnate to short decurrent; stem solid, not very fragile; cheilocystidia absent *Clitocybe* p. 392
 - Gills adnate or emarginate or stem hollow and fragile; cheilocystidia present or absent 225
225. Stem > 5 mm broad; gills emarginate; mycorrhizal *Tricholoma* p. 413
 - Stem < 5 mm broad; gills adnate; not mycorrhizal 226
226. Frb collybioid, not conical, rather tough *Marasmiellus* p. 302
 - Frb mycenoid, often conical 227
227. Cheilocystidia absent or poorly differentiated, only marginally longer than the basidia *Hemimycena* p. 265
 - Cheilocystidia well differentiated, lageniform, less often clavate 228
228. Cap dark grey to brownish grey *Hydropus conicus* p. 283
 - Cap with brighter colours *Mycena* p. 352

Key D: Sp deposit pink or brownish pink

1. Universal veil membranous, forming a volva at stem base *Volvariella* p. 344
 - Universal veil absent 2
2. Gills longitudinally split *Schizophyllum commune* p. 251
 - Gills not longitudinally split 3
3. Sp bluntly verrucose to spiny 4
 - Sp smooth, but may be angular, nodulose or with longitudinal ridges 6
4. On wood; cap with veins forming a net structure *Rhodotus* p. 261
 - On soil; cap without veins forming a net structure 5
5. Sp not cyanophilous, bluntly verrucose *Rhodocybe* p. 491
 - Sp cyanophilous, mostly sharply verrucose to spiny *Lepista* p. 405
6. Sp angular, nodulose or with longitudinal ridges 7
 - Sp not angular, nodulose or with longitudinal ridges 8
7. Sp angular or nodulose-angular, also in side view, without longitudinal ridges *Entoloma* p. 433
 - Sp with longitudinal ridges, ± ellipsoid in side view, angular in polar

	view	<i>Clitopilus</i> p. 431
8.	Stem absent	<i>Phyllotopsis</i> p. 243
-	Stem central	9
9.	Smell fishy or like cucumber	<i>Macrocystidia</i> p. 312
-	Smell different or indistinct	10
10.	Gills decurrent	11
-	Gills free	12
11.	Gills pale ochraceous, later tinged pinkish brown	<i>Lepista martiorum</i> p. 406
-	Gills whitish to pale pinkish	<i>Clitocybe</i> p. 392
12.	Stem with a ring	<i>Leucoagaricus</i> p. 548
-	Stem without a ring	<i>Pluteus</i> p. 335

Key E: Sp deposit greenish

1.	Cap > 50 mm; gills and sp deposit very pale greenish	<i>Chlorophyllum</i> p. 531
-	Cap 10-30 mm; gills vinaceous red or bluish green; sp deposit greenish when fresh, later fading to vinaceous red or brown	<i>Melanophyllum</i> p. 557

Key F: Sp deposit pale to vivid or dull brown

1.	Stem eccentric or absent	2
-	Stem ± central	7
2.	Gills strongly reduced	<i>Chromocyphella</i> p. 862
-	Gills normally developed	3
3.	Sp with germ pore	<i>Psilocybe</i> p. 844
-	Sp without germ pore, or germ pore very indistinct	4
4.	Gills anastomosing near the stem or branched	<i>Tapinella</i> p. 150
-	Gills not anastomosing or branched	5
5.	Sp thick-walled, smooth	<i>Pleuroflammula</i> p. 908
-	Sp thin-walled, smooth or ornamented	6
6.	Frb vinaceous buff, greyish to olivaceous brown; sp smooth, broadly ellipsoid	<i>Simocybe haustellaris</i> p. 908
-	Cap paler or more vividly coloured; sp smooth or ornamented, variously shaped	<i>Crepidotus</i> p. 864
7.	Sp ornamented (immersion!) or calyptrate, without germ pore	8
-	Sp smooth <i>and/or</i> with a germ pore	30
8.	Metuloid cheilo- and pleurocystidia present	9
-	Metuloid cheilo- and pleurocystidia absent	11
9.	Metuloid cystidia amyloid in upper part	<i>Mythicomycetes</i> p. 907
-	Metuloid cystidia without iodine reactions	10
10.	Sp verrucose; cap hygrophanous, translucently striate	<i>Galerina nana</i> p. 800
-	Sp nodulose-angular or spiny; cap not hygrophanous or translucently striate	<i>Inocybe</i> p. 868
11.	Cap, stem and lower side of ring densely pulverulent	<i>Phaeolepiota</i> p. 515

- Cap and stem not pulverulent; ring present or absent 12
- 12. Stem viscid 13
- Stem dry 14
- 13. Veil absent *Phaeocollybia* p. 822
- Veil present, cortina-like or glutinous *Cortinarius* p. 661
- 14. Gills yellowish, at least when young 15
- Gills without yellow tinges 18
- 15. Frb very thin-fleshed 16
- Frb ± thick-fleshed 17
- 16. Cap not distinctly hygrophanous; under *Crataegus* *Tubaria conspersa* p. 784
- Cap hygrophanous; not associated with *Crataegus* *Galerina* p. 785
- 17. On soil *Cortinarius* p. 661
- On wood or woody debris *Gymnopilus* p. 857
- 18. Gills ± decurrent; cap with a fringe of hairs at margin when young *Ripartites* p. 412
- Gills adnate, adnexed or emarginate; cap hardly with a fringe of marginal hairs 19
- 19. Stem ± rooting 20
- Stem not rooting 22
- 20. Cap dry; cheilocystidia absent in most species *Cortinarius* p. 661
- Cap viscid; cheilocystidia present 21
- 21. Cap conical, later with a prominent papilla or umbo *Phaeocollybia* p. 822
- Cap convex, without a pronounced papilla or umbo *Hebeloma* p. 804
- 22. With *Nothofagus*; stem with a hanging ring *Descolea* p. 644
- With other hosts; stem mostly without a hanging ring 23
- 23. Cheilocystidia absent or little differentiated; gill edge not white fimbriate *Cortinarius* p. 661
- Cheilocystidia well differentiated and numerous; gill edge sometimes white fimbriate under lens 24
- 24. Cap viscid to slimy, shiny when dry 25
- Cap dry 26
- 25. Cap yellow, ochre, yellowish brown, hygrophanous and ± translucently striate at margin *Galerina* p. 785
- Cap whitish or greyish brown or reddish brown with paler margin, not or slightly hygrophanous, not translucently striate *Hebeloma* p. 804
- 26. Smell strong and sweetish *Hebeloma hetieri* p. 816
- Smell farinaceous, radish-like or indistinct 27
- 27. Cheilocystidia lecythiform, < 30 µm long *Conocybe dumetorum* p. 644
- Cheilocystidia with a different shape 28
- 28. Pileipellis an (ixo-)epithelium or an (ixo-)paraderm; on soil in damp habitats, often in association with *Alnus*, *Salix*, etc. *Naucoria* p. 817

-	Pileipellis an (ixo-)cutis; on wood, soil or litter	29
29.	Frb thin-fleshed and fragile; not mycorrhizal	<i>Galerina</i> p. 785
-	Frb ± thick-fleshed; mycorrhizal	<i>Cortinarius</i> p. 661
30(7)	Sp with germ pore visible in a light microscope	31
-	Sp without (visible) germ pore	63
31.	Pleurocystidia present as metuloids	32
-	Metuloids absent	33
32.	Cap radially fibrillose	<i>Inocybe</i> p. 868
-	Cap smooth	<i>Psathyrella</i> p. 586
33.	Pleurocystidia present as chrysocystidia	34
-	Chrysocystidia absent	35
34.	Cap greenish; on soil	<i>Stropharia cyanea</i> p. 853
-	Cap ± yellow or orange; or wood or apparently on soil	<i>Pholiota</i> p. 837
35.	Cap viscid to slimy	36
-	Cap dry or at most slightly greasy	49
36.	Gills free; stem hollow and fragile; cap margin ± radially sulcate	<i>Bolbitius</i> p. 624
-	Gills adnexed, adnate or emarginate; stem not hollow or fragile; cap margin not radially sulcate	37
37.	In <i>Sphagnum</i> or other mosses in fens	38
-	On soil, organic debris, dung or wood	39
38.	Sp 12-16 x 7-10 µm	<i>Phaeogalera stagnina</i> p. 837
-	Sp 8-10 x 4.5-5.5 µm	<i>Pholiota henningsii</i> p. 842
39.	On soil or organic debris, including small twigs and wood chips or on dung	40
-	On wood	44
40.	Sp deposit dark reddish brown; stem 1-3 mm broad	<i>Psilocybe</i> p. 844
-	Sp yellowish brown to greyish brown or rusty brown or stem > 3 mm broad	41
41.	Pileipellis an (ixo-)hymeniderm	<i>Agrocybe</i> p. 826
-	Pileipellis an (ixo-)cutis or an (ixo-)trichoderm	42
42.	Cap not hygrophanous, not translucently striate	<i>Pholiota</i> p. 837
-	Frb distinctly hygrophanous, ± translucently striate	43
43.	Cap dark brown, greyish brown to olive brown	<i>Phaeogalera dissimulans</i> p. 837
-	Cap with more vivid, yellow to ochre, orange brown or reddish brown colours	<i>Galerina</i> p. 785
44.	Pleurocystidia present	45
-	Pleurocystidia absent	46
45.	Pileipellis an (ixo-)cutis or an (ixo-)trichoderm	<i>Pholiota</i> p. 837
-	Pileipellis an (ixo-)hymeniderm	<i>Agrocybe</i> p. 826
46.	Sp 11-14 x 5.5-7.5 µm	<i>Hemistropharia</i> p. 831
-	Sp < 11 µm long	47
47.	Stem (13-)15-35 mm broad; sp deposit dull brown	<i>Hemipholiota</i> p. 830
-	Stem ≤ 12 mm broad; sp deposit cinnamon to rusty brown	48
48.	Cap notably hygrophanous; sp with a large germ pore	<i>Kuehneromyces</i> p. 836

- Cap not or weakly hygrophanous; sp with a small germ pore *Flammula* p. 785
- 49⁽³⁵⁾ On wood 50
- On soil or organic debris, including small twigs or on dung 56
50. Stem (13-)15-35 mm broad *Hemipholiota* p. 830
- Stem \leq 15 mm broad 51
51. Pleurocystidia present 52
- Pleurocystidia absent 53
52. Sp \pm thick-walled, yellowish brown in a light microscope; smell farinaceous *and/or* frb with a ring *Agrocybe* p. 826
- Sp thin-walled, pale and dull brown in a light microscope; smell not farinaceous; frb without a ring *Psathyrella* p. 586
53. Sp with a large and distinct germ pore; cap notably hygrophanous *Kuehneromyces* p. 836
- Sp with a small or indistinct germ pore; cap hygrophanous or not 54
54. Cap distinctly yellow when young *Pholiota tuberculosa* p. 838
- Cap not distinctly yellow 55
55. Veil absent; frb often \pm olivaceous *Simocybe* p. 908
- Veil present; frb not olivaceous *Flammulaster* p. 778
56. Cheilocystidia lecythiform 57
- Cheilocystidia not lecythiform 58
57. Cheilocystidia up to 45 μ m long *Pholiotina brunnea* p. 654
- Cheilocystidia up to 30 μ m long *Conocybe* p. 626
58. Sp coarsely verrucose *Panaeolina* p. 646
- Sp smooth or finely punctate-rough 59
59. Entire frb with yellowish colours, in particular when young *Flammulaster limulatus* p. 781
- Frb without yellowish colours, or only cap tinged yellowish 60
60. Sp deposit yellowish brown to rusty brown; frb fragile *Pholiotina* p. 651
- Sp deposit more dull brown to dark brown; frb fragile or robust 61
61. Pileipellis an (ixo-)cutis of distinctly elongate elements *Psilocybe* p. 844
- Pileipellis a paraderm or an epithelium, of \pm isodiametrical elements 62
62. Sp thick-walled, yellowish brown in a light microscope; smell farinaceous *Agrocybe* p. 826
- Sp thin-walled, pale and dull brown in a light microscope; smell not farinaceous *Psathyrella* p. 586
- 63⁽³⁰⁾ Cap, stem and lower side of ring densely pulverulent *Phaeolepiota* p. 515
- Cap and stem not pulverulent; ring present or absent 64
64. Cap distinctly fibrillose, felty, granulose or innately finely scaly, at least in outer part 65
- Cap \pm smooth or pruinose, but sometimes with whitish veil remnants at margin 73
65. Gills \pm decurrent, \pm anastomosing, at least near the stem 66
- Gills emarginate, adnexed, adnate to short decurrent, not anastomosing 67
66. Gills yellow, distant; sp 11-13 \times 4-5 μ m *Xerocomus pelletieri* p. 175
- Gills buff to brown, crowded; sp \leq 11 μ m long *Paxillus* p. 160
67. Veil minutely to distinctly granulose, of spherical elements *Flammulaster* p. 778

-	Veil fibrillose, floccose or membranous, of elongate hyphae or absent	68
68.	Sp deposit dull brown	69
-	Sp deposit buff, pale brown, yellow brown or rusty brown	71
69.	On soil, ectomycorrhizal	<i>Inocybe</i> p. 868
-	On wood or herbaceous stems, saprotrophic	70
70.	Veil absent; cap pruinose to felty	<i>Simocybe</i> p. 908
-	Veil present; cap felty to scaly	<i>Phaeomarasmius</i> p. 781
71.	Frb dominantly yellow; cap dry or viscid; with or without chrysocystidia	<i>Pholiota</i> p. 837
-	Frb without yellow colours; cap dry; without chrysocystidia	72
72.	Veil absent; pileocystidia present	<i>Simocybe</i> p. 908
-	Veil fibrillose or floccose; pileocystidia absent	<i>Tubaria</i> p. 782
73.	Cap ± viscid, shiny when dry	74
-	Cap dry	80
74.	Stem ± rooting; cap conical, later with a prominent papilla or umbo	<i>Phaeocollybia</i> p. 822
-	Stem not rooting; cap convex, often with a rounded umbo	75
75.	Sp 5-6 × 3-4 μm	<i>Stagnicola</i> p. 910
-	Sp ≥ 6 μm long	76
76.	Pileipellis an (ixo-)hymeniderm	77
-	Pileipellis an (ixo-)cutis	78
77.	Frb thick-fleshed; pleurocystidia present	<i>Agrocybe erebia</i> p. 826
-	Frb thin-fleshed; pleurocystidia absent	<i>Pholiotina</i> p. 651
78.	Stem > 5 mm broad	<i>Pholiota</i> p. 837
-	Stem < 4 mm broad	79
79.	Cap dark brown, greyish brown to olive brown	<i>Phaeogalera dissimulans</i> p. 837
-	Cap with more vivid, yellow to ochre, orange brown or reddish brown colours	<i>Galerina</i> p. 785
80.	Cheilo- and pleurocystidia 60-100 × 12-24 μm, ± fusiform; smell strong of cucumber or fish	<i>Macrocyttidia</i> p. 312
-	Cheilo- and pleurocystidia not so large and conspicuous; smell different or indistinct	81
81.	Cheilocystidia lecythiform, < 30 μm long	<i>Conocybe</i> p. 626
-	Cheilocystidia not lecythiform or > 30 μm long	82
82.	Pileipellis a hymeniderm	83
-	Pileipellis a cutis or a trichoderm	85
83.	Sp deposit yellowish brown to rusty brown	<i>Pholiotina</i> p. 651
-	Sp deposit dull brown to dark brown	84
84.	Veil present; cap strongly hygrophanous; frb very fragile, without an olivaceous tinge	<i>Psathyrella</i> p. 586
-	Veil absent; cap only slightly hygrophanous; frb not very fragile, often with an olivaceous tinge	<i>Simocybe</i> p. 908
85.	Frb ± mycenoid, hygrophanous, yellow to ochre, orange brown or reddish brown	<i>Galerina</i> p. 785

- Frb ± collybioid, hygrophanous or not, often more dull coloured 86
- 86. Veil absent; pileocystidia present *Simocybe* p. 908
- Veil present, fibrillose, floccose or membranous; pileocystidia absent *Tubaria* p. 782

Key G: Sp deposit very dark brown, dark purplish brown or black

- 1. Stem eccentric or absent *Psilocybe* p. 844
- Stem ± central 2
- 2. Gills long decurrent 3
- Gills free, emarginate, adnexed, adnate to short decurrent 5
- 3. Stem 1-4 mm broad; sp 9-14 × 5-7 μm, with rounded warts *Melanomphalia* p. 861
- Stem ≥ 6 mm broad; sp ≥ 15 μm long, smooth 4
- 4. Veil slimy; gills whitish when young, later greyish to black; sp without iodine reactions *Gomphidius* p. 154
- Veil dry; gills tinged buff or brown; sp dextrinoid *Chroogomphus* p. 153
- 5. Sp ornamented 6
- Sp smooth 12
- 6. Cap radially fibrillose or scaly 7
- Cap smooth, but often covered with universal veil 8
- 7. Gills mottled, with white fimbriate edge; stem 3-13 mm broad; sp with germ pore *Lacrymaria* p. 583
- Gills not mottled or with white fimbriate edge; stem 1-4 mm broad; sp without germ pore *Melanomphalia* p. 861
- 8. Cap becoming radially grooved in outer part 9
- Cap not radially grooved 10
- 9. Pileocystidia present *Coprinellus* p. 558
- Pileocystidia absent *Coprinopsis* p. 568
- 10. Gill colour not marbled *Psathyrella* p. 586
- Gill colour marbled 11
- 11. Sp deposit dark brown; sp distinctly verrucose *Panaeolina* p. 646
- Sp deposit black; sp finely asperulate (immersion) *Panaeolus olivaceus* p. 648
- 12. Cap becoming radially grooved in outer part 13
- Cap not radially grooved 16
- 13. Cap with universal veil 14
- Cap without veil 15
- 14. Pileocystidia present; veil granulose to floccose *Coprinellus* p. 558
- Pileocystidia absent; veil granulose or fibrillose *Coprinopsis* p. 568
- 15. Stem entirely smooth; cap smooth or with long, brown setiform hairs *Parasola* p. 584
- Stem and cap pruinose from hyaline cystidia *Coprinellus* p. 558
- 16. Gills free; cap dry 17
- Gills adnexed to broadly adnate; cap dry or viscid 19

17. Cap \pm cylindrical, later bell-shaped, deliquescent *Coprinus* p. 532
 - Cap conical, hemisphaerical or convex, not deliquescent 18
18. Cap mostly hygrophanous, often translucently striate; stem fragile;
 veil mostly fibrillose, less often forming a membranous ring *Psathyrella* p. 586
 - Cap not hygrophanous or translucently striate; stem not fragile;
 veil present as a membranous ring or ring zone *Agaricus* p. 519
19. Gills mottled *Panaeolus* p. 646
 - Gills not mottled 20
20. Stem viscid to slimy *and/or* cap with greenish colours *Stropharia* p. 851
 - Stem dry; cap without greenish colours 21
21. Chrysocystidia absent 22
 - Chrysocystidia present 25
22. Sp thin-walled, not hexagonal; pleurocystidia often present and
 conspicuous; cheilocystidia mostly $> 10 \mu\text{m}$ broad *Psathyrella* p. 586
 - Sp \pm thick-walled *and/or* hexagonal; pleurocystidia absent;
 cheilocystidia $< 10 \mu\text{m}$ broad 23
23. Stem with fibrillose veil or seemingly without veil *Psilocybe* p. 844
 - Stem with a membranous ring 24
24. Sp \pm hexagonal; on dung *Psilocybe* p. 844
 - Sp ellipsoid to ovoid; on soil or rotten wood *Stropholoma* p. 855
25. On humus, herbaceous litter, dung or among mosses 26
 - On wood, sometimes on buried wood, wood chips or sawdust 27
26. Stem with a ring that is often striate or grooved on the upper side,
 sometimes sfugacious *Stropharia* p. 851
 - Stem without a ring; veil absent or very fugacious and cortina-like *Hypholoma* p. 832
27. Stem with a well developed and persistent membranous ring *Stropharia* p. 851
 - Stem with a fugacious ring or cortina-like ring zone 28
28. Sp $\leq 9 \mu\text{m}$ long; frb often yellowish *Hypholoma* p. 832
 - Sp $\geq 10 \mu\text{m}$ long; frb not yellowish *Stropholoma* p. 855

Agaricus L.: Fr. HENNING KNUDSEN, CHRISTIAN LANGE & TOMMY KNUTSSON

Psalliota (Fr.) P. Kumm., *Allopsalliota* Nauta & Bas

Frb with cap, free, dark brown gills and central stem with a membranous ring. Cap 20-200 mm, at first almost spherical, soon expanded and convex to almost plane, smooth, fibrillose or scaly, with even margin, white, yellow, grey or purplish, dry, in some species with remnants of veil. Gills free, broad to narrow, crowded to very crowded, whitish, but soon pink or pinkish grey, becoming dark brown or greyish brown. Stem 20-140 x 4-40 mm, cylindrical or slightly swollen at the middle, in some species with a bulbous base or tapering, with a narrow, central cavity or solid, mostly white, but also yellowish, brownish or greyish, with a persistent or more often a loose membranous ring, in some species with membranous remnants of the veil below the ring, above ring smooth or rarely floccose, below ring smooth or floccose scaly. Ring variable, either thick, two layered with cogwheel-like scales on the underside, or one layered, thin and narrow, membranous to cortina-like and fugacious, hanging or ascending. Flesh white, but often discolouring pink, red or brownish, yellowish or yellow when cut or bruised. An orange reaction (Schäffer reaction) occurs in some species on the cuticle when aniline is mixed with nitric acid. Smell either absent or recalling bitter almonds (benzaldehyde), fish, urine, ink (carbolic) or acidulous. Taste mild or acidulous, rarely unpleasant. Sp deposit dark brown.

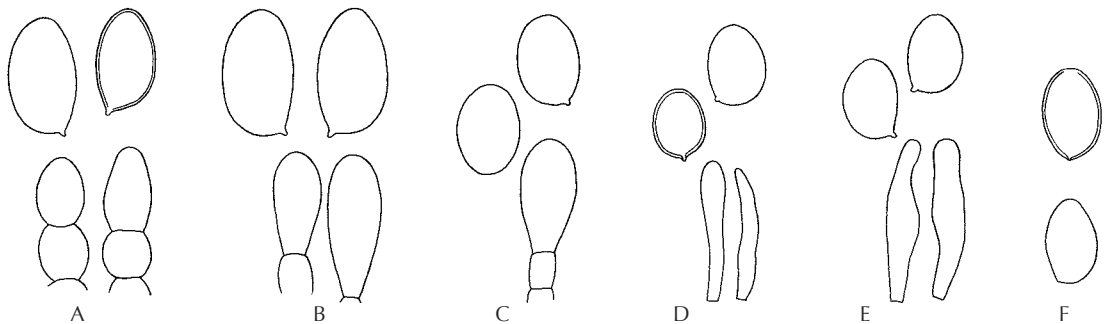
Sp ellipsoid to ovoid or subglobose, smooth, thick-walled, brown, often with granular contents, in most species without germ pore. Cheilocystidia present in most species, hyaline or ± brown. Basidia 4(-2)-spored, hyaline to brown. Pileipellis a cutis, in some species with terminal hyphae coloured and differentiated. Clamps absent.

Saprotrophic, in open land on various types of grasslands, dunes and coastal meadows, in deciduous and coniferous forests and in man-made habitats such as gardens, parks, roadsides, and manure mixed with straw, on naturally rich, calcareous or clayey soil as well as on fertilized soil. Sometimes forming conspicuous fairy-rings. Spring to late autumn. Solitary or gregarious, sometimes in abundance.

38 species in the key, but species delimitation is far from settled and the infrageneric division is also still tentative.

The general look of the frb is strongly affected by the weather and by ecological conditions often resulting in aberrant frb being difficult to identify. Especially variable is the cap cuticle, where scales may be ± pronounced, the cuticle ± rimose, the colour ± yellow depending on the amount of direct sunshine to which the frb has been exposed, but also the presence/absence of scales on the stem is variable. Likewise the spore size is variable, and in some cases this has led to the description of closely related taxa only separated by spore size.

Lit.: Bohus 1969, 1974, 1975, 1976, 1978, 1980, Capelli 1984, Galli 2004, Heinemann 1977, 1978, Møller 1950, 1952, Nauta in Noordeloos et al. 2001, Pilát 1951, Wasser 1979.



Spores and cheilocystidia: A: *Agaricus augustus*, B: *A. urinascens*, C: *A. arvensis*, D: *A. bitorquis*, E: *E. bernardii*, F: *A. campestris*.

1. Stem base immediately yellow when cut or rubbed; smell unpleasant, metallic or ink-like 2
 - Stem base unchanging or slightly reddish or yellow when cut or rubbed; smell pleasant or unpleasant 4

2. Cap smooth, white, when sun-exposed often turning mouse grey and eventually cracking radially or into irregular patches. Cap 50-130 mm, bell-shaped to angular, expanding to plane; gills crowded, pinkish grey, with age dark chocolate brown; stem 50-100 x 10-15 mm, cylindrical with a clavate base, with a large membranous ring with scaly underside; flesh strongly yellowing on rubbing, especially at cap margin and stem base; smell carbolic, ink-like, especially when cooked; taste slightly unpleasant or indistinct. Sp 4.5-6.5 x 3.5-5.5 μm , ellipsoid; cheilocystidia 15-25 μm , broadly pear-shaped to ellipsoid. In parks, lawns, cemeteries, flowerbeds and other human influenced places, rarely in natural forests and grassland, often gregarious and forming fairy rings; summer to autumn; occasional in temp.-hemib.; DK (LC), NO (LC), SE (LC). – FE 1:503, Phil 244c, R&H 407, Svp 28:17, Ves 286, ☉. – Slightly poisonous.

A. xanthodermus Genev. (*Psalliota* x. (Genev.) Richon & Roze, *P. x.* (Genev.) Richon & Roze var. *grisea* A. Pearson, *A. xanthodermus* (Genev.) var. *griseus* (A. Pearson) Bon & Cappelli, *A. xanthodermus* Genev. var. *lepiotoides* Maire, 'xanthoderma'. See note p. 911.

 - Cap with distinct appressed fibrils, brown, grey brown or dark grey to black 3

3. Cap with dark grey to black fibrils. Cap 50-150 mm, first bell-shaped to angular, expanding to plane, towards the edge radially fibrillose, exposing the white flesh; gills crowded, first pinkish grey, with age dark chocolate brown; stem 60-100 x 10-15 mm, cylindrical with \pm abrupt clavate base, silky, white to grey brown, with a large membranous ring with a thick, greyish underside, cracking into irregular scales; flesh yellowing on rubbing, especially at cap margin and stem base, with age turning reddish brown; smell carbolic, ink-like; taste indistinct. Sp 4.5-6.5 x 3-4 μm , ellipsoid; cheilocystidia 10-15 μm wide, clavate to pear-shaped. In parks, shrubs and forest edges on rich soil; autumn; rare in temp.-hemib., very rare in FI; DK (VU), FI (CR, V: Houtskari), NO (LC), SE (LC). – B&K 4:188, FE 1:509, 511, Friesia 4: pl. 20a, Phil 244a, Svp 28:21. – Slightly poisonous.

A. moelleri Wasser (*A. xanthodermus* Genev. var. *obscuratus* Maire, *Psalliota meleagris* Jul. Schäff. var. *o.* (Maire) F.H. Møller, *Agaricus meleagris* (Jul. Schäff.) Imbach var. *terricolor* F.H. Møller nom. illeg., *Psalliota meleagris* Jul. Schäff. var. *terricolor* F.H. Møller nom. illeg., *Agaricus praeclaresquamosus* A.E. Freeman var. *terricolor* (F.H. Møller) Bon & Cappelli, *Psalliota meleagris* Jul. Schäff., *A. m.* (Jul. Schäff.) Imbach non Sowerby, *A. moelleri* Wasser var. *m.* (Jul. Schäff.) Rauschert, *A. praeclaresquamosus* A.E. Freeman, *A. placomyces* Peck s. auct.)

 - Cap with grey-brown to hazel-brown fibrils. Cap 50-130 mm, first bell-shaped to angular, expanding to plane, towards the edge cracking into appressed fibrils, exposing the white flesh; gills crowded, first pinkish grey, with age dark chocolate brown; stem 50-80 x 7-15 mm, cylindrical with a \pm abrupt clavate base, silky, white to grey brown, with large membranous ring with scaly, faintly brown underside; flesh yellowing on rubbing, especially at cap margin and stem base, but turning reddish after a while; smell carbolic, ink-like; taste indistinct. Sp 4.5-6 x 3-4 μm , ellipsoid; cheilocystidia 12-25(-30) μm wide, swollen clavate to ovoid. In parks, gardens and shrubs; autumn; rare in temp.; DK (VU), NO (NE), SE (NE). – FE 1:513, Friesia 4: pl. 20b, Lud 90.35, Svp 28:21, Ves 287 (too yellow). – Slightly poisonous.

A. phaeolepidotus (F.H. Møller) F.H. Møller (*Psalliota p.* F.H. Møller, *Agaricus meleagris* (Jul. Schäff.) Imbach var. *perdicinus* Pilát nom. inval., *A. perdicinus* Pilát)

4. Cap yellowing when bruised, dried or old, mostly > 80 mm broad; Schäffer reaction positive; smell often of bitter almonds 5
 - Cap smaller or not yellowing when bruised; Schäffer reaction negative or positive; smell of bitter almonds, different or indistinct 11

5. Cap densely covered with appressed, ochre to reddish brown, fibrillose scales. Cap 80-200 mm, ochraceous yellow to light brown, towards edge with white flocci from veil; gills pale, but soon flesh-coloured and finally dark brown; stem 100-200 x 20-30 mm, often thicker towards the base and rooting; smooth above ring and flocculose-scaly below ring; ring broad, hanging, thin and fragile, underside with thick ochraceous to brownish scales; cap and stem turning deep yellow when rubbed; flesh white, with age ± flesh-coloured; smell pleasant, like almonds (or aniseed). Sp 7-10 x 5-6 μm, ellipsoid (fig. 523A); cheilocystidia catenulate, individual cells 6-30 x 4-18 μm, terminal cell often apically tapering, often with yellowish-brownish pigments. In coniferous and deciduous forests, gardens and parks, on rich soil, sometimes on compost, rotting heaps of debris, ant-hills, etc., mostly in small groups; occasional in temp.-southern bore., rare in middle bore.-suba.; DK (LC), FI (NT), NO (LC), SE (LC). – B&K 4:169, FAD 135B, 136B (as *subrufescens*), Galli 04:147+157-161, SMT 27(2):35, Ves 287, ☉.
A. augustus Fr. (*Psalliota a.* (Fr.) Quéf., *Agaricus perrarus* Schulzer, *Psalliota p.* (Schulzer) Bres., *Agaricus subrufescens* Peck s. J.E. Lange)
- Cap smooth to fibrillose but without distinctly coloured scales 6
6. Sp on av > 10 μm long; stem often with distinctly tapering and deeply rooting base. Cap 100-200 mm, hemispherical, then expanded and plane, when very young loosely floccose, soon smooth, but often cracking due to drought, sometimes into pyramidal warts, white but soon alutaceous or ochraceous at centre; stem 50-100 x 25-35 mm, cylindrical, coarsely floccose towards base; ring broad, thin, with fine scales on the underside; flesh rust-coloured when cut, especially at stem base; smell faint of almonds. Sp 9-12 x 5.5-7 μm, ellipsoid (fig. 523B); cheilocystidia 15-40 x 6-16 μm, vesiculose to ovoid. In meadows, steppes, alvar habitats and open places in forests; summer to late autumn; occasional in temp.-hemib., rare in bore.-arc./alp., north to 78°; DK (LC), FO, NO (LC, incl. Svb), SE (LC). – B&K 4:183, FAD 139C, Friesia 4: pl. 19a, Phil 239d, Ves 288, ☉.
A. urinascens (F.H. Møller & Jul. Schäff.) Singer (*A. u.* var. *excellens* (F.H. Møller) Nauta, *Psalliota excellens* F.H. Møller, *Agaricus excellens* (F.H. Møller) F.H. Møller, *Psalliota arvensis* (Schaeff.) Gillet subsp. *macrospora* F.H. Møller & Jul. Schäff., *P. macrospora* (F.H. Møller & Jul. Schäff.) F.H. Møller, *Agaricus m.* (F.H. Møller & Jul. Schäff.) Pilát non Montagne, *Psalliota straminea* F.H. Møller & Jul. Schäff., *Agaricus s.* (F.H. Møller & Jul. Schäff.) Singer non Scop., *A. kuehnerianus* Heinem., *A. stramineosquamulosus* Rauschert, *A. substramineus* Courtec., *A. tabularis* Peck s. Knudsen)
- Sp on av < 10 μm long; stem tapering, cylindrical or bulbous 7
7. Sp on av > 7.5 μm long; frb robust with stem cylindrical to ± bulbous 8
- Sp on av < 7.5 μm long or frb slender with stem abruptly bulbous 9
8. Cap 100-200 mm, stem > 20 mm thick; at least some cheilocystidia lageniform with a small papilla. Cap ovoid, then expanding, smooth but radially fibrillose with some scales towards margin, silky white, when bruised with yellowish tinge; gills at first pale grey, later flesh-coloured and finally blackish brown; stem 100-180 x 25-35 mm, at base up to 45 mm, often bent, usually bulbous, smooth apart from the floccose-finely scaly base, most often pink at top; ring fairly thick, broad with distinct scales forming a cogwheel on the underside, often becoming sulphur yellow; flesh white with distinct flesh-colour at top, hardly changing; smell of almonds. Sp 7-9 x 4.5-5.5 μm, ellipsoid; cheilocystidia variable, some fusiform to bottle-shaped, some papillate. In forests, but also in rather open meadows and grasslands; summer to autumn; rare temp.-bore., north to 70°; DK (LC), NO (NE), SE (NE). – B&K 4:182, Galli 04:171, Lud 90.47.
A. macrocarpus (F.H. Møller) F.H. Møller (*Psalliota m.* F.H. Møller, *Agaricus arvensis* Schaeff. var. *m.* (F.H. Møller) E. Ludw.)
- Cap 70-150 mm; stem < 20(-25) mm thick; cheilocystidia not lageniform with a papilla. Cap ovoid, then expanding to hemispherical and convex, smooth or very finely floccose near

margin, sometimes cracking into scales, white, then ochraceous, yellowing when rubbed; stem 80-110 x 15-20(-25) mm, cylindrical, at most with very slightly bulbous base, white, smooth; ring white, thin, broad, forming a cogwheel on the underside; flesh pale yellow when cut. Sp 7-8 x 4.5-5.5 μm , ellipsoid (fig. 523C); cheilocystidia 10-30 x 6-20 μm , vesiculose. In meadows, gardens, shrubland and parkland, more rarely in coastal, saline meadows with a more yellow and distinctly radially cracking cap by some recognised as *A. fissuratus*, sometimes in fairy rings; summer to autumn; common in temp.-bore., occasional in suba. in IS, elsewhere rare in suba.-arc./alp., in FI north to InL in NO north to Finn; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – Däh 498, Lud 90.46, Phil 243d, Ves 288, ☉.

A. arvensis Schaeff. (*Psalliota a.* (Schaeff.) P. Kumm., *P. fissurata* F.H. Møller, *Agaricus f.* (F.H. Møller) F.H. Møller, *Psalliota leucotricha* F.H. Møller, *Agaricus l.* (F.H. Møller) F.H. Møller)

9. Stem with a \pm tapering base. Cap 80-180 mm, at first hemispherical, but soon expanded, sometimes with a reflexed margin, smooth or slightly floccose-finely scaly at margin, silky white, slightly and slowly yellowing on bruising; gills long pale, then pinkish grey and finally blackish brown; stem 80-100 x (15-)20-25 mm, cylindrical but often with narrowing and slightly curved base, when young with a few loose furfuraceous scales, naked with age; ring fairly thick, hanging, smooth above, on underside with a circle of coarse, roundish scales resembling a cogwheel; flesh white, hardly discolouring when cut, in stem base brownish or pinkish brown; smell like almonds. Sp (5-)6-7 x 4-5 μm , ellipsoid; cheilocystidia 9-15 x 6-12 μm , clavate-cylindrical(-globose). In meadows, pastures and garden lawns; summer to autumn; common in temp., lacking or overlooked in further north; DK (LC), SE. – Friesia 4: pl. 18b; Galli 04:173, 211, Lud 90:50, ☉.


A. osecanus Pilát (*A. arvensis* Schaeff. subsp. *o.* (Pilát) Pilát, *Psalliota nivescens* F.H. Møller, *Agaricus nivescens* (F.H. Møller) F.H. Møller, *Psalliota n.* F.H. Møller var. *parkensis* F.H. Møller, *Agaricus n.* (F.H. Møller) F.H. Møller var. *p.* (F.H. Møller) F.H. Møller, *A. parkensis* (F.H. Møller) Kerrigan, *A. nivescens* (F.H. Møller) F.H. Møller var. *squarrosipes* Bon & Collin, *A. osecanus* Pilát var. *s.* (Bon & Collin) Nauta)

Note: possibly only a small-spored variant of *A. arvensis*.

- Stem with distinctly bulbous base 10
10. Sp 5-6 x 3-4 μm , ellipsoid. Cap 50-80 mm, ovoid, then expanded, often with flattened centre, shiny, white but very fast turning yellowish, when rubbed becoming dark yellow; gills pale, then only very faintly greyish red before becoming blackish brown; stem 60-80 x 10-15 mm, with \pm abruptly swollen base, smooth all the way or weakly flocculose below ring; ring thin, fairly broad, hanging, with yellowish to whitish scales on underside; flesh white or faintly reddish in stem; smell of aniseed. Cheilocystidia 10-20 x 7-20 μm , globose, numerous. In forests, scrubs and gardens, sometimes on compost, more often in open habitats than *A. essettei*; summer to autumn; common in temp.-bore., occasional in suba., rare in suba. in IS; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:194, Galli 04:149, 175-177, Lud 90:49, Phil 245e-f, ☉.
- A. sylvicola* (Vittad.) Peck s. str. (*Psalliota s.* (Vittad.) Richon & Roze, '*silvicola*', '*silvicolus*')
- Sp 6-8 x 4-5 μm , ellipsoid. Cap 80-120 mm, ovoid to bell-shaped, finally expanded with slight umbo, usually without flattened centre, naked or flocculose-finely scaly towards margin, silky white, when bruised dark lemon yellow; gills pale, then faintly greyish red before becoming blackish brown; stem 100-120 x 10-20 mm, always with \pm abruptly swollen marginate-bulbous base which is flat underneath, smooth all the way or weakly flocculose below ring; ring thin, broad, hanging, with whitish but yellowing scales on underside often forming a cogwheel; flesh white or faintly reddish in stem; smell of almonds. Cheilocystidia 8-30 x 7-20 μm , globose, numerous. Mainly in coniferous forests, but also under solitary coniferous trees in other habitats; on rich soil, more often in closed habitats than *A. sylvicola*; summer to autumn; common in temp.-hemib., occasional in bore.-suba.; DK, FI, NO, SE. – B&K 4:177, FAD 138B, Galli 04:149, 181-183, Lud 90:48, Phil 81:169.

A. essettei Bon (*A. abruptibulbus* (Peck) Kauffm. s. auct.)

Note: possibly only a large-spored variant of *A. sylvicola*.

11. Flesh in stem top \pm reddening, slowly or immediately; Schäffer reaction negative; cheilocystidia present; ring hanging or ascending 12
 - Flesh in stem top not reddening; Schäffer reaction positive or negative; cheilocystidia present or absent; ring hanging 26
12. Cap brown all over or at least most of it with conspicuous, appressed or recurved scales; flesh when young strongly reddening to slowly browning, especially in stem top and cap 13
 - Cap pale, white to grey or pale brown, sometimes greyish brown with age, smooth or with fine fibrillose scales; flesh white or whitish, sometimes slightly browning 19
13. Basidia 2-spored; stem as long as or shorter than cap diam. Cap 50-120 mm, hemispherical, then expanding to flattened convex, with appressed brownish scales on a lighter background, without velar remnants; gills crowded, first pinkish, turning dark brown with age, with a whitish edge; stem 30-60 x 10-20 mm, cylindrical to slightly clavate, whitish, with a relatively thick, floccose ring; flesh white, turning faintly pinkish brown when cut; smell pleasant; taste mild. Sp 6.5-8 x 5.5-6.5 μ m, broadly ellipsoid; cheilocystidia 15-35 x 8-12 μ m, cylindrical to clavate. In meadows, parks, gardens, roadsides and around manure, often originating from waste from cultivated specimens; summer to autumn; occasional in temp.-southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:172, C&D 723, Däh 485, FE 1:381, Phil 242b, . – Edible and cultivated in large scale
A. bisporus (J.E. Lange) Imbach var. *bisporus* (*Psalliota hortensis* (Cooke) J.E. Lange var. *bispora* J.E. Lange, *P. bispora* (J.E. Lange) F.H. Møller & Jul. Schäff., *P. b.* (J.E. Lange) Imbach f. *avellanea* J.E. Lange, *P. b.* (J.E. Lange) Imbach var. *avellanea* (J.E. Lange) Singer, *Agaricus hortensis* (Cooke) S. Imai non Pers.)
 Note: see under 21 for white forms.
- Basidia 4-spored; stem longer or shorter than cap diam. 14
14. Stem shorter than cap diam. and with brown belts below the ring. Cap 50-120 mm, first convex, expanding to plane with a depressed centre, with brown appressed scales, shiny; gills crowded, first pinkish grey/cream, with age dark brown, with irregular whitish edge; stem 40-80 x 10-20 mm, above whitish greyish, smooth, below with girdles of brownish, woolly scales, broadly clavate, ending in a distinct rhizomorph; with distinct ring with cream upperside and woolly underside, covered with brownish scales; base of stem and rhizomorph often yellowing or even reddening on handling; flesh slightly reddish or brownish when cut, even a bit yellow at base; smell pleasant, taste mild. Sp 5.5-8 x 3.5-4.5 μ m, ellipsoid; cheilocystidia 10-25 μ m broad, pear-shaped to globose. In deciduous forests on rich soil; autumn; rare in temp.; DK (LC), SE (DD). – C&D 732, FE 1:421, Friesia 4: pl 1b, Lud 90:24, Phil 241e.
A. lanipes (F.H. Møller & Jul. Schäff.) Hlaváček (*Psalliota l.* F.H. Møller & Jul. Schäff.)
- Stem longer than cap diam. or without brown belts 15
15. In open land, scrubs, manure heaps, cemetaries, gardens and nurseries; flesh turning slightly pink when cut 16
 - In forests and scrubs; flesh strongly reddening when cut 17
16. Cap with coarse, brown, appressed scales; stem stout, cylindrical or tapering at base. Cap 70-150 mm, firm and thick-fleshed, convex then plane; stem 60-120 x 20-40(-50) mm, white, but browning when bruised or old, sometimes with veil remnants below the ring, seen as an irregular white or brown, scaly zone; ring thick, 1-2 mm, striate on the upperside, narrowly adnate; flesh firm, pale grey pink when cut; Schäffer-reaction negative. Sp 6.5-7.5 x 5-6.5 μ m, subglobose to broadly ellipsoid; cheilocystidia 5-9 μ m broad, cylindrical to narrowly clavate, some septate. In well manured lawns, rubbish heaps, and along roads, nurseries, often in dense clusters and with cap covered with soil; summer to autumn; occasional in temp., rare in hemib.-southern bore., only a few records from FI, IS and NO; DK (LC), FI (DD),

IS, NO (NE), SE (NE). – Däh 489, 490, FAD 140D, FE 1:15, 22, Lud 90:25, Phil 234c, ☉.

A. subperonatus (J.E. Lange) Singer (*A. hortensis* (Cooke) J.E. Lange f. *subperonata* J.E. Lange, *A. campestris* L.: Fr. var. *vaporarius* Pers., *Psalliota v.* (Pers.) F.H. Møller & Jul. Schäff., *Agaricus vaporarius* (Pers.) Cappelli non Schrank, *A. pseudovillaticus* Rauschert)

- Cap at least partly with pointed, erect scales; stem tapering towards base. Cap 60-200 mm, conical to convex, finely scaly, towards edge radially fibrillose, brown to grey brown; gills crowded, first greyish pink, turning dark brown with age; stem 80-200 x 12-35 mm, cylindrical, tapering, with thick, often torn ring, silky white to dirty brown, towards base with brownish patches of cap colour; flesh compact, white, turning reddish grey or slightly yellow when cut, Schäffer reaction positive; smell fungoid, slightly unpleasant; taste mild. Sp 5.5-7 x 4.5-6 μm , ellipsoid to subglobose; cheilocystidia 15-30 x 6-10 μm , cylindrical to slightly clavate, evenly distributed along the gill edge. In parks and gardens, \pm strongly fasciculate, fascicles sometimes forming rings; autumn; rare in temp.; DK (LC). – FE 1:419, Lud 90:21, Svp 53:59, ☉.

A. bohussii Bon (*A. elvensis* Berk. & Broome s. Cooke, Bohus)

17. Sp 4.5-6 x 3.5-4 μm . Cap 40-100 mm, convex with a flattened or subumbonate centre, dark reddish brown, yellowish brown to grey brown, centre finely scaly to fibrillose, towards margin fibrillose on a paler background, turning red when handled; gills crowded, at first greyish to pinkish brown, with age dark brown, with whitish, irregularly floccose edge; stem 50-140 x 6-12 mm, cylindrical to clavate, with a bulbous base, whitish to pale greyish brown, silky to flocculose, with a thin, often torn ring with striate upperside and dentate-finely scaly underside, often turning greyish; flesh whitish, turning red or orange red when handled or cut; smell acidulous to indistinct; taste mild. Sp ellipsoid; cheilocystidia 15-30 x 7-15 μm , clavate to inflated. In coniferous and deciduous woods, often in needle litter or on ant-hills; autumn; common in hemib.-bore., in NO north to Troms, in FI to InL, occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:192, C&D 739, FE 1:17, 17bis, Lud 90:29, Ves 284, ☉.

A. sylvaticus Schaeff.: Fr. ('*sylvaticus*', *Psalliota s.* (Schaeff.: Fr.) P. Kumm., *P. s.* (Schaeff.: Fr.) P. Kumm. var. *saturata* F.H. Møller, *Agaricus s.* Schaeff.: Fr. var. *saturatus* (F.H. Møller) F.H. Møller, *A. haemorrhoidarius* Schulzer, *A. sanguinarius* P. Karst., *A. vinosobrunneus* P.D. Orton)

- Sp > 6 μm long 18
18. Cap 40-120 mm, first conical, expanding to flattened umbonate, brown, reddish brown to purplish brown, fibrillose with broad, appressed scales on a pale background, turning faintly reddish when handled; gills crowded, first pinkish brown, with age dark brown, with an entire, slightly paler edge; stem 50-120 x 7-20 mm, cylindrical to clavate, not distinctly bulbous, with a thick, persistent ring with whitish, smooth upperside and brownish dentate to finely scaly underside; flesh whitish, discolouring reddish when cut; smell acidulous to indistinct; taste mild. Sp 7-9 x 4-6 μm , oblong to ellipsoid; cheilocystidia 20-45 x 10-20 μm , clavate to globose. In coniferous and deciduous woods and parks, less often in lawns; autumn; occasional in temp.-bore.; DK (LC), FI (DD), NO (LC), SE (LC). – B&K 4:179, C&D 736, FE 1:27, 27bis, Lud 90:30, ☉.

A. langei (F.H. Møller) F.H. Møller (*Psalliota l.* F.H. Møller, *P. mediofusca* F.H. Møller, *A. m.* (F.H. Møller) Pilát, *A. haemorrhoidarius* Schulzer s. J.E. Lange)

- Cap 40-60 mm, convex, often umbonate, silky, dark brown, towards margin densely radially fibrillose, rather thin fleshed; gills crowded, rose, turning dark brown when mature, with whitish edge; stem 50-100 x 6-12 mm, whitish, discolouring brownish when handled, cylindrical or slightly clavate, smooth to fibrillose, with a thin, whitish ring; flesh whitish, turning faintly pink when cut; smell mild; taste indistinct. Sp 6-8 x 4-5 μm , ovoid; cheilocystidia 15-30 x 10-20 μm , globose. In woods on rich soil; autumn; very rare or confused with related species; the taxonomic status is still debatable; DK (LC), SE (LC). – FE 1:21, Friesia 4: pl. 2b, Lud 90:20.

A. fuscofibrillosus (F.H. Møller) Pilát (*Psalliota f.* F.H. Møller)

19. Stem with two separate rings, an upper, thick, sheath-like ring, striate above, and a thin narrow, sheathing lower ring. Cap 40-120 mm, white to greyish white or pale grey, smooth, convex then plane; gills crowded, narrower than cap flesh, first pink, turning dark brown with age, with paler edge; stem 30-70(-100) x 15-30 mm, cylindrical, white; flesh firm, pale pink when cut; smell acidulous; taste mild. Sp 5-7 x 4-5.5 μm , broadly ellipsoid (fig. 523D); cheilocystidia 5-16 μm broad, broadly clavate. In dry places in cities, often along roads, in gardens and parks, on naked, exposed soil, typically breaking up through the substrate; late spring to autumn; common in temp., occasional in hemib.-southern bore., rare in middle bore., north to 65°; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:173, Däh 486, Phil 241f, R&H 405, Ves 283, ☉.
- A. bitorquis* (Quél.) Sacc. (*Psalliota* b. Quél., *Agaricus campestris* L.: Fr. var. *edulis* Vittad., *A. edulis* (Vittad.) F.H. Møller & Jul. Schäff., *Psalliota* e. (Vittad.) Buchw., *P. e.* (Vittad.) Buchw. var. *validus* F.H. Møller, *Agaricus* e. (Vittad.) F.H. Møller & Jul. Schäff. var. *validus* (F.H. Møller) Bon & Cappelli)
- Stem with one ring 20
20. Stem as long as cap diam. or shorter; ring \pm triangular in section or ascending 21
- Stem longer than cap diam.; ring hanging 24
21. Cap white or whitish; ring narrow, \pm triangular in section; basidia 2-spored. For other characters see *A. bisporus* var. *bisporus* p. 524. – B&K 4:172, C&D 723, Däh 485, FE 1:381, Lud 90.18E.
- A. bisporus* (J.E. Lange) Imbach var. *albidus* (J.E. Lange) Singer (*Psalliota hortensis* Cooke f. *albida* J.E. Lange, *Agaricus* h. (Cooke) S. Imai)
- Cap white but soon greyish; ring ascending; basidia 4-spored 22
22. Stem 7-15 mm broad; in dunes. Cap 30-80 mm, plane, white or greyish white with a pink tinge; stem 30-50 mm long, concolorous with cap, smooth; ring white, a few mm broad, sometimes disrupted into loosely attached, narrow membranous bands down the stem; flesh slightly pink at stem top when cut. Sp 6-7 x 5-5.5 μm , broadly ellipsoid; cheilocystidia 20-40 x 8-12 μm , clavate. Often with the stem deeply buried and with an incrusting bulbous sand-bag at the base; autumn; occasional in temp.-hemib.; DK (vu), NO (vu). – FE 1:4, Lud 90:1, Phil 236c, ☉.
- A. devoniensis* P.D. Orton (*Psalliota arenicola* Wakef. & A. Pearson, *Agaricus arenophilus* Huijsman)
- Stem 12-30(-40) mm broad; in saline meadows, steppes, forests, parks, gardens and roadsides 23
23. Cap smooth, but soon coarsely cracked-scaly; in saline meadows along the coast, in steppes, along (salted) roadsides, more rarely in fertilized parks. Cap 80-150(-200) mm, first hemispherical, expanding to flattened with a depressed centre, dirty white to grey or greyish brown; gills crowded, much narrower than cap flesh, first pink, turning dark brown with age, with paler edge; stem 40-80 x 20-30(-40) mm, cylindrical to clavate, smooth to fibrillose, whitish, with a ring often like a velar sock, first thick but with age thin; flesh firm, white, turning pink to reddish or orange brown when cut; smell \pm unpleasant; taste mild to slightly unpleasant. Sp 5.5-7.5 x 4.5-6.5 μm , broadly ellipsoid (fig. 523E); cheilocystidia 30-50 x 5-10 μm , irregularly cylindrical, flexuous. Summer to autumn; rare in temp.-southern bore.; DK (LC), FI (DD), NO (LC), SE (LC). – C&D 729, FE 1:371, Lud 90:5, Phil 235e, ☉.
- A. bernardii* Quél. (*Psalliota* b. (Quél.) Quél., *P. ingrata* F.H. Møller, *Agaricus* i. (F.H. Møller) Pilát non Schumach., *A. maleolens* F.H. Møller)
- Cap smooth, with scattered flocculose, white velar remnants, especially near the margin; on rich soil under conifers in parks, gardens and forests, also in birds cliffs. Cap 60-110 mm, hemispherical, expanding to flattened convex, appressed finely scaly, towards the edge

radially fibrillose, greyish brown, with tufts of whitish, velar flocks, at margin exceeding gills with a whitish rim; gills crowded, first pink, turning dark brown with age; stem 30-60 x 12-25 mm, cylindrical, white to pinkish brown, shorter than cap width, with a thick and persistent, ascending ring; flesh white, discolouring pinkish reddish when cut; smell indistinct, not unpleasant; taste mild. Sp 5.5-7.5 x 4.5-6 μm , broadly ellipsoid; cheilocystidia 30-50 x 10-15 μm , cylindrical to narrowly clavate. Summer to autumn; rare in temp.-hemib. and arc./alp.; DK (LC), NO (Svb), SE. – B&K 4:195, FAD 139D, Lud 90:23, Ves 285, ☉.

A. subfloccosus (J.E. Lange) Pilát (*Psalliota hortensis* (Cooke) J.E. Lange f. *subfloccosa* J.E. Lange, *P. s.* (J.E. Lange) J.E. Lange)

24. Cap centre grey brown to blackish brown. Cap 40-100 mm, first subglobose, expanding to flattened convex, cracking towards margin, radially fibrillose, exposing the whitish flesh, thin-fleshed; gills crowded, first pink, when mature brown, with a whitish edge; stem 80-130 x 10-15 mm, with a clavate to bulbous base, fibrillose towards base, white to pale brown, with a thin, but distinct ring with fibrillose-finely scaly underside and a brownish rim; flesh whitish, turning faintly and slowly reddish when cut; smell unpleasant, like *Lepiota cristata*; taste mild to unpleasant. Sp 5-6.5 x 3-4 μm , ellipsoid to oblong; cheilocystidia 15-30 x 10-20 μm , globose to ovoid. Most common in coniferous forests on rich soil, but also in deciduous forests, shrubs, hedgerows and in open, dry meadows and dunes; autumn; occasional in temp., very rare in hemib.; DK (LC), NO (M&R: Stordal), SE (LC). – FE 1:18, Knu 150, Lud 90:19, Nyl 349, Ves 284, ☉.

A. impudicus (Rea) Pilát (*Psalliota brunneola* J.E. Lange, *Agaricus b.* (J.E. Lange) Pilát, *Psalliota variegata* F.H. Møller, *Agaricus v.* (F.H. Møller) Pilát, *Psalliota v.* F.H. Møller var. *koelerionensis* Bon, *Agaricus k.* (Bon) Bon, *A. variegans* F.H. Møller, *A. reae* Bon, 'reai')

- Cap centre whitish or pale brownish fibrillose 24

25. Frb soon reddening when bruised; sp 5-6.5(-7) x 3.5-5 μm . Cap 60-150(-180) mm, subglobose to hemispherical, finally flattened convex, white, not shiny, smooth or with numerous small, concolorous or greyish brown appressed scales; gills crowded, first greyish pink, when mature dark brown, with a whitish edge; stem 50-150 x 10-25 mm, cylindrical with a bulbous base, white, with a thick, persistent ring with smooth upperside and a cogwheel on the underside, above ring smooth, below fibrillose-finely scaly; flesh white, turning deep red on handling or cutting; smell faint, pleasant; taste mild. Sp broadly ellipsoid; cheilocystidia 15-25 x 8-12 μm . In deciduous and coniferous forests, at roadsides and in pastures on rich soil; autumn; rare in temp.-southern bore.; DK (DD), FI (DD), NO (LC), SE (LC). – B&K 4:170, C&D 733, FE 1:20, Lud 90:31, R&H 406.

A. benesii (Pilát) Pilát (*Psalliota b.* Pilát, 'benesi', *P. squamulifera* F.H. Møller, *Agaricus s.* (F.H. Møller) Pilát, 'squamulifer' see note p. 911, *A. caroli* Pilát)

- Frb not reddening when bruised; sp 7-9 x 4-5 μm . Cap 40-60 mm, subglobose to convex, finally flattened convex, white, pale brownish or greyish, smooth or slightly fibrillose-finely scaly from concolorous scales; gills crowded, first greyish pink, when mature dark brown, with a whitish edge; stem 40-70 x 10-15 mm, cylindrical, smooth, fibrillose towards base, white to faintly flesh-coloured, with a thin, hanging ring with a scaly underside; flesh whitish, turning pale flesh coloured when cut; smell faint; taste mild. Sp ellipsoid to oblong; cheilocystidia 15-30 x 10-20 μm , clavate to globose. In deciduous woods; summer to autumn; rare in temp.-hemib., but possibly confused with similar species; DK (DD), NO (NE), SE (NE). – FE 1:32, Friesia 4: pl. 3a, Lud 90:26.

A. depauperatus (F.H. Møller) Pilát (*Psalliota d.* F.H. Møller, *Agaricus deyllii* Pilát)

- 26⁽¹¹⁾ Sp with germ pore or thin-walled apex; cheilocystidia absent 27
 - Sp without germ pore, wall uniformly thick; cheilocystidia present or absent 32
27. Cap distinctly coloured, with brown to ± purplish brown, appressed scales 28
 - Cap white, whitish or dirty greyish yellowish, often fibrillose-cracked, but without distinct scales 29
28. Sp 7-10 × (4-)5-6 μm, ellipsoid; stem usually tapering towards base. Cap 40-70 mm, at first pale vinaceous flocculose-finely scaly, but soon or with handling the scales become dirty purplish brown; stem 30-50 × 8-15 mm, most often tapering towards base, often curved; ring thin and fragile, often lacking; when dried with at most a yellowish shade; smell weak, like *A. campestris*. In dry grasslands on sandy soil and in dunes; summer to autumn; occasional in temp.-hemib., rare in southern-middle bore, with a few records from southernmost NO (Østf, AA, VA); DK (LC), FI (DD), FO, NO (VU), SE (LC). – FE 1:12, Friesia 4: pl. 4b, Galli 04:89, Lud 90:16, ☉.
A. cupreobrunneus (F.H. Møller) Pilát (*Psalliota* c. F.H. Møller)
- Sp 6-7 × 4.5-5 μm, ellipsoid; stem base often slightly swollen. Cap 40-60 mm, purplish vinaceous, radially fibrillose-striate, finely scaly; gills crowded, broad, pink then dark brown; stem 30-50 × 15-20 mm, whitish above, purplish vinaceous below, floccose under the ring; ring narrow, hanging. In sandy, dry grassland, possibly also on steppes. Little known species, apparently very rare and with few verified records in the area; in DK only known from the type collections, besides a few records from NO and SE; DK (DD), NO (NE, Østf: Fredrikstad), SE (NA). – FE 1:13, Friesia 4: pl. 4c, Lud 90:17.
A. lividonitidus (F.H. Møller) Pilát (*Psalliota* l. F.H. Møller, *P. porphyrea* F.H. Møller, *Agaricus p.* (F.H. Møller) Pilát non Alb. & Schwein., *A. porphyrocephalus* F.H. Møller)
29. Stem longer than cap diam.; smell unpleasant metallic, like *Lepiota cristata*, *Scleroderma* or indistinct. Cap 50-100 mm, appressed silky fibrillose, with age sometimes with small appressed scales, whitish with yellowish centre, later becoming greyish brownish, usually bruising yellow; gills bright red when young, then dark greyish brown; stem 60-100 × 10-25 mm, cylindrical or slightly swollen below, white, ring thin and fragile, fugacious, simple, but often with thin scales on the underside; flesh pale pink in the upper part of stem, sometimes pale buff in base. Sp 7.5-8 × 5-5.5 μm, ellipsoid; cheilocystidia absent. In deciduous and coniferous forests as well as parklands on rich soils; late spring and summer; occasional in temp., rare in hemib., but occurring solitary or in small groups early in the season and thus somewhat overlooked; DK (LC), NO (NE, Østf: Moss), SE (LC). – B&K 4:166, FE 1:46, Friesia 4: pl. 4a (as *Psalliota aestivalis* var. *flavotacta*), Jordst 16(1): cover, Svp 50:7 (as *decorata*).
A. altipes (F.H. Møller) Pilát (*Psalliota* a. F.H. Møller, *P. aestivalis* F.H. Møller, *Agaricus a.* (F.H. Møller) Pilát non Schumach., *A. aestivalis* (F.H. Møller) Pilát var. *flavotactus* (F.H. Møller) Pilát, *Psalliota decorata* F.H. Møller, *Agaricus d.* (F.H. Møller) Pilát non Lindgren, *A. albosericeus* Rauschert, *A. perturbans* E. Ludw. & W. Pohl)
- Stem as long as cap diam. or shorter; smell not metallic 30
30. Sp on av > 8.5 μm long, with visible germ pore. Cap 40-90 mm, convex to plane, smooth, becoming slightly fibrillose and eventually somewhat cracked, white or slightly brownish; stem 30-60 × 10-15 mm, cylindrical or slightly tapering towards base, smooth; ring narrow, weak, fragile, thin, smooth; flesh white, unchanging when cut; smell and taste mild. Sp 7.5-10 × 5-7 μm. Similar to *A. campestris* and thus probably confused with this; very few confirmed occurrences in the area, one record from SE (Öl) on a seashore meadow. – B&K 4:186, Galli 04:97.
A. pampeanus Speg.
- Sp on av < 8 μm long, without visible germ pore, but with thin-walled at apex 31
31. Cap white, not yellowing, usually fibrillose, sp on av > 7.5 μm long. Cap 40-90 mm, convex to plane, pure white or very slightly yellowing when bruised, finally pale greyish brown; stem 30-50 × 10-15 mm, cylindrical, white, smooth or very finely floccose below the ring;

ring white, narrow, fragile, thin; flesh pale, sometimes with a pale pink flush; smell slightly acidulous. Sp 6.5-8.5 x 4.5-6 μm , ellipsoid (fig. 523F). In open meadows, grassland, alvar areas and lawns; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:174, Däh 493, Galli 04:91, Phil 237d, Ves 282, ☉.

A. campestris L.: Fr. (*Psalliota* c. (L.: Fr.) Quél., *P. c.* var. *squamulosa* Rea, *Agaricus* c. var. s. (Rea) Pilát, *P. c.* (L.: Fr.) Quél. var. *fuscopilosella* F.H. Møller, *A. c.* var. *f.* (F.H. Møller) Pilát, *Psalliota* c. var. *equestris* F.H. Møller, *Agaricus* c. var. *equestris* (F.H. Møller) Pilát, *Psalliota* c. var. *isabellinus* F.H. Møller, *Agaricus* c. var. *i.* (F.H. Møller) Pilát, *A. c.* var. *pilatianus* Kühner) Note: a large number of varieties and forms of doubtful taxonomic value have been described and are not considered further here.

- Cap yellowing when bruised, almost smooth, sp on av < 7.5 μm long. Cap 50-90 mm, glabrous, cream white; stem 40-65 x 15-20 mm, white, densely floccose, finely scaly above the ring; flesh compact, bruising pale pink; smell slightly acidulous or of almonds. Sp 5.5-7.5 x 4-5.5 μm , ellipsoid. In meadows and grasslands; little known taxon, with a few confirmed records from DK (DD). – FE 1:11, FND 24:37-39, Galli 04:95, Lud 90:13, ☉.

A. moellerianus Bon (*Psalliota campestris* (L.: Fr.) Quél. var. *floccipes* F.H. Møller, *Agaricus* c. L.: Fr. var. *f.* (F.H. Møller) Pilát, *A. f.* (F.H. Møller) Bohus non Fr.)

32. In arctic areas. Cap 90-120 mm, convex, when young densely fimbriate-scaly, with inrolled margin, irregular-scaly, white; gills pink, then greyish and finally dark brown; stem 60-80 x 15-23 mm, cylindrical or with narrowed base, solid, smooth above the ring, below woolly fibrillose; ring narrow, simple, thin, irregular; flesh white, thick, faintly pink above the gills and in stem top; smell aromatic; taste mild. Sp 7-9 x 6-7 μm , broadly ellipsoid to subglobose, wall-thickness homogeneous without a thin-walled area/germ pore; cystidia absent. In open heath-like vegetation with coal deposits from mines, with *Dryas* and *Salix polaris*; only known from NO (NE, SvB). – AAF 2:41.

A. aristocratus Gulden (*A. arcticus* Gulden non Sommerf., *A. campestris* L.: Fr. var. s. M. Lange)

- In temp.-bore. 33
33. Cap or at least at centre with reddish, vinaceous or purplish fibrils or scales 34
 - Cap white or yellow, when old yellowing or browning 35
 34. Cap 50-80 mm, hemispherical, but soon convex to plane, with dense, appressed fibrillose, purplish brown scales on a pale vinaceous background, margin pale; stem 30-70 x 7-10(-15) mm, cylindrical with a slightly clavate base, white, yellowing when bruised, often with a basal mycelial cord; ring white, thin; flesh yellowing, especially towards stem base; smell almond-like. Sp 5-6 x 3.5-4 μm , broadly ellipsoid. In deciduous and coniferous forests on rich soil, also in shrubs, solitary or in small groups; summer to autumn; occasional in temp.-bore.; DK (VU), NO (NT), SE (LC). – Däh 502, FE 1:51, Friesia 4: pl. 21a (as *Psalliota purpurascens*), Lud 90:51.

A. porphyrrhizon P.D. Orton ('*porphyrrhizon*', *A. purpurascens* (Cooke) Pilát non Alb. & Schwein.)

 - Cap 20-60 mm, hemispherical then convex, white with vinaceous fibrils at centre, becoming yellow and at centre more dull brownish, when old or dried with a distinctly darker centre and paler margin; stem 40-70 x 4-8 mm, cylindrical with a bulbous base, white, yellowing when bruised or old; ring white, thin, narrow; flesh white, slightly yellowing, especially towards stem base; smell almond-like. Sp 5-6 x 3.5-4 μm , broadly ellipsoid. In small groups in coniferous, more rarely deciduous forests, parks and lawns, also in meadows and subalpine *Betula* forests; summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Däh 503, FAD 137A, 135A, FE 1:54, 55, Lud 90:9, 10, Phil 238a, ☉.

A. semotus Fr. (*A. dulcidulus* Schulzer, *Psalliota purpurella* F.H. Møller, *Agaricus* p. (F.H. Møller) F.H. Møller), see note p. 911).

35. Stem cylindrical with a distinctly bulbous base with circular, several mm long girdles of scales resembling the base of *Amanita muscaria* and a thin ring. Cap 30-60 mm, hemispherical, whitish, then light yellowish buff, silky, towards margin with appressed scales; gills whitish, then pink before becoming dark brown; stem 25-55 x 5-12 mm, base up to 20 mm, ring simple and thin, soon disappearing or hanging from edge of cap; flesh white, yellowing in base of stem and weakly reddening above base; smell pleasant. Sp 5.5-7(-8) x 3.5-4.5 μ m, broadly ellipsoid; cheilocystidia absent. In sandy *Pinus/Populus/Robinia*-dominated forests on old dunes close to the sea; very rare, in the area only known from one record in SE (Öl), where it occurred in August after a very dry and hot summer. – FE 1:36.

A. amanitaeformis Wasser

- Stem base without scale girdles 36
36. Sp 6.5-8.5 x 5-6.5 μ m. Cap 50-120 mm, whitish to cream, without distinct, coloured scales, first hemispherical, expanding to \pm irregular plane, a bit scaly-cracking at centre and irregularly spotted; gills crowded, first pinkish, turning dark brown with age; stem 30-60 x 10-20 mm, white, eventually ochraceous to brownish, even yellowing at base, with a basal rhizomorph, with a thin ring; flesh firm, white, faint brownish reddish when cut, even yellowish at base and on rhizomorphs; smell faint, pleasant, with age sometimes unpleasant, taste mild. Sp broadly ellipsoid; cheilocystidia 15-20 x 5-12 μ m, clavate, inconspicuous and interspersed with basidia. In dunes, dry pastures and sandy grasslands; summer to autumn; occasional in temp.-southern bore.; DK (LC), NO, SE (NT). – C&D 730 (as *spissicaulis*), FE 1:455, Friesia 4: pl 3b (as *Psalliota spissa*), Lud 90:27, Ves 285.
- A. litoralis* (Wakef. & A. Pearson) Pilát (*Psalliota l.* Wakef. & A. Pearson, *P. spissa* F.H. Møller, *Agaricus spissus* (F.H. Møller) Pilát non Fries, *A. spissicaulis* F.H. Møller, *A. maskae* Pilát)
- Sp < 6.5 μ m long 37
37. Cheilocystidia absent or scattered and inconspicuous and mixed with basidia. Cap 20-40 mm, convex, when old flattened or slightly depressed at centre, white or whitish, becoming yellowish, when old browning at centre; stem 20-35 x 3-5 mm, cylindrical or slightly thicker below; ring white, thin, narrow, soon disappearing; flesh whitish, slightly yellowing when cut; smell of bitter almonds. Sp 4.5-5.5 x 3-4 μ m, ellipsoid. Solitary or in small groups in grass in lawns, dunes, pastures, meadows, deciduous forests and along grassy paths, also in greenhouses; occasional in temp.-southern bore., rare in middle bore.-arc./alp., north to 78°; DK (LC), FI (LC), NO (LC, incl. SvB), SE (LC). – B&K 4:175, Däh 501, Lud 90:8, Phil 240c.
- A. comtulus* Fr. (*A. niveolutescens* Huijsman)
- Cheilocystidia conspicuous or sometimes mixed with basidia. Cap 30-70 mm, convex then plane, with inrolled margin, pale yellowish brown, at centre uniformly pale brown, towards the margin with numerous fine, scattered, appressed fibrillose scales, yellowing when bruised; gills greyish, becoming dark brown; stem 25-60 x 5-12 mm, with a broader, bulbous base, whitish, yellowing or becoming pale brown when bruised; ring thin, white, hanging; flesh white, yellowing when bruised, especially towards the stem base; smell of bitter almonds. Sp 4.5-6.5 x 4-5 μ m, broadly ellipsoid; cheilocystidia distinct, hyaline or brown, 25-40 x 6-13 μ m, almost cylindrical to clavate, not balloon-shaped. In coniferous or mixed forests on rich soil and in calcareous, dry meadows; summer to autumn; very rare in temp. or possibly confused with related species; DK (DD), SE (LC). – FE 1:58, Friesia 4: pl. 21b, c, d, Lud 90:7.
- A. lutosus* (F.H. Møller) F.H. Møller (*Psalliota l.* F.H. Møller, *P. xantholepis* F.H. Møller, *A. x.* (F.H. Møller) F.H. Møller, *P. luteomaculata* F.H. Møller, *Agaricus l.* (F.H. Møller) F.H. Møller)
- Note: a species or species complex not yet satisfactorily understood.

Agrocybe Fayod

SVENGUNNAR RYMAN

Frb collybioid to tricholomatoid. Cap 5-100(-150) mm, smooth, pruinose or rimose, often with white flocks of veil at margin, usually greasy to slimy, white, yellowish or brown, hygrophanous or not, margin sometimes striate. Gills yellowish to brownish, sometimes with lilac tinge, edge often paler. Stem with or without ring, rhizomorphs often present. Smell and taste often farinaceous. Sp deposit yellow brown to dark red brown.

Sp ellipsoid to amygdaloid, thick-walled, smooth, often with germ pore, yellowish brown. Cheilocystidia present. Pleurocystidia often present. Pileo- and caulocystidia mostly absent. Pileipellis an (ixo-)hymeniderm. Clamps usually present.

Saprotrophic on soil, in grass, amongst mosses, on wood, including wood chips, rarely on dung.

12 species in the Nordic countries, 14 species in the key.

Lit.: Nauta 1987, Nauta in Noordeloos et al. 2005, Watling 1982.

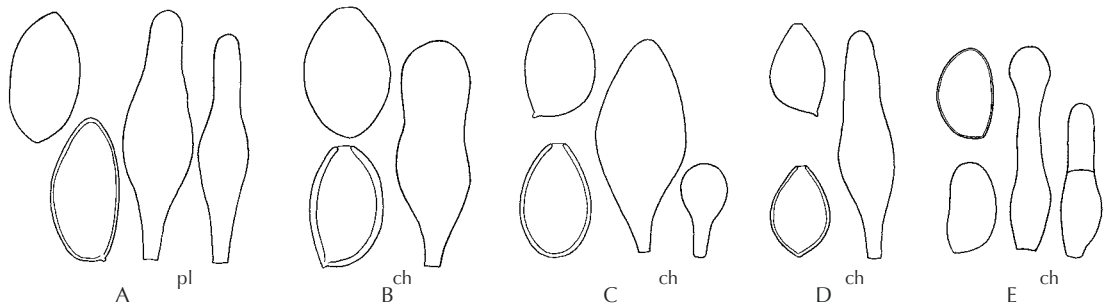
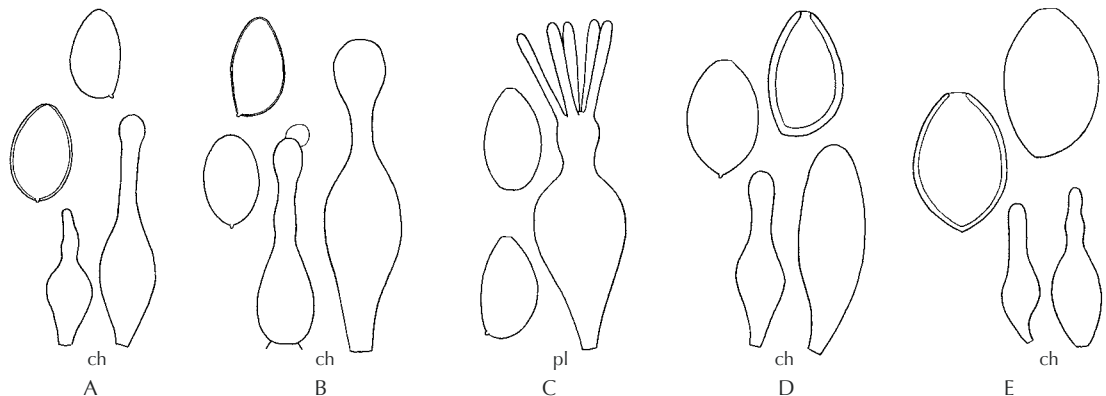


Fig. 827. Spores, pleurocystidia and cheilocystidia: A: *Agrocybe erebia*, B: *A. dura*, C: *A. elatella*, D: *A. praecox*, E: *A. firma*.



Spores, cheilocystidia and pleurocystidia: A: *Agrocybe vervacti*, B: *A. pusilla*, C: *A. arvalis*, D: *A. putaminum*, E: *A. pediades*.

1. Ring present, at least in young specimens 2
- Ring absent 8
2. Sp 8-12(-15) μm broad; cap yellow to brown, usually 10-30 mm broad
 - Sp 5-9 μm broad, or up to 10 μm broad and then cap white to yellowish white, 30-120 mm broad 3
3. Cap dark brown or blackish brown with paler margin; sp without germ pore; basidia usually 2-spored. Cap 20-70 mm, convex, then expanded, usually with a blunt umbo, when moist viscid, when dry glossy, smooth, hygrophanous, margin translucently striate when moist, often with white flocks of veil at margin; gills first pale brown to greyish brown, then brown to dark greyish brown; stem 30-70(-100) \times 3-6(-15) mm, pale brown, blackening when old or when handled, paler and striate above the hanging, striate ring; smell and taste farinaceous. Sp (9-)11-15(-17) \times (5-)6-7.5(-8) μm , ovoid to amygdaloid (fig. 827A); cheilocystidia both clavate and lageniform; pleurocystidia usually lageniform or utriform. On rich naked soil or in grass in deciduous woods, gardens and parks; summer to late autumn; occasional in temp.-hemib., rare in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:364, Lud 1.2, Phil 246a, R&H 439, Ves 304, ☉.
A. erebia (Fr.: Fr.) Singer
 - Cap white or pale brownish; sp usually with a conspicuous germ pore; basidia usually 4-spored 4
4. Germ pore up to 0.5 μm broad; on wood. Cap 20-100(-150) mm, convex, then expanded, not hygrophanous, first greasy, then often velvety to rugulose, when young brown or pale brown, then whitish at least at the centre, margin sometimes with remnants of veil; gills first yellowish white to pale brown, then dark yellowish brown with a whitish edge; stem 40-110 \times 5-15 mm, white to pale brown, darkening when old or handled, with hanging, sometimes striate ring; smell aromatic, not farinaceous. Sp 8-12(-15) \times 5-6.5(-8) μm , ellipsoid to slightly phaseoliform; cheilocystidia clavate, sometimes lageniform or utriform; pleurocystidia clavate to fusiform. On wood or wood chips of deciduous trees, esp. of *Populus* or *Salix*; late spring to autumn; in the Nordic countries an alien on rubbish-heaps, etc.; edible and sometimes cultivated, at least in southern Europe; rare in temp.-hemib.; NO (NE, VA: Marnardal, Østf: Fredrikstad), SE (LC). – B&K 4:362, C&D 1296, Däh 589, Lud 1.7, Phil 247e.
A. cylindrica (DC.: Fr.) Maire ('*cylindracea*', *A. aegerita* (V. Brig.) Singer)
 - Germ pore 1-1.5 μm broad; on soil or wood chips 5
5. Cap radially venose or areolate-rimose; sp 10-14 μm long 6
- Cap smooth; sp 7.5-11(-12) μm long 7
6. Cap radially venose; taste strongly farinaceous. Cap 40-100 mm, first conical, then convex to expanded with a conspicuous umbo, first smooth and viscid, then dry and strongly radially venose, with whitish or grey remnants of veil, esp. at margin, hygrophanous, when moist first brown, then yellow brown with a paler margin, when dry pale yellow; gills first pale yellow, then grey brown; stem 50-150 \times 5-12 mm, base often bulbous, up to 16 mm broad, white above the pendulous, prominent ring, yellowish brown below the ring and brownish when handled. Sp 10-14 \times (6-)6.5-8(-8.5) μm , ellipsoid to oblong or slightly amygdaloid; cheilo- and pleurocystidia clavate to pedicellate globose. On big piles of wood chips; spring to autumn; very rare in temp., but probably spreading; DK (NA, Sj: Kostræde).
A. rivulosa Nauta
 - Cap soon areolate-rimose; taste not farinaceous. Cap 40-90(-120) mm, first convex, then expanded, not hygrophanous, fleshy and firm, slightly viscid when moist, white, when old with pale yellowish tint, often with white remnants of veil at margin; gills long whitish, finally pale greyish brown with a violet tint; stem 50-90(-110) \times 3-10(-15) mm, white, with a

cottony, often ephemeral ring, not darkening when handled. Sp 10-14(-18) x 6-8(-9) μm , ellipsoid to oblong, sometimes amygdaloid (fig. 827B); cheilo- and pleurocystidia broad, constricted cylindrical or utriform. On or near decaying grass in cultivated fields and gardens and forests, usually on clayey or calcareous soil; summer; occasional in temp.-hemib., rare in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:363, Däh 590, Lud 1.9, Phil 246c, R&H 439. *A. dura* (Bolton) Singer (*A. molesta* (Lasch) Singer)

7. Stem 1-4 mm thick; gill edge sterile, cheilocystidia usually clavate, some lageniform to utriform (fig. 827C). Cap 10-20(-40) mm, first convex, then expanded, often depressed or with a low umbo, when wet slightly viscid and with short striate margin, hygrophanous, when moist reddish or yellow brown with a paler margin, when dry yellowish; gills first pale brown, often with a pinkish tinge, then dark brown; stem 30-100 x 1-4 mm, paler than cap, with a ring, without rhizomorphs; smell and taste strongly farinaceous. Sp 8-11(-12) x 5-8 (-9) μm , ellipsoid to oblong, sometimes amygdaloid; pleurocystidia lageniform to utriform, rarely fusiform. Deeply rooted amongst mosses in marshy meadows and fens, often with *Dactylorhiza majalis*, in FI also found in parks and gardens, usually on calcareous soil; spring to summer; occasional in temp.-arc./alp.; DK (LC), FI (NT), FO, IS, NO (LC), SE (NT). – B&K 4:367, Däh 591, FAD 106E, Lud 1.5, Phil 247f.

A. elatella (P. Karst.) Vesterh. (*A. paludosa* (J. Lange) Watling & N.M. Greg.)

- Stem 3-11 mm thick; gill edge fertile with basidia mixed with scarce narrowly utriform cheilocystidia (fig. 827D). Cap 20-80(-120) mm, first conical, then expanded, often with a low umbo, rarely depressed, greasy and usually smooth, hygrophanous, when moist ochraceous to yellowish brown, often darker at the centre, when dry whitish, pale yellowish or greyish brown, paler at margin, at margin often with remnants of veil; gills first pale grey brown, then dark brown; stem 40-70(-100) x 3-6(-11) mm, whitish to yellowish, with a ring and usually with white rhizomorphs; smell and taste strongly farinaceous. Sp 8-10(-12) x 5-7(-8) μm , ellipsoid to ovoid; pleurocystidia usually utriform. On soil and amongst grass in gardens, deciduous woods etc., also on wood chips; spring to summer (to autumn); common in temp.-hemib., occasional, but locally common in bore.-suba., rare in arc./alp. in IS (Mi); DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:368, Däh 592, Phil 246b, R&H 440, Ves 395, ⊙.

A. praecox (Pers.: Fr.) Fayod

Notes: a complex of four biological species (Flynn & Miller 1990). Included here are *A. acericola* (Peck) Singer recorded from NO, *A. gibberosa* (Fr.) Singer recorded from NO, and *A. sphaleromorpha* (Pers.: Fr.) Konrad & Maubl. recorded from NO.

- | | | |
|----|--|----------------------|
| 8. | Cap when moist white to yellowish white; taste not farinaceous | see <i>A. dura</i> 6 |
| - | Cap when moist yellow, yellow brown or brown; taste farinaceous or not | 9 |
| 9. | Sp (5.5-)6-10(-11.5) μm long, germ pore absent or up to 0.5 μm broad | 10 |
| - | Sp 8-18(-20) μm long, with a 1-2 μm broad germ pore | 12 |

10. On wood. Cap 10-30(-40) mm, first conical, then expanded, sometimes with an umbo, hygrophanous, dark brown to grey olivaceous, on drying more yellowish; gills pale brown to yellow brown with a white edge; stem 30-50(-90) x 1-3(-5) mm, yellow brown, at the top olivaceous greyish pruinose, darker towards the base and darkening on handling, usually with white rhizomorphs; smell and taste farinaceous. Sp (5.5-)6-8(-8.5) x 4-5(-5.5) μm , ellipsoid (fig. 827E), germ pore absent or inconspicuous; cheilocystidia variable, usually lageniform; pleurocystidia usually broadly utriform; pileocystidia cylindrical to lageniform; caulocystidia abundant, usually lageniform. On deciduous wood (*Fagus* and *Alnus*) in moist forests, rarely on wood-chips; summer to late autumn; very rare in temp.-hemib.; DK (EN), FI (DD, U: Helsinki), NO (NE, S&F: Leikanger), SE (NT). – B&K 4:365, GBW 4:294, Ger 01:323, End 308, Lud 1.8.


A. firma (Peck) Singer

- On soil

11. Cap (10-)20-50 mm, first hemispherical to convex, then expanded, slightly viscid when wet, yellow to ochraceous with a paler margin; gills first pale brown, sometimes with a lilac tinge, then brown with a whitish edge; stem 15-40(-60) x 2-4(-5) mm, white to yellowish; smell and taste not farinaceous. Sp 7-9(-10) x 4.5-6 μm , ellipsoid to oblong (fig. 829A), with an inconspicuous germ pore; cheilo- and pleurocystidia lageniform, usually subcapitate. Amongst grass at roadsides, in fields, gardens and deciduous forests, often on calcareous ground; summer to autumn; rare in temp.-hemib., very rare in southern bore.; DK (EN), FI (NT), NO (LC, Oslo, Rog: Strand), SE (LC). – B&K 4:371, FAD 126G, GBW 4:301, Lud 1.10, RdM 44:13.
A. vervacti (Fr.: Fr.) Singer
- Cap 5-10(-15) mm, hemispherical to convex, then expanded, viscid when moist, yellow to ochraceous with a slightly paler margin; gills first pale brown with a slight violet tinge, then dark brown with concolorous or whitish edge; stem 10-35 x 0.5-1.5 mm, pale yellowish, often with white rhizomorphs; smell and taste farinaceous. Sp 7-10(-11.5) x 4.5-6(-6.5) μm , ellipsoid to amygdaloid, without germ pore (fig. 829B); cheilo- and pleurocystidia variable, usually lageniform, often capitate and with crystals at apex; pileocystidia lageniform; caulocystidia esp. on top of stem, clavate to lageniform. Amongst grass on sandy soil, stubble fields, etc.; autumn to late autumn; rare in temp.-hemib.; DK (LC), FI (DD, U: Helsinki), NO (LC), SE (LC). – Lud 1.14, RdM 37:119, ☉.
A. pusiola (Fr.: Fr.) R. Heim
12. Pleurocystidia digitate (fig. 829C). Cap 10-35(-50) mm, convex, then expanded, hygrophalous, when moist often striate at margin, viscid, smooth, deep yellow to yellow brown, when dry pale yellowish; gills pale brown, then dark yellowish brown with a whitish edge; stem 30-100(-150) x 2-5 mm, pale yellowish, pruinose, rooting and usually (always?) springing from a black, 20-30(-50) mm large sclerotium; smell and taste farinaceous. Sp 8-10.5(-12) x 4.5-6 μm , ellipsoid to oblong, with a narrow germ pore; cheilocystidia usually lageniform, sometimes digitate; pileocystidia usually present, lageniform; caulocystidia abundant, lageniform. Amongst grass in pastures, stubble fields, moist forests, at roadsides and in gardens, rarely on wood chips; summer to autumn; occasional in temp.-hemib., rare in bore., very rare in suba., in FI north to KP; DK (LC), FI (LC), IS (Ve), NO (LC), SE (LC). – B&K 4:361, Däh 594, FAD 126D, Lud 1.4, Ves 305.
A. arvalis (Fr.: Fr.) R. Heim & Romagn.
- Pleurocystidia clavate, lageniform, utriform or absent 13
13. Pileocystidia present, lageniform to utriform. Cap 20-70(-90) mm, first conical, then expanded, sometimes with a low umbo, not hygrophalous, dry, velvety, ochraceous to yellow brown; gills first pale yellow brown, then brown, with concolorous or whitish edge; stem 30-80 x 4-10 mm, base sometimes up to 15 mm broad, strongly fibrillose, pale yellow brown, darker on handling, often with white rhizomorphs; smell and taste farinaceous. Sp 9.5-13 (-15) x 5.5-7(-8) μm , ellipsoid to oblong (fig. 829D), with a narrow germ pore; cheilocystidia variable, often capitate; pleurocystidia clavate or utriform; caulocystidia abundant, lageniform. On wood chips and soil in gardens, etc.; summer to late autumn; rare in temp.-hemib.; DK (LC), FI (DD, U: Helsinki), NO (NE, Oslo), SE (LC). – GBW 4:300, Ger 323, Lud 1.6, Svp 19:40, ☉.
A. putaminum (Maire) Singer
- Pileocystidia absent 14
14. Cap when young with an olivaceous tint; sp with a 1 μm broad germ pore. Cap 20-70 mm, convex, then expanded, slightly viscid, smooth, becoming pale brown; gills brown to cinnamon; stem 20-65 x 10-20 mm, pale brown, darkening when old; smell and taste farinaceous. Sp 11-13.5 x 6.5-8 μm , ellipsoid; cheilo- and pleurocystidia lageniform. On wood chips in parks; summer; DE.
A. smithii Watling & H.E. Bigelow
- Cap yellow to brown, without an olivaceous tint; sp with a 1.5-2 μm broad germ pore 15

15. Pleurocystidia present. Cap 10-30 mm, convex, viscid, smooth, ochraceous yellow, with darker centre and paler margin; gills brown; stem 30-50 x 2-4 mm, pale yellowish; smell and taste farinaceous. Sp 11.5-15.5 x 8-10(-12) μm , ellipsoid, with a 1.5-2 μm broad and sometimes eccentric germ pore; cheilocystidia lageniform, often capitate; pleurocystidia lageniform to utriform. On soil mixed with wood chips; *NL*.

A. ochracea Nauta

- Pleurocystidia absent. Cap 5-30(-50) mm, conical to hemispherical, then expanded, slightly hygrophanous, greasy to viscid, smooth, yellow to yellow brown, paler when dry; gills pale, milky coffee with a slight violet or pinkish tinge, with concolorous or whitish edge; stem 25-20(-75) x 1-3(-5) mm, whitish to pale yellowish, fibrillose, pruinose at top, usually without ring, at the base often with white rhizomorphs; smell and taste farinaceous. Sp 10-16(-20) x 7-11(-15) μm , ellipsoid (fig. 829E), with a 1.5-2 μm broad germ pore; cheilocystidia narrowly utriform, capitate. Amongst grass in lawns, sandy fields and dunes, rarely on dung; late spring to autumn; common in temp.-hemib., occasional in bore., in IS rare in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:370 (as *splendida*), Lud 1.13, Phil 247d, R&H 438, Ves 304, .

A. pediades (Fr.: Fr.) Fayod (*A. semiorbicularis* (Bull.) Fayod)

Note: very variable and sometimes split in several taxa on both species and varietal level, probably without justification (see Nauta 2005).

Amanita Pers.

JAN VESTERHOLT

Amanitopsis Roze

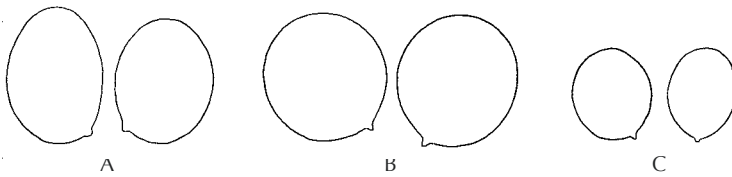
Frb with central stem, free gills, volva and often ring. Cap 20-200 mm, hemispherical, conical, ovoid or convex, later expanding with or without an umbo, smooth, radially sulcate at margin or not, greasy to almost dry, not hygrophanous, white, yellow, orange, red, greenish, olive, brown, buff or grey. Gills free, white or whitish, rarely pale greyish buff or greenish. Stem fibrillose to floccose, sometimes with girdles, white or tinged like cap. Universal veil whitish, yellowish or greyish, in some species staining brownish, in some species membranous forming a volva at the stem base, in other species breaking up into warts or patches on the cap. Partial veil absent or membranous, whitish, striate above or not, forming a ring on the stem. Smell mostly indistinct, but in some species nauseous honey-like or like raw potato. Sp deposit white.

Sp globose to ellipsoid (figs 333A-C), smooth, hyaline, amyloid or non-amyloid. Basidia mostly 4-spored. Cheilocystidia absent or little differentiated. Pileipellis a cutis or an ixocutis. Clamps present or absent.

Ectomycorrhizal, in association with deciduous and coniferous hosts. Summer to autumn. Several species poisonous, some even deadly.

30 species in the Nordic countries, 32 species in the key. Some species complexes in sect. *Vaginatae* are in need of a revision.

Lit.: Bas 1969, Contu 2000, Fraiture 1993, Knudsen & Borgen 1987, Neville & Poumarat 2004, Rune 2006, Tulloss 1994, 2000, Tulloss & Gulden 1999.



Spores: A: *Amanita argentea*, B: *A. vaginata* var. *vaginata*, C: *A. excelsa*.

1. Cap margin smooth; sp amyloid Key C, subgen. *Lepidella* p. 331
- Cap margin becoming ± radially sulcate in expanded frb; sp non-amyloid 2
2. Partial veil forming a membranous ring; stem base bulbous Key A, subgen. *Amanita* sect. *Amanita* p. 326
- Partial veil absent, but stem sometimes with fugacious remnants of veil; stem base not bulbous Key B, subgen. *Amanita* sect. *Vaginatae* p. 327

Key A: Subgen. *Amanita* sect. *Amanita*. Ring present; sp non-amyloid

1. Cap red, sometimes discolouring to pale orange. Cap 60-200 mm, hemispherical, then convex to expanded; universal veil forming loose, white to yellowish fragments on the cap; gills white; stem 80-250 x 10-25 mm, cylindrical to clavate, pruinose to floccose, white, with an up to 50 mm broad basal bulb with concentric rings of volval scales; ring membranous, white with a yellowish margin. Sp 8-10 x 6-7 μm, broadly ellipsoid. Under deciduous trees and conifers, most common under *Betula*, *Pinus* and *Picea*, in particular on sandy or peaty soil; summer to autumn; very common in temp.-suba., but occasional in IS; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – C&D 837, FE 9: phot. 18, Phil 140ab, R&H 397, Ves 266, ⊙. – Poisonous.

A. muscaria (L.: Fr.) Lam. var. *muscaria*

var. *regalis* (Fr.) Bertill. (*A. regalis* (Fr.) Michael) differs in having a brown cap. In coniferous and mixed forests and in subalpine *Betula* forests, mostly with *Picea*, rarely with *Betula*; common in hemib.-suba., occasional in temp., but in DK only with one record; DK (NE, WJyl: Marbæk Plt.), FI (LC), NO (LC), SE (LC). – Däh 465, FE 9: phot. 27, pl. 26, GBW 4:19, R&H 398, Sieniop 95. – Poisonous.

Note: *A. muscaria*, the fly agaric, has been used as an insecticide as well as for different types of spiritual and medicinal purposes.

- Cap cream, yellow, buff or brown 2
- 2. Cap cream to yellow or ± pinkish buff 3
- Cap yellow brown to dark brown 4
- 3. Cap yellowish cream to yellow; in sandy *Pinus* forests. Cap 30-100 mm, hemispherical, then convex to expanded; universal veil forming loose, white fragments on the cap and/or a volva at the base; gills white; stem 50-100 x 10-20 mm, cylindrical to clavate with a bulbous base, flocculose, white; ring fugacious, white; smell indistinct. Sp 8-12 x 6-9 µm, broadly ellipsoid to ellipsoid. Autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (DD, V), NO (LC), SE (NT). – B&K 4:151, Däh 467, Jordst 12(1), Phil 148a, Ves 270, ☉. – Poisonous.
A. gemmata (Fr.) Bertill. (*A. junquillea* Quél.)
- Cap pale pinkish buff to pinkish buff or yellowish buff; in deciduous forests. Cap 40-90 mm, convex to plane; universal veil whitish, forming a fragile volva at the base, sometimes also fragments on the cap; gills white; stem 75-150 x 10-15 mm, cylindrical with a bulbous base, whitish to pale pinkish buff; smell indistinct. Sp 10.5-13 x 6.5-9 µm, broadly ellipsoid to ellipsoid. Summer to autumn; very rare in temp.; DK (CR), SE (NE). – C&D 840, Däh 468, GBW 4:12, Phil 152b, Svp 1:9. – Poisonous.
A. eliae Quél.
- 4. Cap 60-200 mm; flesh yellow under the cuticle see *A. muscaria* var. *regalis* 1
- Cap 40-100 mm; flesh white. Cap hemispherical, then convex to expanded, yellowish brown to brown; universal veil forming loose, white fragments on the cap; gills white; stem 60-100 x 10-20 mm, cylindrical with a bulbous base, fibrillose, white; ring white, not striate; smell indistinct. Sp 10-12 x 7-9 µm, broadly ellipsoid. In forests and parks under *Fagus*, *Quercus*, *Tilia*, etc., less often in coniferous forests and in sand dunes with *Salix repens*, on neutral to calcareous soil; summer to autumn; common in temp.-hemib., occasional in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 839, FE 9: phot. 34, Phil 145cd, R&H 398, Ves 266, ☉. – Very poisonous.
A. pantherina (DC.: Fr.) Krombh.

Key B: Subgen. *Amanita* sect. *Vaginatae* (Fr.) Quél. Ring absent; sp non-amyloid

- 1. Cap white or tinged pale grey, at least when young 2
- Cap distinctly coloured 4
- 2. Frb tall and fragile, pure white and remaining so; with deciduous and coniferous hosts in temp.-suba. see *A. vaginata* f. *alba* 18
- Frb not very tall and at the same time fragile; cap often tinged greyish or pale buff with age; with *Salix*, *Betula* or *Polygonum viviparum* in suba.-arc./alp. 3
- 3. Cap white, becoming pale buff at centre; stem 45-210 x 6-25 mm, with floccose girdles in upper part. Cap 40-140 mm, hemispherical to conical, later convex to expanded with an umbo, radially sulcate up to 0.3 the radius; universal veil white, forming a sack-like volva and sometimes a large patch on the cap; gills white; stem cylindrical to clavate, white to pale cream, ± greying with age, sometimes with fugacious remnants of veil. Sp 10-13 x 9-12.5 µm, globose to subglobose. In suba.-arc./alp. with *Salix* or *Betula*, in bore. with *Picea*; summer to

autumn; rare in bore.-arc./alp.; FI (LC), IS, NO (LC), SE. – SMT 27(2):12, 27(3):61-62.

A. arctica Bas, Knudsen & T. Borgen (*A. islandica* Melot)

Note: the synonymy is based on unpublished phylogenetic data (R. Kjøller pers. comm.).

- Cap tinged pale grey to silvery grey, sometimes white when young; stem 30-70 x 5-15 mm, finely floccose. Cap 20-80 mm, conical, later convex with an umbo, radially sulcate up to 0.3 the radius; universal veil whitish, forming a sack-like volva and sometimes a few patches on the cap; gills white to cream; stem cylindrical to clavate, white or tinged greyish or pinkish, sometimes with fugacious remnants of veil. Sp 10-13.5 x 9-12 μm , globose to subglobose. With dwarf *Salix*, *Betula* or *Polygonum viviparum*; summer to autumn; common in suba.-arc./alp.; FI (LC), FO, IS, NO (LC), SE (LC). – AAF 1:25, B&K 4:1421, Bol Bres 43:177, 189 & 182, R&H 394, SMT 27(3):63, ☉.

A. nivalis Grev. (*A. alpina* Contu)

- 4. Universal veil breaking up into warts or patches on the cap or stem and/or discolouring to grey, dominated by spherocysts or with an equal mixture of spherocysts and filamentous hyphae 5
- Universal veil membranous, forming a well defined volva at the base, white or externally with orange or brown stains, dominated by filamentous hyphae 12
- 5. With *Salix* or *Betula* in suba.-arc./alp. 6
- In deciduous or coniferous forests or parks in temp.-suba. 7

- 6. Cap radially sulcate up to 0.2 the radius, clay buff to greyish brown or yellowish brown, margin sometimes straw-coloured; universal veil forming small to large patches on the cap. Cap 30-120 mm, hemispherical, then convex to expanded with or without a low umbo; universal veil whitish to greyish; gills white to pale cream; stem 40-150 x 8-20(-33) mm, clavate, whitish with greyish buff to brownish girdles. Sp 9-12.5 x 8-11.5 μm , globose to subglobose. With *Salix* or *Betula*; summer; rare in arc./alp., FI (DD), NO (NE). – Bor 62, ☉.

A. groenlandica Knudsen & T. Borgen

- Cap radially sulcate up to 0.4 the radius, yellowish brown to olive brown; universal veil often forming a basal volva. Cap 35-75 mm, conical to bell-shaped, later expanded with an umbo; universal veil greyish; gills white to pale buff; stem 60-140 x 6-17 mm, clavate, whitish or tinged brownish, pruinose. Sp 9.5-13 x 8.5-11.5 μm , subglobose. With *Salix* or *Betula*; summer to autumn; very rare in arc./alp.; IS (Na), NO (NE, Troms: Kåfjord). – Bor 64, SMT 27(3):54, ☉.





A. mortenii Knudsen & T. Borgen

- 7. Cap 20-60 mm; stem 40-90 x 4-15 mm; on damp soil with deciduous trees 8
- Cap 50-200 mm; stem 90-300 x 10-55 mm; on dry soil under deciduous trees or conifers 9
- 8. Cap sepia to greyish brown or brownish grey; universal veil greyish, forming numerous small scales on the cap; sp 10-12.5 x 8-10 μm , broadly ellipsoid. Cap 20-60 mm, convex, then expanded to depressed, radially sulcate up to 0.35 the radius; gills whitish; stem 40-90 x 4-15 mm, cylindrical to clavate, flocculose, whitish to pale grey. With *Alnus incana*; summer to autumn; rare in hemib.-bore.; FI (NT), NO (VU), SE (NT). – B&K 4:138, Bol Bres 37:100, 43:164, Sieniop 91, ☉.


A. friabilis (P. Karst.) Bas

- Cap olive grey to greyish brown; universal veil white to ochraceous grey, breaking up into patches on the cap and lower part of stem; sp 9-13 μm , \pm globose. Cap conical, then expanded with an umbo, with a radially sulcate margin; gills white; stem 50-95 x 5-10 mm, cylindrical to clavate, white with greyish to olive fibrils. On damp soil with deciduous trees like *Betula* and *Alnus* and in subalpine *Betula* forests; autumn; occasional in bore.-suba., very rare in temp.; DK (EN), FI (LC). – Sieniop 93.



A. olivaceogrisea Kalamees

9. Stem buff grey to grey, turning dark grey when handled. Cap 60-120 mm, conical, then convex to expanded, radially sulcate up to 0.4 the radius, greyish brown; universal veil grey, forming conspicuous remnants on cap and stem; gills white to greyish white; stem 70-300 x 15-35 mm, cylindrical to clavate, floccose. Sp 11.5-14 μm , \pm globose. In deciduous forests and parks on clayey soil, especially under *Quercus* and *Fagus*; summer to autumn; rare in temp.-hemib.; DK (NT), FI (DD, V: Turku and Tenhola), SE (NT). – B&K 4:136, Däh 454, Phil 150c, R&H 394, Ves 271, .
- A. ceciliae* (Berk. & Broome) Bas (*A. strangulata* (Fr.) Roze s. auct., *A. inaurata* Secr. nom. inval.)
- Stem whitish to cream or pale buff, not turning dark grey when handled 10
10. Universal veil \pm greyish. Cap 50-120 mm, conical to convex, later expanded, radially sulcate up to 0.25-0.4 the radius, olivaceous yellow to greyish brown or olive brown; gills whitish; stem 100-200 x 10-20 mm; universal veil forming scales on the cap and/or an irregularly torn volva at the base. Sp 10-14 μm , \pm globose. With conifers and deciduous trees, especially *Picea*, on acid or calcareous soil and marine clay; summer to autumn; common in bore., occasional in temp.-hemib.; DK (NE), FI (LC), IS (Su), NO (LC), SE (LC). – B&K 4:142, Blekks 79:4, Bol Bres 43:230, GBW 4:30, SMT 27(3):52, .
- A. submembranacea* (Bon) Gröger var. *submembranacea*
var. *bispora* D.A. Reid (*A. submembranacea* (Bon) Gröger s. Reid, *A. castaneogrisea* Contu nom. inval.) differs in having a sepia cap. With *Betula* and conifers. NO. – Bol Bres 43:18, Phil 150a (as *vaginata*).
- Universal veil whitish to buff 11
11. Universal veil forming a \pm coherent volva, fragile, often damaged when picked, whitish, sometimes orange brown on the outside. Cap 60-200 mm, conical, then expanded with a broad umbo, radially sulcate up to 0.25 the radius, cream to pinkish buff; gills whitish, often with a grey-brown edge; stem 90-200 x 10-25 mm, clavate, floccose, white to cream or pale buff. Sp 9-13 μm , \pm globose. With deciduous trees on clayey or calcareous soil in parks and open forests; summer to autumn; very rare in temp.-hemib.; DK (EN), FI (DD, V: Turku), NO (NE), SE (NE). – B&K 4:140, Bol Bres 43:252, Bon 295, GBW 4:25, .
- A. lividopallescens* (Boud.) Kühner & Romagn.
- Universal veil forming numerous warts on the cap, and a belt of tissue at the base, but without a coherent volva, white, turning brownish. Cap up to 120 mm, conical to hemispherical, later expanded, radially sulcate in outer part, buff to yellowish brown or greyish brown; gills whitish; stem 100-200 x 12-20 mm, cylindrical to clavate, floccose, white, turning brownish. Sp 10-12 x 9-11 μm , subglobose. In deciduous forests; DE. – Bol Bres 37:98.
A. beckeri Huijsman
12. Cap buff yellow, yellowish, orange, yellow brown or orange brown 13
- Cap with olivaceous, grey, buff, pinkish buff, greyish brown or sepia colours 15
13. Cap yellow brown to orange brown; volva partly staining orange brown on the outside. Cap 30-80 mm, ovoid to conical, then convex to expanded or depressed with a small umbo, radially sulcate up to 0.6 the radius; universal veil forming a free, sack-like volva; gills white with a brownish tinge; stem 70-180 x 6-20 mm, clavate, fibrillose, whitish, tinged yellowish brown. Sp 10-12 μm , \pm globose. In deciduous and mixed forests, mainly under *Betula* and *Quercus* on poor, often peaty soil, more rarely under *Fagus*; summer to autumn; very common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:139, Däh 458, Ger 01:27, R&H 396, Ves 270, . – Edible.
A. fulva (Schaeff.: Fr.) Fr.
- Cap yellow, orange or buff yellow; volva white 14

14. Cap yellowish orange at centre, paler towards margin; stem yellowish cream to brownish orange with contrasting, pale orange girdles, mostly much longer than cap diam. Cap 40-100 mm, ovoid to conical, then convex to expanded or depressed with a small umbo, radially sulcate up to 0.3 the radius; universal veil forming a sack-like volva; gills white; stem 85-230 x 7-15 mm, clavate, white or tinged orange. Sp 9.5-12 x 8.5-11 μm , globose to subglobose. With deciduous trees, mostly with *Betula* and *Quercus*, less often with conifers; summer to autumn; common in hemib.-bore., occasional in suba., rare in temp.; DK (NT), FI (LC), IS, NO (LC), SE (LC). – Däh 460, GBW 4:21, Phil 152a, R&H 395, Sieniop 90, ☉.
A. crocea (Quél.) Singer
- Cap \pm uniformly buff yellow, fading with age; stem white, without contrasting girdles, not much longer than cap diam. Cap 40-90 mm, ovoid to conical, then convex to expanded or depressed with a small umbo, radially sulcate up to 0.2 the radius; universal veil forming a sack-like volva; gills white; stem 75-120 x 9-13 mm, cylindrical to clavate, white to cream, without contrasting girdles. Sp 9-12.5 x 8-10.5 μm , subglobose to broadly ellipsoid. With deciduous trees and conifers; summer to autumn; rare in temp.-suba.; DK (NA), NO (LC), SE (LC). – Blekks 79:5, Bol Bres 37:58, SMT 27(3):60, ☉.
A. flavescens (E.-J. Gilbert & S. Lundell) Contu (*A. vaginata* (Bull.: Fr.) Lam. var. *flavescens* E.-J. Gilbert & S. Lundell, *A. adnata* (W.G. Sm.) Sacc. s. Fungi Exsic. Suecici)
15. Sp ellipsoid to broadly ellipsoid (fig. 333A), $Q_{av} > 1.15$ 16
- Sp globose or subglobose (fig. 333B), $Q_{av} < 1.15$ 17
16. Volva to 107 x 62 mm and to 10 mm thick. Cap 80-115 mm, hemispherical, then convex to expanded, radially sulcate at margin, greyish with a slight olive tinge, with a slightly deeper grey zone on the inner edge of sulcation; universal veil white, developing rusty spots; gills white to cream, with floccose edge; stem 95-125 x 15-20 mm, cylindrical to clavate, developing transverse cracks, whitish. Sp 10-15 x 8.5-12 μm , broadly ellipsoid. In deciduous and coniferous, grass- and herb-rich forests; summer to autumn; rare in hemib.-bore.; FI (DD), NO (NE), SE. – Bol Bres 43:258.
A. magnivolvata Aalto (*A. mairei* Foley var. *amplivolvata* Contu)
- Volva smaller and thinner. Cap 60-100 mm, hemispherical, then convex to expanded, radially sulcate up to 0.35 the radius, silvery grey; universal veil white, forming patches on the cap and a sack-like volva; gills greyish white; stem 60-140 x 15-30 mm, clavate, appressed flocculose, greyish white. Sp. 9.5-13.5 x 8.5-10.5 μm , broadly ellipsoid (fig. 333A). With deciduous trees; summer to autumn; very rare in temp.; DK (EN), SE (Sk). – B&K 4:141, Bol Bres 43:228.
A. argentea Huijsman (*A. mairei* Foley s. auct. p.p.)
17. Volva fragile, easily breaking into pieces see *A. lividopallescens* 11
- Volva coherent 18
18. Cap grey; volva white to pale greyish without spots. Cap 30-80 mm, ovoid to conical, then convex to expanded or depressed, radially sulcate up to 0.4 the radius, grey or brownish grey; universal veil forming a whitish to pale greyish, free, sack-like volva; gills white; stem 50-130 x 5-10 mm, cylindrical to clavate, fibrillose, whitish, tinged yellowish brown. Sp 9-12 μm , \pm globose (fig. 333B). Under deciduous trees, especially *Fagus*, but also with *Betula* and conifers; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), IS, NO, SE (LC). – C&D 827, GBW 4:31, Ger 01:27, SMT 27(3):53, Ves 271, ☉.
A. vaginata (Bull.: Fr.) Lam. f. *vaginata*
f. *alba* (De Seynes) Veselý differs in being pure white; DK, FI, NO. – GBW 4:31, SMT 27(3):56.
- Cap greyish brown to greyish olivaceous, olivaceous brown or dull brown; volva whitish with orange-brown spots 19

19. Volva 60-100 mm high. Cap 60-150 mm, at first conical to convex, expanding with an umbo, radially sulcate in outer part, olivaceous brown to dull brown; universal veil forming a sack-like volva with orange-brown spots; gills white with a brownish edge near cap margin; stem 70-180 x 10-30 mm, clavate, velvety, whitish to pale buff. Sp 10-12.5 μm , \pm globose. In parks under *Fagus*; summer to autumn; very rare in temp.- bore.; DK (DD), NO (NE, Hedm. Trysil). – BCat 1001, GBW 4:27, .
A. pachyvolvata (Bon) Krieglst.
- Volva 20-40 mm high. Cap 50-120 mm, at first conical to convex, expanding with an umbo, radially sulcate in outer part, greyish brown to greyish olivaceous or olivaceous brown, often appearing zonate; universal veil forming a sack-like volva with orange brown spots; gills white with a brown edge; stem 70-160 x 7-20 mm, clavate, whitish with grey to brown flocks. Sp 10-13 μm , \pm globose. In deciduous and coniferous forests, parks and pastures; summer to autumn; common in hemib.-bore., rare in temp., very rare in IS; DK (NE), FI (LC), IS (Ve), NO (LC), SE (LC). – C&D 834, Däh 462, R&H 396, Sieniop 89, SMT 27(3):58.
A. battarrae (Boud.) Bon

Key C: Subgen. *Lepidella* (E.-J. Gilbert) Veselý. Ring present; sp amyloid

1. Universal veil forming a free, sack-like volva; smell nauseous honey-like 2
 - Universal veil breaking up into warts, scales or patches on the cap; smell indistinct, potatolike or earthy 3
2. Cap radially silky-fibrillose, greyish green to olive green; stem whitish to pale greenish with a zig-zag pattern. Cap 30-120 mm, hemispherical, then convex to expanded; universal veil forming a free volva, occasionally also large patches on the cap, white; gills white; stem 40-150 x 10-20 mm, cylindrical to clavate with a 30-45 mm broad basal bulb; ring white; smell \pm nauseous honey-like. Sp 7.5-9 x 6-7.5 μm , subglobose to broadly ellipsoid (fig. 303D). Under deciduous trees, mainly *Fagus* and *Quercus* in forests and parks; summer to autumn; common in temp., occasional in hemib.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 851, FE 9: phot. 55, Phil 144a, R&H 399, Ves 265, . – Deadly poisonous.
A. phalloides (Vaill.: Fr.) Link var. *phalloides*
 var. *alba* Costantin & Dufour differs in being pure white. DK, SE. – BCat 902, Bol Bres 43:106, FE 9: phot. 56.
 Note: *A. phalloides* has destructive effects on liver and kidneys and is responsible for more deadly incidents in Europe than any other agaric.
- Cap smooth, white; stem white, floccose. Cap 30-120 mm, conical, then bell-shaped to expanded with an umbo, often asymmetrical; universal veil forming a free volva, white; gills white to cream; stem 60-160 x 6-20 mm, cylindrical to clavate with a 20-40 mm broad basal bulb; ring white; smell \pm nauseous honey-like. Sp 7-8 μm , \pm globose. Under deciduous trees and conifers on acid soil; summer to autumn; common in temp.-southern bore., rare, but locally common in middle bore.-suba., in FI north to PeP and Ks; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 854, FE 9: phot. 60, Phil 148c, 149d, R&H 399, Ves 264, . – Deadly poisonous.
A. virosa (Fr.) Bertill.
 Note: *A. virosa* has destructive effects on liver and kidneys and is often responsible for deadly incidents in Europe.
3. Smell like potato; ring smooth or indistinctly striate on the upper side 4
 - Smell indistinct or earthy; ring distinctly striate on the upper side 5
4. Cap greyish brown; ring blackening. Cap 30-90 mm, bell-shaped, then convex with a low umbo, greyish brown; universal veil may form loose, brownish grey fragments on the cap; gills white; stem 60-110 x 5-12 mm, cylindrical to clavate with a rounded basal bulb; ring thin; smell potato-like. Sp 8-10 μm , \pm globose. On poor soil under conifers, less often with deciduous trees, also in subalpine *Betula* forests; summer to autumn; very common in

hemib.-bore., common in temp., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 473, FE 9: phot. 92, Phil 146a, R&H 400, Ves 269, ☉.

A. porphyria Alb. & Schw.: Fr.

- Cap whitish to pale greenish yellow; ring not blackening. Cap 30-100 mm, hemispherical, then convex to expanded; universal veil forming loose, whitish to buff fragments on the cap; gills white; stem 40-120 x 5-20 mm, cylindrical to clavate with a 20-40 mm broad, rounded basal bulb; ring white; smell potato-like. Sp 8-10 x 7-9 μm , subglobose. In deciduous and coniferous forests; summer to autumn; very common in temp.-hemib. common in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 855, Phil 147d, R&H 400, Svp 48:21, Ves 265, ☉.

A. citrina (Schaeff.) Pers. f. *citrina* (*A. mappa* (Batsch) Quél.)

f. *alba* (Pers.) Quél. differs in being pure white. DK, NO, SE. – B&K 4:147, Däh 475, FE 9: phot. 88, Phil 147c.

5. Flesh very slowly turning brownish red when bruised and where eaten by slugs and larvae. Cap 50-150 mm, hemispherical, then convex to expanded, reddish buff to pale reddish brown; universal veil forming loose, whitish to reddish brown fragments on the cap; gills white; stem 60-150 x 15-40 mm, cylindrical to clavate with a rounded basal bulb; ring white, striate; smell indistinct. Sp 8-9 x 6-7 μm , broadly ellipsoid. Under deciduous trees and conifers; summer to autumn; very common in temp.-hemib., common in bore., occasional in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 842, FE 9: phot. 83, Phil 143d, R&H 401, Ves 268, ☉. – Edible.

A. rubescens (Pers.: Fr.) Gray f. *rubescens*

f. *alba* (Coker) Sartory & Maire differs in being white. DK, NO. – Däh 475, FE 9: phot. 84, pl. 86.

- Flesh unchanged or turning brown where eaten by slugs and larvae 6
- 6. Gills pale greyish buff or greenish; universal veil forming acute, persistent scales on the cap. Cap 30-90 mm, hemispherical, then convex to expanded, greyish cream to greyish buff; universal veil whitish to pale buff; stem 40-80 x 15-40 mm, clavate with widened, but pointed-radicating base with concentric scales, whitish to greyish white; ring whitish; smell indistinct or earthy. Sp 9-12 x 6-8 μm , ellipsoid. In *Fagus* forests on limestone; summer to autumn; very rare in temp.; DK (EN). – B&K 4:158, Däh 480, FE 9: phot. 45, Svp 22:1, Ves 267.

A. solitaria (Bull.: Fr.) Mérat (*A. echinocephala* (Vittad.) Quél.)


- Gills white; remnants of universal veil on cap polygonal, wart-like or floccose, persistent or fugacious 7
- 7. Bright yellow colours present on cap margin, ring margin or stem base. Cap 50-100 mm, hemispherical, then convex to expanded, cream to buff yellow; universal forming loose, yellowish to buff fragments on the cap; gills white; stem 50-100 x 10-20 mm, cylindrical to clavate with a bulbous base, white; ring whitish; smell indistinct. Sp 8-10 x 6-7 μm , ellipsoid. In deciduous forests and parks on limestone or rich soil; summer to autumn; rare in temp.; DK (NT), SE (VU). – GBW 4:37, Phil 146b, R&H 401, SMT26(2):53, Ves 269.

A. franchetii (Boud.) Fayod (*A. aspera* (Pers.) Pers. s. auct.)

- Without yellow colours 8
- 8. Cap 80-200 mm, whitish to pale sordid greyish; universal veil forming large, whitish to greyish, polygonal to amorphous, sometimes fluffy scales on the cap. Cap hemispherical, then convex to expanded; gills white; stem 100-200 x 20-30 mm, cylindrical to clavate with a bulbous base, white; ring white; smell indistinct. Sp 10-13.5 x 7-8.5 μm , ellipsoid. On calcareous soil under deciduous trees; late summer to late autumn; rare in temp.; DK (VU), SE (VU). – C&D 843, Däh 479, FE 9: phot. 49, pl. 52-53, Phil 146c, Ves 267, ☉.

A. strobiliformis (Vittad.) Bertill.

- Cap 30-140 mm, buff to greyish brown; universal veil forming whitish to greyish warts or patches on the cap. Cap hemispherical, then convex to expanded; gills white; stem 60-140 x

8-25 mm, cylindrical to clavate with a bulbous base, whitish, often with brown spots at base; ring whitish, striate; smell indistinct or faintly potato-like. Sp 7-10 × 6-8 μm, subglobose (fig. 333C). In deciduous and coniferous forests, parks, etc.; summer to autumn; common in temp.-hemib., occasional in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 841, FE 9: phot. 75-77, pl. 82-87, Phil 142a, R&H 402, Ves 268, .

A. excelsa (Fr.: Fr.) Bertill. f. *excelsa* (*A. spissa* (Fr.) P. Kumm.)

f. *alba* (Quél.) Neville & Poumarat differs in being white; DK, NO (Hedm: Strange). – FE 9: phot. 78.

Ampulloclitocybe Redhead, Lutzoni, Moncalvo & Vilgalys JAN VESTERHOLT

Clavicybe Harmaja

One species in the Nordic countries; see description below.

Lit.: Kuyper in Bas et al. 1995, Redhead et al. 2002.

Frb clitocyboid with clavate stem. Cap 30-80 mm, convex, later plane, smooth to slightly tomentose, dry or somewhat greasy when moist, buff to greyish brown or dark brown with a paler margin, not hygrophanous, not translucently striate. Gills long decurrent, soft, rather thick, medium spaced, white to cream. Stem 30-60 x 5-20 mm, clavate to broadly clavate, at base up to 40 mm broad, striate to fibrillose, cream to buff or greyish brown. Flesh spongy in stem base. Veil absent. Smell faintly acidulous to aromatic. Taste mild. Sp deposit white.

Sp 6-9.5 x 4-5 μm , ellipsoid, smooth (fig. 189D), hyaline, without iodine reactions. Cheilocystidia absent. Pileipellis a cutis of repent to slightly ascending hyphae. Clamps present.

In deciduous and coniferous forests, often along tracks, less often in heathland or grassland; autumn; very common in temp.-bore., common in suba.-arc./alp., occasional in IS; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:154, Däh 190, Phil 90c, R&H 268, Ves 189, ⊙.

A. clavipes (Pers.: Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Clitocybe c.* (Pers.: Fr.) P. Kumm.)



Spores.

Armillaria (Fr.: Fr.) Staude

JAN VESTERHOLT

Armillariella (P. Karst.) P. Karst.

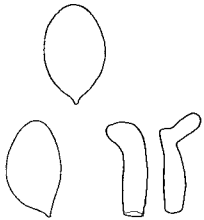
Frb with central stem, mostly fasciculate. Cap convex to bell-shaped, later expanded to slightly depressed, scaly, dry, hygrophanous or not. Gills adnate to short decurrent, medium spaced to crowded. Stem cylindrical, often with clavate, bulbous or tapering base, smooth or with floccose remnants of veil, with or without a white to yellow, membranous or cottony ring. Rhizomorphs black and conspicuous in some species. Smell indistinct. Taste mild to bitter. Sp deposit white to cream.

Sp ellipsoid, smooth, hyaline, without iodine reactions. Basidia 4-spored. Cheilocystidia small, cylindrical to clavate or branched, often septate. Pileipellis a cutis to a trichoderm. Clamps present or absent.

Parasitic or saprotrophic, on wood, sometimes apparently on soil, or in peat bogs. Some species are severe pathogens in forests and gardens.

Six species in the Nordic countries.

Lit.: Cherubini 2003, Gminder & Krieglsteiner in Krieglsteiner 2001, Intini 1998, Korhonen 1978, Ludwig 2001, Marxmüller & Printz 1982, Termorshuizen in Bas et al. 1995.



Spores and cheilocystidia: *Armillaria mellea*.

1. Ring absent; in peat bogs and temporarily flooded lake shores. Cap 15-60 mm, conical to bell-shaped, later expanded to depressed, dry, buff yellowish to yellowish brown with brown scales at centre; stem 30-100 x 5-20 mm, clavate, fibrillose, cream to yellowish buff, turning orange brown from base; frb solitary or fasciculate. Sp 7-9 x 5.5-6.5 μm , ellipsoid. Often among *Phragmites* and *Carex*, but also among *Sphagnum*; late summer to autumn; rare but locally occasional and declining in bore., very rare in temp.-hemib.; DK (EN), FI (VU), SE (NT). – FAD 36F, GBW 3:123, Lud 2.2, Svp 47:54, Ves 217, ⊙.
A. ectypa (Fr.: Fr.) Herink
 - Ring present; on wood or apparently on soil 2
2. Ring cottony, with a pronounced tendency to become torn and irregular 3
 - Ring membranous to cottony, \pm persistent and regular, for a long time with entire margin 4
3. Expanded cap with scattered scales, almost to margin; stem with yellow remnants of veil. Cap 25-100 mm, convex to expanded, honey yellow to brownish yellow with small brownish scales, hygrophanous; stem 60-120 x 8-15 mm, clavate with an up to 25 mm broad base, whitish to pale greyish or yellowish brown; ring fluffy and irregular; frb mostly fasciculate. Sp 7-9 x 4.5-5.5 μm , oblong. On all kinds of deciduous wood, rarely on conifers, often apparently on soil; summer to late autumn; very common in temp.-bore., less common towards north, rare in IS; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Lud 2.6, Phil 100a (as *cepistipes*), R&H 296A, Svp 5:6, Ves 217, ⊙.
A. lutea Gillet (*A. gallica* Marxm. & Romagn., *A. bulbosa* (Barla) Velen. s. auct.)
 - Expanded cap mostly only with scales at centre; stem without yellow veil, but often floccose and/or with yellowish base. Cap 20-100 mm, convex to bell-shaped, later expanded with or

without an umbo, dry, greyish, brownish yellow to yellowish brown or buff, hygrophanous, with brown scales; stem 50-120 x 5-15 mm, cylindrical with widened base, whitish to pale yellowish buff; ring fluffy and fugacious; frb solitary or fasciculate. Sp 7-9 x 5-6 μm , ellipsoid. On deciduous and coniferous wood; summer to autumn; rare in temp.-bore.; DK (LC), NO (LC), SE (LC). – B&K 3:133, Bol Bres 41:12, Lud 2.5, 2.7, Mar 818, Svp 5:7.

A. cepistipes Velen. (incl. *A. pseudobulbosa* (Romagn. & Marxm.) Arnolds & Termorshuizen)

4. Cap with contrasting blackish scales on a cream to honey yellow background; ring margin and stem with blackish floccs. Cap 20-100 mm, convex to expanded, dry, slightly hygrophanous; stem 50-120 x 5-10 mm, cylindrical or with a slightly widened base, cream, but soon turning greyish brown from base; ring rather persistent; frb fasciculate. Sp 8-10 x 5-6 μm , ellipsoid. On coniferous wood, less often on deciduous wood; summer to autumn; common in temp.-hemib., occasional in bore.-suba., in FI found north to EH; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:135, Lud 2.4, R&H 296B, Svp 5:4, Ves 216, ☉. – Poisonous when raw. *A. ostoyae* (Romagn.) Herink (*A. obscura* (Schaeff.) Horak s. auct., *A. polymyces* (Gray) Singer & Cléménçon s. auct.)

- Cap scales brown or \pm concolorous with the background; ring margin and stem not distinctly floccose

5

5. Frb mostly in large and dense fascicles, often with > 25 frb; ring membranous; stem 4-10 mm broad, cylindrical with tapering base; clamps absent. Cap 20-80 mm, convex to expanded, dry, mostly olive yellow with greyish brown centre, with brown scales; stem 50-150 mm long, cream at top, yellowish brown to orange brown towards base, with scattered whitish veil remnants. Sp 7-9 x 5-6 μm , ellipsoid (fig. 255A). On deciduous wood in forests on rich soil; late summer to autumn; in temp., occasional in DK, very rare in SE (Sk); DK (LC), SE (LC). – GBW 3:125, Lud 2.8, Phil 100b, Svp 5:3, Ves 216, ☉.

A. mellea (Vahl: Fr.) P. Kumm.

- Frb in fascicles, but hardly with > 25 frb; ring submembranous to cottony; stem 8-20 mm broad, cylindrical to clavate; clamps present. Cap 30-100 mm, convex to expanded, dry, olive yellow to orange brown with \pm concolorous scales; stem 50-150 mm long, greyish yellow to orange brown, smooth or slightly floccose, with scattered whitish veil remnants. Sp 7-8.5 x 4.5-5.5 μm , ellipsoid. On deciduous and coniferous wood, on living and dead trunks, but also in stumps and leftover logs; summer to late autumn; very common in bore, occasional in temp.-hemib. and suba.; DK (LC), FI (LC), NO (LC), SE (LC). – Bol Bres 41:15, C&D 316, Lud 2.3, Svp 5:5.

A. borealis Marxm. & Korhonen

Arrhenia Fr.

STEEN A. ELBORNE

Leptoglossum P. Karst., *Leptotus* P. Karst., *Phaeotellus* Kühner & Lamoure, *Omphalina* Quél. p.p.

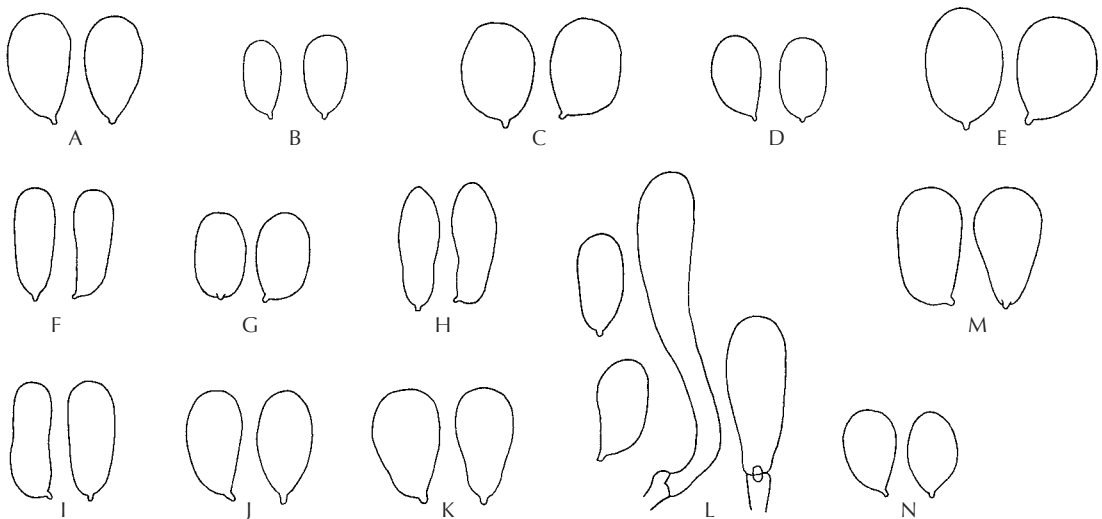
Frb omphalinoid, spathulate or membranous with gilled, veined or smooth hymenophore. Cap 1-50 mm, spathulate, cup-, kidney-, fan-, shell- or funnel-shaped, or convex to plane with ± depressed centre, smooth to finely scaly, translucently striate or not, grey brown to almost black, rarely with bluish colours. Gills absent, veined or normally developed, decurrent, mostly distant, sometimes forked and anastomosing, grey to grey brown. Stem absent or lateral, eccentric or central, 2-70 × 0.5-6 mm, cylindrical to compressed, smooth to pubescent, concolorous with cap or paler. Flesh thin. Smell indistinct to *Pelargonium*-like. Taste indistinct. Sp deposit white.

Sp subglobose, ellipsoid, ovoid, amygdaloid, cylindrical or dacryoid, smooth, hyaline, thin-walled, without iodine reactions, not cyanophilous. Basidia 2- or 4-spored. Cheilocystidia mostly absent, when present simple cylindrical, clavate to narrowly lageniform, thin-walled, hyaline. Pleurocystidia absent. Caulocystidia absent, but cylindrical to clavate, short to long hairs often present. Pileipellis a cutis or a poorly developed trichoderm. Pigments mostly incrusting. Clamps present or absent.

Saprotrophic or parasitic on mosses, solitary or in groups, often in pioneer vegetation with almost naked soil in mountains, in heathland, peat bogs and in grassland, rarely on wood in forests. All year around.

23 species in the Nordic countries, 25 species in the key. Most of the species now placed in *Arrhenia* were previously considered to be members of the genus *Omphalina*. However recent molecular data have shown that they belong together with the more reduced forms in *Arrhenia* (Redhead et al. 2002).

Lit.: Barrasa & Rico 2003, Bigelow 1985, Clemençon 1982, Høiland 1976, Kühner & Lamoure 1972, Kuyper in Bas et al. 1995, Lamoure 1974, 1975, 1982, Ludwig 2001, Redhead 1984a.



Spores and hairs from stem: A: *Arrhenia auriscalpium*, B: *A. retiruga*, C: *A. lobata*, D: *A. spathulata*, E: *A. salina*, F: *Arrhenia peltigerina*, G: *A. onisca*, H: *A. gerardiana*, I: *A. griseopallida*, J: *A. rickenii*, K: *A. trigonospora*, L: *A. velutipes*, M: *A. obscurata*, N: *A. obatra*.

1. Stem absent or short and lateral 2
 - Stem central to eccentric 6
2. With normal gills. Cap 6-35(-40) mm, kidney-shaped to rounded fan-shaped seen from above, first low convex to plane seen from side, then almost funnel-shaped, with slightly involute, when with old strongly lobed and wavy margin, not striate to translucently striate halfway towards attachment, smooth, innately fibrillose to pubescent at centre, hygrophanous, grey brown to grey, drying pale grey; gills adnate to decurrent, distant, thin to somewhat thickened, sometimes forked, dark grey, edge entire, concolorous; stem 2-10 x 2-6 mm, lateral, rarely eccentric or absent, white tomentose; flesh thin, paler or concolorous with surface; smell indistinct to slightly *Pelargonium*-like; taste indistinct. Sp (5-)6-9.5(-11) x (3-)4-6.5(-7) μm , subglobose, ovoid, ellipsoid to dacryoid; basidia 4-spored; cystidia absent; pileipellis a cutis; clamps present. Solitary or in small groups on soil often with low mosses or on rotting plant debris or on wood, in open grassland and in forests; autumn; rare, but locally occasional in temp.-arc. / alp.; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – B&K 3:136, C&D 165, FAD 63B, D, Lud 3.1, R&H 297, ☉.
- A. acerosa* (Fr.: Fr.) Kühner var. *acerosa* (*Leptoglossum a.* (Fr.: Fr.) M.M. Moser, *Phaeotellus a.* (Fr.: Fr.) Gulden, *Omphalina a.* (Fr.: Fr.) M. Lange, *A. glauca* (Batsch) Bon & Courtec., *A. latispora* (J. Favre) Bon & Courtec.)
- var. *tenella* (Kühner) Aronsen, differs in having 2-spored basidia and larger spores, 10-15 (-19.5) x 5.5-9.5 μm ; very rare; NO (incl. Svb). – AAF 2:31.
- Note: *A. latispora* is recognized by some authors as a separate taxon based on broader spores, but there seems to be intergradations with the typical variant and they are therefore treated as synonyms here.
- Hymenophore smooth to venose 3
3. Stem normal, lateral, delimited from cap by a rim. Cap 2-10(-20) mm, first cup-shaped with incurved margin, then expanding to ellipsoid, obovoid, spatulate, fan-shaped or semi-circular, first erect then drooping, margin lobed and wavy, smooth to innately fibrillose, opaque to faintly translucently striate, hygrophanous, dark grey brown to blackish, drying pale grey brown; hymenophore first smooth then veined, intervenose, forked and anastomosing, delimited from stem by a sterile margin, colour of cap or paler; stem 2-10 x 0.5-2 mm, cylindrical, slightly tapering towards base, erect or oblique, pubescent, base white tomentose, concolorous with cap; flesh thin, whitish to brownish; smell and taste indistinct. Sp (5-)7.5-10(-11) x 4-6.5(-7.5) μm , ellipsoid, amygdaloid or dacryoid (fig. 229A); basidia 4-spored; cystidia absent; pileipellis a cutis; clamps present. Solitary or in small groups on naked sandy soil or with low mosses in pioneer vegetation, sometimes on old fire-places; summer to autumn; occasional in arc. / alp., rare in middle bore.-suba., in FI down to KP; FI (LC), IS, NO (LC, incl. Svb), SE (LC). – AAF 2:23, B&K 3:137, C&D 164 Lud 3.3, SMT 27(2):21, 48, ☉.
- A. auriscalpium* (Fr.: Fr.) Fr.
- Stem absent or rudimentary, not delimited from cap by a rim 4
4. Frb pale greyish to almost white. Cap 1-10(-15) mm, dorsally attached in a central to eccentric point, cup-shaped to disc-shaped, circular to spatulate when seen from above, with incurved, strongly lobed and wavy margin, opaque to slightly translucently striate, innately fibrillose, pubescent at margin, greyish white, pale beige to pale grey brown; hymenophore first smooth, then radially wrinkled to veined, forked and intervenose anastomosing, pale grey-brown; stem absent; flesh very thin, concolorous or paler than surface; smell indistinct or slightly *Pelargonium*-like; taste indistinct. Sp (5-)6-9.5(-11.5) x 3-5(-7) μm , ellipsoid, ovoid or dacryoid (fig. 229B); basidia 4-spored; cystidia absent; pileipellis a cutis; clamps absent. In groups, sometimes imbricate on living mosses and on dead grasses and other plant debris in moist places in forests and in open grassland, also on deciduous trunks and in rocky habitats; all year; occasional in temp.-arc. / alp.; DK (LC), FI (LC), IS, NO (LC, incl. Svb), SE

(LC). – AAF 2:27, Phil 265, Lud 3.5, Sieniop 281, ☉.

A. retiruga (Bull.: Fr.) Redhead (*Leptoglossum r.* (Bull.: Fr.) Ricken)

- Frb with dark grey to brown colours 5
- 5. Clamps present; on wet mosses, esp. *Drepanocladus* and *Calliargon*, along streams, in mires, fens and snow-beds. Cap 5-50 mm, laterally to dorsally attached, kidney-shaped, semicircular or fan-shaped, with lobed and wavy, incurved margin, smooth, innately radially fibrillose, sometimes zonate, translucently striate, hygrophanous, yellowish brown to dark grey brown, drying pale greyish; hymenophore first smooth, then radially veined, veins undulating, forked and anastomosing, concolorous with cap or paler; stem absent, frb attached by a sterile whitish tomentose part of the cap; flesh thin, soft, gelatinous, concolorous with surface; smell indistinct to slightly acidulous; taste indistinct. Sp 5-10(-15) × 4-8.5 μm, subglobose, ellipsoid or dacryoid (fig. 229C); basidia 2- or 4-spored; cystidia absent; pileipellis a cutis. In large groups, sometimes imbricate; spring to autumn; common in suba.-arc./alp., rare, but locally occasional in temp.-bore.; DK (EN), FI (LC), FO, IS, NO (LC, incl. SvB), SE (LC). – AAF 2:25, B&K 3:138, GBW 3:129, Lud 3.6, Svp 20:95, ☉.
A. lobata (Pers.: Fr.) Redhead (*Leptoglossum l.* (Pers.: Fr.) Ricken)
 - Clamps absent; on mosses, esp. *Tortula ruralis*, in dry habitats on calcareous soil, limestone rocks or in sand dunes. Cap 5-15(-25) mm, spathulate, fan-, kidney- or shell-shaped, rarely half funnel-shaped, with straight, lobed and wavy, sometimes furrowed margin, somewhat zonate, translucently striate halfway to centre, smooth, hygrophanous, dark grey, greyish ochre to grey brown, drying brownish grey; hymenophore first smooth, then veined, veins often forked and anastomosing, concolorous with cap; stem rudimentary, 2-5 × 0.5-4 mm, lateral, continuous with cap, smooth to minutely tomentose, base white strigose, white or concolorous with cap; flesh thin, concolorous with surface; smell indistinct or of *Pelargonium* when drying; taste indistinct. Sp (5.5-)6-10(-10.5) × 4-6.5 μm, ellipsoid to dacryoid (fig. 229D); basidia (2-)4-spored; cystidia absent; pileipellis a cutis. In small groups; autumn to winter; rare but locally occasional in temp.-bore., in FI north to Ks; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:139, C&D 167, GBW 3:131, Lud 3.7, R&H 297.
A. spathulata (Fr.) Redhead (*Leptoglossum muscigenum* (Bull.: Fr.) P. Karst., non *A. muscigena* (Pers.: Fr.) Quél.)
- 6. Hymenophore with venose, forked and anastomosing ridges; gregarious on low mosses, e.g. *Campylium* and *Pohlia* in open meadows or on sea cliffs on salt influenced sea shores in the arctic. Cap 5-33(-42) mm, low convex with broadly and shallowly depressed centre to slightly funnel-shaped, with incurved, crenulate, somewhat lobed, wavy margin, smooth, innately fibrillose, translucently striate at margin to halfway towards centre, hygrophanous, pale grey brown, greyish ochre, olivaceous brown to dark sepia brown, paler at centre, drying pale beige to almost white; hymenophore pale olive grey, pale grey brown or pale beige; stem 2-16 × 2-6 mm, central to eccentric, cylindrical to compressed, tapering towards base, pubescent to tomentose, base white tomentose, concolorous with cap or slightly paler; flesh soft, semitransparent, pale olive grey, drying whitish; smell and taste indistinct. Sp (7-)7.5-10(-11) × 5.5-8.5 μm, subglobose, ellipsoid or broadly dacryoid (fig. 229E); basidia 4-spored; cystidia absent; pileipellis a cutis; clamps present. Summer to autumn; very rare in arc./alp.; NO (NT, incl. SvB). – AAF 2:29, Lud 3.4.
A. salina (Høil.) Bon & Courtec. (*Leptoglossum s.* Høil., *L. littorale* Høil. non Rostrup, *A. littoralis* (Høil.) Høil.)
 - Hymenophore with normal gills, or not growing on arctic sea shores 7
- 7. Frb with bluish green colours. Cap (3-)5-25(-30) mm, first low convex with papilla, then plane with shallowly depressed centre to slightly funnel-shaped, minutely velvety-wrinkled at centre, translucently striate at margin to halfway towards centre, weakly hygrophanous, greyish green with blue tint, darker blue green to blackish green at centre, drying somewhat

paler to yellowish brown; gills decurrent, very distant, thin, sometimes forked, whitish, pale bluish to greenish grey towards cap, edge entire, concolorous; stem 8-30 x 1-3 mm, cylindrical, smooth, silky, dark bluish green with greyish base; flesh very thin, concolorous with surface; smell absent, but rancid-farinaceous when cut. Sp (6.5-)7-9.5(-11) x (3-)3.5-5.5(-6) μm , ellipsoid to cylindrical or dacryoid; basidia 4-spored; cystidia absent; pileipellis a cutis; clamps present. Solitary or in small groups among low mosses and lichens on sandy soil in dry grassland, along forest roads and in heathland, from lowlands to mountains above timberline; summer to autumn; very rare or overlooked in temp.-arc. / alp.; DK (DD), FI (LC), NO (LC), SE (LC). – FAD 60G, Lud 55.15.



A. chlorocyanea (Pat.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina c.* (Pat.) Singer, *O. viridis* (Hornem.) Kuyper, *O. viridimammata* (Pilát) Bresinsky, *O. smaragdina* (Berk.) Malençon & Berthier s. auct.)


- Frb with greyish to brownish colours 8
- 8. On dead parts of the foliose lichen *Peltigera*. Cap 4-20 mm, convex, then low convex with depressed centre to funnel-shaped, with incurved, then wavy-lobed to crenate margin, translucently striate, smooth to innately fibrillose, hygrophanous, reddish brown to dark brown, drying clay cream to vinaceous buff, silky tomentose when dry; gills arcuate-decurrent, distant, moderately broad, sometimes forked and intervenose, vinaceous grey to pale brown, edge sometimes darker brown; stem 8-30 x 0.5-3.5 mm, cylindrical or slightly widened at base and top, smooth to entirely pubescent, concolorous with cap to almost white; flesh thin, concolorous with surface; smell indistinct or like polypores or *Auricularia*; taste indistinct. Sp 7-11 x 4-5.5(-6.5) μm , oblong ellipsoid to dacryoid (fig. 231A); basidia (2-)4-spored; cystidia absent; pileipellis a cutis; hairs on stem 10-140 x 4-8 μm , cylindrical or slightly swollen below; clamps present. Solitary or caespitose, on roadsides and heathland, from the lowlands to the mountains above timberline; autumn; very rare in hemib.-arc. / alp.; FI (DD), NO (NE, incl. SvB), SE. – Lud 55.17, Sieniop 180, ☉.
- A. peltigerina* (Peck) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina p.* (Peck) P. Collin, *O. cupulatooides* P.D. Orton)
- On soil, mosses, sedges or wood 9
- 9. On strongly decayed coniferous and deciduous wood. Cap 12-40 mm, low convex with deeply depressed centre to funnel-shaped, with straight, crenulate margin, first minutely floccose to finely scaly at centre, then smooth, translucently striate to centre, hygrophanous, dark grey brown to blackish, drying dark grey to grey brown; gills strongly decurrent, medium spaced to crowded, pale grey to grey; stem 20-35 x 2-5 mm, cylindrical to flattened, smooth, base white tomentose, grey brown to dark brown; flesh thin, watery grey; smell and taste indistinct. Sp 6-9(-11) x 3.5-5(-6) μm , ellipsoid, ovoid, subcylindrical or dacryoid; basidia 4-spored; cheilocystidia up to 25 x 10 μm , irregularly clavate to vesiculose; pileipellis a cutis; clamps present. Solitary on strongly decayed fallen logs or stumps, mainly of *Picea* in older forests, more rarely in bogs; summer to autumn; rare in temp.-bore.; DK (EN), FI (LC), NO (LC), SE (LC). – B&K 3:378, GBW 3:480, Lud 55.40, R&H 261, Sieniop 179, ☉.
- A. epichysium* (Pers.: Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina e.* (Pers.: Fr.) QuéL.)
- On soil or mosses 10
- 10. On *Sphagnum* in bogs and on lake shores 11
- On other mosses, on sedges or on soil 13
- 11. Cap smooth to innately fibrillose, dark grey brown to blackish brown. Cap (8-)15-35(-40) mm, first convex with narrowly depressed centre, then funnel-shaped, with downcurved, wavy margin, translucently striate 2/3 towards centre, shiny, hygrophanous, drying medium grey brown; gills strongly decurrent, medium spaced, sometimes forked and intervenose, pale grey brown, ash grey or olivaceous grey, edge concolorous; stem 16-50 x 1.5-5 mm,

cylindrical, smooth, shiny, concolorous with cap, at base white tomentose; flesh concolorous with surface; smell and taste indistinct. Sp 6-10 x (3.5-)4-6 μm , broadly ellipsoid to ellipsoid or pyriform (fig. 231B); basidia 4-spored; cystidia absent; pileipellis a cutis; clamps present. Solitary or in small groups on wet peaty soil in *Sphagnum* and *Polytrichum* in bogs, but also in coniferous forests; summer to late autumn; occasional, but locally common in hemib.-arc./alp., rare in temp.; DK, FI (LC), IS, NO (LC, incl. SvB), SE (LC). – B&K 3:382, Fav 48:2.1-2, Lud 55.33, 34 (var. *olivaceofolia*).

A. onisca (Fr.: Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina o.* (Fr.: Fr.) Quél., incl. var. *olivaceofolia* E. Ludw., *O. fusconigra* P.D. Orton)

- Cap minutely scaly, pale grey brown to buff 12
12. Sp narrowly dacryoid to subcylindrical (fig. 231C); cap scales dark. Cap 8-37 mm, first convex to plane with shallowly depressed centre, then deeply funnel-shaped, first with inrolled, then straight, crenulate margin, translucently striate, radially fibrillose, with dark brown to blackish pointed scales, hygrophanous, ochraceous brown, reddish brown to umber, drying greyish brown to olivaceous buff; gills strongly decurrent, medium spaced to distant, often forked, greyish brown to brownish buff, with concolorous edge; stem 30-50(-60) x 1-3(-5) mm, cylindrical, slightly clavate towards base, smooth, base white tomentose, concolorous with cap; flesh thin, concolorous with surface; smell and taste indistinct. Sp (8-)9-13(-14) x (3-)3.5-5 μm ; basidia 4-spored; cystidia absent; pileipellis a cutis with transition towards a trichoderm; clamps present. Solitary or in small groups on *Sphagnum* in bogs and fens; early summer to autumn; occasional in temp.-arc./alp.; DK (DD), FI, NO (LC), SE (LC). – B&K 3:386 (as *Omphalina sphagnicola*), FAD 60I, Lud 55.35, R&H 262 (as *O. philonotis*).
- A. gerardiana* (Peck) Elborne, see p. 913 (*Omphalina g.* (Peck) Singer, *O. sphagnicola* (Berk.) M.M. Moser s. auct.)
- Sp ellipsoid to oblong ellipsoid; cap scales concolorous and pale. Cap 15-50 mm, deeply funnel-shaped, with slightly downcurved margin, translucently striate, radially fibrillose, minutely appressed scaly, hygrophanous, brownish buff to grey brown, drying pale greyish; gills strongly decurrent, medium spaced to distant, sometimes forked, rather thick, first white, then pale brownish buff, with concolorous edge; stem 32-55(-70) x 3-6 mm, cylindrical to compressed, smooth, concolorous with cap or somewhat darker; flesh thin, concolorous with surface; smell and taste indistinct. Sp 7-12 x 4.5-8 μm ; basidia 4-spored; cystidia absent; pileipellis a cutis; clamps present. Solitary or in small groups on *Sphagnum* in bogs; summer; rare, but locally occasional in temp.-arc./alp.; DK, IS, NO (LC), SE (LC). – Fav 48:2.3-4, Lud 55.32, ☉.
- A. philonotis* (Lasch) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina p.* (Lasch) Quél.)
13. Stem long and slender, 2-3 times the cap diam.; sp globose to subglobose; on tufts of *Carex* in marshes and at lake shores. Cap up to 15 mm, deeply funnel-shaped, with involute, then straight margin, smooth, innately radially fibrillose, hygrophanous, translucently striate, dark grey brown, fading to ash grey; gills strongly decurrent, distant, thin, with entire edge, concolorous with gills, dark grey brown to pale grey; stem 15-50 x 1-1.5 mm, cylindrical, smooth, shiny, dark grey brown to pale grey brown; flesh thin; smell and taste indistinct. Sp 5.5-6.5(-7) x 5-6(-6.5) μm ; basidia 4-spored; cystidia absent; pileipellis a cutis; clamps present. Summer; DE, NL. – Lud 55.27, SZP 65(4):79.
- A. cyathella* (Kuyper) Elborne, see p. 913 (*Omphalina cyathella* Kuyper, *O. cyathella* J. Favre & Schweers nom. inval.)
- Stem short and medium thick, < 2 times diam. of cap; sp ellipsoid, long ellipsoid or dacryoid; habitat different 14
14. Gills pleated, forked and often intervenose 15
- Gills normally developed 16

15. Clamps present. Cap 5-25 mm, first convex, then low convex with shallowly depressed centre to almost funnel-shaped, with incurved to straight, sulcate, often wavy margin, \pm translucently striate, smooth to minutely scaly or wrinkled, hygrophanous, dark brownish grey, drying to isabella or almost white; gills decurrent, distant, thick, forked and intervenose, sometimes pleated, dark grey brown, with entire, concolorous edge; stem (7-)10-30 x 1-4 mm, central to eccentric, cylindrical or tapering towards base, often flexuose, smooth to minutely tomentose, greyish buff; flesh thin, concolorous with surface; smell indistinct or faintly of *Pelargonium*; taste indistinct. Sp (7.5-)8-12(-14) x (4.5-)5-7(-8) μ m, oblong ellipsoid, pyriform or dacryoid (fig. 231D); basidia 2-spored or 4-spored; cystidia absent; pileipellis a cutis; hairs on stem scattered, hyaline. Solitary or in small groups among mosses in dry grassland, at roadsides, in heathland, sand dunes and rocky habitats, also on peat in the alpine zone; summer to autumn; rare in temp.-arc. / alp.; DK (DD), FI (LC), NO (LC), SE (LC). – B&K 3:379, C&D 325, FAD 60D, Phil 78b, Lud 55.30, 31 (var. *tetraspora*), .
- A. griseopallida* (Desm.: Fr.) Watling (*Leptoglossum* g. (Desm.: Fr.) M.M. Moser, *Omphalina* g. (Desm.: Fr.) Quél., incl. var. *tetraspora* (Kühner & Lamoure) Bresinsky & Stangl)
- Clamps absent. Cap 5-25 mm, first convex, then low convex with depressed centre to funnel-shaped, with crenulate, incurved to straight margin, translucently striate, almost smooth, hygrophanous, dark brownish grey, drying greyish buff; gills decurrent, pleated, forked, often intervenose, pale greyish brown to pale olive brown, edge entire, concolorous; stem 7-20(-30) x 1-2 mm, cylindrical, often flexuose, smooth, shiny, concolorous with cap; flesh thin, greyish; smell indistinct or faintly of *Pelargonium*; taste indistinct. Sp 6.5-9(-10) x 3.5-5.5 μ m, ellipsoid, oblong ellipsoid or dacryoid (fig. 231E); basidia 4-spored; cystidia absent; pileipellis a cutis. Among low mosses, especially *Barbula* species on calcareous sand along roadsides, on lake shores and on old walls; autumn to winter; very rare in temp.-southern bore.; DK (DD), NO (STr: Trondheim), SE (LC). – BCat 432, B&K 3:384, C&D 326, Lud 55.25, .
- A. rickenii* (Hora) Watling (*Omphalina* r. Hora, *Leptoglossum* r. (Hora) Singer, *O. cupulata* (Fr.) P.D. Orton s. Orton)
16. Sp < 7(-7.5) μ m long 17
 - Sp > 7 μ m long 18
17. Smell and taste indistinct; sp 5-7(-7.5) x 4-6(-6.5) μ m, subglobose, broadly ellipsoid or ovoid. Cap 4-8(-14) mm, low convex with shallowly depressed centre, with crenulate margin, translucently striate, smooth, hygrophanous, sepia brown, drying pale greyish ochre; gills strongly decurrent, distant, pale grey brown; stem 15-25 x 1-1.5 mm, cylindrical, slightly tapering towards base, smooth, dark sepia brown; flesh thin, concolorous with surface. Basidia 4-spored; cystidia absent; pileipellis a cutis; clamps present. Solitary or in small groups on sandy, acid soil between low mosses and lichens, in heathland, along roads in forests; summer to autumn; occasional in temp.-bore.; DK (DD), FI (LC), IS, NO (LC), SE (LC). – FAD 59E, Lud 55.28, R&H 261.
- A. rustica* (Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina* r. (Fr.) Quél.)
 Note: the species has been very differently interpreted. Here it is conceived in the sense of J.E. Lange.
- Smell and taste farinaceous; sp 5-7(-7.5) x 3-4.5 μ m, ellipsoid, broadly to narrowly dacryoid or subcylindrical. Cap 4-7(-15) mm, low convex, then plane with shallowly depressed centre, sometimes umbonate, dry, smooth, translucently striate, hygrophanous, grey brown, darker at centre, drying pale greyish ochre; gills slightly to strongly decurrent, distant, thick, grey brown, edge entire, concolorous; stem (8-)14-24 x (0.5-)1-1.5(-2) mm, cylindrical, smooth, concolorous with cap; flesh thin, concolorous with surface. Basidia (2-)4-spored; cystidia absent; pileipellis a cutis; clamps present. Solitary or in small groups on poor sandy soil in heathland, mossy grassland and in sand dunes; late autumn; very rare in temp.; DE, NL. – Lud 55.38, OPN 10B.
- A. baeospora* (Singer) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina* b. Singer, *O. microsperma* Arnolds)

18. Cheilocystidia present. Cap 12-35 mm, convex to plane with narrowly, often deeply depressed centre, with decurved to straight, crenulate margin, smooth to innately radially fibrillose, slightly tomentose at centre, not striate or weakly translucently striate towards margin, hygrophanous, dark blackish brown, paler on drying; gills arcuate decurrent, medium spaced, ochraceous to greyish with darker edge; stem 20-30 x 1-4 mm, cylindrical, smooth, under lens white pruinose at top and wrinkled below, dark brown; flesh relatively thick, whitish, but concolorous towards surface; smell and taste indistinct. Sp (6-)7.5-10 x 4-7 μm , broadly ellipsoid to subglobose, slightly dacryoid; basidia 4-spored; cheilocystidia 22-42 x 3-5(-15) μm , clavate to lageniform with \pm contorted appendices; hairs on stem 32-123 x 3.5-9 μm , cylindrical to constricted, hyaline; pileipellis a cutis; clamps present. Among low mosses in moist habitats, esp. in snow-beds in arc./alp.; summer; very rare in hemib. and arc./alp., north to Nordl; NO (NE).
A. umbratilis (Fr.: Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina u.* (Fr.: Fr.) Quél.)
 - Cheilocystidia absent 19
19. Sp rhomboid, triangular or amygdaloid (fig. 231F). Cap 8-17(-22) mm, first convex to almost hemispherical, then narrowly and shallowly depressed, smooth, minutely wrinkled under lens, translucently striate, hygrophanous, dark grey brown, fading on drying; gills slightly arcuate-decurrent, distant, thin, grey brown; stem 16-30 x 1.5-2.5 mm, cylindrical, smooth, minutely pubescent under lens, sooty brown to black; smell faintly of *Pelargonium*. Sp 8-11 x 5.5-7 μm , 2-nucleate; basidia 4-spored; hairs on stem brown, clavate; pileipellis a cutis; clamps present. In small groups on naked soil or between low mosses on roadsides, more rarely in snow-beds with *Salix herbacea* and the liverwort *Anthelia*; summer; rare in arc./alp.; NO (NE), SE.
A. trigonospora (Lamoure) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina t.* Lamoure)
 - Sp ellipsoid, ovoid or dacryoid 20
20. Stem pubescent-hairy over entire length 21
 - Stem smooth to minutely rough 22
21. Cap translucently striate; smell of *Pelargonium*. Cap 4-18(-30) mm, first hemispherical to convex, then plane with shallowly depressed centre, with incurved to plane, sulcate and crenulate margin, smooth to subtomentose, hygrophanous, dark grey brown, olivaceous brown or blackish brown, drying pale brownish grey; gills strongly decurrent, medium spaced to distant, rather thick, grey brown, edge concolorous or darker; stem 7-25 x 0.5-1.5 mm, cylindrical to slightly widened towards base, minutely pubescent over entire length, base white tomentose, concolorous with cap; flesh concolorous with surface; taste indistinct. Sp (6-)7-9(-10) x 4-6 μm , ellipsoid, long ellipsoid to obovoid or dacryoid (fig. 231G), 1(-2)-nucleate; basidia (2-)4-spored; cystidia absent; hairs on stem 25-80 x 4-12(-20) μm , thin- to slightly thick-walled, hyaline; pileipellis a cutis; clamps present. In groups between low mosses on calcareous clayey and loamy soil, but also on old fire-places and on humus-rich soil in arc./alp.; spring to late autumn; common in arc./alp., occasional in temp.-hemib.; DK (LC), FI (DD), FO, NO (LC, incl. Svb), SE (LC). – B&K 3:387, Bor 46, Fav 55:4.2, FND 32:35, Lud 55:37, .
A. velutipes (P.D. Orton) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina v.* P.D. Orton)
 - Cap not striate; smell indistinct. Cap 10-15 mm, low convex with \pm deeply depressed centre, with crenate, minutely tomentose margin, hygrophanous, dark grey brown; gills strongly decurrent, distant, with entire edge concolorous with gills, grey brown; stem up to 15 x 1 mm, cylindrical or slightly tapering towards base, minutely pubescent, bluish black; flesh concolorous with surface; taste indistinct. Sp 7-9 x 4.5-6 μm , ellipsoid to ovoid, 1-2-nucleate; basidia (2-)4-spored; cystidia absent; hairs on stem 50-80 x 9-15 μm , clavate, hyaline to brown; pileipellis a cutis or a trichoderm; clamps present. In small groups on naked, acid soil with low mosses in pioneer vegetation in mountains above timberline; very rare in arc./alp.; NO (NE).
A. parvivelutina (Cléménçon & Irlet) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina p.* Cléménçon & Irlet)

22. Sp oblong ellipsoid, pyriform to dacryoid (fig. 231H). Cap 3-16(-23) mm, first convex, then low convex to plane with shallowly depressed centre, with sulcate margin, translucently striate to centre, smooth to subtomentose, hygrophanous, grey brown to blackish brown, drying pale greyish brown; gills broadly adnate to decurrent, distant, rather thick, sometimes forked, grey brown with darker edge; stem 4-16(-25) x 0.5-2 mm, cylindrical to slightly widened towards base, smooth, top minutely pubescent when young, base white tomentose-strigose, concolorous with cap; flesh concolorous with surface; smell and taste indistinct. Sp 7.5-11(-13) x (4-)4.5-6.5(-7.5) μm , 2-nucleate; basidia (2-)4-spored; cystidia absent; hairs on stem scattered; pileipellis a cutis; clamps present. In groups between low mosses or on naked sandy to loamy soil, from lowland to arc./alp.; spring and autumn; common in temp. to arc./alp.; DK (LC), FO, NO (LC, incl. Svb), SE (LC). – GBW 3:484, Lud 55.36, OPN 10C.
- A. obscurata* (D.A. Reid) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina* o. D.A. Reid)
- Sp broadly ellipsoid, ellipsoid or ovoid 23
23. Cap with a papilla, minutely scaly all over. Cap 10-15 mm, first convex, then low convex to plane with narrowly depressed centre to almost funnel-shaped, often with slightly striate and crenulate margin, hygrophanous, dark umber brown to blackish brown, drying pale sordid brown; gills strongly decurrent, distant, greyish brown; stem 25-30 x 1-1.5 mm, cylindrical, smooth, top sometimes slightly pruinose, greyish brown to dark brown; flesh thin. Sp 7.5-9 x 4.5-5.5 μm , broadly ellipsoid to ovoid; basidia 4-spored; cystidia absent; pileipellis a cutis or a trichoderm; clamps present. On peaty soil with low mosses, rarely on *Sphagnum* and on burnt ground in arc./alp.; summer; very rare in arc./alp.; SE.
- A. lundellii* (Pilát) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina* l. (Pilát) Bresinsky)
- Cap without papilla, smooth to minutely wrinkled or hirsute 24
24. Smell indistinct; sp 7-8(-9) x (3.5-)4-5 μm , ellipsoid with small rounded apiculus (fig. 231I), 1(-2)-nucleate. Cap 6-12 mm, convex to low convex with shallowly depressed centre, with downcurved, crenulate margin, translucently striate, smooth, wrinkled under lens, hygrophanous, dark brown to blackish brown, drying greyish beige; gills strongly decurrent, distant, rather thick, dark grey brown, becoming black towards edge; stem 10-18 x 1-1.5 mm, cylindrical to slightly tapering towards base, smooth, dark brown; flesh thin, greyish beige in stem; taste indistinct. Basidia 4-spored; cystidia absent; pileipellis a cutis; clamps present. In groups on naked soil in snow-beds with *Salix herbacea* or on silty soil with low mosses in mountains above timberline; spring and autumn; very rare in arc./alp.; FO, NO (LC, incl. Svb). – B&K 3:381, C&D 342, Lud 55.29.
- A. obatra* (J. Favre) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina* o. (J. Favre) P.D. Orton)
- Smell of *Pelargonium*; sp 7-8 x 5-5.5 μm , broadly ellipsoid with prominent truncate apiculus, 2-nucleate. Cap 4-11(-14) mm, low convex to plane, rarely funnel-shaped, smooth, wrinkled and hirsute when seen under lens, translucently striate, dark blackish brown; gills medium spaced, arcuate-decurrent, rather thick, blackish brown; stem 10-16 x 1.5-2 mm, cylindrical, smooth, minutely rough under lens, dark blackish brown; taste indistinct. Basidia 4-spored; cystidia absent; pileipellis a cutis or a trichoderm; clamps present. In groups on naked soil or in pioneer vegetation along small streams and on lake shores; very rare in arc./alp.; SE.
- A. rigidipes* (Lamoure) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina* r. Lamoure)

Asterophora Ditmar: Fr.

KUULO KALAMEES

Nyctalis Fr.

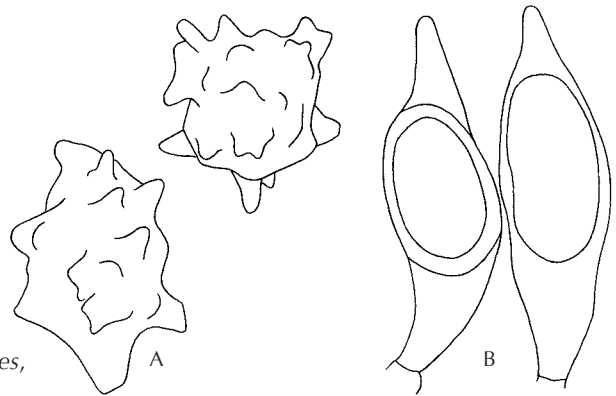
Frb mycenoid to collybioid, on fungi. Cap 5-30 mm, conical, hemispherical or convex, smooth to fibrillose or powdery, dry, white, greyish to brownish. Gills thick, distant, often reduced. Stem 10-40 x 2-6 mm, ± cylindrical, concolorous with cap. Smell and taste farinaceous, indistinct or slightly unpleasant. Sp deposit white.

Sp ellipsoid, smooth, without iodine reactions, cyanophilous, their production reduced. Chlamydospores formed abundantly on cap surface or on gills, cyanophilous. Cystidia absent. Pileipellis a cutis or a conioderm. Clamps present.

Parasitic on frb of *Russula* and *Lactarius* in summer to autumn, but with a somewhat meteoric occurrence, being quite common in some years and totally absent in others.

Two species in the Nordic countries.

Lit.: Bon 1999, Kalamees 2004.



Chlamydospores: A: *Asterophora lycoperdoides*,
B: *A. parasitica*.

1. Cap soon powdery, thick-fleshed; chlamydospores on cap surface stellate (fig. 497A). Cap 10-20(-30) mm, hemispherical to convex, whitish and flocculose when young; gills adnexed, very narrow, thick, reduced to veins, distant, greyish white; stem 10-30 x 2-6 mm, short and stout, whitish to brownish, silky-fibrillose to cottony-tomentose; smell and taste farinaceous. Sp 5-6 x 3-4 μm , ellipsoid; chlamydospores 15-24 x 12-21 μm , distinctly stellate, ovoid to subglobose, with large protuberances. In forests, parasitic on frb of *Russula*, especially on *R. adusta* and *R. delica*, also on frb of *Lactarius*, especially on *L. piperatus* group and *L. necator*; summer to autumn; occasional in temp.-bore., most common in the southern part; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:375, Däh 286, M&H 3:236, Phil 88c, R&H 306, ⊙.
A. lycoperdoides (Bull.: Fr.) Ditmar (*Nyctalis l.* (Bull.: Fr.) Konrad & Maubl., *Asterophora agaricoides* Fr.: Fr., *Nyctalis a.* (Fr.: Fr.) Bon & Courtec., *N. asterophora* Fr.)
- Cap not powdery, thin-fleshed; chlamydospores forming on gills only, ellipsoid-fusiform (fig. 497B). Cap 5-30 mm, conical, bell-shaped to low convex or slightly depressed at centre, white, greyish to brownish, often with a lilac tinge, silky-fibrillose to nearly glabrous, dry to slightly viscid; gills adnate, often reduced, thick, distant, waxy, whitish to cream; stem 10-40 x 2-3 mm, fistulose, cottony to silky fibrillose, dry, concolorous with cap; smell and taste indistinct or slightly unpleasant. Sp 5-7 x 3-4 μm , ellipsoid; chlamydospores 12-20 x 7-10 μm , smooth, yellowish brown. In forests, parasitically on frb of *Russula*, especially on *R. delica* and *R. adusta*, also on frb of *Lactarius* species; summer to autumn; common in temp.-southern hemib., occasional in northern hemib., rare in southern bore.; DK (LC), FI (vu), NO (LC), SE (LC). – B&K 3: 376, Däh 287, M&H 3:237, Phil 88d, R&H 306, ⊙.
A. parasitica (Bull.: Fr.) Singer (*Nyctalis p.* (Bull.: Fr.) Fr.)

Aureoboletus Pouzar

HENNING KNUDSEN & ANDY TAYLOR

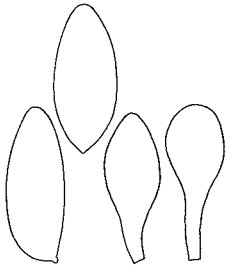
One species in the Nordic countries; see description below.

Frb boletoid with viscid cap and yellow tubes. Cap 20-70 mm, convex, viscid, reddish brown, pink to almost red. Tubes and pores golden yellow, finally with olivaceous tinge, pore layer convex. Stem 30-80 x 5-15 mm, cylindrical, tapering at base, viscid, above yellow, towards base rusty spotted or brown. Flesh whitish, unchanging when cut. Taste mild. Smell pleasant, fruity. Sp deposit ochraceous buff.

Sp 11-16 x 4.5-6 μm , subfusiform in side view, ellipsoid in face view (fig. 165A), yellow. Cheilo- and pleurocystidia clavate, often with yellow contents. Clamps absent. Pileipellis an ixocutis of thin, gelatinous hyphae.

Ectomycorrhizal; in deciduous forests on rich, clayey soil with *Fagus* and *Quercus*, sometimes close to old bonfires; late summer to autumn; very rare in temp.-hemib.; DK (VU), NO (EN), SE (VU). – B&K 3:40, P&D 25, Phil 285f, Rim 6:39, Ves 134, ⊙.

A. gentilis (Quél.) Pouzar (*Pulveroboletus* g. (Quél.) Singer, *A. cramesinus* (E.-J. Gilbert) Watling)



Spores and hymenial cystidia.

Baeospora Singer

GRO GULDEN

Frb mycenoid to collybioid, on cones or wood. Cap 5-30(-40) mm, umbonate, convex or depressed, at first with incurved margin, ± hygrophanous. Gills very crowded and narrow, adnexed-adnate. Stem 10-60 x 1-4 mm, pubescent. Smell and taste not distinctive. Sp deposit white.

Sp 3-5 x 1.5-3 μm, ellipsoid, smooth, hyaline, amyloid, not cyanophilous. Basidia 4-spored. Cheilocystidia abundant. Pleurocystidia absent. Caulocystidia present. Pileocystidia rare. Hymenophoral trama without iodine reactions. Pileipellis a cutis of radial, repent hyphae. Clamps present.

Saprotrophic on coniferous wood and cones; summer to autumn.

Two species in the Nordic countries.

Lit.: Andersson 1978, Favre 1939, Gulden 1966, Tuomikoski 1953.



Spores and cheilocystidia.

1. On cones; gills whitish to pale beige. Cap 5-25 mm, convex to plane with blunt umbo, smooth, mat, faintly hygrophanous, hazel brown to ochre brown, paler at margin, drying pale beige; stem 20-70 x 1-2 mm, fistulose, finely pruinose to tomentose over entire length, with whitish top, downwards more brownish, with whitish, strigose pseudorrhiza. Sp 3-4.5 x 1.5-2 μm, ellipsoid (fig. 275A); cheilocystidia 16-40 x 5-12 μm, lageniform or clavate, thin-walled, without crystals; caulocystidia similar or more hyphoid. In small groups on fallen, ± buried cones of conifers, especially *Pinus*; summer to autumn; common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:140, FAD 44C (as *Collybia conigena*), Lud 4.2, Phil 80c, R&H 370, ⊙.

B. myosura (Fr.: Fr.) Singer

- On rotting wood or bark; gills when young lilac to amethyst, later brownish with lilac shade. Cap 10-30(-40) mm, convex to depressed, smooth, mat, hygrophanous, when moist evenly greyish brown, with ± lilac tinge, drying to ochre brown and pale beige; stem 10-50 x 2-4 mm, becoming fistulose, mat and finely pruinose, ± concolorous with cap; flesh watery lilac. Sp 3.5-5 x 2-3 μm, ellipsoid; cheilocystidia 17-30 x 4.5-6 μm, cylindrical, clavate to ± lageniform; caulocystidia similar; pileocystidia scarce. In groups on stumps and fallen trunks of *Picea*, rarely on wood of deciduous trees, in southern Europe mainly on *Abies*; late autumn to winter; rare in bore.-suba.; FI (EN), NO (DD), SE (LC). – B&K 3:141, BSMF 119:410, Däh 388, GBW 3:135, Lud 4.1, ⊙.

B. myriadophylla (Peck) Singer

Blasiphalia Redhead

STEEN A. ELBORNE

Monotypic genus; see description below. The genus is very close to *Rickenella*. It differs in forming clasping digitate appressoria on the rhizoids of the liverwort *Blasia*, whereas species of *Rickenella* penetrate the rhizoids of mosses directly.

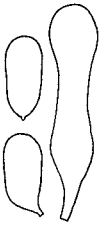
Lit.: Antonín & Noordeloos 2004, Gulden, Jenssen & Stordal 1985, Ludwig 2001, Redhead 1980, Smith 1947.

Frb omphalinoid, on or close to liverworts. Cap 2-9 mm, convex to low convex with slightly depressed centre, with straight, crenulate margin, hygrophanous, translucently striate to centre, faintly sulcate, smooth, yellowish to olivaceous brown at centre, paler towards margin and between the stipes. Gills adnate to adnexed with a decurrent tooth, moderately distant, whitish to pale olivaceous. Stem 3-15 x 0.5-1.5 mm, cylindrical to slightly widened towards both ends, dry, dull, smooth to slightly pubescent, concolorous with cap or paler; flesh thin, white; smell and taste indistinct.

Sp (6-)6.5-8.5(-9.5) x 3-5(-6.5) μm , ellipsoid, dacryoid to cylindrical, thin-walled, smooth (fig. 67A); basidia 2- and 4-spored. Cheilo- and pleurocystidia 30-70 x 10-21(-35) μm , broadly clavate, utriform to vesiculose, thin-walled. Pileocystidia 25-50 x 8-15 μm , similar to cheilocystidia. Caulocystidia 30-85 x 8-17 μm , subcylindrical to clavate, thin-walled, smooth. Pileipellis a cutis. Clamps present.

Biotrophic, solitary or in small groups on sandy to clayey soil on riverbanks with low mosses, always in association with the liverwort *Blasia*; summer to autumn; rare, but locally occasional in bore.-arc./alp.; FI (LC), IS, NO, SE. – AAF 1:17, A&N 04:185, Bor 48, Lud 76.2, R&H 263, ⊙.

B. pseudogrisella (A.H. Sm.) Redhead (*Rickenella p.* (A.H. Sm.) Gulden, *R. demisella* (M. Lange) Cléménçon)



Spores and hymenial cystidia

Bolbitius Fr.

ANTON HAUSKNECHT & JAN VESTERHOLT

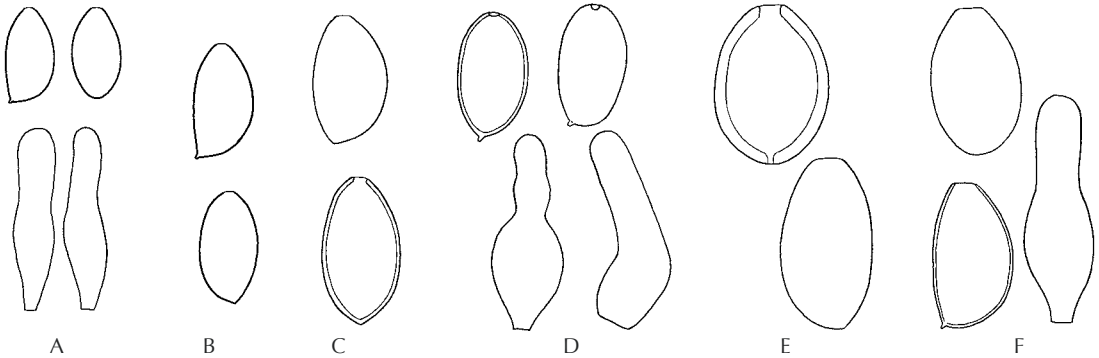
Frb very thin-fleshed and fragile, with brown sp deposit. Cap ovoid to ellipsoid, later expanding, in some species wrinkled or reticulate-venose, sulcate at margin, viscid to slimy. Gills narrowly adnate or free, crowded to very crowded, rusty ochraceous with age, often deliquescent. Stem pruinose, at least at top, white or light coloured, hollow. Veil absent. Smell and taste insignificant. Sp deposit orange brown to reddish brown.

Sp ellipsoid to ovoid or amygdaloid, smooth, thin- to thick-walled, with a distinct germ pore, rusty ochraceous in KOH. Basidia 4-spored. Cheilocystidia clavate to utriform or lageniform, often soon collapsing. Pleurocystidia absent, but basidioles (pseudoparaphyses) present. Caulocystidia clavate, lageniform or ± irregular, appearing in clusters. Pileipellis a hymeniderm, covered with a thin, gelatinous layer. Pigment intracellular. Clamp connections mostly absent.

Saprotrophic; on dung, manured soil, rotten wood and herbaceous litter.

Seven species in the Nordic countries.

Lit.: Arnolds in Noordeloos et al. 2005, Ludwig 2001, Watling 1982.



Spores and cheilocystidia: A: *Bolbitius pluteoides*, B: *B. reticulatus* f. *reticulatus*, C: *B. lacteus*, D: *B. demangei*, E: *B. coprophilus*, F: *B. titubans*.

1. Sp on av < 10 μm long, rather thin-walled, pale yellow brown to brownish orange in KOH; on deciduous wood 2
 - Sp on av > 10 μm long, thick-walled, orange brown to rusty brown in KOH; on dung, manured soil, wood chips, herbaceous litter, etc. 4
2. Cap 5-15 mm, silver grey to buff grey, pale rose or lilac; stem 0.5-2 mm broad. Cap convex, later plane to slightly depressed, smooth, viscid; gills narrowly adnate, crowded; stem 15-30 mm long, cylindrical, whitish. Sp 7-9.5 \times 4.5-5.5 μm , ellipsoid to ovoid or amygdaloid (fig. 625A), rather thin-walled; cheilocystidia 20-35 \times 6-15 μm , cylindrical to lageniform. On deciduous wood; summer to autumn; rare in temp.; DK (DD). – C&D 1312, FRIC 7:53b, M&J 2, Svp 4:75 (as *lacteus*).
B. pluteoides M.M. Moser
- Cap 12-45 mm, violet grey, greyish brown, brown to orange brown; stem 1-4 mm broad 3
3. Cap 20-45 mm, with strongly wrinkled to reticulate-venose centre, dark violet grey, greyish brown to brown. Cap low convex to expanded; gills free, crowded, whitish, becoming orange brown; stem 15-55 \times 1-4 mm, cylindrical or widened downwards, pruinose, white to greyish white. Sp 7-12 \times 4-5.5 μm , ellipsoid to ovoid or amygdaloid (fig. 625B), rather thin-walled; cheilocystidia 20-50 \times 5-14 μm , clavate to utriform or lageniform. On very decayed deciduous wood, especially *Fagus*; summer to autumn; occasional in temp., rare in hemib.-bore.; DK (LC), FI (NT), NO (NT), SE (NT). – BSMF 110:291, C&D 1311 (typical), FAD 131E, Lud 5.3A, R&H 437 (pale), ⊙
B. reticulatus (Pers.: Fr.) Ricken f. *reticulatus*

- Cap 12-30 mm, smooth, pale greyish lilac, lilac brown to pale brown; in other characters like in the main form. On deciduous wood, mostly in damp habitats, occasional in temp.-hemib. DK, NO (Østf: Rygge). – C&D 1310, FAD 131G, GBW 4:304, Lud 5.3B-D.
B. reticulatus f. **aleuriatus** (Fr.: Fr.) Enderle (*B. aleuriatus* (Fr.: Fr.) Singer)

- 4. Cap white to cream, with age more sordid cream; stem white. Cap 8-15 mm, conical to convex, later expanded, smooth; gills free, crowded, white, becoming orange brown; stem 27-50 x 1-3 mm, cylindrical, pruinose to flocculose, white to cream. Sp 10.5-13 x 6-7 μm , ellipsoid to ovoid or amygdaloid, thick-walled (fig. 625C); cheilocystidia 23-37 x 11-18 μm , clavate to utriform or lageniform. In grassy places and open forests; summer to autumn; rare in temp.-hemib.; DK (DD), NO (Østf: Halden), SE (NA). – C&D 2209, Däh 585, FAD 196D, Lud 5.2.
B. lacteus J.E. Lange

- Cap yellow, olive yellow, rose, reddish brown or violet grey; stem white or \pm concolorous with cap 5

- 5. Cap violet grey, pale brownish violet, pale brown to lilaceous brown. Cap 30-70 mm, ovoid to conical or convex, later expanded, smooth, radially sulcate in outer part, partly reticulate-venose; gills free, crowded, white to pale yellow, becoming greyish brown; stem 50-100 x 3-5 mm, gradually widened downwards, to 8 mm broad, whitish to pale yellowish. Sp 8.5-14 x 6-8.5 μm , ellipsoid to ovoid or amygdaloid (fig. 625D), thick-walled; cheilocystidia 30-50 x 9-28 μm , broadly clavate to utriform or lageniform. On straw and organic debris, found in a stockyard; very rare in bore., poorly known; FI (DD, PK).
B. demangei (Quél.) Sacc. & D. Sacc

- Cap rose to reddish brown or yellow to olive yellow 6

- 6. Cap rose to reddish brown when young, discolouring with age; sp often distinctly lentiform (fig. 625E). Cap 25-85 mm, ellipsoid to ovoid or obtusely conical, later convex to expanded, smooth, radially sulcate in outer part; gills free, very crowded, whitish, becoming orange brown; stem 50-180 x 2-10 mm, cylindrical or widened in lower part, pruinose to flocculose, especially in upper part, white or pale pinkish. Sp 11.5-16 x 8-11 x 7-9 μm , ellipsoid to ovoid or amygdaloid, thick-walled; cheilocystidia 25-55 x 7-19 μm , cylindrical to clavate or lageniform. On dung and manured soil; late winter to late autumn; very rare in temp.-hemib.; DK (LC), FI (DD), SE (NE). – Cet 2211 (as *incarnatus*), GBW 4:303, Lud 5.1, M&J 2, Svp 24:9, .
B. coprophilus (Peck) Hongo

- Cap yellow to olive yellow; sp not or only slightly lentiform 7

- 7. Cap pale to warm yellow, radially sulcate at margin or to centre, not or only slightly wrinkled or reticulate-venose; stem only yellow in the top and soon discolouring to white. Cap 10-50 mm, ovoid to conical, later convex to plane or slightly depressed; gills free, crowded, white to straw yellow, becoming yellowish brown; stem 25-100 x 1.5-7 mm, cylindrical or widened downwards, pruinose to flocculose. Sp 9.5-15 x 5.5-9 μm , ellipsoid to ovoid or amygdaloid (fig. 625F), thick-walled; cheilocystidia 25-85 x 8-25 μm , lageniform. On dung and manured soil, decaying hay, etc. in meadows and ruderal places, nitrophilous; spring to autumn; very common in temp.-bore., rare in suba.; DK (LC), FI (LC), FO, IS (Na, Au), NO (LC), SE (LC). – C&D 1308, Lud 5.4, Phil 233f, R&H 207, Svp 50:50, .
B. titubans (Bull.: Fr.) Fr. (*B. vitellinus* (Pers.: Fr.) Fr., *B. fragilis* (L.) Fr.)

- Cap ochraceous yellow, olive yellow to olive brown, mostly strongly wrinkled to reticulate-venose at the centre; stem yellow in entire length, paler when old. Cap 15-70 mm, ovoid, later convex; gills free, crowded, yellow, becoming yellowish brown; stem 40-100 x 3-10 mm, widened downwards, pruinose to flocculose. Sp 10.5-14 x 6-8.5 μm , ellipsoid to ovoid or amygdaloid, thick-walled; cheilocystidia 25-85 x 8-25 μm , lageniform. On wood chips, organic debris, in meadows and ruderal places, nitrophilous; summer to autumn; occasional in temp.-arc./alp.; DK (LC), FI (DD, V: Turku), NO (incl. SvB), SE (LC). – C&D 1308, Däh 586, GBW 4:305, Lud 5.5, Ves 306.
B. varicolor G.F. Atk. (*B. vitellinus* (Pers.: Fr.) Fr. var. *olivaceus* Gillet, *B. titubans* var. *varicolor* (G.F. Atk.) Krieglst., *B. titubans* s. auct. p.p., *B. vitellinus* s. auct. p.p.)

Boletus L.: Fr.

HENNING KNUDSEN & ANDY TAYLOR

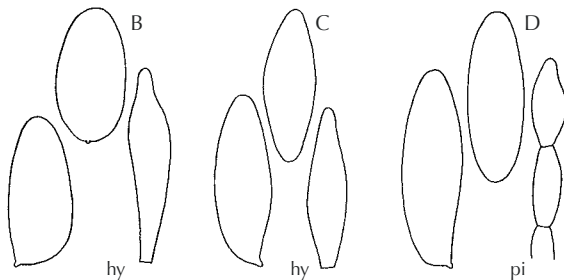
Frb boletoid with white or yellow tubes easily splitting from each other and concolorous or vividly coloured pores. Cap 20-250(-400) mm, regularly convex, in most species brown, more rarely yellow, grey, red, pink or white, unchanging or blueing when bruised, glabrous to tomentose, dry or greasy. Tubes 5-40 x 0.3-2 mm, easily separated from the flesh, round, either whitish becoming yellowish then olivaceous or yellow, becoming olivaceous yellow, easily separated from each other. Pores concolorous with tubes or orange to red, unchanging or blueing when bruised. Stem 30-150 x 5-60 mm, cylindrical or swollen below, brown, yellow, red or whitish, glabrous, floccose or scabrose, in some species with a distinct sharp-meshed reticulum at least at top. Flesh white or yellow, sometimes with a vinaceous purplish base, unchanging or blueing when cut. Taste mild and pleasant in most species, bitter in two. Smell rather weak when fresh, in older specimens of some species of urine. Sp deposit olivaceous brown.

Sp characteristically subfusiform in front view, in profile with ± distinct hilar depression, smooth, yellow, thick-walled. Cheilo- and pleurocystidia present but generally of low diagnostic value. Caulocystidia present in some species. Basidia 4-spored. Clamps generally absent, but reported to be rare in *B. legaliae*. Pileipellis a cutis to a trichoderm, often with differentiated end-cells.

Ectomycorrhizal with trees and scrubs. Early summer to late autumn, often in large amounts. Some of the boletes are considered as belonging to the best edible fungi and are in several countries collected for the market, especially *B. edulis* and closely related species. *B. satanas* on the other hand causes a very unpleasant poisoning.

16 species in the Nordic countries. See also *Xerocomus* since the limit between the two genera has changed recently due to molecular results

Lit.: Galli 1998, Hallgrimsson 1962, Kallio 1984, Kallio & Heikkilä 1978, Muñoz 2005, Ryman 1978, Vesterholt & Holm 2002.



Spores, hymenial cystidia and pileipellis elements: B: *Boletus luridus* var. *luridus*, C: *B. reticulatus*, D: *B. pinophilus*.

- | | | |
|----|--|---|
| 1. | Tubes yellow; pores orange red or red | 2 |
| - | Tubes and pores concolorous, whitish or yellow | 8 |
| 2. | Stem top finely punctate, reticulum absent | 3 |
| - | Stem top with fine to coarse reticulum | 4 |
| 3. | Pores red; cap dark brown. Cap 50-150(-200) mm, convex, velvety or rarely almost smooth; tubes yellow with distinctly red pores, underside of cap flesh next to the pores yellow; stem red 60-120 x 20-40 mm, clavate, punctate-floccose on a yellow background in whole length, strongly blueing when bruised; flesh firm, yellow, rapidly blueing. Sp 13-17 x 4-6 μm, Q = 2.5-3, subfusiform; cutis of 4-6 μm broad, hyaline or brown hyphae; hyphal walls in stem | |

base dextrinoid. In deciduous and coniferous forests on acid or mesic soil; summer to early autumn; common in temp., occasional in hemib., becoming rare in bore., in NO north to NTr (63° 30'), in FI to EH; DK (LC), FI (LC), NO (LC), SE (LC). – Nit 227, Phil 282b, R&H 220, Svp 45:3, Ves 142, ☉.

B. luridiformis Rostk. var. *luridiformis* (*B. erythropus* Pers. s. Fries et auct. plur., non Persoon 1796)

- Pores orange; cap at first dark brown, then olivaceous yellow brown, orange brown or orange red. Cap 50-120 mm, convex, velvety-tomentose or in places ± smooth; stem 60-120 x 15-30 mm, clavate, punctate-floccose, yellow to orange, purplish at base; flesh yellow, in stem base purple, immediately blueing. Sp 10-14 x 5.5-7 μm, Q = 2-2.5, subfusiform; pileipellis a cutis of 6-8 μm broad, mostly hyaline hyphae; hyphal walls in stem base amyloid. Mycorrhizal with *Fagus*, *Quercus* and *Corylus* on rich soil, solitary or a few together, summer to autumn; rare in temp., very rare in hemib., in FI only in V; DK (VU), FI (VU), NO (DD), SE (VU). – Däh 57, Nit 227, Phil 279f, P&D 59, Svp 45:3., ☉

B. queletii Schulzer var. *queletii* (*B. erythropus* Pers. 1796 nom. amb. non *B. erythropus* s. Fries et auct. plur.)

var. *rubicundus* Maire has an entirely red cap. DK.

4. Flesh above the tubes with a thin red line when cut, blueing immediately. Cap 60-150(-200) mm, convex, tomentose, olivaceous yellow brown, yellow brown or brown, sometimes with a pink tinge; pores orange to red; stem 60-150 x 20-40 mm, cylindrical or clavate, yellow to orange or reddish brown, with a rather coarse red reticulum over most part; flesh whitish in cap, yellowish in stem, purplish in stem base, slightly blueing when bruised or cut. Sp 11-15 x 5.5-7 μm, subfusiform (fig. 165B); hyphal walls of stem base amyloid; pileipellis a cutis of 4-6 μm broad, hyaline or brown hyphae. In deciduous forests, parks and gardens on rich, often calcareous soil with *Fagus*, *Quercus* and *Tilia*, more rarely under *Betula* and *Populus*, in central Norway mainly with *Corylus*, in open dry localities; summer to early autumn; occasional in temp., rare in hemib., in FI only in A and V, in NO also in bore., north to Troms; DK (LC), FI (NT), NO (LC), SE (LC). – Däh 61, Nit 226, GBW 2:214, Phil 281e, Svp 45:5, ☉.

B. luridus Schaeff.: Fr. var. *luridus*

var. *rubriceps* (Maire) Dermek has an entirely red cap; DK, SE. – Svp 20:95, 45:5.

- Flesh above the tubes yellow, without a thin red line when cut 5
5. Cap immediately strongly blueing when touched. Cap 50-300 mm, convex, with a dry, suede-like surface, irregular-rough, at first yellow to cream or peach-coloured, but soon becoming greyish or silvery pink to coral red all over; tubes yellow; pores red or orange, blueing; stem 60-100 x 40-80 mm, yellow or greenish yellow, all over with a fine coral red to brownish red reticulum; flesh pale yellow, blueing. Sp 12-13.5 x 5-5.5 μm, subfusiform; hyphal walls of stem base amyloid; pileipellis a cutis of 3.5-6.5 μm broad, cylindrical, finely incrustated, hyaline or brown hyphae. Mycorrhizal with *Fagus* or *Quercus* on calcareous soil in warm, exposed localities; late summer to early autumn; very rare in temp. and hemib., only known from one record from DK (Fyn: Bjørnemoose) and two from SE (Ög, ÖI); DK (NA), SE (EN). – Nit 224, Phil 282c, Svp 45:8 (as *purpureus*), Ves 144 (as *purpureus*), ☉.

B. rhodopurpureus Smotl.

- Cap unchanging or only slightly changing colour when touched 6
6. Cap pale ash grey or silvery grey, becoming brownish with age or rarely brownish all the time, without or with some marginal pink. Cap 60-200(-300) mm, convex, dry, suede-like; tubes yellow; pores usually distinctly red, sometimes almost yellow towards the margin; stem 40-140 x 40-60(-100) mm, cylindrical or more often bulbous, yellow above, reddish below or all over, with a fine red reticulum at least on upper half; flesh whitish to yellowish, slightly blueing; smell when young indistinct, when old unpleasant, of ammonia, urine or

rotting cabbage. Sp 11-13.5 x 5-6 μm , subfusiform; hyphal walls of stem base amyloid; cutis of smooth, cylindrical, 4-6.5 μm broad hyphae. Mycorrhizal with *Fagus* and *Quercus*, rarely also *Tilia*, on rich calcareous or clayey soil in warm exposed localities; summer to autumn; rare in temp. and hemib., only in the southeastern part of DK and on Gtl in SE; DK (vu), SE (EN). – Däh 62, Phil 281f, R&H 220, Svp 31:3, 45:7, Ves 143, ☉. – Poisonous.

B. satanas Lenz

- Cap at least when mature fully pink or red or mixed with pale grey or brown 7
- 7. Flesh in cap whitish to yellowish. Cap 60-150 mm, convex, when young pale grey, soon becoming pink or lilaceous pink all over, when old brownish grey at the centre; tubes yellow; pores red; stem 40-80 x 30-50 mm, cylindrical or clavate, at least on the upper half with a fine, red reticulum on a yellow background, below reticulate or smooth, red or lilaceous; flesh pale yellow, blueing; smell indistinct. Sp 11.5-13 x 5-6 μm , subfusiform; hyphal walls of stem base amyloid; pileipellis a cutis of 4-7 μm broad, finely incrustated, cylindrical hyphae, some with brown contents. Mycorrhizal with *Fagus* and *Quercus* on rich calcareous or clayey soil in warm exposed localities; summer to autumn; very rare in temp.; DK (EN); SE. – Bon 39, Phil 280b, P&D 68, Svp 26:8, 45:8, Ves 144, ☉.

B. legaliae Pilát (*B. satanoides* Smotl. s. Smotlacha 1952, non 1920)

- Flesh in cap and stem yellow. Cap 50-200 mm, convex, rough and uneven, slightly sticky, then dry and tomentose, pale whitish or greyish to olivaceous greyish, soon mixed with pink or purplish pink; tubes yellow; pores intensely red; stem 40-200 x 20-65 mm, cylindrical or clavate, yellow with a distinct pure red reticulum at least on upper half becoming more coarse and vinaceous in the base; flesh yellow, blueing only in cap, in stem base vinaceous purple; smell indistinct or pleasant fruity. Sp 10-14 x 4-5.5 μm , subfusiform; hyphal wall of stem base amyloid; pileipellis a cutis of 3.5-6 μm broad, finely incrustated, cylindrical hyphae, some with brown contents. Mycorrhizal with *Fagus* and *Quercus* on rich calcareous or clayey soil in warm localities; no confirmed records in the area; DE, UK. – Däh 65, GBW 2:223, Phil 283d, Svp 45:9.

B. rhodoxanthus Kallenb. (*B. sanguineus* var. *rhodoxanthus* Krombh. nom. nud., *B. purpureus* Pers. s. Fries 1836)

- 8. Stem without a distinct reticulum, blueing immediately when touched 9
- A large part of the stem or at least the top distinctly reticulate 10
- 9. Frb completely yellow or with pale orange pores or fine orange dots at stem top; stem 60-120 x 20-50 mm. Cap convex, finely velvety, bright yellow or chrome yellow or with a yellow-brown centre, spotted vinaceous when old; flesh and whole surface of frb strongly and immediately blueing. In other characters like the main variety. In coniferous and deciduous forests on acid soil, sometimes occurring near the type-variety; very rare, with a few records in temp.-hemib.; DK, NO (NE), SE. – Boud 148, P&D 57, Sing 2.13, ☉.

B. luridiformis Rostk. var. *discolor* (Quél.) Krieglst. (*B. luridiformis* Rostk. var. *junquilleus* (Quél.) Knudsen)

- Cap color different from tubes and stem color; stem 30-80 x 10-30 mm. Cap 40-80 mm, convex, tomentose then smooth, yellowish brown, becoming darker greyish brown, sometimes with a red tinge; stem cylindrical or enlarged at top, yellow at least when young and above, with brown or red patches below; flesh yellow, purplish at base, strongly and immediately dark blue after bruising as is the whole frb. Sp 11-15 x 4-6 μm , subfusiform; pileipellis a cutis of 4-6 μm broad, hyaline or brown hyphae. Mycorrhizal, in dense deciduous forests and scrubs on mull; rare in temp.-hemib.; DK (LC), NO (NE), SE (vu). – Däh 66, GBW 2:225, Jordst 16(2), Phil 280c, Ves 138.

B. pulverulentus Opat. (*Xerocomus p.* (Opat.) E.-J. Gilbert)

10. Taste when young distinctly bitter, when old almost mild 11
 - Taste completely mild, pleasant 12
11. Stem top or upper half yellow, lower half red, all over covered with a fine concolorous reticulum, 40-120 x 15-50 mm, cylindrical or more rarely bulbous. Cap 40-150 mm, convex, dry, greyish brown; flesh pale yellow, slightly blueing. Sp 12-16 x 4.5-6 μm , subfusiform; pileipellis cutis of 4-10 μm broad hyphae, Q usually 2-4, \pm incrustated; hyphal walls of stem base amyloid. Solitary or a few together in deciduous and coniferous forests on acid soil, in FI with *Quercus*; summer to autumn; occasional in temp.-hemib., rare in southern-middle bore., in NO north to M&R, in FI only known from A and V; DK (LC), FI (CR), NO (LC), SE (LC). – Däh 69, Jordst 24(3):43, Phil 283f, R&H 225, Ves 145, ☉.
B. calopus Pers.: Fr.
- Stem pale yellow all over, sometimes with a narrow reddish band at the middle, with a fine yellow reticulum at least at top, 40-100 x 25-60 mm, cylindrical to clavate. Cap 60-200 mm, convex, dry, often with an areolate pattern, greyish to brownish; flesh pale yellow, slightly blueing when cut. Sp 11-15 x 4.5-6 μm , subfusiform; pileipellis a cutis of 4-7 μm broad hyphae, Q usually > 6; hyphal walls of stem base dextrinoid. In deciduous forests, parks and gardens, mostly associated with old *Fagus* and *Quercus*, more rarely with *Tilia* and *Carpinus*, in warm localities on rich, clayey or calcareous soil; summer to autumn; rare in temp.-hemib., with few record from FI (V); DK (LC), FI (EN), SE (NT). – Däh 72, GBW 2:230, Phil 278a,c, R&H 225, Ves 145, ☉.
B. radicans Pers.: Fr. (*B. albidus* Rocques)
12. Flesh yellow 13
 - Flesh white (*edulis*-group) 15
13. In old *Picea* forests on calcareous soil. Cap 60-110 mm, convex, dry, finely tomentose, ochre brown to red brown; tubes and pores yellow; stem 50-100 x 30-45 mm, cylindrical, base rounded or slightly tapering, yellow, above with a fine reddish brown reticulum, below paler; flesh whitish, yellow above the tubes and beneath the cuticle, in base reddish brown, in central stem and cap slowly becoming pinkish brown; KOH on cap and stem red. Sp 12-14.5 x 3.5-4.5 μm , subfusiform; pileipellis a trichoderm of 2-6 μm broad hyphae, some of them incrustated. Summer to autumn; a few records are known from NO (Busk, AA, Hord). – B&K 3:24, Däh 76, RdM 44:124.
B. subappendiculatus Dermek, Lazebn. & J. Veselský
- Mycorrhizal with deciduous trees 14
14. Cap brown and remaining so; stem 40-80 x 15-40 mm, yellow and reticulate on upper half, below often \pm brown and pruinose, short but clearly tapering. Cap 50-100(-150) mm, dry, tomentose; flesh yellow, below the cutis pale brown, sometimes slightly blueing when cut. Sp 13-16 x 3.5-5 μm , subfusiform; pileipellis cutis of regular, 3-8 μm broad, hyaline or brown hyphae. Mycorrhizal with *Fagus* or *Quercus* on rich soil, solitary, subfasciculate or a few together; summer to autumn; rare in temp. and hemib.; DK (LC), NO (LC), SE (NT). – Däh 77, GBW 2:236, Phil 277c, R&H 224, Ves 146, ☉.
B. appendiculatus Schaeff.
- Cap at first silvery grey, becoming brownish grey; stem 40-150 x 20-60 mm, yellow, but often with a narrow red or reddish zone at the middle or the lower half, most part covered with a fine yellow reticulum. Cap 50-150 mm; flesh yellow, pale brown under the cuticle, slightly blueing slightly but distinctly when cut. Sp 12-14.5 x 5-5.5 μm , subfusiform; pileipellis of regular, hyaline or brown, 2.5-5.5 μm broad hyphae. Mycorrhizal with *Fagus* or *Quercus* on rich, fertile soil in warm localities; very rare in temp.; DK (EN), SE (VU). – GBW 2:239, R&H 226, P&D 51, Sing 2.9, Ves 146.
B. fechtneri Velen. (*B. appendiculatus* Schaeff. subsp. *pallescens* Konrad)

15. Cap pale brown, alutaceous, often finely to coarsely cracking, dry, finely tomentose; mycorrhizal with *Fagus*, *Quercus*, *Corylus* and *Tilia*. Cap 60-150(-200) mm, convex; stem 40-150 x 20-50(-70) mm, cylindrical or swollen at the middle, above with a fine whitish to pale brown reticulum on a brown background. Sp 13-17 x 4-5.5 μ m, subfusiform (fig. 165C); pileipellis a cutis of cylindrical hyphae with obtuse apices, easily spreading out when mounted in KOH. Summer and early autumn; common in temp., occasional in hemib., rare in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 82, Phil 277d, R&H 222, Svp 42:12, Ves 140, ☉.
B. reticulatus Schaeff. (*B. aestivalis* (Paulet) Fr.)
- Cap either darker brown, yellow, greasy or occurring with conifers 16
16. Cap blackish brown, often marbled with alutaceous, finely tomentose; mycorrhizal with *Fagus* or *Quercus* in mull rich or calcareous forests. Cap 60-200 mm, dry; stem 40-150 x 20-60 mm, cylindrical or swollen at the middle, above with fine whitish to pale brown reticulum on a brown background. Sp 14-17 x 4.5-6 μ m; hyphae of pileipellis cylindrical with obtuse apices, easily spread out when mounted in KOH. Summer to early autumn; rare in temp.; DK (VU), NO (DD), SE. – Bon 35, Däh 78, Phil 275e, Svp 42:13, Ves 141, ☉.
B. aereus Bull.: Fr.
- Cap paler, yellow brown, grey brown or reddish brown, smooth or wrinkled-rugose; in deciduous or coniferous forests 17
17. Mycorrhizal with *Pinus*; apical in cutis distinctly inflated to 10-20 μ m (fig. 165D). Cap 50-200(-250) mm, greasy, red brown to brown, often wrinkled-rugose; pores yellow, when old often \pm reddish brown; stem 40-150 x 20-50(-70) mm, swollen at base, with a whitish to red brown reticulum, reddish brown colouration occasionally strong, becoming bright orange with ammonia. Sp 15-19 x 4.5-5.5 μ m. On acid, sandy soil, often in dry lichen-heathland; summer to autumn; very common in bore, common in temp.-hemib., north to 69°; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 79, Phil 275d, R&H 223, Svp 42:13, Ves 141, ☉.
B. pinophilus Pilát & Dermek (*B. pinicola* (Vittad.) A. Venturi non Sw.: Fr., *B. separans* Peck s. Knudsen)
- Mycorrhizal in deciduous and coniferous forests under *Fagus*, *Quercus*, *Betula* and *Picea*, rarely *Pinus*; cutis without inflated cells. Cap 50-200(-400) mm, greasy, from almost white to pale brown or brown, more rarely yellow brown or red brown; stem 40-150 x 20-50(-70) mm, cylindrical or swollen at base, with a white reticulum on a pale brown background. Sp 14-17 x 4.5-6 μ m, subfusiform; pileipellis a rubbery-elastic cutis, hyphae strongly adhering when mounted in KOH. On acid to mesic soil, rarely under *Salix repens* in dunes and in suba. and arc./alp. also with *Betula nana*, some years occurring in large amounts; summer to autumn; very common in temp.-bore., rare in suba.-arc./alp., in IS not in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – GBW 2:247, Phil 276a, R&H 223, Svp 42:12, Ves 140, ☉.
B. edulis Bull.: Fr. (*B. betulicola* (Vassilkov) Pilát & Dermek, *B. edulis* Bull.: Fr. f. *betulicola* Vassilkov, *B. edulis* Bull.: Fr. f. *arcticus* Vassilkov)

Buchwaldoboletus Pilát

HENNING KNUDSEN & ANDY TAYLOR

Frb boletoid with concave, yellow tubes. Cap dry, yellow or brown. Tubes and pores when young golden yellow, becoming olivaceous yellow, angular, tube layer concave. Stem cylindrical, tapering at base, dry or viscid. Flesh whitish or yellow, unchanging or very slightly blueing above the tubes. Taste mild. Smell indistinct. Sp deposit ochraceous or olivaceous brown.

Sp subfusiform, smooth, yellow, thick-walled. Cheilo- and pleurocystidia with yellow contents. Pileipellis a tomentose layer of 3-7 μm broad with yellowish contents. Clamps present or absent.

Saprotrophic/mycoparasites associated with stumps, roots of conifers or wood decay fungi.

Two species in the Nordic countries.

Lit.: Lipka 1987, Piątek 1999, Szczepka & Sokół 1984.



Spores and pileipellis elements: *Buchwaldoboletus lignicola*.

1. Cap cinnamon to warm buff, 30-70 mm; frb slender. Cap convex with incurved margin, tomentose; tubes and pores somewhat decurrent, cream becoming pale yellow, finally with olivaceous tinge, angular; stem 20-60 x 5-15 mm, cylindrical or tapering at base, dry, glabrous, pale brown above, darker towards the base; flesh whitish to pale yellowish, darker yellow at stem base, slightly blueing above the tubes. Sp 6.5-8.5 x 3-3.5 μm ; clamps present (fig. 165E); pileipellis of long, regular, hyaline, 4-6 μm broad hyphae, sometimes swollen at septa. On old large stumps of *Larix*, *Pinus*, and *Pseudotsuga*, possibly a mycoparsite on *Phaeolus schweinitzii*, solitary or a few together; summer to autumn; very rare, with a few records from temp.-southern bore.; DK (CR), FI (NT), NO (LC, Østf: Sarpsborg, Fredrikstad), SE (DD). – B&K 3:41, Däh 53, GBW 2:290, M&J Pulveroboletus 1, P&D 26, ⊙.
B. lignicola (Kallenb.) Pilát (*Pulveroboletus l.* (Kallenb.) E.A. Dick & Snell)
- Cap pale sulphur yellow to yellow, becoming rusty spotted, 50-120 mm; frb robust. Cap hemispherical, long time with incurved margin, tomentose; tubes and pores yellow, short, blueing; stem 40-150 x 10-50 mm, concolorous with cap or with a rust-coloured or vinaceous base, dry, glabrous; flesh pale yellow to whitish, in stem base rust-coloured or vinaceous, slightly blueing. Sp 5.5-11 x 3-5 μm , very variable in shape and size; clamps absent. Saprotrophic on sawdust and stumps of conifers, especially *Pinus*; summer to autumn; very rare, with a few records from hemib.; SE. – BCat 245, P&D 26, RdM 42:157, 159, Sing 2.1.
B. sphaerocephalus (Barla) Watling & T.H. Li (*B. hemichrysus* (Berk. & M.A. Curtis) Pilát s. auct. Eur., *Boletus sulphureus* Fr. non Bull., *Xerocomus* s. (Fr.) Quél.)

Calathella D.A. Reid

HENNING KNUDSEN

One species in the Nordic countries; see description below.

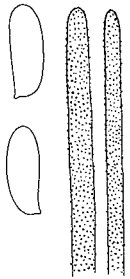
Lit.: Agerer 1973, 1983, Reid 1964.

Frb cyphelloid with hairy outside. Frb tubular, cup-shaped, bell-shaped or turbinate with a constricted base, 1-2 mm, rather tough. Outside below with greyish brown hairs, at apex with white hairs, partly covering the pale hymenium.

Sp 7-9 x 2.5-3.5 μm , cylindrical to narrowly ellipsoid, smooth (fig. 245C). Basidia clavate, 30-35 x 4.5-5.5 μm . Hairs cylindrical, fragile, up to 250 x 4-6 μm , thick-walled, finely incrustated or glabrous, apex rounded or tapering, at the base with clamps, sometimes secondarily septate, irregularly swollen in KOH, some of them dextrinoid.

Saprotrophic, gregarious on dead, decorticate branches, most common on *Populus tremula* and cultivated *Populus* species, more rarely on other trees such as *Sorbus* and *Pyrus*; mostly in late spring to early summer; occasional in hemib.; FI, NO (NE), SE (LC). – R&H 343, ⊙.

C. eruciformis (Batsch: Fr.) D.A. Reid (*Lachnella e.* (Batsch: Fr.) W.B. Cooke, *Flagelloscypha e.* (Batsch: Fr.) Singer, *Cyphella eumorpha* P. Karst.)



Spores and apical parts of hairs.

Callistosporium Singer

JAN VESTERHOLT

One species in the Nordic countries; see description below.

Lit.: Ludwig 2001, Moser 1986, Redhead 1982a, Stålberg 1987.

Frb collybioid, often fasciculate. Cap 15-45 mm, convex to bell-shaped, later expanded to slightly depressed, with or without an umbo, smooth, sometimes rugulose, dry, hygrophanous, yellowish brown to olive brown, not translucently striate. Gills emarginate, rather narrow, crowded, buff yellow. Stem 20-65 x 2-7 mm, cylindrical, sometimes compressed, fibrillose, pruinose at top, yellowish brown with dark olive brown base. Flesh soft, olive yellow, violet in KOH. Smell faint. Taste mild or somewhat bitter. Sp deposit white.

Sp 4-7 x 3-4.5 μ m, ellipsoid, smooth (fig. 425I), with yellow contents. Basidia 4-spored. Cystidia absent. Pileipellis a cutis. Clamps present.

Saprotrophic on *Pinus*, possibly also on other kinds of woody debris; autumn; very rare in hemib.-bore.; FI (DD, EH: Jämsä), SE (LC). – Bres 214, Däh 269, Jordst 8(2), Lud 6.1, M&J 1.

C. luteo-olivaceum (Berk. & M.A. Curtis) Singer (*C. xanthophyllum* Bon)



Spores.

Calocybe Donk

KUULO KALAMEES

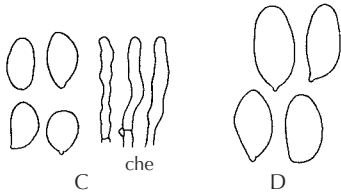
Frb tricholomatoid. Cap 40-120 mm, conical to convex, smooth to finely tomentose, dry. Gills emarginate, very crowded. Stem cylindrical, solid. Flesh thick. Taste and smell farinaceous or sometimes somewhat unpleasant. Sp deposit white to cream.

Sp ellipsoid (fig. 495C-D), smooth, cyanophilous, without iodine reactions. Basidia up to 30 μm long, siderophilous. Cheilocystidia present or absent. Pileipellis a cutis. Pigments absent or vacuolar, not parietal. Clamps present.

Saprotrophic in forests, brushwoods and meadows.

Two species in the Nordic countries.

Lit.: Bon 1999, Kalamees 2004, Raitelhuber 1979.



Spores and cheilocystidia: C: *Calocybe favrei*, D: *C. gambosa* f. *gambosa*.

1. Gills pale to ochre sulphureous to bright yellow; frb staining rapidly red, then black when bruised. Cap 50-120 mm, finely tomentose, violet grey, violet blue, violaceous lead grey; gills emarginate, 6-10 mm broad; stem 40-80 x 10-25 mm, finely pruinose at top, concolorous with cap but paler; flesh pale sulphureous in cap, whitish in stem; smell almost mouldy; taste sometimes slightly farinaceous. Sp 3.5-4.5(-5) x 2.5-3 μm , short ellipsoid to ovoid (fig. 497C); cheilocystidia 25-35 x 3-5 μm , irregularly cylindrical. Solitary or gregarious on forest litter in deciduous forests; autumn; DE. – B&K 3:259, Bol Bres 22:24-25, Phil 113f, ☉.

C. favrei (R. Haller Aar. & R. Haller Suhr) Bon (*Lyophyllum* f. R. Haller Aar. & R. Haller Suhr)

- Gills white; frb not discolouring when bruised. Cap 40-110 mm, conical-convex to convex-plane, with thin involute tomentose margin, often irregularly wavy, dry, smooth and glabrous, not or slightly hygrophanous, sometimes spotted, whitish, cream to pale ochraceous; gills emarginate or roundly adnexed, often with a tooth, narrow, crowded, white to pale cream; stem 30-90 x 10-30 mm, cylindrical to clavate, sometimes with hygrophanous spots, dry, fibrillose, pruinose at top, whitish; taste and smell farinaceous. Sp 5-7 x 2-4 μm (fig. 497D). In fairy rings on rich soil in grasslands, meadows, pastures, gardens and rich deciduous forests; spring, rarely in autumn; common in temp., occasional in hemib.-southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:144, C&D 482, Cet 350, Däh 282, Phil 104ab, ☉.

C. gambosa (Fr.: Fr.) Donk f. *gambosa* (*C. georgii* (L.) Kalamees, *C. vasilievae* (Singer) Singer) f. *graveolens* (Pers.: Fr.) Kalamees (non *C. graveolens* (Pers.: Fr.) Singer s. Bon) differs in having a fuliginous, light greyish brown or pale dingy tan cap and gills turning brownish; rare in temp.; DK. – Bres 104, FAD 27A.

Calyptella Quél.

HENNING KNUDSEN

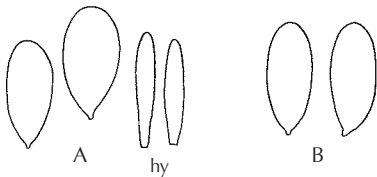
Frb cyphelloid, funnel-shaped, smooth. Frb 2-8 mm, with a contracted, stem-like base or a short stem, white, grey or yellow. Stem 1-5 x 0.1-0.2 mm, very thin-fleshed, soft, uniformly coloured on the outside and inside. Hymenium smooth. Outside finely floccose-pubescent, with regular or when old often somewhat crenulate margin.

Sp broadly ovoid, ellipsoid, pip-shaped to cylindrical, often in tetrads or 2-3 together, smooth, hyaline, without iodine reactions. Cystidia present or absent. Basidia 20-25 x 5-8 μm , clavate, 2-4-spored, often slightly incrustated above or covered with a very thin, yellow, granulose layer. Clamps present, but very scattered. Hyphae thin-walled, 5-8 μm broad, mixed with 2-3 μm broad hyphae; outside covered with irregularly diverticulate and coralloid hyphae, in some species with marginal dichophysoid cells. Outside smooth or with irregularly shaped hairs.

Gregarious on dead, rarely living stems of herbs and bark of *Sambucus nigra*. Spring to autumn.

Three species in the Nordic countries.

Lit.: Cooke 1961.



Spores and hyphenal cystidia: A: *Calyptella cernua*, B: *C. capula*.

1. On bark of *Sambucus nigra*; cystidia present (fig. 267A). Frb hanging, 2-5 mm, at first regularly funnel-shaped with a short stem, when old more crenulate and sometimes sideways opening and flattened, white or yellow, often within the same mycelium; hymenium smooth; outside finely pruinose; stem smooth or very finely pubescent. Sp 9-11 x 4-5 μm , ellipsoid, often adhering in tetrads or pairs; cystidia present in variable numbers, sometimes scattered, sometimes dominating, lanceolate to mucronate, of the same length but more slender than the basidia; outside of irregular, \pm polygonal-coralloid, slightly thick-walled hyphae. Saprotrophic; spring to autumn; rare, but very likely confused with *C. capula*; DK. *C. cernua* (Schumach.) W.B. Cooke s. Schumacher non Cooke
- On dead stems of herbs and ferns, more rarely on dead, still standing or living herbs; cystidia absent
2. Frb white or yellow. Frb hanging, 3-8 mm, at first regularly funnel-shaped with a short stem, when old more crenulate and sometimes sideways opening and flattened, white or yellow; hymenium smooth; outside finely pruinose; stem smooth or very finely pubescent. Sp 7-12 x 3.5-5 μm , elongate to almost cylindrical or pip-shaped with distinct apiculus (fig. 267B), often adhering in tetrads or pairs; margin of hymenium with dichophysoid cells the size of basidia, having short irregular, often slightly incrustated branches; outside of irregular, \pm polygonal-coralloid, slightly thick-walled hyphae. Saprotrophic, often growing gregariously; most common on *Urtica dioica*, but found on a variety of herbs, e.g. *Aegopodium*, *Angelica*, *Anthriscus*, *Arctium*, *Filipendula*, *Epilobium*, *Lathyrus*, *Mentha*, *Petasites*, *Potentilla*, *Symphytum* and *Trisetum*; spring to autumn; common in temp.-hemib, rare but locally occa-

sional in bore., in suba. only from FO; DK (LC), FI, FO, NO (NE, Nordl), SE (LC). – B&K 2:225 (as *campanula*), GBW 3:592, Holmsk 22, Ⓣ.

C. capula (Holmskj.: Fr.) Quél. (incl. *C. campanula* (Nees: Fr.) Fr., *C. laeta* (Fr.) W.B. Cooke, *Glabrocypbella upplandensis* W.B. Cooke)

Note: Cooke (1961) separated *C. campanula* from *C. capula* by the lack of specialized hairs; Breitenbach & Kränzlin (1986) illustrated *C. campanula* as having specialized dichophysoid cells; in both cases the spores were given as slightly broader than those of *C. capula*. Given that the general morphology is the same, the hosts are the same, the confusion of presence or absence of hairs and the small difference in spore width, *C. campanula* is here considered to be a synonym of *C. capula*.

- Frb whitish, pale grey to grey. Frb hanging, 2-6 mm, at first regularly funnel-shaped with a short stem, when old more crenulate; hymenium smooth; outside finely pruinose; stem smooth or very finely pubescent. Sp 5-7 x 2.5-4.5 μm , broadly ellipsoid to more elongate and pip-shaped to almost cylindrical, often forming adhering tetrads or pairs; flesh of inflated, thin-walled hyphae up to 13 μm broad; outside with irregular, slightly thick-walled, hair-shaped or diverticulate, coralloid cells with irregular excrescences. Saprotrophic or parasitic on *Solanum tuberosum*, with frb scattered on old rotten stems, also on ferns; spring to autumn; apparently rare or at least rarely recorded; confirmed records from temp. and bore.; DK (LC), FI (DD, OP: Haukipudas), SE (LC).

C. gibbosa (Lév.) Quél.

Camarophylloopsis Herink

DAVID BOERTMANN

Hodophilus R. Heim, *Hygrotrama* Singer

Frb omphalinoid with whitish to brown gills. Cap dry, smooth or finely scaly, hygrophanous. Gills thick, distant, adnate to decurrent. Stem dry, smooth or punctate, without veil. Smell distinct in one species. Taste not significant. Sp deposit white.

Sp globose, subglobose or broadly ellipsoid, smooth (but may appear rugulose in very high magnification), usually < 6 μm long, but up to 8 μm long from 2-spored basidia, hyaline, without iodine reactions. Basidia up to 70 μm long, narrowly clavate. Cheilo- and pleurocystidia absent. Pileipellis either a trichoderm with short rounded terminal elements in young frb (subgen. *Camarophylloopsis*) or a distinct hymeniderm (subgen. *Hodophilus* (R. Heim) Arnolds). Clamps absent in Nordic taxa.

Saprotrophic, on soil, species from subgen. *Hodophilus* usually on black soil or basic clay in deciduous woodland and copses, occasionally in unfertilized grassland, *C. schulzeri* (only species of subgen. *Camarophylloopsis*) most frequent in grassland; late summer to autumn.

Five species in the Nordic countries. The four species of subgen. *Hodophilus* are closely related and are mainly separated by macroscopical characters, which however show intraspecific variation, and a much needed revision probably will reduce the number of species. *C. schulzeri* deviates from the other species and resembles macroscopically a *Hygrocybe* of sect. *Neohygrocybe* Herink.

Lit.: Arnolds in Bas et al. 1990, Gulden 1999, Printz & Læssøe 1986.



Spores: B: *Camarophylloopsis schulzeri*, C: *C. micacea*.

1. Smell strong, fetid, gas-like, unpleasant and often discernible several metres away. Cap 5-25 mm, convex, plane to umbilicate, pale greyish brown, brown to blackish brown when old, smooth to tomentose or irregularly cracked when old; gills distant, decurrent, paler and more greyish than cap; stem 15-50 x 2-4 mm, tapering downwards, concolorous with cap, darker towards base and silky shiny when young, occasionally dark or pale punctate. Sp 5-6.5 x 4-5 μm, subglobose; basidia up to 55 μm long; terminal cells in pileipellis clavate, pyriform, subglobose, ≤ 40 μm broad. Mainly in woodland, occasionally in grassland; summer to autumn; rare in temp.-bore.; DK (NT), FI (VU, A, PH), NO (VU), SE (NT). – Blekks 78:7 (somewhat dry and cracked), M&J 1, R&H 257 (very pale frb), Svp 14:84, Ves 161, ⊙.
C. foetens (W. Phillips) Arnolds (*Hygrotrama* f. (W. Phillips) Singer)
- Smell absent or weakly spermatic 2
2. Gills relatively thin, not very distant, adnate to decurrent with a tooth, white when young; stem not dark punctate-scaly. Cap 0.5-50 mm, convex, plane, often irregularly convex or with depressed centre, margin thin and often slightly translucently striate, dry, when young tomentose to punctate, when older more radially fibrillose, finely scaly and cracked, yellowish brown, reddish brown, rarely greyish brown; stem 15-60 x 2-6 mm, often somewhat twisted, cylindrical or plane, often tapering downwards, concolorous with cap, occasionally whitish pruinose at top and silky shiny when young. Sp 4-5 x 3.5-5 μm, subglobose to broadly ellipsoid (fig. 189B); basidia up to 35 μm long; pileipellis when mature a trichoderm with scattered inflated terminal cells, when young also with scattered pyriform and globose,

20-40 μm broad cells. Most frequent in grassland, occasionally in woodland; summer to late autumn; rare in temp.-bore., in FI north to EH; DK (NT), FI (VU), NO (NT), SE (NT). – Blekks 78:9 (typical woodland frb), Svp 14:85 (typical grassland frb), Ves 161 (dried out frb), ☉.

C. schulzeri (Bres.) Herink (*Hygrotrama s.* (Bres.) Singer)

Note: frb from grassland are often larger and *Hygrocybe*-like, while frb from copses and woodland often are more like the *Hodophilus*-species in appearance.

- Gills thick, distant to very distant, decurrent, rarely white; stem in one species distinctly dark punctate to finely scaly 3

3. Stem with distinct blackish scales, dots or warts, especially at the top. Cap 5-20 mm, convex to plane with depressed centre, pale greyish brown to brown, smooth to tomentose or irregularly cracked when old; gills decurrent, distant, paler and more greyish than cap; stem 15-50 x 2-4 mm, tapering downwards, concolorous with cap, darker towards base, silky shiny when young. Sp 5-6.5 x 4-5 μm , subglobose; basidia up to 50 μm long; pileipellis with terminal cells clavate, pyriform or subglobose. Mainly in woodland, occasionally in grassland; summer to autumn; very rare in temp.-hemib., one record from NO (Akh: Asker); DK (EN), FI, NO (EN), SE (VU). – Bol Bres 48:6-7, C&D 624, FAD 166A, RdM 37:7, Svp 14:85.

C. atropuncta (Pers.: Fr.) Arnolds (*Hygrotrama a.* (Pers.: Fr.) Singer)

- Stem smooth or with pale or concolorous scales or dots at the top 4
4. Stem with yellow colours, at least at the top. Cap 5-20 mm, convex, plane and often with depressed centre when old, dry, weakly translucently striate, smooth to finely radially fibrillose to finely scaly, pale ochre grey, pale yellow brown to dark brown, when young sometimes with pink or incarnate hue; gills decurrent, thick, distant, paler or concolorous with cap, sometimes with a pink reflex; stem 10-40 x 1.5-3 mm, cylindrical or tapering downwards, smooth and occasionally pruinose at the top. Sp 4-6 x 4-5 μm , broadly ellipsoid to globose (fig. 189C); basidia up to 40 μm long. Mainly in woodland, occasionally in grassland; summer to autumn; rare in temp.-hemib.; DK (EN), NO (EN), SE (NT). – M&J 2, Svp 14:85.

C. micacea (Berk. & Broome) Arnolds (*Hygrotrama m.* (Berk. & Broome) Bon, *C. phaeoxantha* (Romagn.) Arnolds)

- Stem greyish brown, reddish brown, brown, without yellow, and often pale or concolorous punctate-scaly at the top. Cap 5-20 mm, pale grey-brown to dark brown, often with a pink or incarnate hue; gills concolorous with cap; stem 10-35 x 1.5-3 mm. Sp 4-6 x 3.5-5 μm , broadly ellipsoid to subglobose to globose; basidia up to 55 μm long. Mainly in woodland, occasionally in grassland; summer to autumn; rare in temp.-hemib.; DK (VU), NO (EN), SE (NT). – M&J 1 (pale frb), Svp 14:88.

C. hymenocephala (A.H. Sm. & Hesler) Arnolds (*Camarophyllus h.* (A.H. Sm. & Hesler) M. Lange, *C. phaeophylla* (Romagn.) Arnolds)

Campanella Henn.

MACHIEL NOORDELOOS

One species in the Nordic countries, see description below.

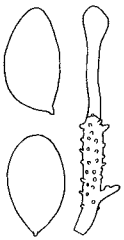
Lit.: Bas in Bas et al. 1995, Redhead 1984a.

Frb crepidotoid with veined hymenophore. Frb without stem, dorsally or eccentrically attached to substrate. Cap 2-17 mm, inversely cup-shaped to convex, then plane, slightly radially wrinkled, gelatinous-sticky, glabrous, not hygrophanous, not or only vaguely translucently striate, variable in colour from violaceous blue grey to greenish grey, olivaceous grey, or pale yellowish brown, paler towards margin. Gills reduced, rather broad, often ± vein-like and anastomosing, sometimes almost reticulate, with pruinose edge, distant, $L = 3-7$, concolorous with cap or paler. Smell indistinct. Taste mild. Sp deposit white.

Sp (6.5-)7.5-9.5(-10) × 4-5.5(-6) μm , broadly ellipsoid to oblong, ovoid or amygdaloid, thin-walled, smooth (fig. 287D), hyaline, without iodine reactions. Basidia 4-spored, rarely 2-spored. Cheilocystidia (20-)30-50(-60) × (2.5-)3-5 μm , lageniform, sometimes subcapitate, with lageniform lower part bearing numerous filiform appendages, abundant. Pileipellis a ramealis structure. Clamps abundant.

Saprotrophic on dead culms of grasses, in grasslands, marshy places and exposed coastal dunes, widespread, very rare in temp.-bore.; DK (DD, WJyl: Rømø, Lol: Rødbyhavn), NO (NE, Oppl: Dovre). – BCat 806, Bol Bres 45:58, Lud 8.1, M&J 1, ⊙.

C. caesia Romagn. (*C. europaea* Singer)



Spores and cheilocystidia.

Cantharellopsis Kuyper

STEEN A. ELBORNE

Monotypic genus; see description below.

Lit.: Bigelow 1985, Clémenton 1982, Kuyper 1986b.

Frb omphalinoid with non-hygrophanous cap. Cap 4-40 mm, low convex to plane, often with deeply depressed centre, with incurved to straight, wavy-flexuose, crenulate, non-striate margin, smooth, silky fibrillose, not hygrophanous, margin pruinose, centre alutaceous brown, white towards margin. Gills strongly decurrent, crowded, narrow, thin, often forked or intervenose, white to yellowish clay. Stem 19-40(-60) × 0.5-3(-4) mm, compressed, equal or tapered towards base, pruinose then smooth, dry, dull, stuffed, white. Flesh rather thick, soft, white. Smell and taste indistinct. Sp deposit white to cream.

Sp 4.5-6(-6.5) × 2.5-4 μm, ellipsoid, ovoid or dacryoid, smooth (fig. 67B), hyaline, without iodine reactions. Basidia 4-spored. Cheilo- and pleurocystia absent. Pileipellis a cutis. Clamps absent.

Saprotrophic; solitary or in small groups between mosses on calcareous soil in mires, along drained brooks, and in rich forests; autumn; rare in bore.-suba.; FI (LC), NO (LC), SE (LC). – Ri 2.3, Lud 55.7, ⊙.

C. prescottii (Weinm.) Kuyper (*Gerronema p.* (Weinm.) Redhead, *G. albidum* (Fr.) Singer s. auct.)



Spores

Cantharellula Singer

JAN VESTERHOLT

One species in the Nordic countries; see description below.

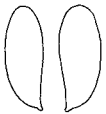
Lit.: Kuyper in Bas et al. 1995, Ludwig 2001.

Frb omphalinoid with forked gills. Cap 20-50 mm, low bell-shaped, later expanded to depressed or shallowly funnel-shaped with an umbo, smooth or finely tomentose, sometimes rugulose, dry, not hygrophanous, violaceous grey to lead grey, later turning reddish brown. Gills decurrent, rather narrow, notably forked, medium spaced, cream, reddening with age, often with reddish brown spots. Stem 30-90 × 3-8 mm, cylindrical to ± clavate fibrillose, grey with paler, tomentose base. Flesh soft, white, slowly reddening. Smell indistinct. Taste mild or slightly adstringent. Sp deposit white.

Sp 8-11 × 3-4 μm, fusiform (fig. 231J), smooth, hyaline, amyloid. Basidia 4-spored. Cystidia absent. Pileipellis a cutis, a trichoderm or a tomentum. Clamps present.

Saprotrophic among mosses (*Polytrichum*, *Dicranum*, *Pleurozium*) in coniferous forests and heathland on sandy soil; autumn to late autumn; common in hemib.-bore., occasional in temp. and suba.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 288, Lud 9.1, Phil 95e, R&H 307, Ves 181, ⊙.

C. umbonata (J.F. Gmel.: Fr.) Singer



Spores.

Catathelasma Lovejoy

JAN VESTERHOLT

Biannularia Beck

One species in the Nordic countries; see description below.

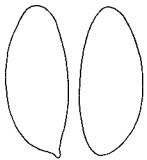
Lit.: Ludwig 2001, Vellinga in Bas et al. 1995.

Frb tricholomatoid with a double ring. Cap 80-150(-220) mm, hemispherical to convex, later expanded with decurved margin, sometimes finally depressed to funnel-shaped, smooth, dry to slightly viscid, greyish brown with dark greyish brown patches, not hygrophane. Gills decurrent, narrow, sometimes forked, crowded, cream. Stem 60-130 x 30-60 mm, cylindrical with a tapering, rooting base, cream to pale sordid buff. Veil membranous, forming a double ring on the stem, greyish brown on outer side, cream and sulcate on the inner side. Flesh very firm, white. Smell and taste strongly farinaceous. Sp deposit white.

Sp 11-14 x 5-6.5 μm , narrowly ellipsoid to cylindrical or fusiform, smooth (fig. 425H), hyaline, amyloid. Basidia 4-spored. Cheilocystidia up to 65 x 12 μm , cylindrical, mostly with yellow contents. Pleurocystidia absent. Pileipellis an ixocutis. Clamps present.

Ectomycorrhizal, often on calcareous soil in association with *Pinus* or *Picea*, in central Europe also with *Abies*; summer to autumn; rare in hemib.-bore.; FI (NT), NO (LC), SE (NT). – B&K 3:147, GBW 3:148, Lud 10.1, Phil 97d, R&H 314, 📍.

C. imperiale (Fr.) Singer



Spores.

Cellypha Donk

HENNING KNUDSEN

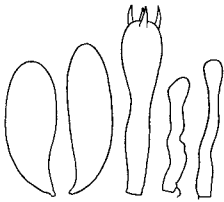
One species in the Nordic countries; see description below.

Frb cyphelloid with white hairy outside. Frb on a whitish, inconspicuous subiculum, 0.5-4 mm, sessile; hymenium smooth to wrinkled, white; outside tomentose, at base with a white fibrillose myelium.

Sp 10-13.5 x 3.5-4 μm , ellipsoid to fusiform or narrowly pip-shaped, with prominent apiculus, smooth (fig. 275B). Basidia clavate, 2(-4)-spored, 30-35 x 7-8 μm . Hairs on the outside hyaline, 23-58 x 2-3.5 μm , smooth or slightly incrustated, irregularly flexuose, slightly tapering towards the capitate apex, 3.5-6 μm diam. Hyphae 2.5-4 μm broad; clamps present.

Saprotrophic on dead culms of grasses, more rarely sedges, occasionally on other substrates, often near the coast, gregarious; late spring to late autumn, most common in summer; only few records, but most probably common when searched for in temp.-bore.; DK (LC), NO, SE (LC). – Bol Bres 37:69, 📄.

C. goldbachii (Weinm.) Donk (*Cyphella lactea* Bres.)



Spores, basidia and hairs from outside.

Chaetocalathus Singer

HENNING KNUDSEN

One species in the area, see description below.

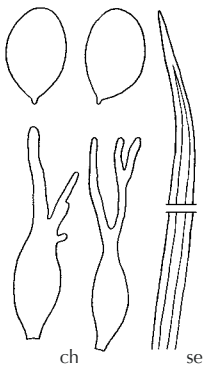
Frb crepidotoid with long hyaline hairs. Cap 4-20 mm, whitish, tomentose. Gills pale, whitish or yellowish, narrow. Stem absent. Flesh thin, white, tough. Taste mild. Smell insignificant. Sp deposit white.

Sp 7-9 × 5-6 μm, broadly ellipsoid, hyaline, thin-walled, without germ pore (fig. 287E), dextrinoid, cyanophilous. Basidia 2-spored. Clamps present. Cheilocystidia 30-45 × 8-12 μm, irregularly apically branched. Pileipellis with thick-walled, erect, hyaline hairs, up to 250 × 4-7 μm, dextrinoid, seta-like.

Saprotrophic on trunks and branches of scrubs, e.g. *Fagus*, *Rubus* and *Clematis*; DE, UK. – Lud 11.1, RdM 31:217, ⊙.

C. craterellus (Durieu & Lév.) Singer (*Pleurotellus patelloides* P.D. Orton)

Note: not occurring in the Nordic countries; the references to FAD 66D by Ludwig (2001) and Gröger (2006) are erroneous and rather depicts *Clitopilus hobsonii*.



Spores, cheilocystidia and setiform hairs from cap.

Chalciporus Bataille

HENNING KNUDSEN & ANDY TAYLOR

One species in the Nordic countries; see description below.

Frb boletoid with pink cinnamon tubes. Cap 20-60(-80) mm, convex, greasy to viscid, shiny when dry, ochraceous buff, sometimes with reddish tinge. Tubes and pores concolorous, cinnamon to rust coloured, slightly decurrent, angular. Stem 30-70 x 5-10(-15) mm, cylindrical or slightly tapering at base, ochraceous brown, yellow at base. Flesh pale yellow, deep yellow in the base, unchanging when cut. Taste peppery. Smell indistinct. Sp deposit brown with reddish tinge.

Sp 8-11 x 4-5 μm , subfusiform (fig. 165F), yellow. Cheilo- and pleurocystidia present. Pileipellis a cutis of long, elongated, hyaline, glabrous, 7-12 μm broad hyphae. Clamps absent.

Found in a wide range of forest types on acid to somewhat richer soil, mycorrhizal status doubtful, often solitary or a few together; autumn; common in temp.-suba., rare in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:27, Däh 51, Phil 279d, R&H 219, Ves 129, 📍.

C. piperatus (Bull.: Fr.) Bataille (*Suillus p.* (Bull.: Fr.) Kuntze, *C. hypochryseus* (Šutara) Courtec.)



Spores and hymenial cystidia.

Chamaemyces Earle

CHRISTIAN LANGE

Drosella Maire

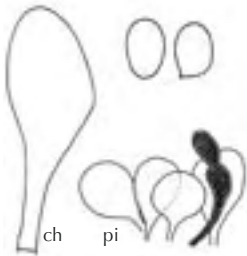
One species in the Nordic countries; see description below.

Frb lepiotoid, exuding yellowish drops on stem. Cap 30-70 mm, first hemispherical, expanding to plane with a low umbo, smooth, viscid to dry, ochre brown, cream brown to yellowish, towards margin almost white, discolouring brown on handling. Gills free, ventricose, crowded, white to cream. Stem 30-60 x 8-10 mm, cylindrical, with an ascending, fibrillose-torn ring zone, above ring zone silky and white, below with small, yellowish brown to reddish brown scales in dense, girdle-like belts, with drops of yellowish exudate. Flesh white to cream. Smell strong, sweetish or gas-like. Taste mild. Sp deposit cream.

Sp 4.5-5.5 x 2.5-4 μm , ellipsoid to ovoid, without germ pore (fig. 533A), hyaline, without iodine reactions, metachromatic. Cheilocystidia and pleurocystidia 30-60 x 10-20 μm , clavate, utriform to fusiform, hyaline or with granular or crystal-like content. Pileipellis an ixohymeniderm with 25-50 x 8-20 μm , narrowly clavate elements. Clamps present.

Terrestrial, probably saprotrophic on calcareous soil in forests and grassland; autumn; rare in temp.-hemib., very rare in FI; DK (vU), FI (EN, V: Dragsfjärd, Parainen), NO (Vestf: Sande), SE (vU). – B&K 4:200, C&D 656, FAD 15B, GBW 4:50, Svp 41:56, 🕒.

C. fracidus (Fr.) Donk (*Lepiota irrorata* Quél.)



Spores, cheilocystidia and pileipellis elements.

Cheimonophyllum Singer

JAN VESTERHOLT

One species in the Nordic countries; see description below.

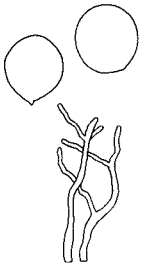
Lit.: Ludwig 2001, Senn-Irlet 1991b, Watling & Gregory 1989.

Frb crepidotoid, uniformly whitish. Frb with lateral, reduced stem or without stem, narrowly attached, shell- to kidney-shaped in outline, white, sometimes imbricate. Cap 5-15 mm, gradually narrowed towards base, often with lobed or crenulate margin, finely velvety near attachment point, outwards smooth, dry. Gills rather narrow, medium spaced, turning pale yellow with age. Flesh soft, without a gelatinous layer. Smell and taste indistinct. Sp deposit white.

Sp 5-6 x 4.5-5.5 μm , globose to subglobose, smooth (fig. 275C), hyaline, without iodine reactions. Cheilocystidia 1.5-4 μm broad, hyphoid, branched. Pileipellis a cutis to a trichoderm. Clamps present.

Saprotrophic on deciduous wood, e.g. *Corylus*, *Populus tremula* and *Sorbus aucuparia*, rarely on coniferous wood or herbs; summer to autumn; occasional in eastern hemib., otherwise rare in temp.-bore.; DK (vU), FI (LC), NO (LC), SE (LC). – Lud 13.1, R&H 316, Sieniop 282, Ves 179, ⊙.

C. candidissimum (Berk. & M.A. Curtis) Singer



Spores and cheilocystidia.

Chlorophyllum Masee

CHRISTIAN LANGE

Endoptychum Czern.

Frb agaricoid or sequestrate. Agaricoid taxa with cap 60-180 mm wide, first globose to subglobose, expanding convex to plane, sometimes with a distinct umbo, cream, brownish to greyish brown, splitting into radially fibrillose or patchy scales on a whitish or brownish background, with concolorous or darker edge, in sequestrate species pear-shaped, for long time closed, greyish-brownish, dry and coriaceous with age. Gills free, remote from stem, crowded, white to cream or pale brownish, in sequestrate species rudimentary, labyrinthical, olive-green to brownish. Stem 30-200 x 7-30 mm, cylindrical with ± clavate or bulbous base, smooth to fibrillose, in sequestrate species reduced and tapering upwards. Ring membranous, double, movable. Flesh whitish, turning orange to reddish when handled or cut. Smell and taste indistinct or fungoid. Sp deposit whitish to cream or greenish.

Sp globose, subglobose, ellipsoid to slightly amygdaloid, often truncate, smooth, thick-walled, with an apical germ pore, dextrinoid or without iodine reactions. Basidia with or without clamps. Cheilocystidia globose to clavate, thin-walled, sometimes septate, hyaline, sometimes with brownish contents. Pleurocystidia absent. Clamps present or absent (or difficult to find).

Four species in the Nordic countries. The green spored *C. molybdites* (G. Mey.) Masee found in a tropical greenhouse in SE (Jaederfeldt 2004) is not included. The invalid name *Macrolepiota venenata* Bon has been used for collections from Scandinavia, but no material could be localized. *C. molybdites*, *C. brunneum*, *C. agaricoides* and *Macrolepiota venenata* are regarded as toxic, *C. rachodes* and *C. olivieri* are regarded as excellent edible fungi.

Phylogenetic studies have placed *Endoptychum* inside the genus *Chlorophyllum* (Vellinga et al. 2003). It has been proposed to conserve the name *Chlorophyllum* (Vellinga & de Kok 2002) against the older name *Endoptychum*.

Lit.: Bellù & Lanzoni 1987, de Kok & Vellinga 1998,
Vellinga in Noordeloos et al. 2001, Vellinga, de Kok & Bruns 2003.



Spores, cheilocystidia and pileipellis elements: *Chlorophyllum brunneum*.

1. Frb sequestrate; sp mass olivaceous brown. Frb 20-80 x 10-70 mm, conical, pear-shaped to subglobose, whitish, grey to pale brown, with appressed felty fibrils, first closed, with age opening by splitting or detachment of the peridium from the stem, exposing the spores as a dry powder; peridium about 1 mm thick, first soft, but dry and coriaceous with age; gleba as rudimentary gills, labyrinthical, olive green to brownish; stem 10-15 mm thick, white, enclosed in the frb and hardly recognizable; smell and taste indistinct. Sp 7-10 x 6-8 µm, subglobose, smooth, thick-walled, with germ pore, but hard to see, with short sterigmatal remnant, yellowish olive, without iodine reactions. Saprotrophic on soil in steppe-like localities and xerothermic grasslands; autumn; very rare in hemib.; SE (RE, last recorded in 1941, locality disturbed). – BCat 267, Larsson, M&S 376, ⊙. – Poisonous.

C. agaricoides (Czern.) Vellinga (*Endoptychum a.* Czern.)

- Frb agaricoid; sp deposit white, cream, pinkish or greenish, hyaline in microscope

2

2. Cap cracking into radially fibrillose, uplifted scales, brownish, turning dirty greyish brown and quite uniform coloured with age; stem clavate towards base, often deeply anchored in litter; in coniferous or deciduous woods. Cap 50-150 mm; gills crowded, free, remote from stem; white to cream, with age dull cream; stem 60-180 x 8-15 mm, at base up to 30 mm wide, smooth to fibrillose, cream to greyish beige, darkening with age; ring double, flesh white to cream, turning orange, red to red brown when scratched or cut; smell neutral to fungoid; taste neutral. Sp 8-11 x 5.5-7 μm , ellipsoid, with truncate apex with small germ pore, hyaline, dextrinoid, metachromatic; cheilocystidia 15-45 x 35-45 μm , clavate to ovoid, with brownish intracellular pigment; pileipellis at cap centre a trichoderm with 25-50 x 5-10 μm , narrow clavate terminal elements; clamps present, at least at basidia. Often deep in litter beds, old ant-hills and similar places, forming fairy rings; autumn; common in temp.-bore., very rare in suba., in IS only found in garden (Na: Akureyri, 1960); DK (LC), FI, NO, SE. – FAD 9C (as *Lepiota rachodes*), GBW 4:132, Ves 278 (both as *Macrolepiota rachodes*), Svp 50:38, ©. – Edible.

C. olivieri (Barla) Vellinga (*Lepiota o.* Barla, *Macrolepiota o.* (Barla) Wasser)

- Cap cracking into concentrically arranged, big, patchy scales, cream brown to brown, contrasting the white flesh; stem with a bulbous base, not deeply anchored in the substrate; in deciduous woods and parks, at roadsides and in similar localities 3
3. With a thick, double layered ring; cheilocystidia 10-35 x 8-25 μm , globose to subglobose. Cap 60-180 mm, first subglobose, expanding to flattened convex, cream brown, pale grey brown to brown, cracking into distant, uplifted scales on a white fibrillose background; gills free, remote from stem, crowded, white to cream; stem 30-200 x 7-30 mm, cylindrical with a distinct, up to 50 mm wide bulbous base, smooth to fibrillose, white to cream; lower side of ring of cap colour; flesh white to cream, turning orange, red to reddish brown when scratched or cut; smell neutral to fungoid; taste neutral. Sp 9-12.5 x 5.5-8 μm , ellipsoid, with or without a truncate apex, with germ pore, hyaline, dextrinoid, metachromatic; cheilocystidia often catenate; pileipellis at cap centre a trichoderm with 20-60 x 8-15 μm , narrow clavate terminal elements, with brownish intracellular pigment; clamps present. In deciduous woods, shrubs, parks and gardens, often on rich soil, more rarely in coniferous woods, forming fairy-rings; autumn; occasional to common in temp.-hemib.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:257 (as *Macrolepiota rachodes* var. *hortensis*), C&D 713, Svp 26:cover, 50:36, ©. – Edible.

C. rachodes (Vittad.) Vellinga (*Lepiota r.* (Vittad.) Quél., *Macrolepiota r.* (Vittad.) Singer)

- With a thick, but not distinctly double layered ring; cheilocystidia 25-50 x 8-20 μm , clavate. Cap 80-150 mm, first subglobose, expanding to plane, light brown, greyish brown to dirty brown, cracking into distant, irregular patchy scales on a white fibrillose background; gills free, remote from stem, crowded, white to cream; stem 60-200 x 10-25 mm, cylindrical with a distinct, up to 60 mm wide, marginate basal bulb, smooth to fibrillose, white to cream; lower side of ring of cap colour; flesh white to cream, turning orange, red to reddish brown when scratched or cut, whole frb turning pale brown with age; smell neutral to fungoid; taste neutral. Sp 10-12 x 7-8.5 μm , ellipsoid-amygdaloid with truncate apex, with germ pore (fig. 533B), hyaline, dextrinoid, metachromatic; pileipellis at cap centre a trichoderm with 20-50 x 8-15 μm , narrow clavate terminal elements, with brownish intracellular pigment; clamps present. In shrubs, parks and gardens, often on manured and disturbed soil or on compost, forming fairy rings; autumn; occasional in temp.-hemib., in FI only in flower-pots and indoor localities; DK (LC), FI (NE), NO, SE. – GBW 4:134, Phil 126a, Svp 50:37. – Poisonous.

C. brunneum (Farl. & Burt) Vellinga (*Macrolepiota rachodes* (Vittad.) Vellinga var. *b.* (Farl. & Burt) Candusso, *M. bohémica* (Wichansky) Krieglst. & Pázmány, *M. rachodes* (Vittad.) Singer var. *bohémica* (Wichansky) Bellu & Lanzoni, *M. rachodes* (Vittad.) Singer var. *hortensis* (Pilat) Wasser)

Chromocyphella De Toni & Levi

BEATRICE SENN-IRLET

One species in the Nordic countries; see description below.

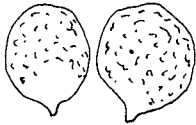
Lit.: Donk 1959.

Frb cup- to disc-shaped, 1-5 mm, cyphelloid, often dorsally attached. Upper surface silky-felty or pruinose, finely hairy at margin, dry, white to cream. Hymenium smooth, wrinkled or with very reduced gills, first cream, soon cinnamon to rust brown. Stem reduced to absent. Veil absent. Smell indistinct. Sp deposit rust brown.

Sp 8-10 × 6.5-8.5 μm, Q = 1.1-1.4, subglobose to broadly ellipsoid, sometimes slightly angular, spotted-verruculose, moderately thick-walled, some with a kind of plage, verruculose (fig. 861F), brown, slightly dextrinoid. Basidia 4-spored. Cystidia absent, but hairs at cap margin cystidia-like, 25-44 × 4.5-6 μm, cylindrical, flexuose, angled, branched. Trama regular. Pileipellis a trichodermal cutis. Pigment golden-brown, incrusting or absent. Clamps present.

Sapro- or bryonecrotrophic on epiphytic mosses and hepatics on barks of living trees; autumn; rare or overlooked in temp., very rare in hemib.-southern bore.; DK (VU), NO (NE, M&R: Smøla, NTr: Flatanger), ⊙.

C. muscicola (Fr.: Fr.) Donk



Spores.

Chromosera Redhead, Ammirati & Norvell THOMAS LÆSSØE & STEEN A. ELBORNE

Monotypic genus; see description below.

Lit.: Boesmillier 1996, Ludwig 2001, Redhead et al. 1995.

Frb omphalinoid with blueing gills. Cap 5-35 mm, convex to funnel-shaped, umbilicate, glabrous, 2/3 striate, slightly viscid to indistinctly fibrillose, at first with bluish tinges, then dirty yellowish brown with ± distinct olive components or more yellow, centre darker than margin, not hygroph-anous, margin often ± blue and crenulate to lobed. Gills arcuate-decurrent, medium spaced, pale violet blue, edge may be more green, more blue or almost white. Stem 15-35 x 1-3 mm, cylindrical, ± viscid, at first bluish and remaining so at top, later greenish to brownish yellow, with bluish basal mycelium. Smell and taste indistinct. Sp deposit white.

Sp 6.5-9(-10) x 3.5-4.5 μm, narrowly ellipsoid, dacryoid to amygdaloid, smooth (fig. 189E), without iodine reactions. Basidia 4-spored. Cystidia absent. Gill trama dextrinoid. Pileipellis an ixocutis. Clamps present.

Saprotrophic, on strongly decayed, ± moss covered conifer trunks, probably mostly *Picea*; late spring to autumn; very rare in hemib.-bore.; NO (CR, Oppl: Gran and S. Land), SE (Jmt: Klövsjö, Upl). – GBW 3:479, Lud 55.10, Mycol Bav 1:7, RdM 42:307, ⊙.

C. cyanophylla (Fr.) Redhead, Ammirati & Norvell (*Omphalina* c. (Fr.) Quél., *Mycena lilacifolia* (Peck) A.H. Sm.)



Spores.

Chroogomphus (Singer) O.K. Mill. HENNING KNUDSEN & ANDY TAYLOR

One species in the Nordic countries; see description below.

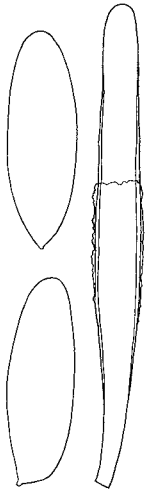
Frb clitocyboid with dark, distant gills. Cap 20-60(-120) mm, convex, often ± conically umbonate with slightly incurved margin, viscid to greasy, shiny when dry, vinaceous, orange rust to hazel, more reddish when old. Gills strongly decurrent, yellowish grey to vinaceous, later fuscous black. Veil arachnoid, soon disappearing except for a slender ring zone on the stem. Stem 40-120 × 5-12 mm, tapering downwards, fibrillose, paler than cap, but lemon or lemon chrome at the base, with or without distinct floccose belts. Flesh vinaceous, more yellow in the stem. Sp deposit dark olivaceous grey.

Sp 15-22 × 5.5-7 μm, subfusiform (fig. 153D). Cheilo- and pleurocystidia present, smooth or brown incrusting. Pileipellis a cutis of broad, smooth or slightly incrusting, strongly amyloid hyphae. Clamps absent in most of frb, present in some amyloid hyphae at the base.

Ectomycorrhizal with *Pinus*, rarely with *Picea*, often solitary on acid soil, more abundant on calcareous soil; late summer to autumn; occasional in temp., common in hemib.-bore. and coniferous suba., in FI north to InL, in NO north to Finnm; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:70, Phil 271g, R&H 238, Svp 33:17, Ves 153, 📍.

C. rutilus (Schaeff.: Fr.) O.K. Mill. 'var. *rutilus* (*Gomphidius r.* (Schaeff.: Fr.) Lund. & Nannf., *G. viscidus* (L.: Fr.) Fr. f. *gigantea* J.E. Lange, *Chroogomphus britannicus* A.Z.M. Khan & Hora)

var. *corallinus* (O.K. Mill. & Watling) Watling has a dry, ochraceous cap and non-amyloid hyphae in the pileipellis. UK. – B&K 3: 69.



Spores and hymenial cystidia.

Chrysomphalina Cléménçon

STEEN A. ELBORNE & THOMAS LÆSSØE

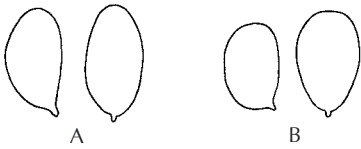
Frb omphalinoid to clitocyboid, on conifers. Cap 7-60 mm, convex, low convex, umbilicate to funnel-shaped, ± hygrophanous, smooth to minutely scaly, non-striate to translucently striate, dry, dull, greenish yellow, yellowish brown, dark brown. Gills decurrent, distant, whitish, greenish yellow or golden yellow. Stem 10-50 × 1-5 mm, cylindrical, smooth, base white tomentose, dry, dull, pale yellowish, greenish yellow to yellowish brown. Smell acidulous or indistinct. Taste indistinct. Sp deposit white to yellowish.

Sp ellipsoid to amygdaloid, smooth, thin-walled, hyaline, without iodine reactions, not metachromatic. Basidia 2- or 4-spored. Cystidia absent. Pileipellis a cutis or trichoderm. Clamps absent.

Saprotrophic, on wood of conifers.

Two species in the Nordic countries.

Lit.: Cléménçon 1982, Kost 1986, Norvell et al. 1994.



Spores: A: *Chrysomphalina chrysophylla*, B: *C. grossula*.

1. Cap yellowish brown to dark brown; gills bright golden yellow to orange yellow. Cap 20-60 mm, convex, umbilicate to funnel-shaped, with crenulate to undulating, non-striate or faintly translucently striate margin, hygrophanous, dry, dull, minutely scaly-floccose; gills strongly decurrent, distant, often intervenose, relatively thin; stem 10-50 × 2-5 mm, cylindrical, sometimes compressed, smooth, white tomentose at base, dry, dull, hollow, yellowish brown, paler towards base; flesh concolorous with surface; smell and taste indistinct; sp deposit yellowish. Sp 9-12 × 5-6 μm, ellipsoid to amygdaloid, smooth (fig. 193A), thin-walled; basidia 4-spored; pileipellis a cutis or a trichoderm. Solitary or in small or large groups on decayed stumps and fallen logs of conifers, often in older forests; autumn; occasional in hemib.-bore., most common in the west and north, rare in temp.; FI (LC), NO (LC), SE (LC). – Bres 258, C&D 330, Lud 55.9, Phil 80a, R&H 262, ⊙.

C. chrysophylla (Fr.: Fr.) Cléménçon (*Omphalina c.* (Fr.: Fr.) Murrill, *Gerronema c.* (Fr.: Fr.) Singer)

- Cap first olive yellow, greenish yellow, then fading to yellowish white or almost white; gills pale greenish yellow, fading to whitish or cream. Cap 7-30 mm, convex, low convex, umbilicate to funnel-shaped, margin entire, non-striate to faintly translucently striate halfway to centre, hygrophanous, dry, dull, smooth to minutely innately fibrillose-scabrous; gills decurrent to triangular, distant, relatively thick, sometimes forked and intervenose; stem 10-38 × 1-3 mm, cylindrical, smooth, base white tomentose, dry, dull, pale yellow to greenish yellow, paler towards base; flesh white to pale cream; smell weakly acidulous; taste mild; sp deposit white to pale cream. Sp 7-10(-11) × (4.5-)5-6 μm, ellipsoid, smooth (fig. 193B), thin-walled; basidia 2- and 4-spored; pileipellis a cutis. Solitary or in small groups on decayed stumps and fallen logs of conifers, especially *Picea*; autumn; rare, but locally occasional in temp.-bore., rare in suba.; DK (LC), FI (DD, V, EH), IS, NO (LC), SE (LC). – B&K 3:75, Cet 1118, FAD 60H, Lud 55.14, R&H 260, ⊙.

C. grossula (Pers.) Norvell, Redhead & Ammirati (*Omphalina g.* (Pers.) Singer, *O. abiegna* (Berk. & Broome) Singer, *O. wynniae* (Berk. & Broome) P.D. Orton)

Clitocybe (Fr.) Staude

JAN VESTERHOLT

Incl. *Singerocybe* Harmaja, *Singerella* Harmaja

Frb clitocyboid. Cap 10-240(-400) mm, convex, plane, depressed or ± funnel-shaped, smooth or finely scaly, hygrophanous or not hygrophanous, in several species, especially when young, covered with a ± whitish pruina that is easily rubbed off. Gills decurrent, less often broadly adnate. Smell mostly distinct, farinaceous, aromatic or like aniseed or coumarin. Sp deposit white to pinkish cream, orange cream or ochraceous.

Sp subglobose, ellipsoid or cylindrical, smooth, hyaline, without iodine reactions, in several species agglutinating, mostly in tetrads (fig. 393A), especially in exsiccates, a feature that seems to be correlated with a pinkish sp deposit. Basidia nearly always 4-spored. Cheilocystidia absent, rarely present. Pileipellis a cutis or a trichoderm. Clamps present, rarely absent.

Saprotrophic on soil or litter in forests, grassland, alpine habitats and dunes, in some species forming fairy rings, less often on wood.

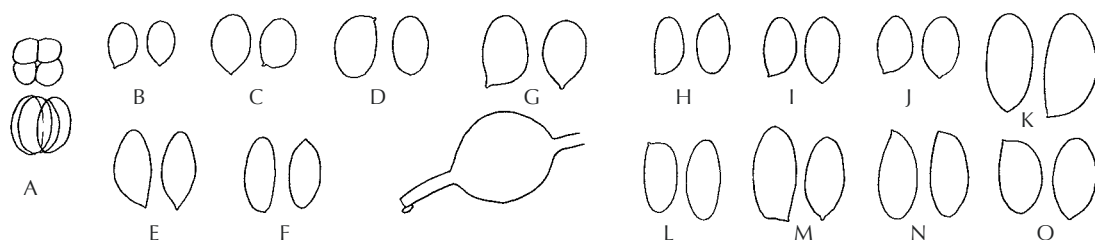
47 species in the Nordic countries, 49 species in the key. *Clitocybe* species are to a large extent recognized by their macroscopical features, like smell, hygrophanity and presence of pruina on the cap. Therefore, it is very important to study fresh material in good condition. Some species are poorly known. Many species are poisonous.

Lit.: Cléménçon 1984, Gminder & Krieglsteiner in Krieglsteiner 2001, Harmaja 1969, Kuyper in Bas et al. 1995.

- | | | |
|----|--|-----------------------------------|
| 1. | Cap with a thin whitish or greyish pruina covering a darker, mostly hygrophanous background in fresh and young specimens | Key A p. 392 |
| - | Cap without a whitish pruina, or only pruinose at the extreme margin | 2 |
| 2. | Cap hygrophanous | Key B p. 395 |
| - | Cap not hygrophanous | 3 |
| 3. | Sp ± dacryoid (fig. 311); cap becoming funnel-shaped, velvety to finely scaly | see <i>Infundibulicybe</i> p. 310 |
| - | Sp ellipsoid to fusiform or cylindrical; cap convex to depressed, smooth to finely scaly | Key C p. 400 |

Key A: Cap hygrophanous with a whitish to greyish pruina

- | | | |
|----|--|-----------------------------|
| 1. | Gills brownish grey; sp 3-4 x 2-3 μm (fig. 393B). Cap 15-40 mm, convex to plane, later with depressed centre, smooth, greyish brown, paler towards margin, when young with a greyish pruina, hygrophanous, not or slightly translucently striate; gills short decurrent, medium spaced; stem 20-70 x 3-7 mm, cylindrical, buff, whitish fibrillose when young; smell farinaceous; sp deposit white. Sp subglobose to ellipsoid, not agglutinating. On soil in coniferous forests, especially on <i>Picea</i> litter, often numerous in litter on clear-cuttings, less often in deciduous forests and dwarf scrubs; spring and autumn to late autumn; common in temp.-arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:157, Däh 206, Phil 93i, R&H 275, Ves 185, ☉. | |
| | <i>C. ditopus</i> (Fr.: Fr.) Gillet | |
| - | Gills whitish to cream or pale buff; sp > 4 μm long | 2 |
| 2. | Smell like aniseed | 3 |
| - | Smell farinaceous, sweetish-aromatic, fruity, herbaceous, spicy, earthy or indistinct | 5 |
| 3. | Frb with greenish colours | see <i>C. odora</i> key C 1 |
| - | Frb without greenish colours | 4 |
| 4. | Gills crowded. Cap 12-45 mm, convex to plane or somewhat depressed, smooth, orange | |



Spores and intercalary cystidium from pileipellis: A: *Clitocybe diatreta* (agglutinated), B: *C. ditopus*, C: *C. albofragrans*, D: *C. phyllophila*, E: *C. connata*, F: *C. rivulosa*, G: *C. phaeophthalma*, H: *C. agrestis*, I: *C. marginella*, J: *C. diatreta*, K: *C. fragrans*, L: *C. vibecina*, M: *C. amarescens*, N: *C. favrei*, O: *C. metachroa*.

cream, covered with a whitish pruina, especially in outer part, hygrophanous, not translucently striate or only at margin; gills decurrent, whitish, tinged pinkish buff; stem 15-40 x 3-6 mm, cylindrical to ± clavate, fibrillose, pale cream to pale isabella; smell like aniseed; sp deposit pale orange cream. Sp 4-5.5 x 3-4 μm, ellipsoid (fig. 393C), often agglutinating. On soil under deciduous and coniferous trees, in grasslands, meadows and at roadside; summer to autumn; rare in temp.-bore.; DK (LC), FI (LC), SE (NE). – M&J 18, OPN 3A.

C. albofragrans (Harmaja) Kuyper (*Lepista a. Harmaja*)

- Gills distant. Cap 20-40 mm, convex to plane or somewhat depressed, smooth, watery brownish, covered with a whitish pruina, hygrophanous, not translucently striate; gills short decurrent, pale buff; stem 15-30 x 3-6 mm, cylindrical, concolorous with cap or more brownish; smell like aniseed; sp deposit pinkish buff. Sp 4.5-6 x 3-3.5 μm, ellipsoid, often agglutinating. In moss in open deciduous forests and pastures; summer to autumn; rare in hemib., poorly known; FI (DD), SE. – M&J 11.

C. anisata Velen.

5. On wood of deciduous trees. Cap 25-45 mm, convex to plane, smooth, pale brownish, covered with a rather persistent whitish pruina, hygrophanous, not translucently striate; gills short decurrent, crowded, whitish, tinged pinkish buff; stem 20-35 x 2-4 mm, cylindrical, smooth to fibrillose, whitish, tinged isabella; smell earthy; sp deposit white. Sp 4.5-5.5 x 3.5-4 μm, broadly ellipsoid, not agglutinating. On *Alnus*, *Fagus*, *Acer* and *Populus*; autumn; very rare in temp.-hemib.; DK (DD, Sj: Gribskov, Terkelskov), FI (DD, U). – BSMF 122:163, End 240, M&J 20, Rim 8:35, ZM 54:48.

C. truncicola (Peck) Sacc.

- On soil

6

6. Stem base with white rhizomorphs; late autumn to spring. Cap 10-35(-50) mm, convex to plane with depressed to umbilicate centre, smooth, greyish brown under a greyish pruinose cover, not distinctly hygrophanous; gills decurrent, medium spaced, white to cream; stem 20-50 x 2.5(-9) mm, cylindrical, whitish to buff; smell faint, like apples. Sp 4.5-6.5 x 2.5-4 μm, ellipsoid. On soil and moss covered rocks in coniferous forests; common in early spring, rare in late autumn; rare, but locally occasional in temp.-bore.; FI (LC), NO (LC), SE (LC). – Däh 198, GBW 3:186, R&H 272, Sieniop 130.

C. pruinosa (Lasch) P. Kumm. (*C. radicellata* Gillet)

- Stem base without rhizomorphs; summer to late autumn

7

7. Sp deposit pinkish cream to yellowish; sp often agglutinating, especially in exsiccates
- Sp deposit white; sp typically not agglutinating

8

11

8. In forests

9

- In alpine eutrophic habitats with *Dryas*, *Salix*, etc.

10

9. Cap rather weakly hygrophanous; stem 30-65 x 5-15 mm, not very elastic. Cap 20-90 mm, convex to plane, smooth, dry, pale buff to yellowish buff, covered with a rather persistent whitish pruina, not translucently striate; gills broadly adnate to short decurrent, crowded, cream, with age tinged pinkish; stem cylindrical, whitish to cream, whitish tomentose at base; smell spicy, aromatic; sp deposit pinkish cream. Sp 4-5.5 x 3-4 μm , ellipsoid (fig. 393D), often agglutinating. In deciduous and coniferous forests, often on *Picea* litter; autumn; very common in temp., rare in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 176, Däh 187, Phil 90d, Sieniop 130, Ves 183.
C. phyllophila (Pers.: Fr.) P. Kumm. (*Lepista p.* (Pers.: Fr.) Harmaja, *C. cerussata* (Fr.: Fr.) P. Kumm., *C. pithyophila* (Fr.) Gillet)
- Cap strongly hygrophanous; stem 30-90 x 3-6 mm, very elastic. Cap 30-70 mm, convex to plane or slightly depressed, smooth, dry, brownish, covered with a rather persistent whitish pruina, not translucently striate; gills short decurrent, medium spaced to crowded, pale buff; stem cylindrical to \pm clavate, concolorous with cap or darker, whitish tomentose at base; smell faint, agreeably aromatic; sp deposit pinkish cream. Sp 4.5-6 x 3-4 μm , ellipsoid, agglutinating. On soil in coniferous forest and with *Betula* or *Alnus*; autumn; very common in FI, elsewhere occasional in hemib.-suba.; FI (LC), NO (LC), SE.
C. regularis Peck (*Lepista r.* (Peck) Harmaja, *C. phyllophila* (Pers.: Fr.) P. Kumm. var. *tenuis* Harmaja)
10. Cap greyish brown, entirely covered with a whitish pruina when young; frb solitary or sub-caespitose. Cap 12-40 mm, convex to plane, becoming depressed, smooth, hygrophanous; gills adnate to short decurrent, medium spaced, white to cream or greyish cream; stem 10-40 x 2-5 mm, cylindrical to \pm clavate, smooth to fibrillose, cream to pale buff; smell indistinct; sp deposit yellowish. Sp 4.5-6 x 3-3.5 μm , ellipsoid, often agglutinating. On soil with *Dryas*, *Salix*, etc.; summer to autumn; occasional in arc. / alp.; IS, NO (LC, incl. SvB). – AAF 2:13, Fav 55:4.13.
C. festiva J. Favre
- Cap pinkish brown, only extreme margin covered with a whitish pruina when young; frb caespitose see *C. paxillus* key B 13
11. Frb often densely fasciculate; cap and gills violet with FeSO_4 . Cap 20-100 mm, convex, later expanded, smooth, whitish pruinose on a cream background, drying white to pale greyish; gills broadly adnate to short decurrent, crowded, white to cream; stem 50-100 x 5-20 mm, cylindrical or tapering towards base, sometimes \pm compressed, white, central to somewhat eccentric; smell sweetish-aromatic to cyanic. Sp 5.5-6.5 x 3.5-4 μm , ellipsoid (fig. 393E). On soil in deciduous forests, parks, ruderal areas, etc.; late summer to late autumn; common in temp.-bore., occasional in suba.-arc. / alp.; DK (LC), FI (LC), FO, IS, NO (LC, incl. SvB), SE (LC). – B&K 3:256, Lud 44.3, Phil 114a, R&H 300, Ves 208, \odot . – Carcinogenic.
C. connata (Schumach.: Fr.) Gillet (*Lyophyllum c.* (Schumach.: Fr.) Singer)
- Frb mostly solitary; cap and gills not violet with FeSO_4 12
12. Smell farinaceous. Cap 10-20 mm, convex to plane, sometimes umbonate, smooth, greyish isabella, covered in a whitish pruina, hygrophanous, not translucently striate; gills adnate to short decurrent, crowded, pale greyish isabella; stem to 35 x 3.5 mm, cylindrical, fibrillose, whitish; sp deposit white. Sp 4.5-5.5 x 3-4 μm , ellipsoid, not agglutinating. In grass under conifers, but also in ruderal places on rich soil; autumn; very rare in temp.-hemib.; FI (DD, U: Helsinki), SE (NA, Sk: Trolle-Ljungby).
C. augeana (Mont.) Sacc. (*C. ruderalis* Harmaja)
- Smell sweetish, spicy or indistinct 13
13. Stem 3-8 mm broad; in grass. Cap 10-60 mm, convex to plane or slightly depressed, smooth, dry, buff to greyish brown with a rather persistent greyish white pruina, hygrophanous, not translucently striate; gills broadly adnate to short decurrent, medium spaced to crowded;

pale buff; stem 15-40 mm long, cylindrical or compressed, cream to pale buff; smell sweetish or indistinct; sp deposit white. Sp 4.5-6 x 3-4 μm , ellipsoid (fig. 393F), mostly not agglutinating. In dry grassland, forest edges, parks, ruderal areas, etc.; summer to late autumn; very common in temp., occasional in hemib.-arc./alp., in FI considered occasional and only known from hemib. and southern bore.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – C&D 295, Däh 200, Phil 93b, 93e, R&H 274, Ves 184, ☉. – Poisonous.

C. rivulosa (Pers.: Fr.) P. Kumm. (*C. dealbata* (Sowerby: Fr.) P. Kumm. s. auct.)

- Stem 2-4 mm broad; in deciduous or coniferous forests or alpine heathland 14
- 14. Cap translucently striate at margin, pruina fugacious; gills medium spaced. Cap 8-34 mm, convex to plane, smooth, white to pale yellowish buff, hygrophanous; gills broadly adnate to short decurrent, pale yellowish buff; stem 12-25 x 2.5-4 mm, cylindrical, concolorous with cap with slightly darker base; smell indistinct; sp deposit white. Sp 4.5-6 x 3.5-4 μm , ellipsoid to ovoid, not agglutinating. In *Dryas* heathland; autumn; very rare in arc./alp.; SE (LC). – B&K 3:164.

C. dionysae Bon (*C. gracilipes* Lamoure non (Britzelm.) Sacc.)

- Cap mostly not translucently striate, pruina rather persistent; gills crowded to very crowded. Cap 10-35 mm, convex to plane, smooth, dry, buff to pale brown, hygrophanous; gills decurrent, white to cream; stem 15-40 x 2-4 mm, cylindrical, cream; smell faint, spicy; sp deposit white. Sp 5-6.5 x 2.5-3.5 μm , ellipsoid, mostly not agglutinating. On soil in deciduous and coniferous forests, common in rich spruce forests on needles and in litter after clear-cutting; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 296, Cet 1898, FAD 33A, 34C, Ger 01:153, Ves 185.

C. candicans (Pers.: Fr.) P. Kumm. var. *candicans* (*C. gallinacea* (Scop.) Gillet, *C. tuba* (Fr.) Gillet)

var. *dryadicola* (J. Favre) Lamoure (*C. dryadicola* (J. Favre) Harmaja) differs in growing in alpine *Dryas* heathland or *Salix* scrubs; NO (incl. Svb), SE (LC). – AAF 2:11, B&K 3:158, FND 11:2, M&J 11.

Key B: Cap hygrophanous, without pruina

1. Pileipellis with intercalary cystidia (fig 239G); smell sour and unpleasant. Cap 15-50 mm, convex with depressed to umbilicate centre or funnel-shaped, smooth, dry, pale buff to pinkish buff, slightly translucently striate at margin or not, hygrophanous, drying cream to pale buff; gills decurrent, medium spaced, cream; stem 20-40 x 2-6 mm, cylindrical, cream to pale buff; sp deposit white. Sp 4.5-6.5 x 3-4.5 μm , ellipsoid to almost dacryoid (fig. 393G), not agglutinating. On litter in rich deciduous and coniferous forests, thermophilous; late summer to autumn; occasional in temp., rare in hemib.-bore., only two records in NO (Troms: Lyngen and Tromsø), in FI north to EH; DK (LC), FI (vu), NO, SE (LC). – B&K 175, C&D 299, FAD 36D, Phil 93j, Ves 186, ☉.
 - *C. phaeophthalma* (Pers.) Kuyper (*Singerocybe p.* (Pers.) Harmaja, *C. fritilliformis* (Lasch) Gillet, *C. hydrogramma* (Bull.: Fr.) P. Kumm. s. auct., *Singerocybe h.* (Bull.: Fr.) Harmaja s. auct.)
 - Subpellis without physalids; smell indistinct, farinaceous, acidulous or like aniseed, coumarin, peppermint or tomato leaves 2
2. Sp on av < 5.5 μm long 3
 - Sp on av > 5.5 μm long 14
3. Stem base with white rhizomorphs or conspicuously strigose from mycelial hairs 4
 - Stem base smooth or tomentose, without rhizomorphs, not or only slightly strigose from mycelial hairs 6
4. Stem base with conspicuous white rhizomorphs, not conspicuously strigose from mycelial hairs; mostly in spring; sp 3.5-5.5 x 2-3 μm see *C. vermicularis* key C 10
 - Stem base conspicuously strigose from mycelial hairs, with or without rhizomorphs;

- summer to autumn; sp 4-6 x 3-4 μm 5
5. Cap translucently striate in outer part; smell farinaceous, at least in young frb. Cap 15-60 mm broad, convex to plane, finally becoming slightly depressed, smooth, pale brown, hygrophanous; gills short decurrent, medium spaced, pale brownish, paler than cap; stem 20-90 x 3-10 mm, cylindrical or slightly widened at base, slightly fibrillose, concolorous with cap, at base strigose from mycelial hairs; sp deposit white. Sp 4-6 x 3-3.5 μm , ellipsoid to ovoid. In coniferous and deciduous forests, especially on *Picea* litter, often on calcareous soil; late summer to autumn; occasional in temp.-bore.; FI (LC), SE.
C. lohjaensis Harmaja
 - Cap not translucently striate; smell unpleasant sweetish, but farinaceous when cut. Cap 15-50(-70) mm, low convex to plane with depressed centre, later funnel-shaped, smooth, greyish yellow to greyish or greyish brown, hygrophanous; gills decurrent, crowded, whitish; stem 25-45 x 2-4 mm, cylindrical, concolorous with cap, at base strigose from mycelial hairs, often with white rhizomorphs. Sp 4-5.5 x 3-4 μm , broadly ellipsoid to dacryoid. On litter of deciduous and coniferous trees; summer to autumn. DE, PL. – M&J 12.
C. diosma Einhell.
6. Sp 3-4 x 2.5-3.5 μm see *C. ditopus* key A 1
 - Sp in majority ≥ 4 μm long 7
7. Sp \pm globose. Cap c. 25-30 mm; gills crowded, becoming dark brown in exsiccates; stem about 50 x 5 mm, cylindrical. Sp 3.5-5 μm broad. In heath forests on *Picea* litter; summer; rare in hemib-southern bore.; FI (DD, V, EH).
C. globispora Harmaja
 Note: the species is poorly known, and an adequate description of its field characters is not available.
 - Sp broadly ellipsoid to ellipsoid 8
8. Sp not agglutinating; sp deposit white (or colour unknown) 9
 - Sp often agglutinating; sp deposit cream with or without an orange tinge 11
9. Cap greyish brown. Cap 13-35 mm, at first low convex, but soon plane to depressed or funnel-shaped, hygrophanous, translucently striate at margin or not; gills decurrent, crowded, isabella to greyish brown; stem 17-47 x 2-5 mm, cylindrical, smooth, isabella in top, greyish brown downwards; smell insignificant; sp deposit white. Sp 4.5-6 x 3-4 μm , ellipsoid, typically not agglutinating. On leaf and grass litter and on litter of coniferous trees; autumn to late autumn; rare in temp.-bore.; DK (DD), FI (DD), NO (NE). – FAD 37B, Fav 60:5,6.
C. subcordispora Harmaja (*C. vibecina* (Fr.) Quél. var. *pseudoobata* J.E. Lange, *C. pseudoobata* (J.E. Lange) Kuyper)
 - Cap white to pale buff 10
10. In *Dryas* heathland see *C. dionysae* key A 14
 - On litter, soil or wood in subalpine *Betula* forests and grassland. Cap 27-54 mm, conical to convex or plane, mostly with an umbo, whitish with pale buff centre, hygrophanous; gills adnate to subdecurrent, crowded, white to cream; stem 30-65 x 4-5 mm, mostly widened at base, up to 10 mm, white; smell \pm like aniseed; frb tinged pinkish in exsiccates. Sp 4-5.5 x 3-3.5 μm , ellipsoid, mostly not agglutinating. Late summer to early autumn; rare in northern bore.-arc./alp.; NO (LC), SE.
C. laricicola Singer
11. Cap unicoloured cream to pale isabella. Cap 10-50 mm, low convex to plane, becoming depressed, smooth, hygrophanous, translucently striate in outer part; gills broadly adnate to decurrent, crowded, whitish; stem 20-60 x 2-6 mm, cylindrical, sometimes compressed, smooth, cream to isabella; smell like coumarin; sp deposit cream with an orange tinge. Sp 4-6 x 2.5-4 μm , ellipsoid (fig. 393H), often agglutinating. On soil in grassland, including moss rich lawns, coastal meadows, at roadsides, in ruderal areas, etc.; autumn; common in temp.-bore.;

DK (DD), FI (LC), NO (LC), SE (LC). – Bres 183, FAD 37E, GBW 3:156, M&J 10. – Poisonous.

C. agrestis Harmaja (*Lepista a.* (Harmaja) Harmaja, *C. angustissima* (Lasch) P. Kumm. s. auct.)

- Cap more intensely coloured, at least at centre 12
- 12. Cap yellow brown with a pinkish isabella to cream margin, translucently striate in outer part. Cap 15-55 mm, low convex to plane, becoming depressed to funnel-shaped, smooth, hygrophanous, translucently striate in outer part; gills decurrent, crowded, cream or tinged pinkish isabella; stem 20-50 x 1-4 mm, cylindrical to clavate, sometimes compressed, smooth, pinkish buff to brownish; frb elastic; smell ± sweetish to earthy; sp deposit cream, tinged orange. Sp 4.5-6 x 2.5-4 µm, ellipsoid (fig. 393I), often agglutinating. On litter of deciduous and coniferous trees and in heathland and alpine meadows; autumn; common in hemib.-suba., rare in temp. and arc./alp.; DK (LC), FI (DD). – Poisonous.
C. marginella Harmaja (*Lepista m.* (Harmaja) Harmaja)
 - Cap ± unicoloured pinkish or pinkish brown to reddish brown, not translucently striate 13
- 13. Stem 15-30 x 2.5-12 mm; in arc./alp.; frb caespitose. Cap 20-60 mm, convex to bell-shaped, later plane to depressed or almost funnel-shaped, often flexuose, smooth, pinkish brown to pinkish buff, hygrophanous, not translucently striate; gills broadly adnate to short decurrent, crowded, pale pinkish buff; stem cylindrical or tapering downwards; pale pinkish buff to pinkish buff; smell pleasant; sp deposit pinkish cream. Sp 4.5-6 x 3-3.5 µm, ellipsoid. On soil in fairy rings; summer; rare; NO (Svb). – AAF 2:21, FND 32:36, ☉.
C. paxillus Gulden
 - Stem 20-45 x 3-7 mm; in deciduous and coniferous forests and in sand dunes in temp.-suba.; frb not caespitose. Cap 15-45 mm, convex, later expanded with depressed centre, smooth, dry, pinkish to pinkish brown, not translucently striate, hygrophanous, drying pale pinkish buff; gills short decurrent, medium spaced, cream with a pinkish hue; stem cylindrical, finely fibrillose, cream with a pinkish tinge; sp deposit cream with an orange tinge. Sp 4-5.5 x 2.5-3.5 µm, ellipsoid (fig. 393J), often agglutinating (fig. 393A). Late summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 301, Däh 204, GBW 3:164, Ger 01:155, Ves 186, ☉. – Poisonous.
C. diatreta (Fr.: Fr.) P. Kumm. (*Lepista d.* (Fr.: Fr.) Harmaja)
 - 14 (2). Smell like aniseed. Cap 12-35 mm, convex to plane or depressed, smooth, buff to pale greyish brown, hygrophanous, translucently striate at margin or not; gills broadly adnate, medium spaced, cream to pale buff with a pinkish tinge; stem 25-60 x 2-5 mm, cylindrical, smooth to slightly fibrillose, greyish white to pale buff; sp deposit very pale cream to orange cream. Sp 6.5-9 x 3.5-5 µm, ellipsoid (fig. 393K), often agglutinating. On soil in deciduous and coniferous forests, pastures, parks and gardens; late summer to autumn; common in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – FAD 37E, Däh 201, 202, Phil 93c, R&H 274, Ves 185, ☉.
C. fragrans (With.: Fr.) P. Kumm. (*Lepista f.* (With.: Fr.) Harmaja, *C. depauperata* (J.E. Lange) P.D. Orton, *C. obsoleta* (Batsch) Qué! s. auct.)
 - Smell indistinct, nitrous, farinaceous, sweetish or like coumarin, aniseed, coconut, peppermint or tomato leaves 15
 - 15. Cap and gills tinged pink; smell like tomato leaves. Cap 10-40 mm, convex to plane with depressed centre, smooth, dry, pale pinkish isabella, hygrophanous, translucently striate in outer part, drying to whitish; gills decurrent, medium spaced; stem 15-32 x 1.5-5 mm, cylindrical or widened at base, whitish, sometimes with a slight pinkish tinge; sp deposit white. Sp 7-9 x 4-5 µm, ellipsoid, generally not agglutinating. On soil in forests and scrubs; late summer to autumn; very rare in temp.; DK (DD), SE. – GBW 3:174, Phil 93g, RdM 42:199.
C. houghtonii (W. Phillips) Dennis
 - Cap and gills not tinged pink; smell indistinct, nitrous, farinaceous, sweetish or like coumarin or peppermint 16

16. Basidia 2-spored. Cap 20-40 mm, convex with umbilicate centre, smooth, dark greyish brown, hygrophanous, translucently striate at margin; gills decurrent, medium spaced, grey to brownish grey; stem 20-90 x 2-6 mm, cylindrical, fibrillose, dark greyish brown, at base sometime strigose from mycelial hairs; smell insignificant; sp deposit white. Sp 6-9 x 3.5-5 μm , ellipsoid. In moss or on needle litter in coniferous forests; very rare in hemib., described by Fries from Uppsala. – BCat 855, ☉.
C. lituus (Fr.) Métrod
- Basidia 4-spored 17
17. Stem base strigose from mycelial hairs 18
- Stem base not strigose from mycelial hairs 19
18. Stem 30-110 x 3-15 mm, clavate; sp 6-8.5 x 3.5-5 μm , ellipsoid to dacryoid. Cap 25-65 mm, low convex to plane with umbilicate centre, smooth, chestnut brown to umber, hygrophanous, translucently striate at margin; gills short decurrent, medium spaced to crowded, pale greyish brown; stem smooth, concolorous with cap or slightly paler, with a pale zone at the top; smell indistinct. In coniferous or deciduous forests and *Dryas* heathland, often deep in moss, often on calcareous soil; autumn to winter; occasional in hemib.-arc./alp., rare in temp.; FI (LC), NO (LC), SE (LC). – M&J 9.
C. strigosa Harmaja
- Stem 30-50 x 2-5 mm, cylindrical; sp 5.5-7 x 3-3.5 μm , ellipsoid. Cap 25-40 mm, low convex to plane with umbilicate centre to funnel-shaped, smooth, reddish brown to sepia, hygrophanous, translucently striate at margin; gills short decurrent, crowded, dirty brownish; stem smooth, concolorous with cap or slightly paler; smell indistinct-fungoid or slightly musty. In coniferous or mixed forests, on litter of *Picea* and *Populus*; autumn to winter; rare in hemib.-bore., poorly known; FI (DD, V, U).
- C. fennica* Harmaja
19. Smell farinaceous to rancid-farinaceous, at least when cut 20
- Smell acidulous, nitrous, like aniseed, coconut or coumarin or indistinct 23
20. Pileipellis an ixocutis with distinctly incrusting pigment; in dunes and dry grassland. Cap 10-20 mm, low convex to plane with depressed to umbilicate centre, smooth, slightly greasy, dark greyish brown, hygrophanous, translucently striate in outer half; gills short decurrent, medium spaced, greyish brown; stem 15-25 x 2-3 μm , cylindrical, dark greyish brown; smell farinaceous; sp deposit white. Sp 5-7 x 3-4 μm , ellipsoid, not agglutinating. Autumn to winter; occasional in temp.; DK (LC), SE (NA). – M&J 12, OPN 10A.
C. barbularum (Romagn.) P.D. Orton
- Pileipellis a slightly gelatinized cutis with minutely incrusting pigment; habitat often different, in forests, heathland, on wood chips, etc. 21
21. Gills short decurrent to decurrent. Cap 15-50 mm, convex to plane or slightly depressed, smooth, dry, greyish brown with paler margin, hygrophanous, translucently striate in outer part; gills medium spaced, pale buff to brownish; stem 20-60 x 2-7 mm, cylindrical, smooth, buff in upper part, more greyish brown towards base; smell farinaceous to cucumber-like; sp deposit white. Sp 4.5-7 x 3.5-4.5 μm , ellipsoid (fig. 393L), sometimes agglutinating. On mainly acid, nitrogen poor soil in coniferous forests, deciduous forests and in heathland, often on needle litter of *Pinus*, also on wood chips; late summer to winter, more rarely in spring; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:180, C&D 306, End 241, FAD 37A, Ves 185, ☉.
C. vibecina (Fr.) Quél. (*C. langei* Hora)
- Gills broadly to narrowly adnate 22
22. Smell rancid-farinaceous, fetid in exsiccates. Cap 10-45 mm, low convex to plane, becoming depressed, smooth, olivaceous buff to yellowish brown, hygrophanous, translucently striate

in outer part; gills broadly adnate, medium spaced to crowded, pale olivaceous buff; stem 30-60 x 3-6 mm, cylindrical to ± clavate, sometimes compressed, smooth, yellowish brown, darker towards base; sp deposit white. Sp 5.5-6.5 x 3.5-4.5 μm, ellipsoid, not agglutinating. In dry pasture among mosses, outside the area also in deciduous forests; late summer to autumn; only one record from FI (DD, EH). – End 235, GBW 3:167, ZM 47:64.

C. foetens Melot

- Smell farinaceous, becoming peppermint-like when drying and fish-like in exsiccates. Cap 30-60 mm, convex to plane, becoming depressed, smooth, sordid brown, hygrophanous, slightly translucently striate at margin; gills narrowly adnate, medium spaced, pale to dark brown; stem 40-50 x 4-10 mm, cylindrical, sometimes compressed, darker than the cap or more grey, darkest in lower part, paler at top; sp deposit white. Sp 5-7 x 3-3.5 μm, ellipsoid to ovoid, sometimes with median constriction. In litter in deciduous and coniferous forests, parks and gardens; autumn; rare in temp.-bore.; FI (LC), NO (NE, NTr: Lierne), SE (LC).

C. menthiodora Harmaja

23. Stem ± unicoloured, not turning darker brown from base 24
 - Stem turning darker brown from base 25
24. Smell nitrous; on rich soil in deciduous or coniferous forests, especially with *Fagus*. Cap 20-60 mm, convex to plane with umbilicate centre, smooth, greyish brown to olivaceous brown, hygrophanous, not translucently striate; gills decurrent, crowded, buff to greyish brown; stem 40-60 x 4-7 mm, cylindrical, pale grey to pale greyish brown with a paler zone at the top. Sp 6-9 x 3.5-4.5 μm, ellipsoid. Autumn; rare in temp.; DK (LC). – B&K 3:178, FAD 58H, ©. *C. subspadicea* (J.E. Lange) Bon & Chevassut (*Omphalia umbilicata* (Schaeff.) Fr. var. *subspadicea* J.E. Lange)

- Smell faint like coconut or indistinct; on dung, in ruderal places, nutrient rich grassland and rich mixed forests. Cap 10-65 mm, low convex to plane with umbilicate centre to funnel-shaped, smooth, reddish brown to yellowish brown, hygrophanous, translucently striate at margin; gills decurrent, crowded, pale isabella; stem 10-70 x 2-7 mm, cylindrical to ± clavate, sometimes compressed, reddish brown to yellowish brown; taste slightly bitter in caps of old frb; sp deposit pale cream. Sp 6-8.5 x 3.5-4.5 μm, ellipsoid (fig. 393M), often agglutinating. Autumn to winter; occasional in temp.-hemib., but rare in FI; DK (LC), FI (DD), NO (NE), SE (LC). – End 234, Ger 01:155, M&J 10, RdM 42:197, Svp 28:57.

C. amarescens Harmaja (*Lepista a.* (Harmaja) Harmaja, *C. harmajae* Lamoure, *Lepista h.* (Lamoure) Harmaja, *C. nitrophila* Bon)

25. Sp 7-12 x 3.5-4 μm, ellipsoid to cylindrical (fig. 393N). Cap 12-42 mm, convex to plane, sometimes umbonate or with a papilla, sometimes becoming depressed, dark greyish brown with pale margin, hygrophanous, translucently striate in outer part; gills broadly adnate, crowded, pale greyish brown; stem 20-45 x 1.5-4 mm, cylindrical, pale greyish brown, becoming darker greyish brown in lower part; smell insignificant. In raised bogs and oligotrophic forests; spring to late autumn; very rare in temp.-arc. / alp.; DK (DD), NO (LC). – FAD 45A (as *Collybia misera* forma), Fav 48:1.11-12.

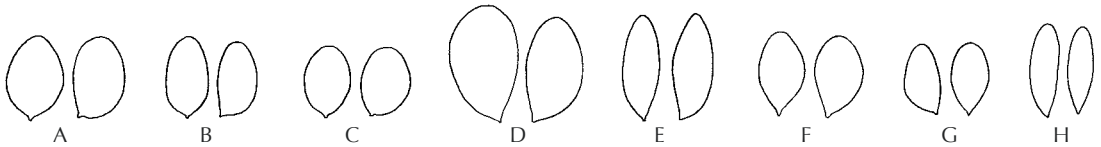
C. favrei Kühner & Romagn. (*Collybia langei* J. Favre)

- Sp ≤ 8.5 μm long, ellipsoid 26
26. Cap dark brown; pileipellis with incrusting pigment. Cap 20-45 mm, low convex to plane with umbilicate centre to funnel-shaped, smooth, hygrophanous; gills decurrent, medium spaced to crowded, ochraceous buff to greyish brown, not translucently striate or only at margin; stem 30-85 x 3-6 mm, cylindrical or widened at top, with fibrillose top, buff to brown with base becoming dark brown; smell insignificant; sp deposit white to pale cream. Sp 6-8 x 3.5-4.5 μm, ellipsoid, sometimes agglutinating. In heath forests, often on litter of coniferous trees; autumn; common in hemib.-bore.; FI (LC), NO.
- C. metachroides* Harmaja (*Lepista m.* (Harmaja) Harmaja)

- Cap greyish buff to greyish brown, darkest at centre; pileipellis without incrusting pigment. Cap 10-50 mm, low convex to plane with depressed to umbilicate centre; smooth, slightly greasy, hygrophanous, mostly translucently striate at margin, drying whitish; gills short decurrent, medium spaced to crowded, cream to pale greyish brown; stem 20-70 x 2-5 mm, cylindrical or compressed, fibrillose, greyish white to pale buff, turning greyish brown base; smell insignificant; sp deposit white. Sp 5.5-8.5 x 3.5-5 μm , ellipsoid (fig. 393O), often agglutinating. On litter in coniferous and deciduous forests and in heathland, less often in grass; late summer to late autumn; very common in temp.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 169, GBW 3:178, Phil 93f, R&H 275, Ves 187, ☉.
C. metachroa (Fr.: Fr.) P. Kumm. var. *metachroa* (*Lepista m.* (Fr.: Fr.) Harmaja, *C. bicolor* (Pers.) Murrill)
 var. *aquosoumbrina* (Raithelh.) Kuyper differs in having a yellowish brown to ochraceous yellow cap. NL. – Bol Bres 41:96.

Key C: Cap not hygrophanous, not becoming funnel-shaped; sp ellipsoid to fusiform or cylindrical

1. Smell strong like aniseed. Cap 20-90 mm, convex, later expanded to depressed, smooth, dry, pale greyish blue to greyish green, not or indistinctly hygrophanous; gills decurrent, crowded, concolorous with cap; stem 30-60 x 4-12 mm, \pm cylindrical, concolorous with cap or slightly paler, whitish tomentose at base; sp deposit pale pinkish cream. Sp 6-8.5 x 4-5.5 μm , ellipsoid (fig. 401A). On soil and litter in deciduous and coniferous forests, including subalpine *Betula* forests; summer to late autumn; very common in temp.-bore., common in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:172, C&D 292, Phil 90b, R&H 268, Ves 184, ☉.
C. odora (Bull.: Fr.) P. Kumm. var. *odora* (*Lepista o.* (Bull.: Fr.) Harmaja)
 var. *alba* J.E. Lange differs in being entirely white; rare in temp.; DK, NO. – Däh 189, FAD 36A.
- Smell different or indistinct 2
2. Frb often densely fasciculate; cap and gills violet with FeSO_4 see *C. conmata* key A 11
- Frb mostly solitary; cap and gills not violet with FeSO_4 3
3. Stem mostly ≥ 13 mm broad 4
- Stem ≤ 13 mm broad, at least in upper part 7
4. Smell sweetish-aromatic, *Lepista*-like; sp deposit deep ochraceous. Cap 40-150(-200) mm, convex, later expanded to depressed, often with a low umbo, margin sometimes with radial ribs, dry, brownish grey to greyish brown, not hygrophanous; gills decurrent, crowded, cream; stem 60-90 x 13-30 mm, cylindrical to clavate, fibrillose, floccose in upper part, pale brownish grey. Sp 6.5-8 x 3.5-4 μm , ellipsoid (fig. 401B). In deciduous and coniferous forests, parks, gardens and ruderal areas, often in fairy rings, up to 550 m alt.; autumn to late autumn; very common in temp.-hemib., common in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:170, C&D 288, Phil 89e, R&H 279, Ves 190, ☉.
C. nebularis (Batsch: Fr.) P. Kumm. var. *nebularis* (*Lepista n.* (Batsch: Fr.) Harmaja)
 var. *alba* Bataille (*C. singeri* (Harmaja) Harmaja) differs in having white or very pale frb; rare in temp.-bore.; DK, FI, NO, SE. – FAD 32F.
- Smell indistinct, faintly aromatic or cyanic; sp deposit white 5
5. Cap becoming \pm funnel-shaped see *Infundibulicybe gigas* p. 310
- Cap low convex to expanded or slightly depressed 6
6. Gills adnate to decurrent; stem 40-60 x 15-40 mm; clamps present. Cap 30-120 mm, convex to expanded or slightly depressed, tomentose to scaly, dry, cream to pale buff; gills crowded, cream to pale yellowish buff; stem clavate to barrel-shaped, fibrillose, whitish to pale



Spores: A: *Clitocybe odora* var. *odora*, B: *C. nebularis*, C: *C. alexandri*, D: *C. sinopica*, E: *C. inornata*, F: *C. subalutacea*, G: *C. trulliformis*, H: *C. fuscusquamula*.

buff, whitish tomentose at base; smell faintly aromatic; sp deposit white. Sp 6-7.5 x 4-5 μm , broadly ellipsoid (fig. 401C). In coniferous and mixed forests on calcareous soil; autumn; rare in temp.-suba.; DK (EN), FI (NT), NO (NT), SE (NT). – FAD 33D, Mar 125, R&H 269, Sien-iop 127, Ves 183.

C. alexandri (Gillet) Gillet

- Gills emarginate to short decurrent; stem 45-80 x 13-22 mm; clamps absent. Cap 50-110 mm, low convex to expanded or slightly depressed with a small umbo, smooth to finely scaly, dry, pale yellow brown to pale beige or pale yellowish buff; gills emarginate to short decurrent, thin, crowded, almost white to pale greyish brown; stem cylindrical to clavate, fibrillose, coloured like cap, whitish tomentose at base; smell indistinct; sp deposit white. Sp 4.5-5.5 x 3-3.5 μm , ellipsoid. On calcareous soil under *Picea* or *Pinus*; late autumn; rare in hemib.-bore.; FI (LC), NO (NE, Busk: Hole), SE (LC).

C. harperi Murrill (*Rhodocybe h.* (Murrill) Harmaja)

- | | | |
|-----|--|---|
| 7. | Sp on av > 4 μm broad | 8 |
| - | Sp on av < 4 μm broad | 10 |
| 8. | Flesh spongy in cap and stem base; cap buff to greyish brown or dark brown with a paler margin | see <i>Ampulloclitocybe clavipes</i> p. 191 |
| - | Flesh not spongy; cap brownish red or dark reddish brown to sepia | 9 |
| 9. | Cap brownish red; smell farinaceous; in temp.-bore. Cap 15-60 mm, convex to plane with depressed centre to funnel-shaped, tomentose to finely scaly, brownish red, not hygrophanous; gills decurrent, crowded, whitish to pale buff; stem 20-50 x 3-8 mm, cylindrical, fibrillose, brownish red, at base with conspicuous rhizomorphs; sp deposit white. Sp 7-10.5 x 5-6 μm (fig. 401D), ellipsoid to slightly dacryoid. On exposed habitats with mineral rich soil, e.g. on old fire places, along roads and paths, lawns and yards, often near <i>Pinus</i> ; spring to autumn; common in hemib.-bore., rare in temp.; DK (DD), FI (LC), NO (LC), SE (LC). – Däh 196, GBW 3:190, Ger 01:151, Phil 93h, R&H 271. | |
| | <i>C. sinopica</i> (Fr.: Fr.) P. Kumm. (<i>C. subsinopica</i> Harmaja) | |
| - | Cap dark reddish brown to sepia; smell indistinct; in suba.-arc./alp. Cap 18-45 mm, convex to plane with depressed centre, tomentose, not hygrophanous; gills decurrent, medium spaced, often veined, cream to pale buff; stem 10-35 x 2.5-8 mm, cylindrical to clavate, fibrillose, dark reddish brown; sp deposit white. Sp 7.5-11 x 5-6 μm , ellipsoid. On calcareous mineral soil; summer; rare in arc./alp., very rare in suba., but common in IS; FI (DD, EnL: Enontekiö, Pikku-Malla), IS, NO (LC, incl. SvB). – AAF 2:17, B&K 3:166, Bor 50, Favre 55:4.11, M&J 4, Ⓞ. | |
| | <i>C. lateritia</i> J. Favre | |
| 10. | Sp 8-10.5 x 3-4 μm (fig. 401E). Cap 10-80 mm, convex to plane or depressed, tomentose to finely scaly, sometimes cracked, buff to greyish brown, paler with age, but not distinctly hygrophanous; gills broadly adnate to short decurrent, medium spaced, pale greyish brown to greyish brown; stem 30-80 x 3-13 mm, cylindrical to \pm clavate, fibrillose, buff to pale greyish brown, at base with conspicuous rhizoids; smell like linseed oil, rather unpleasant; sp deposit white. Sp narrowly ellipsoid to fusiform. In deciduous and coniferous forests, often on calcareous soil; summer to late autumn; rare but locally occasional in | |

temp.-arc./alp.; DK (DD), FI (LC), IS, NO (LC, incl. Sv), SE (LC). – AAF 2:15, Cet 154, Däh 192, 193, FAD 34B, GBW 3:175.

C. inornata (Sowerby: Fr.) Gillet

- Sp $\leq 7.5 \mu\text{m}$ long or $\leq 3 \mu\text{m}$ broad 11
- 11. Stem base with white rhizomorphs 12
 - Stem base without rhizomorphs 13
- 12. Cap smooth, orange brown to reddish brown; mostly in late autumn to spring. Cap 20-60 mm, convex to plane, with age sometimes slightly depressed, slightly greasy, not distinctly hygrophanous, but drying alutaceous; gills adnate to short decurrent, medium spaced, cream; stem 20-60 x 5-10(-15) mm, cylindrical, whitish to buff, at base with white rhizomorphs; smell herb-like or indistinct. Sp 3.5-5.5 x 2-3 μm , ellipsoid. In coniferous and deciduous forests, often on calcareous soil; spring; rare in temp.-bore.; DK (DD), FI (LC), NO (NT), SE (NT). – BCat 1110, B&K 3:179, Mar 129, M&J 7, R&H 273.

C. vermicularis (Fr.) Quél. (*C. rhizophora* Velen.)

 - Cap velvety, sordid white to cream with umber patches; autumn. Cap 20-60 mm, convex, with age with depressed centre, not hygrophanous, but sometimes with hygrophanous flecks; gills decurrent, rather thick and broad, medium spaced to distant, cream to buff; stem 35-60 x 7-12 mm, cylindrical to clavate, up to 15 mm and tapering at base, appressed tomentose, whitish to cream, with white rhizomorphs at base; smell faint, pleasant. Sp 5.5-7 x 4-4.5 μm , ellipsoid tending to be slightly dacryoid (fig. 401F). On soil in coniferous or deciduous forests; autumn; very rare in temp.; DK (DD, EJy1). – FAD 33G.

C. subalutacea (Batsch: Fr.) P. Kumm.
- 13. Frb whitish see key A p. 392
 - Frb \pm coloured 14
- 14. Cap 30-90 mm, dark orange brown to reddish brown; stem 6-12 mm broad. Cap convex to plane with a broad umbo, later depressed, smooth, slightly greasy, sometimes becoming areolate, not hygrophanous; gills short decurrent, crowded, pale, becoming reddish brown; stem 10-60 mm long, \pm clavate, fibrillose, concolorous with cap; smell insignificant; sp deposit white. Sp 4-6 x 3-3.5 μm , ellipsoid. In rich forest on needle litter; autumn to late autumn; rare in hemib.-bore.; FI (DD), NO.

C. gilvaoides Kauffman

 - Cap 10-35 mm, greyish to dark greyish brown; stem 1-4 mm broad 15
- 15. Sp 5-7.5 x 3-4 μm (fig. 401G). Cap 15-35 mm, convex to plane or with slightly depressed centre, tomentose to finely scaly, dark grey to greyish brown, unicoloured or darkest at centre, not hygrophanous; gills decurrent, crowded, whitish; stem 10-20 x 2-4 mm, cylindrical to clavate, sometimes compressed, fibrillose, greyish to greyish brown; smell farinaceous; sp deposit white. Sp oblong. In open places on rich, humose, often calcareous soil in forests; autumn; rare, but locally occasional in temp.-hemib.; DK (LC), NO (Østf.: Hvaler), SE. – C&D 284, End 240, FAD 33B (as *parilis*), M&J 4, Phil 94b, ☉.

C. trulliformis (Fr.: Fr.) P. Karst.

 - Sp $\leq 3 \mu\text{m}$ broad 16
- 16. Sp 6.5-9 x 2-3 μm , narrowly fusiform (fig. 401H). Cap 10-25 mm, convex to plane or slightly depressed, sometimes with a small umbo, tomentose to finely scaly, grey to blackish brown with a paler to whitish margin, not hygrophanous; gills decurrent, medium spaced, white to cream; stem 15-35 x 1-3 mm, cylindrical, whitish to pale greyish; found among needles of *Abies*; very rare in temp.-hemib.; DK (DD), NO (Akh: Bærum). – FAD 32A.

C. fuscquamula J.E. Lange

 - Sp 4.5-6 x 2.5-3 μm , ellipsoid. Cap 7-32 mm, low convex, later expanded to depressed or funnel-shaped, tomentose to finely scaly, greyish to pale greyish brown, not hygrophanous;

gills decurrent, crowded, cream; stem 10-27 x 1-3 mm, cylindrical, finely tomentose, concolorous with cap or paler to white; smell farinaceous; sp deposit white. In dry grassland, thermophilous; summer to autumn; very rare in temp.; DK (DD). – C&D 283.
C. collina (Velen.) Klán (*C. herbarum* Romagn.)

Clitocybula (Singer) Métrod

JAN VESTERHOLT

Frb clitocyboid to collybioid. Cap 10-45 mm, smooth or radially fibrillose, dry, thin-fleshed, not or slightly hygrophanous. Gills adnexed to broadly adnate or short decurrent, medium spaced to crowded. Stem cylindrical to clavate, ± fibrillose. Smell insignificant. Taste mild or raphanoid. Sp deposit white.

Sp globose to subglobose, smooth, hyaline, amyloid. Basidia 4-spored. Cheilocystidia present or absent. Pleurocystidia absent. Pileipellis a cutis. Clamps present.

Saprotrophic on wood, often fasciculate.

One species in the Nordic countries, two species in the key.

Lit.: Ludwig 2001.



Spores: *Clitocybula lacerata*.

1. Cap almost smooth; gills crowded, short decurrent; stem cream to pale buff. Cap 10-45 mm, convex to expanded or slightly depressed, margin decurved for a long time, sordid cream to buff grey, darkest at centre, slightly hygrophanous; gills pale buff; stem 15-80 × 3-8 mm, cylindrical, often curved, often compressed or furrowed; smell indistinct; taste insignificant or raphanoid. Sp (3.5-)4-5 μm, globose, at least partly amyloid; cheilocystidia absent. Fasciculate on rotten coniferous wood; autumn; very rare in bore.; SE (NE). – Lud 14.1.
C. familia (Peck) Singer var. *compressa* (Romagn.) H.E. Bigelow
- Cap radially fibrillose; gills medium spaced, adnexed to broadly adnate; stem cream, greyish brown towards base. Cap 10-40 mm, convex to expanded or slightly depressed, cream to buff or pale greyish brown, slightly hygrophanous; gills whitish; stem 40-70 × 4-6 mm, cylindrical, often curved; smell indistinct or like *Clitocybe nebularis*; taste mild. Sp 4-6 × 4-5 μm, globose to subglobose (fig. 275E), amyloid; cheilocystidia absent or very rare. Fasciculate on rotten wood, mostly of conifers; DE, UK. – B&K 3:183, Bres 217, C&D 323, GBW 3:197, Lud 14.4, ⊙.
C. lacerata (Lasch) Singer

Clitopilus (Fr.: Fr.) P. Kumm.

MACHIEL NOORDELOOS

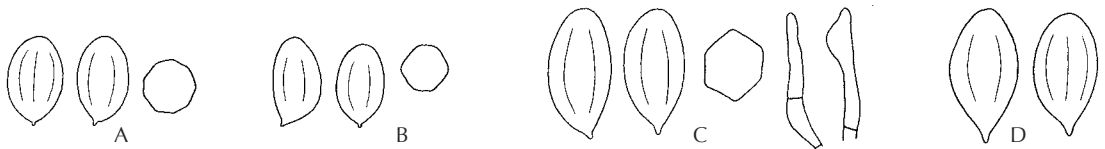
Frb with a central to lateral, well-developed or reduced, sometimes lacking stem, clitocyboid, omphalinoid, crepidotoid or pleurotoid. Cap 2-110 mm, convex to flattened, with a small umbo or centrally depressed to funnel-shaped; white to brown or grey in various shades, usually glabrous, rarely hygrophanous. Gills well-developed, adnate-decurrent, often arcuate-decurrent, tinged ± pink when mature. Stem thin to thick, well-developed or reduced. Smell none, farinaceous-rancid or aromatic. Taste farinaceous-rancid or mild, rarely bitter. Sp deposit brownish pink.

Sp ellipsoid or ± amygdaloid, with 3-12 longitudinal ribs, angular in polar view, thin- to slightly thick-walled, pale straw yellow in water, pink in mass. Cheilocystidia usually absent, rarely present; pigment intracellular, sometimes in addition minutely incrusting or lacking in white species. Pileipellis a cutis of cylindrical hyphae with incrusting or intracellular pigment. Clamps absent or present.

Terrestrial or on dead wood, herbaceous plants, compost or other fungi.

Eight species in the Nordic countries. *C. passeckerianus* growing on beds of cultivated *Agaricus* is not included.

Lit.: Ludwig 2000, Noordeloos 1984, 1993, Noordeloos in Bas et al. 1988.



Spores and cheilocystidia: A: *Clitopilus hobsonii*, B: *C. scyphoides* f. *scyphoides*, C: *C. cystidiatus*, D: *C. paxilloides*.

1. Frb pleurotoid, with lateral stem, or stem lacking; single or in clusters 2
 - Frb clitocyboid, with distinct stem, usually single or in small groups 5
2. Sp 3.5-4 μm broad. Frb spatulate; cap 5-10 mm broad, circular to kidney-shaped; gills decurrent, crowded, pink; stem reduced, 0.5-1.5 \times 1 mm, central, then eccentric or lateral, white. Sp 6-7(-8) \times 3.5-4 μm , ellipsoid, with 6-8 longitudinal ribs. Terrestrial in poor, mossy grassland on sandy or peaty soil; NL.
C. scyphoides (Fr.: Fr.) Singer f. *reductus* Noordel.
 - Sp > 5 μm broad 3
3. Cap 15-45 mm broad; gills ochre pink or brownish pink; on deciduous logs, e.g. *Quercus* and *Ulmus*, often in large groups. Cap 10-25 mm, low convex, glabrous or finely hairy, white to pale cream with a pink tinge; gills decurrent, crowded; stem lacking. Sp 7-9.5(-11) \times 5-5.5(-6) μm , ellipsoid, with 5-8, rather weak longitudinal ribs. In large groups on rotten wood, preferably on *Ulmus*; autumn; NL. – Cet 1858.
C. rhodophyllus (Bres.) Singer
 - Cap 2-15(-20) mm broad; gills pale then purely pink; on remnants of herbaceous plants and on other fungi, rarely on rotten wood 4
4. Sp (6.5-)7.5-8.5(-10) \times 5-5.5(-6) μm , ellipsoid, with 6-12, rather distinct longitudinal ridges (fig. 431A). Cap 2-15(-20) mm, convex, then irregularly shaped, plane, minutely tomentose, glabrescent, white; gills decurrent, medium spaced to distant, white then pink; stem absent or present, 1-1.5 \times 1 mm, lateral or eccentric, white; smell farinaceous. Single or in groups on dead plant material in deciduous forests, gardens, etc.; all year; very common in temp., common in hemib., occasional in bore.-arc. / alp.; DK (LC), FI (LC), IS (Nm, Su), NO (LC), SE (LC). – B&K 4:1, Lud 15.1, R&H 373, Sieniop 283, ⊙.
C. hobsonii (Berk. & Broome) P.D. Orton

- Sp (7-)8-11.5(-12.5) x 5-7 μm , ellipsoid, with 6-9, rather distinct longitudinal ridges. Cap 2-8 mm, convex to irregularly plane, densely and finely tomentose, white; gills distant, slightly reduced, often anastomising and/or forked, white then pink; stem absent or present, up to 1.5 x 1 mm, lateral, white. In groups on rotten wood, herbaceous plants, frequently also on other fungi, such as polypores; summer-autumn; very rare in temp.; DK (NE), SE (LC). – Lud 15.7.
C. daamsii Noordel.
- 5. Frb white or very pale grey at centre of cap 6
- Frb moderately dark to dark grey, grey brown or reddish brown 7
- 6. Frb robust, fleshy; cap 20-110 mm. Cap convex, then irregularly shaped with a broad umbo or depressed centre and lobed margin; gills arcuate-decurrent, crowded, whitish, then pink to pinkish brown; stem 20-60 x 3.5-12 mm, central or eccentric, white; smell strong, farinaceous. Sp 9-12 x 4-6 μm , ellipsoid, oblong or amygdaloid, with 6-8 longitudinal ridges. In small groups on soil in deciduous and coniferous forests, rarely in pastures or gardens, often on rich ground, solitary or in small groups; summer to autumn; common in temp.-middle bore., rare, but locally occasional in northern bore.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:2, FAD 133A, Lud 15.10, Phil 154bc, Ves 240, ☉.
C. prunulus (Scop.: Fr.) P. Kumm.
- Frb thin-fleshed; cap 5-20 mm. Cap convex then flattened with or without depressed centre; gills decurrent, medium spaced, white then pink; stem 5-15 x 0.5-1 mm, usually eccentric, rarely central, white. Sp 5.5-8.5 x 3-4.5 μm , ellipsoid, with 5-9 ridges (fig. 431B). On soil among grasses and mosses, often in warm, sun exposed places, often on calcaerous soil; summer to autumn; occasional in temp.-suba., very rare in suba.; DK (LC), FI (LC), IS (Na), NO (LC), SE (LC). – B&K 4:3-5, Lud 15.2-5, R&H 374, Sieniop 284, Ves 240, ☉.
C. scyphoides (Fr.: Fr.) Singer f. *scyphoides* (*C. cretatus* (Berk. & Broome) Sacc.)
- 7. Cheilocystidia 18-35 x 3-7 μm , filiform-cylindrical to clavate (fig. 431C), abundant; cap grey to grey brown with paler grey marginal zone, when moist often marbled, more rarely with darker water spots. Cap 20-70 mm, conical-convex, then convex with or without a low umbo; gills arcuate-decurrent, crowded, pale grey with faint pink tinge when mature; stem 15-60 x 5-20 mm, grey to beige grey, glabrous. Sp 9.5-13.5 x 5-6.5 μm , ellipsoid to amygdaloid, with 6-8 longitudinal ribs; clamps absent. In small groups on soil in coniferous forests; summer to autumn; distribution poorly known due to confusion with *C. prunulus*; DK (NA). – ÖZP 8:pl.26.
C. cystidiatus Hauskn. & Noordel.
- Cheilocystidia absent; cap grey with darker water-spots or reddish brown 8
- 8. Cap 45-65 mm, uniformly grey with darker water spots; sp 9.5-13.5 x 5.5-7 mm, with 5-8 distinct longitudinal ribs (fig. 431D). Cap convex with slightly depressed centre; gills decurrent, crowded, cream, then pink; stem 25-50 x 10-15 mm, concolorous with cap. Sp ellipsoid to subamygdaloid. In small groups on soil in oligotrophic coniferous *Pinus* forests; autumn; very rare in bore.; NO (vU, Busk, Hedm, Oppl).
C. paxilloides Noordel.
- Cap 10-20 mm, reddish brown to blackish brown; sp 8-9.5 x 4-5 μm , with 5-8 longitudinal ribs. Cap convex, expanding with age; gills broadly adnate, crowded, creamy-pink; stem 20-30 x 1-3 mm, concolorous with cap, finely hairy. Sp ellipsoid to amygdaloid. On soil and on debris on moist, dungy soil, in the area recorded from a brewery; autumn; FI (RE, Vaasa 1867).
C. quisquiliaris (P. Karst.) Noordel.

Collybia (Fr.) Staude

MACHIEL NOORDELOOS

Microcollybia Lennox

Frb small, collybioid. Cap up to 20 mm, often radially wrinkled, white or whitish. Gills narrowly adnate, medium spaced to crowded, white to pale brown or yellowish brown. Stem filiform, pruinose, at least in lower half, often hairy at base, often deeply rooting to sclerotia in the substrate. Smell indistinct. Taste indistinct. Sp deposit white.

Sp up to 7 μm long, ellipsoid, hyaline, without iodine reactions. Cheilocystidia inconspicuous or absent. Pileipellis an (ixo-)cutis. Pigment absent or very pale, intracellular. Clamps abundant.

Saprotrophic?, fruiting on mummified remains of fleshy mushrooms, often on members of *Russulaceae*, but also on other agarics, polypores or in humus with host decayed beyond recognition.

Three species in the Nordic countries.

Lit: Antonín & Noordeloos 1997, 2008, Gröger 2006.



Spores: *Collybia cirrata*.

1. Sclerotium absent. Cap 4-15 mm, convex, sometimes with small papilla, white to very pale greyish brown with slightly darker centre; gills medium spaced, white to creamy white; stem 20-50 x 0.5-3 mm, pruinose at base with radiating, white mycelial hairs. Sp 4.5-6(-7) x (2.5-)3-3.5 μm, ellipsoid (fig. 403A); pileipellis sometimes with scattered coralloid terminal elements. In groups on mummified remnants of fleshy mushroom or in humus, in various vegetation types but especially in open, nutrient poor areas; summer to autumn; very common in temp.-suba., rare in arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – A&N 97:16, B&K 3:201, Cet 1033, Ves 223, ⊙.

C. cirrata (Pers.) Quél. ('*cirrhata*')
 - Sclerotium present 2

2. Sclerotium yellow, ochraceous to yellow orange, ellipsoid to subglobose, with cortex of ± globose, thin-walled, yellow elements; cheilocystidia absent; coralloid elements present in pileipellis. Cap 5-20 mm, convex to low convex, with small papilla or centrally depressed, smooth or finely wrinkled, glabrous to (sub)pubescent, whitish to very pale grey; gills medium spaced to crowded, very pale cream or flesh-coloured; stem 20-50 x 0.5-1.5 mm. Sp 4.5-6(-7) x (2.5-)3-3.5 μm, ellipsoid. In groups on mummified remnants of fleshy agarics; summer to autumn; common in temp.-hemib., occasional in bore., rare in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – A&N 97:19, B&K3 202, Cet 1472, GBW 3:200, R&H 318, ⊙.

C. cookei (Bres.) J.D. Arnold

- Sclerotium dark brown, purplish brown, ellipsoid, fusiform or phaseoliform, with a cortex of thick-walled, brown, short and broad hyphae; cheilocystidia present but scattered; coralloid elements absent in pileipellis. Cap 5-20 mm, convex to low convex, with small papilla or centrally depressed, smooth or finely wrinkled, glabrous to (sub)pubescent, whitish, at centre sometimes tinged ochre or brown; gills medium spaced to crowded, very pale cream or flesh-coloured; stem 20-40(-45) x 0.7-1.5 mm. Sp 4.5-6.5 x 2.5-3.5 μm, ellipsoid. In groups on mummified remnants of fleshy mushrooms or on polypores such as *Meripilus giganteus*; summer to autumn; very common in temp.-bore., occasional in suba., rare in arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – A&N 97:13, B&K 3:203, Cet 544, Däh 312, R&H 317, ⊙.

C. tuberosa (Bull.: Fr.) P. Kumm.

Conocybe Fayod

ANTON HAUSKNECHT & JAN VESTERHOLT

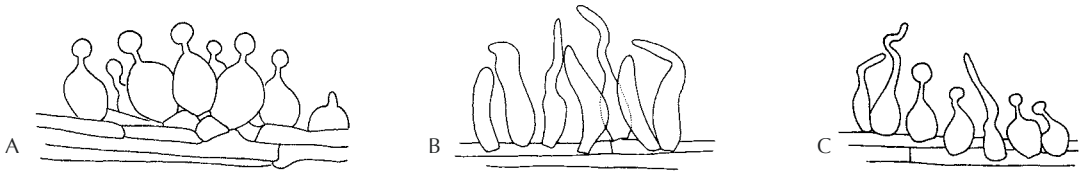
Frb mostly small and thin-fleshed, fragile, rarely more robust. Cap conical, hemispherical, convex, bell-shaped or expanded, sometimes umbonate, margin not becoming radially grooved, dry, mat or ± shiny, pruinose or glabrous, whitish, yellowish, orange, bright to dull brown, olive brown, rarely greyish or blackish, mostly hygrophane, in many species translucently striate at margin when fresh. Gills narrowly attached to almost free, distant to crowded, ± deliquescent in sect. *Candidae*. Stem cylindrical or widened towards base, in some species with a conspicuous, bulbous base, in some species with a pseudorrhiza. Veil absent in most species, but in sect. *Singerella* a universal veil is present, forming a volva at stem base and leaving remnants at cap margin. Smell and taste indistinct, in one species farinaceous. Sp deposit rusty brown, more rarely yellowish ochre to pale brown or dark hazel brown.

Sp ellipsoid, ovoid, subcylindrical, amygdaloid, citriform, fusiform or subangular, in some species distinctly flattened (lentiform), and in such cases the spore size is given in three dimensions, generally smooth, but finely warty-pustulate in sect. *Ochromarasmius*, at least in SEM, with or without germ pore, hyaline-yellowish to rusty brown in KOH. Basidia mostly 4-spored, but in some species dominantly 2-spored. Cheilocystidia lecythiform (figs 629A-J, etc.). Pleurocystidia absent, but with pseudoparaphyses in sect. *Candidae*. Caulocystidia lecythiform (fig. 627A), hair-like or ± ellipsoid to lageniform (fig. 627B), or a mixture of those (fig. 627C). Pileocystidia present or absent. Gill trama regular. Pileipellis a hymeniderm, without a gelatinous covering. Pigment parietal and/or incrusting. Clamps mostly present. In some species crystals are formed in ammonia, mostly after a short while, but in some species only after several hours; the forming of crystals is considered as a positive ammonia reaction, the absence of such a reaction is considered a negative reaction.

Saprotrophic. On soil, dung, compost heaps, herbaceous litter or wood, in grassland, forests, gardens, etc.

58 species in the Nordic countries, 62 species in the key.

Lit.: Arnolds in Noordeloos et al. 2005, Arnolds & Hausknecht 2003, Hausknecht 1995, 1996, 1998, 1999, 2000, 2002, 2003, 2005a, 2005b, Hausknecht & Krisai 1992, Hausknecht et al. 2005, Watling 1982, 1988.



Caulocystidia: A: sect. *Conocybe*, B: sect. *Pilosellae*, C: sect. *Mixtae*.

Main key

1. Pseudoparaphyses present; gills mostly deliquescent with age; cap margin often somewhat sulcate; stem \pm white; caulocystidia never lecythiform 2
 - Pseudoparaphyses absent; gills not deliquescent; cap margin often translucently striate, but not sulcate; stem mostly coloured; caulocystidia lecythiform or \pm ellipsoid, lageniform or hair-like 2

[Key E sect. *Candidae* p. 644](#)
2. Sp $< 8 \times 4 \mu\text{m}$, finely warty-punctate, at least in SEM with distinct pustules and warts 2
 - Sp mostly larger, smooth, also in SEM 3

[Key F sect. *Ochromarasmius* p. 644](#)
3. Caulocystidia in majority lecythiform, only with scattered hair-like, ellipsoid or lageniform elements at top of stem (fig. 627A) 2
 - Stem with hair-like, clavate, ellipsoid or lageniform elements or a mixture of hair-like and lecythiform elements 4

[Key A sect. *Conocybe* p. 627](#)
4. Stem with a mixture of lecythiform and ellipsoid, clavate, lageniform and hair-like elements (fig. 627C) 2
 - Lecythiform caulocystidia absent or few, and then mostly at top of the stem (fig. 627B) 5

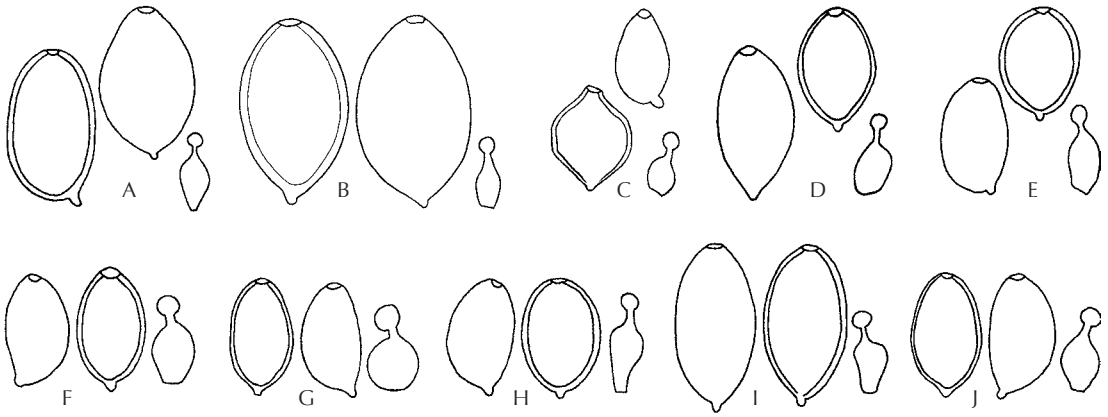
[Key C sect. *Mixtae* p. 641](#)
5. Stem base at first with a distinctly volva-like zone; cap margin sometimes with remnants of veil; sp deposit dark hazel brown 2
 - Without volva or remnants of veil at cap margin; sp deposit rusty brown or lighter 3

[Key D sect. *Singerella* p. 643](#)
[Key B sect. *Pilosellae* p. 634](#)

Key A: Sect. *Conocybe*. Caulocystidia in majority lecythiform

1. Basidia in majority 2-spored 2
 - Basidia in majority 4-spored 4
2. Stem distinctly rooting. Cap 14-32 mm, conical to convex, smooth to wrinkled, \pm shiny, ochraceous brown to orange brown, hygrophanous, translucently striate to 2/3 from margin; gills medium spaced; stem 30-70 \times 2-4 mm, cylindrical or widened at base, white or whitish, with an up to 40 mm long pseudorrhiza. Sp 11-16 \times 7-10.5 \times 6.5-9 μm , ellipsoid to ovoid, slightly to distinctly flattened, with a 1.5-2 μm broad germ pore, thick-walled (fig. 629A), yellowish brown in KOH; cheilocystidia with a 2.5-5 μm broad head. In dry grassland and fields; late summer to late autumn; occasional in temp.; DK (LC), NO. – B&K 4:392 (as spec.), Bol Bres 41:97, M&J 12 (as *neoantipus* var. *carinthiaca*), Ves 307, ÖZP 5:170.1. *C. alboradicans* Arnolds 2
 - Stem not rooting, mostly with an equal or bulbous base 3

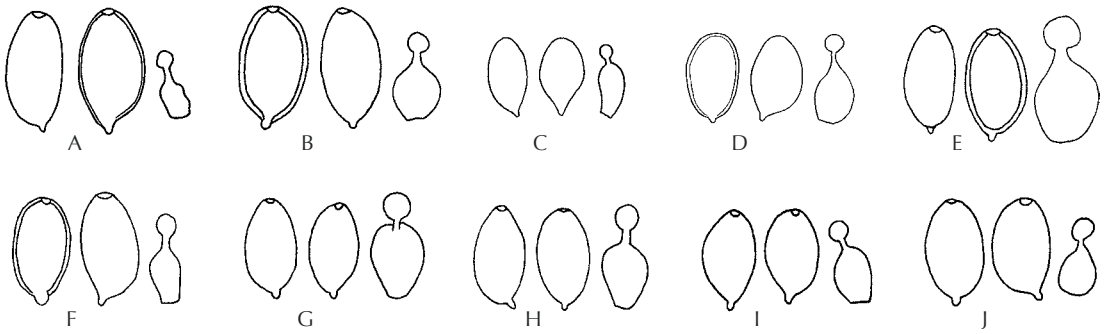
3. Stem almost exclusively with lecythiform cystidia. Cap 15-25 mm, ovoid to bell-shaped, sometimes umbonate, slightly sticky when fresh, ochraceous yellow, hygrophanous, not translucently striate; gills crowded to very crowded; stem 60-100 x 2-4 mm, whitish, for a long time remaining pale. Sp 13.5-19.5 x 8-10.5 μm , ellipsoid to subcylindrical, with an up to 2 mm broad germ pore, thick-walled (fig. 629B), dark brown to reddish brown in KOH; cheilocystidia with a 3-4 μm broad head. On nitrogen rich soil in forests and grassland; summer; very rare; SE.
C. striatipes (Speg.) Singer
- Stem with lecythiform caulocystidia and numerous hair-like elements see key C p. 641
4. Pseudorrhiza to 60 mm long 5
- Pseudorrhiza absent, but stem sometimes deeply submerged in sand 6
5. Sp distinctly hexagonal in face view, flattened (fig. 629C). Cap 10-30 mm, convex to bell-shaped, later expanded, rusty brown to cinnamon, hygrophanous, translucently striate to halfway from margin, drying clay buff to cream; gills medium spaced to crowded; stem 25-80 x 2-5 mm, cylindrical or with a widened base, whitish, soon turning yellowish to ochraceous, with an up to 60 mm long pseudorrhiza. Sp 7.5-11 x 5.5-8.5 x 3.5-6.5 μm , with a c. 1 μm broad germ pore, slightly thick-walled, reddish brown in KOH; cheilocystidia with a 2.5-5 μm broad head. In gardens, on manured soil, compost heaps and dung; autumn; rare in bore.; FI (DD). – Bres 809, C&D 1320, Cet 900.
C. antipus (Lasch) Fayod
- Sp ellipsoid to slightly dacryoid, not flattened see *C. graminis* 24
6. In coastal sand dunes, rarely in inland dunes; stem deeply submerged in sand, not bulbous. Cap 10-30 mm, conical to convex, later more expanded, when fresh intensely brown, chestnut brown to reddish brown, hygrophanous, hardly translucently striate; gills crowded; stem 40-100 x 2-4.5 mm, cylindrical or slightly widened downwards, whitish to pale ochraceous. Sp 10.5-14.5 x 6.5-8.5 μm , ellipsoid to citriform or amygdaloid, with a c. 1.5 μm broad germ pore, thick-walled (fig. 629D), orange brown to reddish brown in KOH; cheilocystidia with a 3-4 μm broad head. Very rare in hemib., one record from NO (Rog: Time). – C&D 1323, FeA 2000:78, RdM 31:124.
C. dunensis Wallace
- Habitat different, or stem with a basal bulb 7
7. Sp on av > 10 μm long 8
- Sp on av < 10 μm long 15
8. Sp distinctly flattened; cap 8-15(-20) mm; in grass in sun exposed places. Cap conical to low conical or convex, often remarkably wrinkled, orange brown to reddish brown, hygrophanous, not translucently striate; gills medium spaced to distant, pale ochraceous when young, later much darker; stem 15-45 x 1-2 mm, slightly widened towards base, whitish, turning reddish brown from base. Sp. 9.5-12.5 x 6-8 x 5.5-7 μm , elliptical in side and face view, with a 1-1.5 μm broad germ pore, thick-walled (fig. 629E), orange brown in KOH; cheilocystidia with a 3-4 μm broad head. Summer; very rare in temp.-hemib.; DK (DD, EJyl: Århus), NO (Tel: Porsgrunn).
C. subxerophytica Singer & Hauskn. var. *brunnea* Hauskn.
- Sp not or only indistinctly flattened; cap often > 15 mm broad; habitat often different 9
9. Cheilo- and caulocystidia voluminous, body to 15 μm broad, head mostly 5-8 μm broad, on av > 5.5 μm broad 10
- Cheilo- and caulocystidia smaller, body to 12 μm , head to 5(-6) μm broad, on av < 5 μm broad 11



Spores and cheilocystidia: A: *Conocybe alboradicans*, B: *C. striatipes*, C: *C. antipus*, D: *C. dunensis*, E: *C. subxerophytica* var. *brunnea*, F: *C. subovalis*, G: *C. juniana* var. *juniana*, H: *C. aurea*, I: *C. semiglobata*, J: *C. subpallida*.

10. Cap 10-50 mm; stem 1-4 mm broad. Cap hemispherical to convex or bell-shaped, pale ochre, yellowish brown, often with an olive tinge, hygrophanous, but hardly translucently striate; gills medium spaced; stem 40-110 mm long, cylindrical with an up to 6 mm broad marginate bulb, whitish to yellowish at top, brownish in lower part. Sp 9-14 x 6-8 μm , ellipsoid, with an up to 2 μm large germ pore, thick-walled (fig. 629F), rusty brown in KOH; cheilocystidia with a 5-8.5 μm broad head. In forests and grassland, at roadsides, etc., also on dung; summer to late autumn; common in temp., rare in hemib.-bore.; DK (LC), FI (DD), NO (LC, VA: Lista), SE (LC). – B&K 4:393, GBW 4:327, FAD 129H (as *Galera tenera*), M&J 1 (as *tenera*), 4, Phil 226c.
C. subovalis Kühner & Watling
- Cap 5-14(-18) mm; stem 0.5-1.2 mm broad. Cap hemispherical to convex or conical, hazel brown to clay brown, hygrophanous, not or only slightly translucently striate; gills medium spaced to crowded; stem 20-70 mm long, cylindrical with to 3.5 mm broad basal bulb, whitish to pale yellowish orange. Sp 8.5-12 x 5-7.5 μm , ellipsoid, with a 1-1.5 μm broad germ pore, thick-walled (fig. 629G), pale orange brown in KOH; cheilocystidia with a 4.5-7 μm broad head. In grassland and forests, also on dung; spring to late autumn; occasional in temp., common in hemib.-arc./alp.; DK (LC), FI (LC), IS, NO (LC, incl. Sv), SE (LC) – B&K 4:382, Däh 581, FAD 129I (as *Galera tenera* f. *minor*), M&J 5.
C. juniana (Velen.) Hauskn. & Svrček var. *juniana* (*C. magnicapitata* P.D. Orton)
11. Sp ellipsoid to ovoid-ellipsoid with a broadly rounded apex, mostly rusty brown to reddish brown, thick-walled, on av 10.5-16 x 6-9 μm 12
 - Sp citriform to amygdaloid or subamygdaloid with a conical, pointed apex, rather pale to ochraceous yellow, yellowish orange, brownish orange or orange brown, thin-walled to thick-walled, on av 10-12 x 5.5-7 μm 13
12. Cap bright yellow, orange yellow, when water soaked to brownish orange. Cap 10-33 mm, hemispherical to low convex or bell-shaped with a broad umbo, hygrophanous, translucently striate, but very soon losing striation; gills crowded; stem 40-85 x 1.5-5 mm, cylindrical with a to 5.5 mm broad basal bulb, yellowish white to cream, hardly darker at base. Sp 10-12.5 x 6-7 μm , ellipsoid, with an up to 1.5 μm broad germ pore (fig. 629H), orange brown to rusty brown in KOH; cheilocystidia with a 3-4.5(-5.5) μm broad head. On nitrogen rich soil, dung, sawdust, bark litter and fertilized meadows; DE. – B&K 4:376, C&D 1321, M&J 2, RCat 24:52, Tin 30:1, 31:3.
C. aurea (Jul. Schäff.) Hongo

- Cap rusty brown to yellowish brown or brown, fading to ochraceous. Cap 7-24 mm, mostly hemispherical to low convex, sometimes with a low umbo, hygrophanous, only translucently striate at margin; gills crowded to medium spaced, often remarkably dark; stem 25-95 x 1-2 mm, cylindrical with an up to 3.5 mm broad basal bulb, whitish to pale orange, darker with age. Sp 9-16 x 5.5-9 μm , ellipsoid, with a 1-2 μm broad germ pore, thick-walled (fig. 629I), orange brown to reddish brown in KOH; cheilocystidia with a 2.5-5 μm broad head. In dry grassland, pastures and lawns, also in leaf- and needle litter; spring to autumn; very common in temp.-hemib., occasional in bore., very rare in suba. in IS; DK (LC), FI (LC), IS (Na), NO (LC), SE (LC). – Bol Bres 36:38 (as *affinis*), 42:72, B&K 4:390, 4:394 (as *tenera*), FAD 129J (as *Galera tenera* f. *convexa*), M&J 2 (as *dunensis*), 3, 16, Ves 307.
C. semiglobata Kühner & Watling (*C. affinis* Singer s. auct.)
- 13. Cap light coloured to pale brown, only slightly translucently striate when fresh; stem top with relatively many hair-like or non-leycthiiform caulocystidia, lecythiiform elements with extremely long neck. Cap 9-35 mm, hemispherical to convex or bell-shaped, hygrophanous; gills medium spaced; stem 40-100 x 1-3.5 mm, cylindrical with an up to 6 mm broad bulbous base, cream, turning darker. Sp 9-12.5 x 5-6.5 μm , amygdaloid to subamygdaloid, with a c. 1 μm broad germ pore, thin-walled (fig. 629J), pale ochraceous yellow in KOH; cheilocystidia with a 3.5-5 μm broad head. In marshland and open deciduous forests, also among *Urtica*; late summer to autumn; rare in temp.-bore.; DK (DD), FI (DD), NO, SE. – Cet 2654 (somewhat dark), GBW 4:329, M&J 17, Mic Due 170, ZM 57:91, ☉.
C. subpallida Enderle
- Cap brown to dark brown, mostly distinctly translucently striate when fresh; stem mostly only with lecythiiform caulocystidia with normal, short neck 14
- 14. Sp moderately thick-walled (fig. 631A), ochraceous yellow to yellowish orange in KOH. Cap 10-32 mm, hemispherical to low convex, sometimes with a small umbo, dark brown to chestnut brown, paler brown towards margin, hygrophanous, translucently striate in outer half, but soon losing striation; gills crowded; stem 30-70 x 1-5 mm, cylindrical with a basal, up to 7 mm broad bulb, whitish to yellowish. Sp 8.5-12.5 x 5.5-7 μm , amygdaloid to subamygdaloid, with a 1-1.5 μm broad germ pore; cheilocystidia with a 2.5-5.5(-6) μm broad head. In deciduous or coniferous forests, rarely in edges of meadows; summer to autumn; occasional in temp.-bore.; DK (DD), FI (DD), SE. – M&J 6 (as *pilosella*), PSE 180:81, ÖZP 9.8 (as *macrocephala* var. *macrospora*).
C. subalpina (Singer) Singer & Hauskn.
- Sp distinctly thick-walled (fig. 631B), brownish orange to orange brown in KOH. Cap 10-45 mm broad, convex to bell-shaped, brown to dark brown when fresh, hygrophanous, distinctly translucently striate; gills crowded to medium spaced; stem 40-115 x 1-3.5 mm, cylindrical with widened to bulbous, up to 6 mm broad base. Sp 9.5-12.5 x 5.5-7 μm , amygdaloid to subamygdaloid, with a 1-1.5 μm broad germ pore; cheilocystidia with a 3.5-6(-7) μm broad head. In grassland and forests, also on burnt ground; summer to autumn; rare in temp.-bore.; DK (DD), FI (DD), SE (LC). – Bol Bres 34:142, C&D 1328, FAD 128D, GBW 4:329, ZM 65:12.
C. tenera (Schaeff.: Fr.) Fayod
- 15. Cap and rarely also stem with fugacious remnants of veil; cheilocystidia up to 45 μm long, with a remarkably long neck (fig. 653C) see *Pholiotina brunnea* p. 654
- Without remnants of veil; cheilocystidia up to 30 μm long, with a short neck 16
- 16. Sp without a germ pore, but sometimes with a callus 17
- Sp with a distinct germ pore 20
- 17. Sp almost smooth to indistinctly rough in light microscope, in SEM distinctly warty see *C. dumetorum* var. *phaeoleiospora* key F 2
- Sp smooth, also in SEM 18



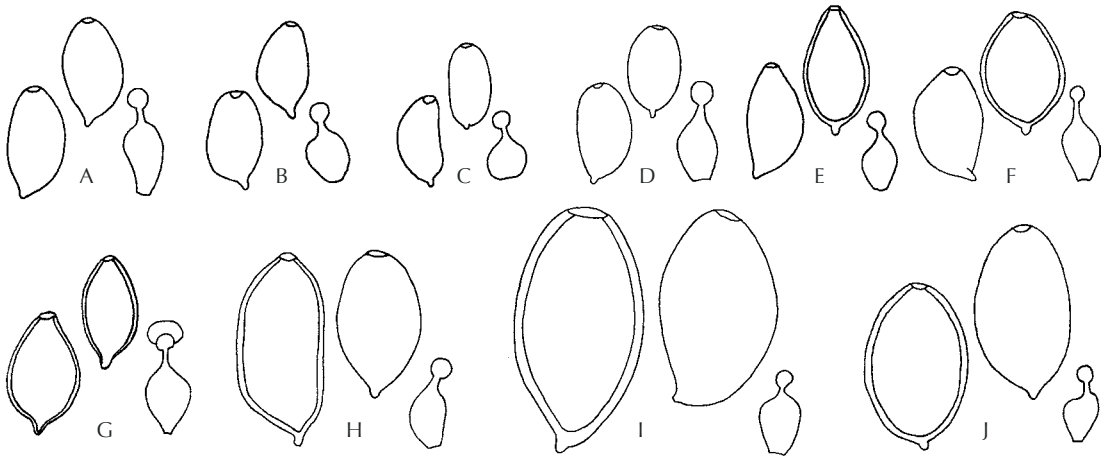
Spores and cheilocystidia: A: *Conocybe subalpina*, B: *C. tenera*, C: *C. haglundii*, D: *C. enderlei* var. *enderlei*, E: *C. juniana* var. *subsejuncta*, F: *C. juniana* var. *sordescens*, G: *C. rickeniana*, H: *C. echinata*, I: *C. graminis*, J: *C. mesospora*.

18. Sp almost hyaline in KOH. Cap up to 8 mm, convex, distinctly umbonate, at centre deeply brown, at margin honey yellow, hygrophamous, translucently striate, but soon loosing striation; gills medium spaced to distant; stem 10-16 x 0.5 mm, cylindrical, hyaline at the top, brownish towards base. Sp 6-8 x 3.5-4.5 μ m, almost dacryoid with a large apiculus, without germ pore, very thin-walled (fig. 631C); cheilocystidia with a 3-4 μ m broad head. In sand; summer; only known from the type locality in hemib. in SE.
C. haglundii Hauskn.
- Sp yellow to orange brown in KOH 19
19. Sp rather thick-walled, without callus (fig. 631D); only with few hair-like caulocystidia. Cap 7-24 mm, convex with a low umbo, yellow brown to rusty brown when fresh, hygrophamous, distinctly translucently striate; gills crowded; stem 20-35 x 1-3 mm, cylindrical, not bulbous, yellowish to pale orange, uniformly coloured. Sp 6-8 x 3.5-5.5 μ m, ellipsoid to ovoid, orange yellow to orange brown in KOH; cheilocystidia with a 2.5-5 μ m broad head. In grassland and forests; autumn; rare in hemib.; FI (DD). – ÖZP 10:23.
C. enderlei Hauskn.
- Sp thin-walled, often with a callus; caulocystidia a mixture of lecythiform and non-lecythiform elements see *C. tuxtlaensis* key C 8
20. Cheilo- and caulocystidia with heads on av > 5.5 μ m broad, body in some species up to 16 μ m broad 21
- Cheilo- and caulocystidia with heads on av < 5 μ m broad, body up to 11 μ m broad 24
21. Sp thick-walled, yellowish brown to rusty brown in KOH 22
- Sp thin-walled with a \pm simple or only slightly thick-walled, hyaline yellow, ochraceous yellow to pale brownish yellow in KOH 23
22. Sp 8-10 x 5-7 μ m, Q = 1.5-1.9 (fig. 631E). Cap 5-10(-18) mm, hemispherical to low convex, greyish brown to dull brown, hygrophamous, only weakly translucently striate at margin; gills medium spaced; stem 28-45 x 0.7-1.2 mm, cylindrical, whitish at top, yellowish brown at base. Sp ellipsoid to ovoid, with 1-1.5 μ m broad germ pore, thick-walled, yellowish brown in KOH; cheilocystidia with a 5-9 μ m broad head. In grass and open areas in forests; summer to autumn; occasional in temp.-suba.; DK (LC), FI (LC), FO, IS, NO, SE.
C. juniana (Velen.) Hauskn. & Svrček var. *subsejuncta* Hauskn.
- Sp 8.5-10.5 x 4.5-6 μ m, Q = 1.8-2.2 (fig. 631F). Cap 8-25 mm, hemispherical to convex or broadly conical, sometimes umbonate, reddish buff to dull clay brown, slightly paler towards margin, hygrophamous, only weakly translucently striate at margin; gills medium spaced; stem 30-50 x 1-2.5 mm, cylindrical or slightly widened at base, pale cream to pale

buff, later honey brown. Sp ellipsoid, with a c. 1 μm broad germ pore, thick-walled, rusty brown in KOH; cheilocystidia with 4-6.5 μm broad head. In grass or in shady places among herbs; summer to autumn; rare in temp.-hemib.; DK (LC), SE.

C. juniana (Velen.) Hauskn. & Svrček var. *sordescens* (P.D. Orton) Hauskn. (*C. sordescens* P.D. Orton)

23. Cap rusty orange to orange brown, later becoming rusty brown to reddish brown; exsiccate pale without brownish grey tinges in cap centre. Cap 10-40 mm, convex to bell-shaped with a low, broad umbo, hygrophanous, translucently striate to centre; gills crowded; stem 30-70 x 1-3.5 mm, cylindrical with a basal bulb, yellowish, towards base orange yellow to brownish yellow or becoming reddish brown. Sp 7-10.5 x 4-5.5 μm , ellipsoid to amygdaloid, with a c. 1 μm broad germ pore, thin-walled (fig. 631G), ochraceous yellow to pale rusty yellow in KOH; cheilocystidia with a 4.5-8.5 μm broad head. Mostly in deciduous or coniferous forests, rarely in grass; summer to autumn; very common in temp., common in hemib.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:387, GBW 4:322, M&J 4, R&H 436, Ves 307, ☉.
C. rickeniana P.D. Orton
- Cap sordid brown to dark brown or blackish, occasionally with a purplish hue; exsiccate with brownish grey tinges in cap centre. Cap 8-30 mm, hemispherical to convex or bell-shaped with low umbo, hygrophanous, only slightly translucently striate at margin; gills medium spaced; stem 30-90 x 0.7-3 mm, cylindrical, only slightly widened at base, orange yellow to greyish brown or dark brown with paler top, later entirely darkening. Sp 7-9 x 4-5 μm , ellipsoid to amygdaloid, with a c. 1 μm broad germ pore, thin-walled to slightly thick-walled (fig. 631H), brownish yellow to pale yellowish brown in KOH; cheilocystidia with a 5-8.5 μm broad head. In nutrient rich places in grassland and forests; summer to autumn; common in temp., rare in hemib.-suba.; DK (LC), FI (DD), NO (LC), SE (LC). – Cet 2225, C&D 1327, FAD 128C (as *Galera teneroides*), M&J 18, Tin 34:23, 55 (both as *nigrodisca*).
C. echinata (Velen.) Singer (*C. sordida* Kühner & Watling)
24. Stem \pm rooting and connected to grass roots. Cap 4-23 mm, hemispherical to convex, dark rusty brown, hygrophanous, translucently striate in outer half; gills crowded, for a long time remaining pale; stem 15-40 x 1-2.5 mm, \pm cylindrical, cream, soon yellowish to straw coloured, turning brownish from base. Sp 7-10 x 4.5-6.5 μm , ellipsoid to slightly dacryoid, with a 0.5-0.8 μm broad germ pore, rather thin-walled (fig. 631I), rusty brown in KOH; cheilocystidia with a 3-4.5 μm broad head. Solitary in dry grassland; summer; rare in hemib.; FI (DD). – ÖZP 5:4.
C. graminis Hauskn.
- Stem not rooting, mostly with a \pm bulbous base, not connected to grass roots 25
25. Cap bright orange brown, yellow orange or rusty orange, centre when fresh to golden brown, retaining a yellow tinge on drying. Cap 10-45 mm, hemispherical to low convex, soon expanding, hygrophanous, distinctly translucently striate; gills medium spaced; stem 20-80 x 1-2.5 mm, cylindrical with an up to 6 mm broad basal bulb, pale yellowish, turning darker from base with age. Sp 7.5-10 x 4.5-6 μm , ellipsoid, with a c. 1 μm broad germ pore, rather thin-walled (fig. 631J), yellow to light orange yellow in KOH; cheilocystidia with a 3.5-5.5 μm broad head. In forests, at roadsides, in grassland and fields; summer to autumn; common in temp.-bore.; DK (LC), FI (LC), NO (LC, Østf: Aurskog-Høland), SE (LC). – GBW 4:318, Jordst 21(2), Mic Due 167, PSE 180:81, ZM 57:96bis (too dark).
C. mesospora Kühner & Watling
- Cap not with such bright colours, \pm tinged brownish, drying sordid whitish to greyish cream or greyish brown 26
26. Sp on av > 7.5 μm long 27
- Sp on av < 7.5 μm long 30



Spores and cheilocystidia: A: *Conocybe macrocephala*, B: *C. brachypodii*, C: *C. microspora* var. *brunneola*, D: *C. microspora* var. *microspora*, E: *C. bispora*, F: *C. microrrhiza* var. *microrrhiza*, G: *C. moseri* var. *bisporigera*, H: *C. inocybeoides*, I: *C. gigasperma*, J: *C. rickenii*.

27. Pileocystidia absent or only scattered in young frb. Cap 15-45 mm, low convex to bell-shaped or umbonate with an upturned margin, pale brown to warm brown, hygrophanous, translucently striate in outer half, strongly fading on drying; gills medium-spaced; stem 30-80 x 1.5-5 mm, cylindrical, base with an up to 7 mm broad, slightly bulbous base, whitish, yellowish white to cream, later darker brown from base upwards. Sp 8-10.5 x 4.5-6 μ m, ellipsoid, with an up to 1 μ m broad germ pore, thin-walled to slightly thick-walled (fig. 633A), brownish yellow to brownish orange in KOH; cheilocystidia with a 4.5-6.5 μ m broad head. Mostly in damp deciduous forests, in *Alnus* swamps, at grassy roadsides, rarely in meadows; summer to autumn; common in temp.-hemib., rare in bore.; DK (LC), FI (DD), NO (LC, Busk: Hurum), SE (LC). – B&K 4:374, Cet 2217, 2653, M&J 3.
C. macrocephala Kühner & Watling (*C. abruptibulbosa* Watling, *C. herinkii* Svrček)
- Pileocystidia numerous 28
28. Sp thin-walled (fig. 633B). Cap 8-35 mm, rounded conical to low convex, often slightly umbonate, later often with recurved margin, yellowish brown to brown, at centre to umber, hygrophanous, translucently striate to 3/4 from margin; gills medium spaced; stem 30-80 x 1-1.5 mm, cylindrical with a slightly widened up to 5 mm broad basal bulb, whitish to pale yellowish, turning \pm brown from base. Sp 7-9.5 x 4-5.5 μ m, ellipsoid, with a 0.7-1.5 μ m broad germ pore, pale orange yellow to ochraceous yellow in KOH; cheilocystidia with a 3.5-5.5 (-6) μ m broad head. Mostly in rather moist deciduous forests, rarely in coniferous forests or in lawns; summer to autumn; occasional in temp.-bore.; DK (DD), FI (DD), NO (LC, Hord: Voss, Akh: Ski), SE. – Bol Bres 36:39, M&J 19, ÖZP 9:9 (somewhat pale), PSE 180:82.
C. brachypodii (Velen.) Hauskn. & Svrček (*C. excedens* Kühner & Watling, *C. excedens* var. *pseudomesospora* Singer & Hauskn., *C. macrocephala* Kühner & Watling var. *riedheimensis* Hauskn. & Enderle)
- Sp thick-walled 29
29. Cap light coloured, to pale brown, only slightly translucently striate when fresh; stem top with relatively many hair-like or non-lecythiform caulocystidia, lecythyform elements with extremely long neck see *C. subpallida* 12
- Cap brown to dark brown, mostly distinctly translucently striate when fresh; stem mostly only with lecythyform caulocystidia with normal, short neck see *C. tenera* 13

30. Sp thick-walled see *C. juniana* var. *sordescens* 22
 - Sp thin-walled 31
31. Sp distinctly phaseoliform in side view. Cap 6-16 mm, conical to bell-shaped or low convex, sometimes with a low umbo, dull brown to dark brown or umber, slightly paler towards margin, hygrophanous, translucently striate to 1/2 to 3/4 from margin; gills crowded to medium spaced; stem 20-40(-60) x 0.7-1.2(-2) mm, cylindrical with a 1-2.5 mm broad basal bulb, whitish at top, becoming greyish brown to dark brown from base. Sp 6-7 x 3.5-4 μ m, ellipsoid to slightly amygdaloid, with a c. 1 μ m broad germ pore, thin-walled (fig. 633C), yellowish to ochraceous or orange yellow in KOH; cheilocystidia with a 3-5(-6) μ m broad head. In grassy places or among herbs in forests; summer to autumn; rare in temp.-hemib.; DK (DD), FI, NO (Oppl: Lunner), SE (LC). – Bon 261, C&D 1322.
C. microspora (Velen.) Dennis var. *brunneola* (Kühner & Watling) Singer & Hauskn. (*C. brunneola* Kühner & Watling)
 - Sp ellipsoid to ovoid 32
32. Cap 6-13 mm, not strongly fading on drying; sp 6.5-7.5 x 3.5-4.5 μ m (fig. 633D); ammonia reaction negative. Apart from spore shape like the main variety. In grassland and at grassy roadsides; summer to autumn; rare in temp.-bore.; DK (DD), FI, SE. – ZM 59:32 (as *robertii*).
C. microspora (Velen.) Dennis var. *microspora*
 - Cap 8-35 mm, strongly fading on drying; 7-9.5 x 4-5.5 μ m; ammonia reaction often positive see *C. brachypodii* 28

Key B: Sect. *Pilosellae* Singer. Caulocystidia non-leycthiiform; stem base without a volva-like zone

1. Basidia in majority 2-spored 2
 - Basidia in majority 4-spored 9
2. Sp remarkably fusiform to citriform or navicular in side view, often with a papilla-like germ pore 3
 - Sp ellipsoid in side view, germ pore not papilla-like 4
3. Sp deep yellowish brown in KOH; stem exclusively with non-leycthiiform elements. Cap 3-15 mm, broadly conical to hemispherical, convex or plane, brown to greyish orange, hygrophanous, translucently striate in outer half, soon drying pale yellowish; gills medium spaced to distant; stem 25-60 x 1-2 mm, cylindrical with a slightly widened base, straw yellow, soon becoming whitish, becoming darker from base. Sp 9.5-13 x 5-7.5 μ m, in side view remarkably fusiform to citriform, in face view narrowly ellipsoid, with a 1-1.5 μ m broad germ pore, thick-walled (fig. 633E); cheilocystidia with a 2.5-4.5(-5.5) μ m broad head. In dry grassland, lawns, open woods; summer to autumn; rare in temp.-bore.; DK (DD), FI (DD), SE. – M&J 6 (as *ambigua*).
C. bispora (Singer) Hauskn.
 - Sp yellow to pale yellowish brown in KOH; stem top with numerous lecythiform cystidia see *C. ambigua* key C 4
4. Sp on av < 12 μ m 5
 - Sp on av > 12 μ m 6
5. Stem with an up to 7 mm long pseudorrhiza, white, then hyaline yellow to honey coloured, yellowish in exsiccates. Cap 6-22 mm, conical to bell-shaped, reddish brown, hygrophanous, translucently striate to more than 1/2 from margin; gills crowded; stem 30-50 x 1-2 mm. Sp 9-12(-15) x 7-8 x 7-7.5 μ m, broadly ellipsoid to almost dacryoid, indistinctly flattened, with a c. 1 μ m broad germ pore (fig. 633F), yellowish brown in KOH;

cheilocystidia with a 2.5-4 μm broad head. In dry grassland, in sun exposed places; *NL*. – PSE 159:108 (as *leporina*).

C. microrrhiza Hauskn. var. *microrrhiza*

- Stem without a pseudorrhiza, pale greyish brown when fresh, becoming remarkably wine red to wine brown in exsiccates, but often only after several years. Sp 9-14 x 6.5-9 x 5.5-7 μm , distinctly flattened, elliptical in face view and side view, with an up to 2 μm broad germ pore, thick-walled (fig. 633G), orange yellow to brownish orange in KOH; basidia 2-spored. In other characters like the main variety. In damp places, at roadsides; summer to autumn; occasional in temp.-bore.; DK (DD), FI (DD), NO (Oslo: Hovedøya), SE. – Cet 2220 (as *moseri*, somewhat pale), M&J 8.

C. moseri Watling var. *bisporigera* Hauskn. & Krisai

- 6. Cap brown, dark brown to blackish olive 7
- Cap pale, also when fresh, pale greyish yellow, greyish buff or pale buff, sometimes with an olive tinge 8
- 7. Sp 12.5-18 x 6.5-9 μm , with an up to 2.5 μm broad, central germ pore (fig. 633H). Cap 10-35(-60) cm, low bell-shaped to convex with a low umbo, dark reddish brown to umber at centre, paler with age, hygrophanous, not translucently striate; gills medium spaced to distant; stem 20-80 x 1-6 mm, gradually widened towards the up to 12 mm broad, marginate bulb; whitish, later pale yellowish brown. Sp narrowly ellipsoid to amygdaloid, thick-walled, yellowish to yellowish brown in KOH; cheilocystidia with a 3-4.5 μm broad head. In grassland and forests; late summer to autumn; rare in temp.-hemib.; DK (DD), SE. – Bol Bres 41:103, C&D 1324, GBW 4:313, ZM 63:13, ☉.

C. inocybeoides Watling

- Sp 16.5-22.5 x 10-12.5 μm , with a 2.3-4 μm broad, eccentric germ pore (fig. 633I). Cap 9-22 mm, paraboloid to bell-shaped, at first chocolate brown with blackish olive centre, then rusty brown to brownish orange, hygrophanous, translucently striate to 1/4 from margin; gills crowded; stem 37-90 x 1.5-3 mm, cylindrical, only slightly widened at base, brownish orange. Sp ellipsoid to ovoid, thick-walled, brownish red in KOH; cheilocystidia with a 3-4.5 μm broad head. In clearings in woods, at roadsides, often near dung; rare in temp.-bore.; FI (DD), SE. – Bol Bres 36:40, M&J 21 (somewhat dark), ZM 58:200.

C. gigasperma Enderle & Hauskn.

- 8. Cap 7-50 mm, when fresh with a distinct olive tinge, later pale greyish yellow to greyish buff, smooth, shiny at first. Cap ovoid, later conical to convex with a slightly recurved margin, rarely hemispherical, hygrophanous, not translucently striate; gills crowded to medium spaced; stem 30-85 x 1-4 mm, cylindrical or with a slightly widened base, brownish, becoming very pale, then turning brown from the base upwards. Sp 12-17 x 7-11 μm , ellipsoid, with a > 2 μm broad germ pore, thick-walled (fig. 633J), reddish brown in KOH; cheilocystidia with a 3.5-5 μm broad head. Mostly on dung, on manured soil, in natural pastures, gardens, etc.; summer to autumn; common in temp.-suba.; DK (LC), FI, IS, NO (LC), SE (LC). – B&K 4:388, Cet 905, 2648, GBW 4:322, M&J 9, Phil 225f.

C. rickenii (Jul. Schäff.) Kühner

- Cap 5-13 mm, when fresh buff to greyish buff, ochraceous or almost whitish, partly somewhat wrinkled, not shiny. Cap hemispherical to low convex, hygrophanous, not translucently striate; gills medium spaced to distant; stem 13-40 x 1-1.5 mm, cylindrical or slightly widened at base, white or whitish. Sp 12-17 x 7.5-10 μm , ellipsoid to ovoid, with a 2-2.8 μm broad germ pore, thick-walled (fig. 637A), reddish brown in KOH; cheilocystidia with a 3-4.5 μm broad head. In grass at roadsides or in dry grassland, in eutrophic *Picea* forests, on naked soil, not directly on dung; early summer to autumn; common in temp.-suba.; DK (LC), IS, FI (DD), NO (LC), SE (LC). – Cet 1295, FAD 128E, M&J 20, SZP 11:224, Zuc 318.

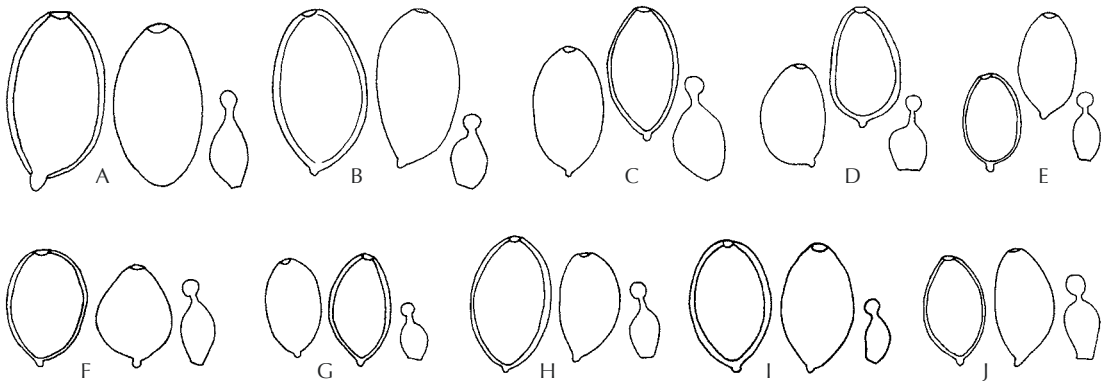
C. siliginea (Fr.: Fr.) Kühner

9. Stem \pm rooting 10
 - Stem not rooting, at base often slightly to distinctly bulbous 13
10. Sp > 10 μm long 11
 - Sp < 10 μm long 12
11. Sp 10-13 x 7-7.5 x 6-7 μm , slightly flattened. Cap 7-30 mm, bell-shaped to hemispherical, yellowish brown, ochraceous to honey-coloured, hygrophanous, translucently striate; gills medium spaced to distant; stem 35-85 x 0.5-2.5 mm, \pm cylindrical, cream to pale ochraceous, turning brownish from base, distinctly rooting or submerged in the substrate. Sp ellipsoid to slightly angular, with a c. 1.5 μm broad germ pore, thick-walled (fig. 637B), rusty brown in KOH; cheilocystidia with a 3.5-5.5 μm broad head. On dung, more rarely on heavily manured soil; autumn; rare in hemib.-bore.; FI (DD), SE. – ZM 63:10 (only small frb on right side below).
C. fimetaria Watling
 - Sp 14.5-18 x 7.5-9.5 μm , not flattened. Cap 10-40 mm, conical to bell-shaped, rust coloured, brown to reddish brown, hygrophanous, not translucently striate; gills crowded; stem up to 100 x 1-3 mm, \pm cylindrical, paler than cap, with an up to 40 mm long pseudorrhiza. Sp narrowly ellipsoid, with a 2.5-3 μm broad, central to slightly eccentric germ pore, thick-walled (fig. 637C), reddish brown in KOH; cheilocystidia with a 2.5-4.5 μm broad head. On horse and elk dung; early summer to autumn; rare in hemib.-suba.; FI (DD), NO (LC), SE.
C. watlingii Hauskn. (*C. neoantipus* (G.F. Atk.) Singer s. Watling 1988)
12. Cap pinkish to wine red or brick, later brownish red; stem pink to vinaceous. Cap 7-20 mm, conical to bell-shaped or convex, hygrophanous, translucently striate in outer half; gills crowded; stem 25-50 x 1-1.5 mm, cylindrical, with an up to 30 mm long pseudorrhiza. Sp 7.5-10.5 x 4-6 μm , ellipsoid, with a 1-1.5 μm broad germ pore, slightly thick-walled (fig. 637D), yellowish brown in KOH; cheilocystidia with a 3-4.5 μm broad head. In fields, flower beds, on bark, sawdust, etc.; summer to autumn; very rare in hemib.-bore.; FI (DD), NO (LC, AA: Grimstad, Oppl: Lunner). – M&H 4:206b (rooting stem base lacking), Kar 45:27, Sienil 54:124 (as *fragilis*) & 56:49.
C. incarnata (Jul. Schäff.) Hauskn. & Arnolds
 - Cap dark reddish brown; stem whitish, yellowish to honey coloured. Sp 7.5-11(-12) x 4.5-7.5 μm , ellipsoid, with a 1-1.7 μm broad germ pore, slightly thick-walled (fig. 637E), rusty brown in KOH; basidia 4-spored. In other characters like the main variety. In dry grassland on sandy soil; summer to autumn; only two records from NO (Akh: Ski, Oppl: S. Land). – DocM 84:2B (as aff. *leporina*), M&J 13 (as *leporina* 4-sp. form).
C. microrrhiza Hauskn. var. *tetraspora* (Singer & Hauskn.) Hauskn.
13. Sp at least partly angular, flattened 14
 - Sp not angular, flattened or not 15
14. Sp on av < 10 μm long (fig. 637F); pileipellis without or with very few hairs. Cap 5-23 mm, conical to bell-shaped or low convex, mostly with a broad umbo, sordid brown to dull rusty brown, hygrophanous, translucently striate to 2/3 from margin; gills crowded; stem 30-80 x 0.5-2 mm, cylindrical with a slightly widened base, white at top, yellowish brown at base, becoming darker with age. Sp 8-9.5(-10.5) x 6-7(-8) x 5-6 μm , slightly to distinctly angular in face view, flattened, with a 1-1.5 μm broad germ pore, thick-walled, ochraceous yellow to orange yellow in KOH; cheilocystidia with a 3-5 μm broad head. Among needle litter or on burnt ground; spring to autumn; rare in hemib.-bore.; DK (DD), FI (DD). – BKPM 12:80, M&J 13.
C. hexagonospora Hauskn. & Enderle
 - Sp on av > 10 μm long (fig. 637G); pileipellis with numerous hair-like elements. Cap 5-25 mm, rounded conical to hemispherical or bell-shaped, umber to date brown or reddish yellow with darker centre, hygrophanous, translucently striate; gills medium spaced; stem

gin; gills crowded; stem 35-80(-130) x 2-4 mm, cylindrical with an up to 7 mm broad basal bulb, pale orange. Sp 11-16 x 7-9.5 x 6.5-9 μm , ellipsoid, slightly flattened, with an up to 2.5 μm broad germ pore, thick-walled (fig. 637J), brownish orange to rusty brown in KOH; cheilocystidia with a 3-4.5 μm broad head. On dung of horse, elk or donkey; late summer to autumn; very rare in hemib.-suba.; FI, IS (Na), NO (LC, Vestf: Tønsberg; Gullkrona), SE.

C. farinacea Watling

- Smell and taste not farinaceous; lecythiform caulocystidia absent or with a narrow neck 19
- 19. Sp on av > 14 μm long 20
- Sp on av < 14 μm long 21
- 20. Stem with an up to 8 mm broad basal bulb. Cap 15-40 mm, broadly conical to convex, hemispherical or bell-shaped, reddish brown to orange brown, hygrophane, translucently striate to 3/4 from margin; gills crowded; stem 60-110 x 2-4 mm, cylindrical with a 5-12 mm broad, marginate basal bulb, yellowish to yellowish brown. Sp 14-16(-18.5) x 8-9.5 μm , ellipsoid to ovoid, with a 2-3 μm broad germ pore, thick-walled (fig. 639A), rusty brown in KOH; cheilocystidia with a 3.5-5 μm broad head. On dung and compost heaps, in grassland and on rotting wood; spring to early autumn; rare in temp.-suba.; DK (DD), FI (DD), NO, SE (LC). – FND 2:2, ZM 65:10.
- C. singeriana* Hauskn.
- Stem without a basal bulb. Cap 5-12 mm, conical to bell-shaped or hemispherical, greyish ochraceous to orange brown, hygrophane, translucently striate to 3/4 from margin; gills crowded; stem 18-30 x 0.8-1.5 mm, cylindrical, whitish, then straw-coloured. Sp 13.5-20.5 x 7.5-10.5 μm , ellipsoid, with a c. 2 μm broad germ pore, thick-walled (fig. 639B), rusty brown in KOH; cheilocystidia with a 3-4(-5) μm broad head. On cow and horse dung; summer to early autumn; very rare in hemib.; NO (Akh: Ås), SE.
- C. magnispora* (Murrill) Singer
- 21. Stem base remarkably conical-clavate or bulbous 22
- Stem base not remarkably widened 25
- 22. Cap orange brown, orange yellow to yellow, drying yellowish; sp 7.5-9 μm broad, slightly flattened and indistinctly angular see *C. hornana* key D 1
- Cap brown to dark brown or pale brownish to rusty ochraceous, soon fading to almost white; sp < 7.5 μm broad, slightly flattened or not, not angular 23
- 23. Cap pale brownish to rusty ochraceous, strongly hygrophane, soon fading to almost white; stem for long time remaining white. Cap 20-60 mm, hemispherical to bell-shaped or broadly convex, sometimes umbonate, only margin translucently striate; gills crowded; stem 60-140 x 2-6 mm, gradually widened towards the 4-25 mm broad basal bulb, becoming pale straw coloured. Sp 11-13.5 x 6.5-7.5(-8) μm , ellipsoid, with an up to 2.5 μm broad germ pore, thick-walled (fig. 639C), yellowish orange to yellowish brown in KOH; cheilocystidia with a 3-5 μm broad head. On herbaceous and woody litter, sawdust or leaf litter or in grass; summer to autumn; rare, but locally common in temp.-suba.; DK (NT), FI (DD), IS, NO (LC), SE (LC). – Cet 2219, Fr 127.1, M&J 18, ☉.
- C. apala* (Fr.: Fr.) Arnolds (*C. huijsmanii* Watling, *C. elegans* Watling)
- Cap brown to dark brown, never strongly fading; stem at first straw coloured to pale ochraceous brown, then darker 24
- 24. Sp on av \geq 10.4 μm long, narrowly ellipsoid to subcylindrical, often slightly flattened (fig. 639D). Cap 15-45 mm, conical to bell-shaped, sometimes with a broad umbo, ochraceous brown, often dark brown to umber at centre, hygrophane, translucently striate; gills crowded; stem up to 80 x 1.5-3 mm, cylindrical, often with a distinct basal bulb. Sp 10-14.5 x 6-8.5 x 5.5-8 μm , with a 1-1.5 μm broad germ pore, thick-walled, orange yellow to rusty orange in KOH; cheilocystidia with a 3.5-6.5 μm broad head. On burnt ground, mineral rich



Spores and cheilocystidia: A: *Conocybe singeriana*, B: *C. magnispora*, C: *C. apala*, D: *C. anthracophila* var. *anthracophila*, E: *C. anthracophila* var. *ovispora*, F: *C. moseri* var. *robustior*, G: *C. moseri* var. *moseri*, H: *C. murinacea*, I: *C. fuscimarginata*, J: *C. ochrostriata* var. *ochrostriata*.

soil, old dung, decaying seaweed and compost heaps; spring to autumn; rare in hemib.-suba.; FI (DD), IS (Su), SE.

C. anthracophila Kühner & Watling var. *anthracophila*

- Sp on av $\leq 10.3 \mu\text{m}$ long, ellipsoid, not flattened (fig. 639E). Cheilocystidia with a $2.5\text{-}5 \mu\text{m}$ broad head. In other characters like the main variety. Gregarious, often subfasciculate on compost heaps or old dung, rotting herbaceous litter and strongly manured soil; summer to autumn; rare in hemib.-middle bore.; FI (DD), NO (Troms: Lyngen), SE. – BKPM 12:80, Chr 67 (as *siennophylla*).

C. anthracophila Kühner & Watling var. *ovispora* Hauskn.

- | | | |
|-----|---|------------------------------|
| 25. | On burnt ground, old dung, compost heaps, manured soil or rotting herbaceous litter | 26 |
| - | In less mineral rich habitats | 27 |
| 26. | Cap \pm brown to dark brown, strongly pruinose | |
| | see <i>C. anthracophila</i> and <i>C. anthracophila</i> var. <i>ovispora</i> | 24 |
| - | Cap pale greyish yellow to ochraceous, when old with a cinnamon tinge, not strongly pruinose | see <i>C. fuscimarginata</i> |
| 27. | Cap umber, chestnut brown, greyish brown, mouse grey to violaceous black | 28 |
| - | Cap buff, ochraceous, ochraceous brown, cinnamon to rusty brown | 30 |
| 28. | Sp very variable in size and shape, ellipsoid, ovoid to slightly citriform, somewhat flattened (fig. 639F); often with many 2-spored basidia intermixed with the 4-spored. Gills crowded; stem $30\text{-}70 \times 1.5\text{-}2.5 \text{ mm}$, with an up to 3.5 mm broad bulb, fairly rigid. Sp $7.5\text{-}12.5 \times 5.5\text{-}8.5 \times 5\text{-}7 \mu\text{m}$. In other characters like then main variety. In grass, gardens, ruderal places; autumn; rare in temp.-bore.; DK (DD), FI, SE. – Chr 67 (as <i>murinella</i>). | |
| | <i>C. moseri</i> Watling var. <i>robustior</i> Hauskn. & H.-J. Hübner | |
| - | Sp ellipsoid, never flattened; 2-spored basidia rare or absent | 29 |
| 29. | Sp on av $9\text{-}10.5 \times 5\text{-}6.5 \mu\text{m}$ (fig. 639G). Cap $3\text{-}20 \text{ mm}$, bell-shaped to convex, dark brown to blackish brown, hygrophanous, translucently striate when fresh; gills medium spaced; stem $30\text{-}70 \times 0.7\text{-}1.5 \text{ mm}$, cylindrical with a slightly widened base, whitish with an orange-yellow base, becoming ochraceous brown downwards, in exsiccates, often not before after 1-2 years, wine red to wine brown and strongly contrasting the grey cap. Sp $8.5\text{-}11.5\text{-}(12.5) \times 5\text{-}7 \mu\text{m}$, ellipsoid, with a c. $1 \mu\text{m}$ broad germ pore, slightly thick-walled, orange yellow to brownish yellow in KOH; cheilocystidia with a $2\text{-}5 \mu\text{m}$ broad head. In grass, meadows, gardens, etc., more rarely on burnt ground; summer to autumn; occasional in temp.-bore.; | |

DK (DD), FI (DD), NO (LC, Busk: N. Eiker, Troms: Tromsø). – B&K 4:383, M&J 8.

C. moseri Watling var. *moseri*

- Sp on av 11-12 × 7 μm (fig. 639H). Cap 15-35 mm, conical to convex, dull reddish brown, mouse grey to violaceous black, resembling a *Panaeolus*, hygrophanous, not translucently striate, but with darker spots when wet; gills crowded; stem 40-100 × 1.5-2.5 mm, cylindrical with up to 5 mm broad basal bulb, pale greyish yellow to greyish cream, in exsiccates sordid yellowish brown. Sp 10-13.5 × 6-7.5 μm, ellipsoid, with a 1-1.5 μm broad, slightly eccentric germ pore, thick-walled, brownish orange in KOH; cheilocystidia with a 3-5.5 μm broad head. On horse dung or manured soil; UK.

C. murinacea Watling

- 30. On dung, compost heaps, strongly manured soil, etc. in gardens, grassland or fields 31
- On leaf- or needle litter, at grassy roadsides, in grassland and gardens 32
- 31. Cap pale greyish yellow to ochraceous, when old with a cinnamon tinge, not translucently striate, viscid and shiny; sp not flattened or angular. Cap 5-40 mm, hemispherical to conical or bell-shaped, not hygrophanous, often somewhat marbled; gills crowded; stem 40-80 × 1-5 mm, cylindrical, sometimes with a basal bulb, whitish, later ochraceous, turning darker from base. Sp 9.5-12.5 × 5.5-8 μm, ellipsoid, with an up to 1.5 μm broad germ pore, thick-walled (fig. 639I), orange yellow to rusty orange in KOH; cheilocystidia with a 3-5 μm broad head. On dung and compost heaps, in meadows, pastures, manured gardens and fields; occasional in temp.-suba.; DK (LC), FI (DD), IS (Na, Ve), NO (LC), SE (LC). – B&K 4:379, Bol Bres 42:70, GBW 4:311, M&J 7, ZM 59:32 & 63:10 (except for frb right side below).

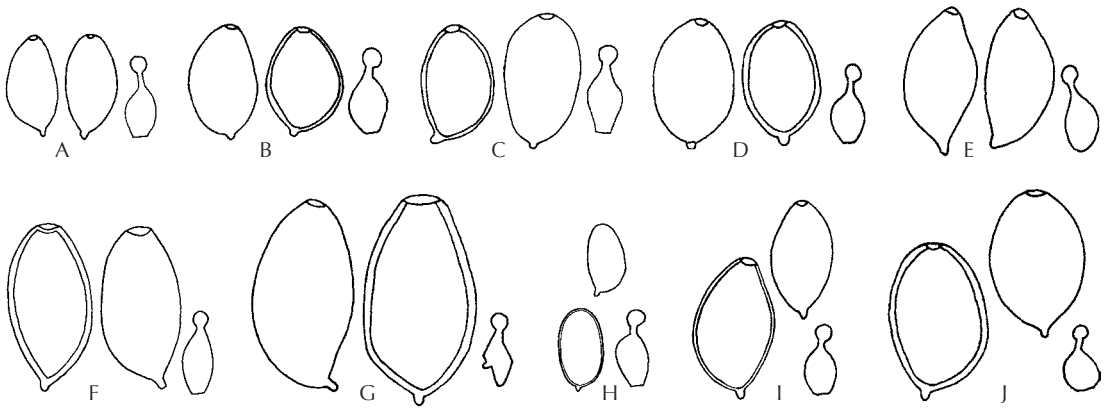
C. fuscimarginata (Murrill) Singer

- Cap honey coloured, yellow brown to rusty brown, strongly translucently striate, not viscid or shiny; sp slightly flattened, sometimes ± angular see *C. fimetaria* 11
- 32. Sp thin-walled to slightly thick-walled, pale yellow, ochraceous yellow to pale brownish yellow in KOH 33
- Sp thick-walled, rusty orange to reddish brown in KOH 34
- 33. Sp on av ≥ 9.8 μm long, narrowly ellipsoid to amygdaloid (fig. 639J). Cap 4-40 mm, broadly conical to convex, sometimes with a low umbo, pale brown to rusty brown, hygrophanous, distinctly translucently striate almost to centre; gills medium spaced; stem 25-70 × 1-3 mm, cylindrical, base only slightly bulbous, greyish orange with a yellowish white top, turning darker from the base upwards. Sp 8.5-12 × 5-7 μm, with a c. 1 μm broad germ pore, slightly thick-walled, pale yellow to brownish yellow in KOH; cheilocystidia with a 2.5-5 μm broad head. Among leaf- and needle litter, in open forests and in grassland; summer to autumn; occasional in temp.-suba.; DK (LC), FI, IS (Ve), NO (LC, Busk: Hemsedal, STr: Trondheim). – B&K 4:391, C&D 1326, Cet 2651, M&J 9, ZM 60:49 (as *siennophylla* form a and b).

C. ochrostriata Hauskn. var. *ochrostriata* (*C. siennophylla* (Berk. & Broome) Singer s. auct.)

- Sp on av ≤ 9.6 μm long, ellipsoid to amygdaloid (fig. 641A). Cap 6-25 mm, conical to bell-shaped, ochraceous brown to rusty brown or pale yellowish brown, hygrophanous, translucently striate to 3/4 from margin; gills crowded; stem 25-70 × 0.5-1.5 mm, cylindrical, only slightly widened at base, whitish to yellowish, turning brown from the base. Sp 6.5-10.5 × 4-6.5 μm, with an up to 1 μm broad germ pore, thin-walled, pale yellow to ochraceous yellow in KOH; cheilocystidia with a 3-5.5 μm broad head. In open forests, grassland, lawns and grassy roadsides; summer to autumn; occasional in temp.-suba.; DK (LC), FI (DD), IS (Na), NO (LC, Oppl: Ringebu, Oslo), SE. – Chr 67 (as *siennophylla*), ZM 60:49 (as *siennophylla* form c).
- C. rostellata* (Velen.) Hauskn.

- 34. Sp slightly to distinctly flattened (fig. 641B). Cap 12-24 mm, hemispherical to convex or bell-shaped, dark ochraceous brown to sordid brown, hygrophanous, translucently striate in outer half; gills medium spaced; stem 30-90 × 0.5-1.5 mm, cylindrical with a slightly widened base, whitish, becoming brownish from base. Sp 9.5-13 × 7-8.5 × 5.5-7 μm, ellipsoid,



Spores and cheilocystidia: A: *Conocybe rostellata*, B: *C. velutipes*, C: *C. ochrostriata* var. *favrei*, D: *C. cettoiana*, E: *C. ambigua*, F: *C. merdaria*, G: *C. macrospora*, H: *C. tuxtilaensis*, I: *C. tetrasporoides*, J: *C. pulchella*.

with a 1-1.5 μm broad germ pore, thick-walled, orange yellow to rusty orange or yellowish brown in KOH; cheilocystidia with a 2.5-5 μm broad head. Among leaf- or needle litter, on soil, in gardens and grassland; spring to autumn; occasional in temp., occasional in hemib.-arc./alp.; DK (LC), FI (DD), IS, NO (LC), SE (LC). – Cet 2657, M&J 7.

C. velutipes (Velen.) Hauskn. & Svrček (*C. kuehneriana* Singer)

- Sp not flattened (fig. 641C). Cap 8-17 mm, convex to distinctly bell-shaped, later expanded, rusty brown to orange brown, later more brownish orange, hygrophanous, translucently striate almost to centre. Sp 9-13.5 \times 5.5-7.5 μm , thick-walled, orange brown to rusty brown in KOH. In other characters like the main variety. In alpine and boreal grassland and mountain heathland, also in damp places in coniferous or mixed forests; summer to autumn; occasional in bore.-arc./alp.; FI, FO, IS, NO (Hedm: Ringsaker), SE. – Bol Bres 40:371 (as *kuehneriana*).
- C. ochrostriata* Hauskn. var. *favrei* Hauskn.

Key C: Sect. *Mixtae* Singer. Stem with lecythiform and ellipsoid, lageniform and hair-like elements

1. Stem rooting 2
 - Stem not rooting, mostly with a widened to bulbous base, rarely somewhat submerged in the substrate 3
2. Sp 14.5-18 \times 7.5-9.5 μm see *C. wallingii* key B 11
 - Sp 8.5-13.5 \times 5.5-8.5 μm . Cap 3-30 mm, ovoid to bell-shaped or hemispherical, later expanded, orange brown to yellowish brown, hygrophanous, translucently striate to 2/3 from margin; gills crowded; stem 20-60 \times 1-2 mm, \pm cylindrical, white, later tinged yellow or orange, with a to 45 mm long pseudorrhiza. Sp ellipsoid, sometimes slightly angular, with a c. 1 μm broad germ pore, rather thick-walled (fig. 641D), ochraceous yellow to orange yellow in KOH; cheilocystidia with a 3-4.5 μm broad head. On dung and on soil in manured grassland; autumn; rare in hemib.; FI (DD). – Bol Bres 37:147, Cet 2655, M&J 15, ZM 57:96.

C. cettoiana Hauskn. & Enderle
3. Basidia in majority 2-spored 4
 - Basidia in majority 4-spored 6
4. Sp distinctly citriform to navicular with a papilla-like germ pore (fig. 641E), pale yellow, yellow, brownish yellow in KOH; caulocystidia on the stem top in majority lecythiform,

more scattered towards base where non-lecythiform caulocystidia are in majority. Cap 7-20 mm, hemispherical to convex to conical, vividly brown, yellow brown to cognac brown, hygrophanous, translucently striate almost to centre and remaining so for a long time; gills medium spaced; stem 20-55 x 1-1.5 mm, cylindrical with a slightly widened to bulbous base, pale at the top, soon ochraceous, ochraceous brown. Sp 10.5-16 x 5-8.5 μm , moderately thick-walled; cheilocystidia with a 3-5 μm broad head. On soil in damp deciduous forests, in *Alnus* swamps, coniferous forests, at grassy roadsides and edges of meadows; spring to autumn; rare in temp., occasional in hemib.-suba.; DK (DD), FI (DD), NO (LC), SE. – B&K 4:375, FAD 129D.

C. ambigua Watling

- Sp ellipsoid or slightly flattened, not distinctly citriform or navicular, orange brown to reddish brown in KOH; caulocystidia on stem more evenly distributed 5
- 5. Sp on av < 15 μm long, with a 1.5-2.5 μm broad germ pore. Cap 12-20 mm, conical to bell-shaped or convex, orange brown to brown or greyish brown, hygrophanous, translucently striate almost to centre; gills crowded; stem 40-80 x 1-2 mm, cylindrical or slightly widened at the base, pale ochraceous yellow. Sp 12-15 x 7.5-9.5 μm , ellipsoid to ovoid, moderately thick-walled (fig. 641F), orange brown in KOH; cheilocystidia with a 3.5-4.5 μm broad head. On dung or manured soil, in grassland and among leaf litter in deciduous forests; autumn; rare in hemib.; FI (DD), SE. – Cet 2224 (as *rubiginosa*, dark and greyish form).

C. merdaria Arnolds & Hauskn.

- Sp on av > 15 μm long, with a 2-4 μm broad germ pore. Cap 6-30 mm, bell-shaped to paraboloid, rusty brown or pale brown, margin somewhat paler, hygrophanous, translucently striate almost to centre; gills crowded; stem 30-100 x 1-3 mm, cylindrical, with a 2-6 mm broad basal bulb, pale yellow to orange yellow. Sp 13.5-21 x 7.5-11 μm , ellipsoid, thick-walled (fig. 641G), orange brown to reddish brown in KOH; cheilocystidia with a 3-4(-5) μm broad head. In nitrogen rich grassland, in pastures, on dung, compost heaps and among leaf- and needle litter; occasional in temp.-suba.; FI (DD), IS, NO (LC), SE (LC). – B&K 4:389, ZM 63:16.

C. macrospora (G.F. Atk.) Hauskn. (*C. rubiginosa* Watling)

- 6. Ammonia reaction spontaneous or positive after 12 hours see key A p. 627
- Ammonia reaction negative 7
- 7. Sp on av < 11 μm long 8
- Sp on av > 11 μm long 9
- 8. Sp 5.5-8 x 3.5-4.5 μm . Cap 4-12(-20) mm broad, hemispherical to convex, brown, pale brown, at centre up to dark brown, hygrophanous, striate, but soon losing striation; gills medium spaced; stem 25-55 x 1-2 mm, cylindrical, base sometimes slightly swollen, up to 2.5 mm, whitish to cream. Sp ellipsoid, without or with an up to 0.5 μm broad germ pore, thin-walled (fig. 641H), yellow to ochraceous yellow in KOH; cheilocystidia with a 3.5-5 μm broad head. In meadows and in forests; rare in temp.-bore.; FI (DD, Ks: Kuusamo), NO (LC, Hord: Voss).

C. tuxtlaensis Singer

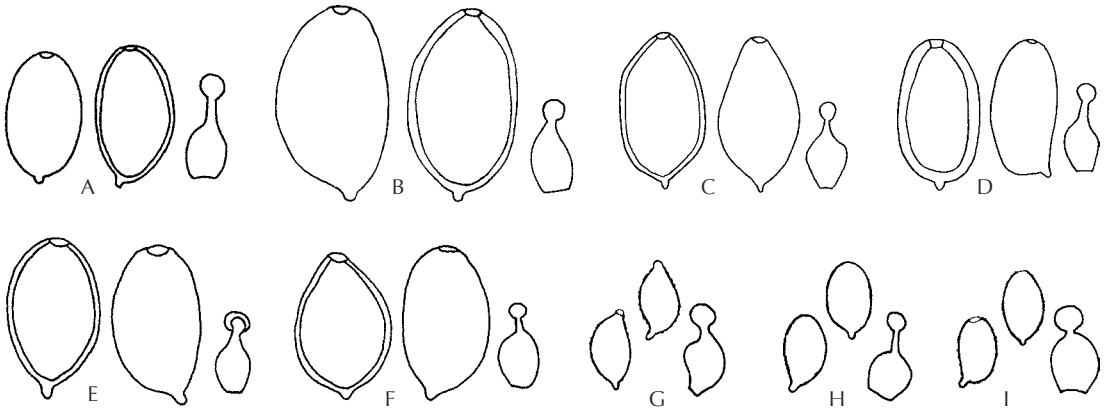
- Sp 9-12 x 5-7 μm . Cap 2-10 mm, hemispherical to low convex, pale orange yellow to pale yellow or cream, paler to whitish near margin, hygrophanous, not translucently striate; gills medium spaced to distant; stem 15-45(-55) x 1-1.5 mm, cylindrical or slightly widened at base, whitish, turning ochraceous to yellowish brown from base. Sp ellipsoid to amygdaloid or citriform, slightly flattened, with a c. 1 μm broad germ pore, rather thin-walled (fig. 641I), orange yellow to ochraceous yellow in KOH; cheilocystidia with a 2.5-4 μm broad head. In grass in lawns and dry grassland; summer; very rare in temp.; DK (DD).

C. tetrasporoides Hauskn.

9. Stem 1-1.5 mm broad; cap mostly higher than broad; gills medium spaced to distant. Cap 4-13 mm broad, 4-14 mm high, bell-shaped to paraboloid, brown, rusty brown, orange brown, hygrophanous, translucently striate almost to centre; gills medium spaced to crowded; stem 45-80 mm long, cylindrical with a slightly widened base, yellowish, then honey-coloured, base becoming reddish brown. Sp 12-18.5 x 6.5-9.5 μm , narrowly ellipsoid, with a c. 2 μm broad germ pore, thick-walled (fig. 641J), orange brown to reddish brown in KOH; cheilocystidia with a 3-4.5 μm broad head. In grassland, lawns, grassy roadsides and forest margins, rarely among herbs or on dung; summer to autumn; common in temp., occasional in bore.-suba.; DK (LC), FI (DD), FO, NO (LC), SE (LC). – M&J 5, ZM 60:49.
C. pulchella (Velen.) Hauskn. & Svrček (*C. pseudopilosella* Kühner & Watling)
- Stem mostly > 1.5 mm broad; cap broader than high; gills crowded to very crowded 10
10. Sp on av < 14 μm long. Cap 7-31 mm broad, hemispherical to low convex or bell-shaped, finely pubescent, brown to buff or yellowish brown, becoming honey yellow, hygrophanous, translucently striate almost to centre; gills crowded to very crowded; stem 17-95 x 1.5-3 mm, cylindrical, mostly with an up to 5 mm broad basal bulb, pale yellow to orange yellow, turning brownish at base. Sp 10-15 x 5.5-8.5 μm , ellipsoid, sometimes slightly flattened, with a c. 1.5 μm broad germ pore, thick-walled (fig. 644A), rusty orange to reddish brown in KOH; cheilocystidia with a 2-5.5 μm broad head. Mostly on soil among leaf- or needle litter, rarely on rotten wood, dung or on soil in grassland; spring to autumn; very common in temp., occasional in bore.-suba.; DK (LC), FI (LC), IS (Ve, Na), NO (LC, Hord: Voss, NTr: Stjørdal), SE (LC). – B&K 4:378, Däh 582, FAD 128H (as *Galera pubescens*), Ger 01:387, M&J 21, ☉.
C. subpubescens P. D. Orton (*C. cryptocystis* (G.F. Atk.) Singer s. auct., *C. digitalina* (Velen.) Singer s. auct.)
- Sp on av > 14 μm long. Cap 7-25 mm, bell-shaped to paraboloid, rarely more expanded, rusty brown to sienna, pale brown, orange brown to brownish orange, hygrophanous, translucently striate in outer half; gills crowded; stem 30-95 x 1-2.5 mm, cylindrical, but base sometimes widened to 4.5 mm, cream to honey coloured, becoming darker from base. Sp 12.5-19.5 x 7-11.5 μm , ellipsoid, with an up to 2 μm broad germ pore, thick-walled (fig. 644B), orange brown to reddish brown in KOH. On dung, compost heaps or manured soil in fields or meadows, rarely on sawdust or very rotten wood; spring to autumn; very common in temp.-hemib., occasional in bore.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Cet 437 (as *ovalis*), M&H 4:203, M&J 1, Phil 226b, Zuc 322.
C. pubescens (Gillet) Kühner

Key D: Sect. *Singerella* Watling. Caulocystidia non-lecythiform; stem base with a volva-like zone

1. Sp ellipsoid, somewhat flattened, 10.5-15 x 7.5-9 x 6.5-8 μm (fig. 644C). Cap 10-60 mm, hemispherical to convex or bell-shaped with a broad umbo, orange brown or orange to yellowish orange, hygrophanous, not or only indistinctly translucently striate, fading yellowish; gills crowded to very crowded; stem 40-140 x 2-10 mm, cylindrical with a marginate, up to 14 mm broad basal bulb, white, then pale yellow. Sp thick-walled with an up to 2.5 μm broad germ pore. On rotting straw, also on sawdust and bark litter and clayey soil; summer to autumn; rare in temp., occasional in hemib.-bore.; FI (DD), NO (LC), SE. – BKPM 5:87, Cet 2656, M&J 15, ZM 65:4.
C. hornana Singer & Hauskn. var. *hornana*
- Sp subcylindrical, in face view almost cylindrical, not flattened, 12-15.5 x 6-8.5 μm (fig. 644D). Sp with an up to 1.5 μm broad germ pore. In other characters like the main variety. On rotting straw or herbaceous litter; summer to autumn; rare in hemib.-bore.; FI, NO (Østf: Grundvik), SE. – Kar 45:27.
C. hornana Singer & Hauskn. var. *subcylindrospora* Hauskn., Vauras, Kytöv. & Ohenoja



Spores and cheilocystidia: A: *Conocybe subpubescens*, B: *C. pubescens*, C: *C. hornana* var. *hornana*, D: *C. hornana* var. *subcylindrospora*, E: *C. pseudocrispa*, F: *C. albipes*, G: *C. dumetorum* var. *laricina*, H: *C. dumetorum* var. *phaeoleiospora*, I: *C. C. dumetorum* var. *dumetorum*.

Key E: Sect. *Candidae* Singer. Pseudoparaphyses present; gills mostly deliquescent with age

- Basidia 2-spored. Cap 5-12(-20) mm broad, 4-11(-15) mm high, hemispherical to rounded conical, margin with age somewhat sulcate, milky white, not hygrophanous, not translucently striate; gills medium spaced; stem 35-60(-100) × 1-2 mm, gradually widened towards base, white. Sp 11-15 × 7-9.5 μm, ellipsoid, with a 1.2-2 μm broad germ pore, thick-walled (fig. 644E), yellowish brown to reddish brown in KOH; cheilocystidia with a 3.5-5 μm broad head. In grassland; summer to autumn; rare in temp.-bore.; DK (NA), IS (Au), FI (DD). – Zuc 318 (as *crispa*).

C. pseudocrispa (Hauskn.) Arnolds

- Basidia 4-spored. Cap 10-25 mm broad, 10-40 mm high, often almost cylindrical to narrowly conical, smooth, milky white to cream, not hygrophanous, not translucently striate; gills crowded, often deliquescent; stem 70-110 × 2-4 mm, gradually widened towards base, white. Sp 10-16 × 7-10 μm, ellipsoid, with an up to 2 μm broad germ pore, thick-walled (fig. 644F), yellowish brown with a reddish tinge; cheilocystidia with a 3.5-5(-5.5) μm broad head. In grassland and lawns, meadows, pastures, sawdust, calciphilous; summer, less often in autumn; common in temp.-hemib., occasional in bore., very rare in suba.; DK (LC), FI (LC), IS (Au), NO (LC), SE (LC). – B&K 4:381, FAD 128F, G, Phil 226e, R&H 435, Ves 306, Ⓢ. – Poisonous.

C. albipes (G.H. Otth) Hauskn. (*C. lactea* (J.E. Lange) Métrod)

Key F: Sect. *Ochromarasmius* (Singer) Hauskn. & Krisai. Sp finely ornamented

- Sp citriform to amygdaloid, in majority with a papilla-like to protruding germ pore (fig. 644G), warts in SEM of variable size, absent near the germ pore. Sp 5-8.5 × 3-5 μm, thin-walled; cheilo- and caulocystidia with a 4-7 μm broad head, with short neck. In other characters like the main variety. In leaf litter or among herbs, rarely in needle litter or on wood; autumn; rare in temp.-bore.; FI, NO (Nordl: Rana), SE.

C. dumetorum (Velen.) Svřček var. *laricina* (Kühner) Hauskn. (*C. laricina* Kühner)

- Sp ellipsoid with indistinct, never protruding germ pore, warts in SEM mostly of equal size

2. Sp almost smooth to indistinctly rough in light microscope, thick-walled; cheilo- and caulocystidia with long neck and mostly a 3-4(-5.5) μm broad head. Cap hemispherical to convex, later expanded to slightly depressed; gills medium spaced to distant. Sp 5-7 x 3-5 μm , ellipsoid to ovoid, with an indistinct germ pore (fig. 644H). In other characters like the main variety. In open, sun exposed places, like dry grassland and sand dunes; autumn; rare in temp.-hemib.; DK, SE. – Bol Bres 41:99, Cet 2223 (as *dumetorum*).

C. dumetorum (Velen.) Svrček var. *phaeoleiospora* Hauskn.

- Sp distinctly punctate in light microscope, thin-walled; cheilo- and caulocystidia with short neck and mostly a $> 5 \mu\text{m}$ broad head. Cap 4-11 mm, hemispherical to convex, bell-shaped, dark brown, dark reddish brown to blackish brown, paler near margin; hygrophorous, translucently striate in outer half; gills crowded; stem 10-20 x c. 1 mm, with a slightly swollen to 1.5 mm broad base, white to whitish, more yellow to honey yellow near the base, darkening from base upwards to yellowish brown. Sp 4.5-7 x 3-4 μm , ellipsoid, rarely subamygdaloid, with an often indistinct, not papilla-like germ pore (fig. 644I), yellow to ochre yellow in KOH; cheilocystidia with a 3.5-6 μm broad head. On soil in leaf litter or among herbs; summer to autumn; rare in temp.-hemib.; DK (VU), FI (DD). – M&J 12, Svp 33:60.

C. dumetorum (Velen.) Svrček var. *dumetorum*

Contumyces Redhead, Moncalvo, Vilgalys & Lutzoni MACHIEL NOORDELOOS

Jacobia Contu

One species in the Nordic countries, see description below.

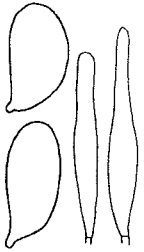
Lit.: Antonin & Noordeloos, 1997, 2004, Contu 1997, Redhead et al. 2002.

Frb omphalinoid with pink cap. Cap 5-20 mm, slightly to deeply umbilicate, finely tomentose, dry, not hygrophanous, pink to pinkish lilac. Gills arcuate-decurrent, pink. Stem 10-30 x 1-2 mm, cylindrical, white to pink. Smell indistinct. Taste indistinct. Sp deposit white.

Sp (7-)8.5-10.5 x 4-6 μm , ellipsoid to dacryoid (fig. 67C), thin-walled, hyaline, without iodine reactions. Cheilocystidia 30-50 x 4-10 μm , narrowly lageniform. Pileipellis a cutis with transitions to a trichoderm, with clavate to lageniform terminal elements, 40-65 x 8-11 μm . Pigment parietal-incrusting. Clamps abundant.

Among grass and mosses in nutrient poor, sandy or gravelly soil; very rare in temp.-bore.; DK (DD), NO (NE, Finnm: Karasjok), SE. – A&N 04:190, Däh 177, FAD 60C, Lud 46.6, RdM 41:48, ⊙.

C. rosellus (Redhead) Redhead, Moncalvo, Vilgalys & Lutzoni (*Omphalia* r. J.E. Lange non (Batsch) Gray, *Clitocybe* r. (J.E. Lange) M.M. Moser nom. illeg., *Marasmiellus* r. (M.M. Moser) Kuyper & Noordel.)



Spores and cheilocystidia

Coprinellus P. Karst.

JAN VESTERHOLT

Pseudocoprinus Kühner, *Coprinus* Pers. s. lato p.p.

Frb with black sp deposit, often short lived, fragile and deliquescent. Cap conical, ovoid, convex or bell-shaped, later expanding with or without an umbo, often becoming radially grooved, dry, whitish to buff, yellowish brown, orange brown, greyish brown or purplish brown, most coloured at centre, later often greyish or blackish. Universal veil granulose or absent. Gills free, distant to crowded. Stem cylindrical, often minutely downy, dry. In some species with a yellowish brown ozonium. Smell indistinct. Taste insignificant or unknown. Sp deposit black.

Sp ellipsoid, ovoid or phaseoliform, less often amygdaloid, citriform, mitriform or angular, in some species broader in face view than in side view, and in such cases the spore size is given in three dimensions, with central or eccentric germ pore, smooth, less often verrucose, dark brown to black. Basidia mostly 2- or 4-spored. Cheilocystidia present, spheropenunculate, ellipsoid, utri-form, lageniform, tapering or cylindrical. Pleurocystidia present or absent, spheropedunculate, ellipsoid, utriform, lageniform, tapering or cylindrical. Caulocystidia mostly present, lageniform, tapering or cylindrical. Pileipellis a hymeniderm of round elements covered with narrow hyphae, in most species with pileocystidia, cylindrical, tapering or capitate, in some species with thick-walled sclerocystidia, narrowly lageniform or tapering. Veil absent or consisting of ± globose elements or of chains of fusiform to ellipsoid or globose, thin-walled or partly thick-walled elements, in some species with spherocysts. Clamps present or absent.

Saprotrophic. On soil or wood, stems, dung, burnt ground, etc. Spring to autumn.

37 species in the Nordic countries, 39 species in the key. Some species which morphologically fit in *Coprinellus*, are placed here temporarily, though their generic affinities still remain uncertain.

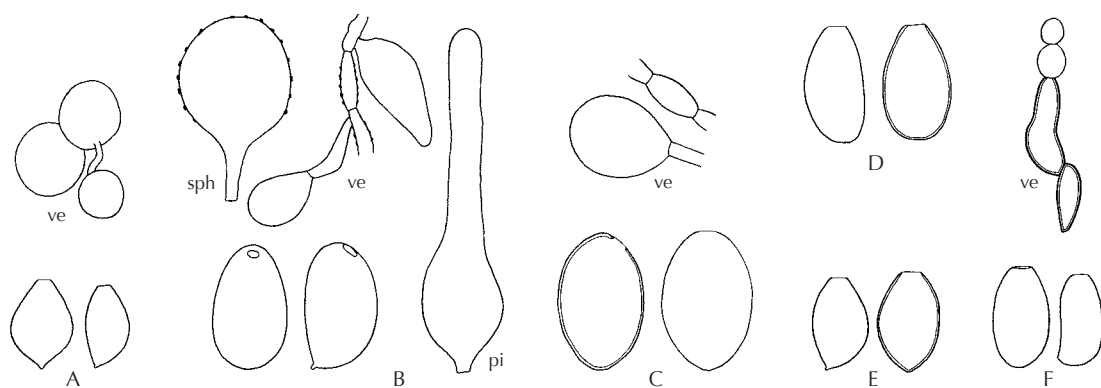
Lit.: Orton & Watling 1979, Redhead et al. 2001, Uljé 1988, Uljé in Noordeloos et al. 2005, Uljé & Bas 1991.

Main key

1. Cap floccose from remnants of veil when young
- Cap without or only with scanty veil

Key A p. 559

Key B p. 561



Spores, veil elements, spherocysts and pileocystidia: A: *Coprinellus micaceus*, B: *Coprinus aquatilis*, C: *Coprinellus flocculosus*, D: *C. radians*, E: *C. xanthothrix*, F: *C. domesticus*.

Key A: Cap floccose from remnants of veil when young

1. Veil of ± globose, thin-walled elements, connected by narrow, somewhat diver-ticulate elements (fig. 559A) 2
 - Veil of chains of fusiform, ellipsoid to globose, partly thick-walled elements 5
2. With caulocystidia, giving the stem a downy appearance 3
 - Without caulocystidia 4
3. Sp ellipsoid. Cap up to 30 x 25 mm, ovoid to ellipsoid, later conical to convex, pale buff, with brownish centre; veil minutely granulose, white; gills crowded, finally black and strongly deliquescent; stem 50-80 x 3.5-5 mm, with clavate base, pruinose, whitish. Sp 7-9 x 5-6 x 4.5-5 µm, ovoid, with central germ pore; pleurocystidia numerous; veil of globose ele-ments. On soil or wood; summer to autumn; rare in hemib.; FI (DD, V: Koski). – Lud 93.77, M&J 26.

Coprinus pallidissimus Romagn.

 - Sp ovoid to mitriform in face view, ellipsoid in side view (fig. 559A). Cap 10-35 x 8-25 mm, ovoid, later bell-shaped to expanded, yellowish brown; veil granulose, whitish; gills crowded, finally black and ± deliquescent; stem 40-100 x 2-6 mm, cylindrical or slightly

widened downwards, pruinose, white. Sp 7.5-10 × 4.5-6 × 4-5.5 μm, with central germ pore; pleurocystidia few or absent; veil of ± globose elements. On or around stumps of deciduous wood or on buried wood, often in large groups; spring to late autumn; very common in temp.-hemib., occasional, but locally common in bore.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – Lud 93.75A-C, Phil 260b, R&H 426, Svp 41:21, Ves 292, ☉.

C. micaceus (Bull.: Fr.) Vilgalys, Hopple & Jacq. Johnson (*Coprinus m.* (Bull.: Fr.) Fr.)

Note: a form with veil forming large patches is described as *Coprinus micaceus* f. *dermatovelatus* E. Ludwig. SE (Sk: Ivö). – Lud 93.75D.

4. Veil white and remaining so. Cap ovoid to conical, buff to yellowish brown; veil floccose; gills crowded, finally black and deliquescent; stem 80-100 × 4-6 mm, cylindrical, whitish. Sp 7-9 × 5-6 × 4.5-5 μm, ovoid, with central germ pore. On soil, plant debris or wood; spring to autumn; very rare in hemib., only two records from NO (LC, AA: Arendal, Østf: Fredrikstad). – End 399, Lud 93.74, ZM 54:64.

Coprinus saccharinus Romagn.

- Veil whitish, becoming buff to yellowish brown. Cap 10-25 × 10-25 mm, ovoid to conical, later expanding, buff to yellowish brown; veil granulose; gills crowded, finally black, deliquescent or not; stem 40-100 × 2-5 mm, slightly widened towards base. Sp 8-9.5 × 5-6.5 μm, ovoid to ellipsoid, with central germ pore; veil of ± globose elements. On trunks or stumps of deciduous trees; spring to late autumn; rare in temp., very rare in hemib.; DK (DD), NO (Østf: Fredrikstad). – End 400, FAD 160I, Lud 93.76, M&J *Coprinus* 13, ZM 54:64.

C. truncorum (Schaeff.) Vilgalys, Hopple & Jacq. Johnson (*Coprinus t.* (Schaeff.) Fr.)

5. Sp on av > 11 μm long 6
 - Sp on av < 11 μm long 7
6. On sticks and branches in rivulets and brooks, hardly in very large numbers. Cap up to 12 × 6 mm, ellipsoid to ovoid, later bell-shaped to expanded, yellowish brown, becoming radially grooved, finely mealy-granulose when young; gills medium spaced; stem 20-40 × 1-2 mm, cylindrical, downy, whitish. Sp 10.5-13 × 6-7 μm, ellipsoid, with eccentric germ pore (fig. 559B); pileocystidia lageniform with a cylindrical neck; with brownish velar spherocysts on the cap. Summer; common hemib.-bore., rare in suba.; FI (LC), NO (LC).

Coprinus aquatilis Peck

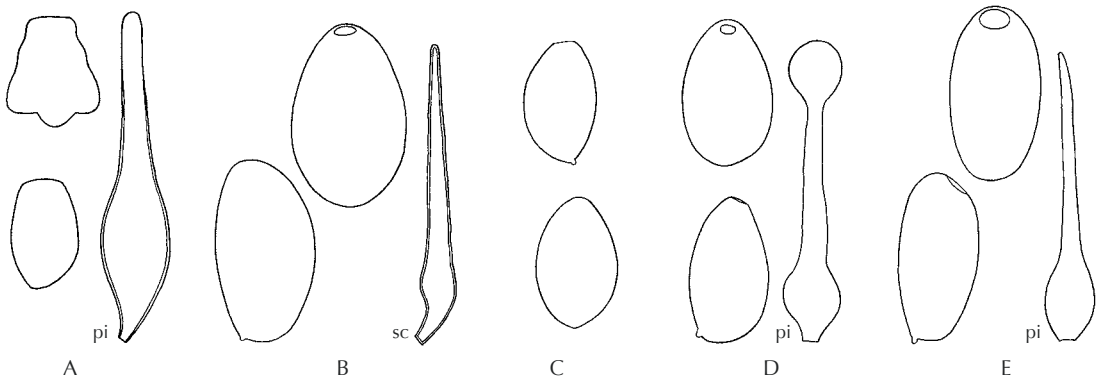
- On soil, sawdust, wood chips, rotten straw, etc. Cap 10-37 × 7-25 mm, ovoid to bell-shaped, later bell-shaped to expanded, whitish; veil fibrillose to floccose, whitish; gills crowded, finally black and deliquescent; stem 40-60 × 3-6 mm, widened downwards, white. Sp 11-15 × 7-9.5 × 6.5-7.5 μm, ellipsoid to ovoid, with eccentric germ pore (fig. 559C); veil of chains of globose to ellipsoid or cylindrical elements. Summer to autumn; occasional in temp.-middle bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:277, Däh 549, End 394, FAD 157E (as *Coprinus rostrupianus*), Lud 93.58.

C. flocculosus (DC.) Vilgalys, Hopple & Jacq. Johnson (*Coprinus f.* (DC.) Fr.)

7. Veil breaking up into patches like an *Amanita*. Cap up to 40 × 35 mm, ovoid to ellipsoid, later conical to convex, centre pale ochraceous or rust-coloured, paler towards margin; veil white; gills finally black and deliquescent; stem 30-80 × 2-7 mm, clavate, white. Sp 8.5-10.5 × 5-6 μm, ovoid to elliptical in face view, sometimes phaseoliform in side view, with eccentric germ pore; veil of chains of cylindrical, ellipsoid or globose elements. In damp deciduous forests, on rotting *Alnus* wood chips, on ciniferous wood, etc., often fasciculate; summer to autumn; very rare in hemib.; FI (DD), NO (Østf: Fredrikstad). – Lud 93.106.

Coprinus bipellis Romagn.

- Veil breaking up in small flocks 8
8. Sp on av > 9.5 μm long (fig. 559D). Cap 10-25 × 10-15 mm, ellipsoid to acorn-shaped, later bell-shaped to expanded, white to cream; veil granulose, white to brownish; gills crowded, finally black and strongly deliquescent; stem 40-80 × 3-5 mm, widened downwards, white.




Spores, pileocystidia and sclerocystidia: A: *Coprinellus angulatus*, B: *C. sassii*, C: *C. bisporus*, D: *C. curtus*, E: *C. heptemerus*.

Sp 8.5-11.5 x 5.5-6.5 μm , ellipsoid to phaseoliform, with central germ pore; veil of globose or ellipsoid elements and chains of fusiform to cylindrical elements. On stumps, logs and branches of deciduous trees; spring to summer; occasional in hemib.-southern bore., rare in temp.; DK (LC), FI (LC), NO (LC), SE (NE, Sk). – C&D 767, Cet 420, End 399, Lud 93.104, RdM 48:59.

C. radians (Desm.) Vilgalys, Hopple & Jacq. Johnson (*Coprinus r.* (Desm.) Fr.)

- Sp on av < 9 μm long 9
- 9. Sp 7-10 x 4.5-6 μm , ellipsoid to slightly amygdaloid, hardly phaseoliform (fig. 559E). Cap 10-30 x 10-20 mm, ellipsoid to acorn-shaped, later bell-shaped to expanded, white to pale buff yellow; veil granulose, white to brownish; gills crowded, finally blackish and moderately deliquescent; stem 35-80 x 2-5 mm, widened downwards, finely downy, white. Sp with central germ pore; veil of \pm globose elements and chains of ellipsoid to fusiform, brownish elements. On branches or sticks of deciduous trees; spring to autumn; common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:307, C&D 768, Ger 01:349, Lud 93.107, Ves 293.

C. xanthothrix (Romagn.) Vilgalys, Hopple & Jacq. Johnson (*Coprinus x.* Romagn.)

- Sp 6-9 x 3.5-5 μm , ellipsoid to phaseoliform (fig. 559F). Cap 20-40 x 15-30 mm, ellipsoid to ovoid, later bell-shaped to expanded, whitish to pale yellowish buff; veil granulose, white to brownish; gills crowded, finally blackish and deliquescent; stem 30-100 x 2-9 mm, widened downwards, white, sometimes with a distinct, volva-like veil zone at base. Sp with central germ pore; veil of globose or ellipsoid elements and chains of ellipsoid to cylindrical elements. On or around trunks of deciduous trees, less often on logs and branches or wood chips; spring to autumn; common in temp.-hemib., occasional in western part of bore.-suba.; DK (LC), IS, NO (LC), SE (LC). – B&K 4:273, Ger 01:349, Lud 93.102, 105, Phil 260c, R&H 426, .
- C. domesticus* (Bolton : Fr.) Vilgalys, Hopple & Jacq. Johnson (*Coprinus d.* (Bolton.: Fr.) Gray, incl. *C. ellisii* P.D. Orton, *Coprinellus e.* (P.D. Orton) Redhead, Vilgalys & Moncalvo)

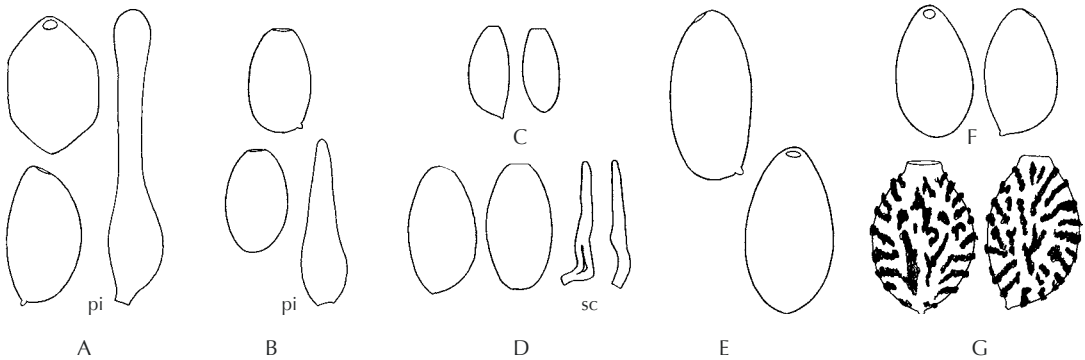
Key B: Cap not floccose from remnants of veil

1. Sp mitriform (fig. 561A); on burnt ground or burnt wood. Cap 4-25 x 5-20 mm, conical to ellipsoid, later bell-shaped to expanded, becoming radially grooved, dark orange brown to buff, towards margin often more greyish brown; gills medium spaced to distant, finally black and deliquescent; stem 10-60 x 1-3 mm, cylindrical or widened downwards, downy, white. Sp 7.5-10.5 x 6-8 x 5-6 μm , truncate, with central germ pore; pileocystidia 50-100 x 12-15, lageniform with tapering neck; without velar spherocysts. Early summer to autumn; oc-

casional, but locally common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:264, Däh 553, Ger 01:359, Lud 93.20, Sieniop 256.

C. angulatus (Peck) Redhead, Vilgalys & Moncalvo (*Coprinus a.* Peck, *C. boudieri* Quél.)

- Sp ellipsoid, ovoid, amygdaloid, citriform or angular; on dung, rotting straw, soil, branches, twigs, leaves or herbaceous stems 2
- 2. On dung or rotting straw 3
- On soil, branches, twigs, leaves or herbaceous stems 12
- 3. Basidia 2-spored 4
- Basidia 4-spored 5
- 4. Clamps present; with sclerocystidia (fig. 561B). Cap 4-20 x 3-12 mm, ellipsoid to narrowly conical, later expanded with upturned margin, becoming radially grooved, buff with reddish brown centre, paler and more greyish towards margin; gills distant, finally black and strongly deliquescent; stem 20-80 x 1-3 mm, cylindrical, downy, whitish. Sp 13-20 x 8-11 μ m, ellipsoid, with eccentric germ pore; pileocystidia 30-100 x 5-16 μ m, lageniform with tapering neck; sclerocystidia lageniform with tapering neck. On dung or rotting straw; very rare in temp.; DK (DD). – Lud 93.32, M&J Coprinus 23.
C. sassii (M. Lange & A.H. Sm.) Redhead, Vilgalys & Moncalvo (*Coprinus s.* M. Lange & A.H. Sm.)
- Clamps absent; without sclerocystidia. Cap 5-16 x 4-12 mm, ellipsoid, later expanded, becoming radially grooved, pale buff, paler towards margin; gills distant, finally black and deliquescent; stem 30-80 x 1-2 mm, cylindrical or widened downwards, often somewhat rooting, downy, white. Sp 10-14 x 5.5-7.5 μ m, ellipsoid to amygdaloid, germ pore eccentric (fig. 561C); pileocystidia 60-120 x 10-22 μ m, lageniform with tapering neck; without velar spherocysts. Fasciculate on dung or rotting straw; spring; common in temp.-bore.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 4:267, FAD 160E, Lud 93.33, RdM 31:247, ZM 56:24.
C. bisporus (J.E. Lange) Vilgalys, Hopple & Jacq. Johnson (*Coprinus b.* J.E. Lange)
- 5. Velar spherocysts on the cap present 6
- Velar spherocysts on the cap absent 7
- 6. Sp 9.5-14 x 6.5-9 x 6-8 μ m; pileocystidia tibiiform (fig. 561D). Cap 2-8 x 2-5 mm, narrowly ovoid, later bell-shaped to expanded, becoming radially grooved, yellowish brown, later pale greyish towards margin; veil granulose, yellow brown to reddish brown; gills medium spaced to distant, finally black, only slightly deliquescent; stem 10-70 x 0.3-1 mm, cylindrical, downy, hyaline to white or pale brownish. Sp ellipsoid to ovoid, germ pore eccentric; pileocystidia 40-90 x 10-20 μ m; veil of spherocysts. On horse dung and on compost; spring to autumn; rare in temp.-suba., but poorly known; DK (DD), FI (LC), NO (LC), Oppl: Vågå, SE (LC). – FAD 160G, Lud 93.44, ZM 50:16.
C. curtus (Kalchbr.) Vilgalys, Hopple & Jacq. Johnson (*Coprinus c.* Kalchbr.)
- Sp 12.5-16.5 x 7-8.5 μ m; pileocystidia lageniform with a tapering neck (fig. 561E). Cap 5-9 x 3-9 mm, almost cylindrical to conical, later expanded, becoming radially grooved, buff, later more greyish towards margin; gills medium spaced to distant, finally black, deliquescent or not; stem 10-50 x 0.5-1 mm, cylindrical, downy, hyaline to white. Sp ellipsoid, with strongly eccentric germ pore; pileocystidia 50-120 x 8-21 μ m; veil of spherocysts. On dung; all year around; occasional in temp.-suba.; DK (LC), FI (LC), FO, IS, SE (LC). – Lud 93.45, RdM 31:233, ZM 52:107.
C. heptemerus (M. Lange & A.H. Sm.) Vilgalys, Hopple & Jacq. Johnson (*Coprinus h.* M. Lange & A.H. Sm.)
Note: a similar fungus described as *Coprinus pusillulus* Svrček with sp up to 11.5 μ m long may be an infraspecific variant. SE (Bl: Jämshög). – Lud 93.46.
- 7. Sp 6-angled in face view (fig. 563A). Cap 5-15 x 3-10 mm, almost cylindrical to ellipsoid,



Spores, pileocystidia and sclerocystidia: A: *Coprinellus marculentus*, B: *C. brevisetulosus*, C: *C. pellucidus*, D: *C. heterosetulosus*, E: *C. ephemerus*, F: *C. congregatus*, G: *Coprinus silvaticus*.

later conical to expanded, becoming radially grooved, centre yellowish brown to purplish brown, towards the margin paler and more greyish; gills medium spaced to distant, soon black and deliquescent; stem 40-80 x 0,7-2 mm, cylindrical, downy, greyish white. Sp 9.5-14.5 x 6.5-8.5 x 6-7.5 μm , ellipsoid in side view, with eccentric germ pore; pileocystidia 50-100 x 12-20 μm , lageniform with cylindrical neck; without velar spherocysts. On dung or rotting straw; spring to late autumn; rare in temp.-southern bore.; DK (DD), FI (LC), SE (LC). – B&K 4:292, End 297, Ger 01:357, Lud 93.43, ZM 52:128.

C. marculentus (Britzelm.) Redhead, Vilgalys & Moncalvo (*Coprinus m.* Britzelm., *C. hexagonosporus* Joss.)

- Sp ellipsoid to ovoid 8
- 8. Sp with central germ pore 9
- Sp with \pm eccentric germ pore 10

9. Pleurocystidia present; sp 8-11.5 x 5-6.5 μm (fig. 563B). Cap 2-10 x 2-7 mm, ellipsoid, later expanded, becoming radially grooved, buff, becoming paler towards margin; gills medium spaced to distant, finally black and deliquescent; stem 20-50 x 0.5-2.5 mm, cylindrical, downy, hyaline-whitish. Sp ovoid to ellipsoid, with central germ pore; pileocystidia 20-65 x 7-14 μm lageniform with tapering neck; without velar spherocysts. On dung; all year round; rare in temp.-bore.; DK (DD), NO (LC), SE. – Lud 93.27.

C. brevisetulosus (Arnolds) Redhead, Vilgalys & Moncalvo (*Coprinus b.* Arnolds, *C. stellatus* Buller nom. inval.)

- Pleurocystidia absent; sp 6.5-9.5 x 3-4 μm (fig. 563C). Cap 3-8 x 2-4 mm, narrowly ellipsoid, later expanded, becoming radially grooved, buff, towards margin more greyish; gills medium spaced to distant, slowly deliquescent; stem 8-70 x 0.1-1.5 mm, cylindrical, downy, hyaline to white. Sp narrowly ellipsoid, with central germ pore; pileocystidia 25-50 x 7-12 μm , lageniform with tapering neck; without velar spherocysts. On cow dung; all year round; common in temp., rare but locally occasional in hemib.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Lud 93.30, RdM 31:243.

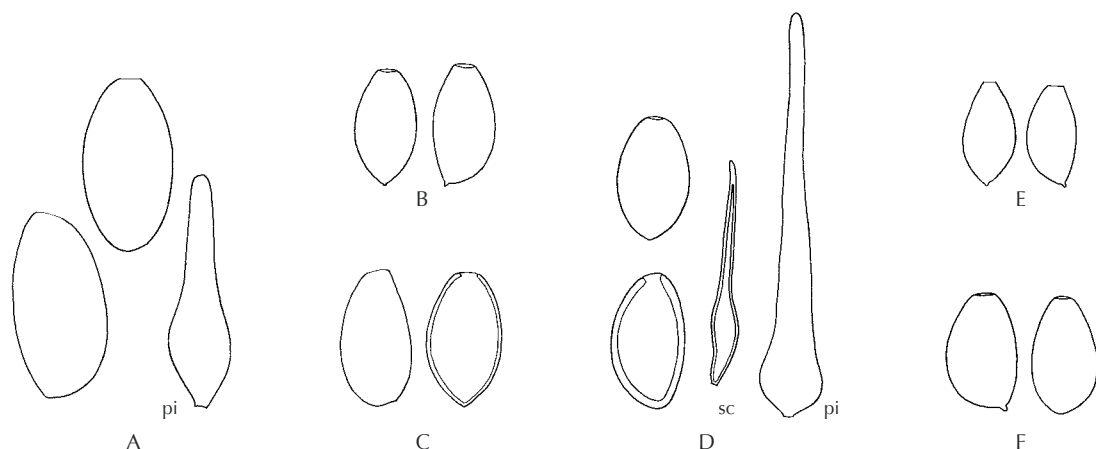
C. pellucidus (P. Karst.) Redhead, Vilgalys & Moncalvo (*Coprinus p.* P. Karst.)

10. Sp 8-11 x 5-6.5 μm (fig. 563D); sclerocystidia lageniform with a narrow neck. Cap 2-7 x 1-4 mm, ovoid, later expanded, becoming radially grooved, reddish brown to umber, paler towards margin; gills distant, finally black and deliquescent; stem 15-50 x 0.3-1 mm, cylindrical, downy, hyaline-greyish. Sp ellipsoid, with eccentric germ pore; pileocystidia 30-95 x 8-21 μm , lageniform with tapering neck; without velar spherocysts. On horse and elk dung; spring to autumn; common in temp., rare in hemib.-southern bore.; DK (LC), FI (LC), NO (Tel:

Bamble, Østf: Fredrikstad), SE. – B&K 4:281, Lud 93.35, RdM 31:241, ZM 52:109.

C. heterosetulosus (Watling) Vilgalys, Hopple & Jacq. Johnson (*Coprinus h.* Watling)

- Sp on av > 11 μ m long; sclerocystidia absent 11
- 11. With clamps. Cap 5-20 x 4-12 mm, narrowly ellipsoid, later expanded, becoming radially grooved, centre buff to cinnamon, paler towards margin; gills medium spaced to distant; stem 20-80 x 1-3 mm, cylindrical or slightly widened downwards, downy, white. Sp 11.5-16 x 6-8 μ m, ovoid to ellipsoid, with eccentric germ pore (fig. 563E); pileocystidia 30-120 x 8-18 μ m, lageniform with tapering neck; without velar spherocysts. On cow, horse and elk dung and rotting straw; spring to late autumn; occasional in temp.-bore., rare in suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – M&J *Coprinus* 20, RdM 31:249.
C. ephemerus (Bull.: Fr.) Redhead, Vilgalys & Moncalvo (*Coprinus e.* (Bull.: Fr.) Fr.)
- Without clamps. Cap 5-20 x 5-18 mm, narrowly ellipsoid, later expanded, becoming radially grooved, pale buff to buff or cinnamon, later greyish yellow; gills medium spaced to distant, finally black and deliquescent; stem 20-80 x 0.5-5 mm, cylindrical or slightly widened downwards, often slightly rooting, downy, white. Sp 10-14 x 5.5-7.5 μ m, ellipsoid, with eccentric germ pore (fig. 563F); pileocystidia 30-120 x 8-18 μ m, lageniform with tapering neck; without velar spherocysts. Gregarious on dung and rotten straw; spring to late autumn; occasional in temp., rare in hemib.-southern bore.; DK (LC), FI (LC), SE (LC). – Lud 93.31, M&J *Coprinus* 21, Phil 259j, RdM 31:245.
C. congregatus (Bull.) P. Karst. (*Coprinus c.* (Bull.) Fr.)
- 12. Sp verrucose 13
- Sp smooth 14
- 13. Basidia 4-spored; pleurocystidia absent. Cap 15-35 x 8-25 mm, acorn shaped to ellipsoid, later bell-shaped to convex, becoming radially grooved, pale buff to buff with a reddish brown centre; veil granulate, buff; gills medium spaced to distant, finally black and slowly deliquescent; stem 30-90 x 2-5 mm, cylindrical, downy, whitish. Sp 10-15 x 7-10 μ m, citri-form to amygdaloid, with a wrinkled perispore forming warts and ridges (fig. 563G); with central germ pore; pileocystidia 60-150 x 20-35 μ m, lageniform with a tapering neck; veil of spherocysts. On clayey soil, mostly fasciculate; spring to summer; occasional in temp., rare in hemib.; DK (LC), NO (LC). SE (LC). – B&K 4:302, Lud 93.6, M&J 19, Phil 261e, Ves 292.
Coprinus silvaticus Peck
- Basidia 2-spored; pleurocystidia present. Cap up to 15 x 12 mm, ellipsoid, later expanded, becoming radially grooved, dark brown, becoming paler towards margin; veil granulate, brown; gills medium spaced to distant, finally black, not or little deliquescent; stem 30-70 x 1-3 mm, cylindrical, downy, whitish. Sp 11-17 x 7-9.5 μ m, ellipsoid to amygdaloid, verrucose, with central germ pore; pileocystidia 80-210 x 18-25 μ m, lageniform with a tapering neck; veil of spherocysts. On clayey soil; NL. – Lud 93.38, Wöl 36.
C. verrucispermus (Joss. & Enderle) Redhead, Vilgalys & Moncalvo (*Coprinus v.* Joss. & Enderle)
- 14. Basidia 2-spored 15
- Basidia 4-spored 17
- 15. Cheilocystidia ellipsoid to spherical. Cap up to 12 x 9 mm, ellipsoid, later expanded, becoming radially grooved, buff to cinnamon; gills medium spaced to distant; stem 40-80 x 1-3 mm, cylindrical, downy, whitish. Sp 10.5-13.5 x 6.5-8.5 μ m, ellipsoid to ovoid, with eccentric germ pore; pileocystidia 50-110 x 12-25 μ m, lageniform with tapering neck; without velar spherocysts. In forests on branches and leaves; summer; rare in temp.; SE. – Lud 93.34.
C. bisporiger (P.D. Orton) Redhead, Vilgalys & Moncalvo (*Coprinus b.* P.D. Orton)
- Cheilocystidia narrowly lageniform 16
- 16. Unexpanded cap 6-12 x 4-6 mm; sp with eccentric germ pore (fig. 565A). Cap ellipsoid to



Spores, pileocystidia and sclerocystidia: A: *Coprinellus amphithallus*, B: *C. hiascens*, C: *C. impatiens*, D: *C. callinus*, E: *C. disseminatus*, F: *C. heterothrix*.

bluntly conical, later expanded, becoming radially grooved, cream with orange-brown to dark brown centre; gills medium spaced to distant; stem 30-70 x 0.8-2 mm, cylindrical, downy, hyaline to whitish. Sp 12-17 x 6.5-9 μm , ellipsoid to ovoid; pileocystidia 40-85 x 10-15 μm , lageniform with tapering neck; without velar spherocysts. On soil or pieces of wood, on sawdust, at roadsides, etc.; summer to autumn; rare in temp., very rare in hemib.; DK (LC), NO (NE, Norl: Træna), SE. – Lud 93.24, ZM 50:32.

C. amphithallus (M. Lange & A.H. Sm.) Redhead, Vilgalys & Moncalvo (*Coprinus a.* M. Lange & A.H. Sm.)

- Unexpanded cap up to 3 x 2 mm; sp with central germ pore. Cap hemispherical to ovoid, later expanded, becoming radially grooved, pale brown to buff, discolouring greyish; gills medium spaced to distant; stem 20-35 x 0.5-1 mm, cylindrical, downy, hyaline to whitish. Sp 10-17 x 7-11 μm , ellipsoid; pileocystidia 50-85 x 11-18 μm , lageniform with cylindrical to tapering neck; without velar spherocysts. On soil in lawns, at roadsides, etc.; NL. – Pers 13:487, 14:334.

C. singularis (Uljé) Redhead, Vilgalys & Moncalvo (*Coprinus s.* Uljé)

- | | | |
|-----|---|----|
| 17. | Pileocystidia with distinctly tapering neck | 18 |
| - | Pileocystidia with cylindrical neck | 24 |
| 18. | Germ pore central | 19 |
| - | Germ pore eccentric | 20 |

19. With cylindrical velar elements on the cap; sp base pointed (fig. 565B). Cap 6-12 x 4-8 mm, ellipsoid to ovoid, later expanded, becoming radially grooved, pale orange brown to buff, paler and more greyish towards margin; gills medium spaced to distant, finally slowly deliquescent; stem 20-100 x 1-3 mm, cylindrical, downy, greyish to whitish. Sp 7.5-11.5 x 4.5-6 μm , ellipsoid to ovoid, with central germ pore; pileocystidia 50-200 x 13-24 μm , lageniform with tapering neck. Fasciculate on clayey or mull soil, in deciduous forests, parks, pastures, in grass at roadsides, etc.; summer to autumn; occasional in temp.-southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 157C, Lud 93.28, RdM 51:259, Ves 293, ZM 52:112,

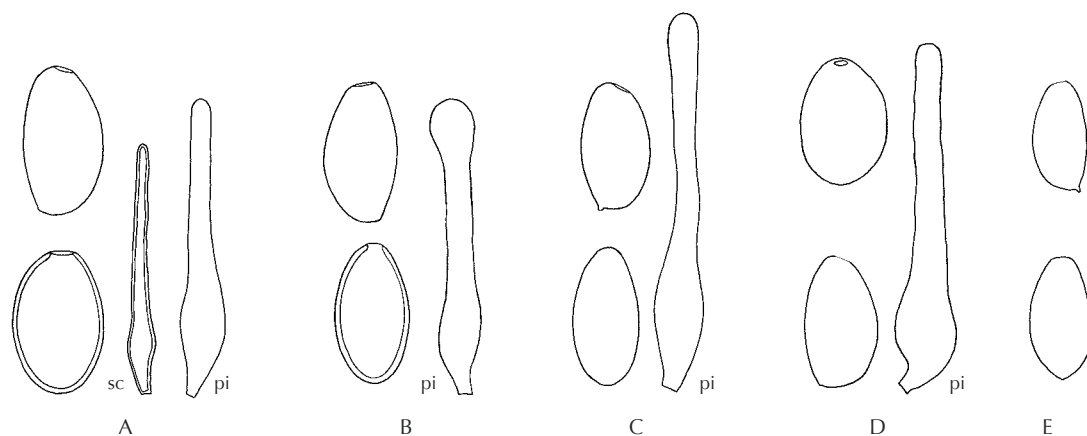
C. hiascens (Fr.: Fr.) Redhead, Vilgalys & Moncalvo (*Coprinus h.* (Fr.: Fr.) J.E. Lange)

- Without cylindrical velar elements on the cap; sp base rounded (fig. 565C). Cap 10-25 x 3-12 mm, ovoid to conical, later bell-shaped to convex, becoming radially grooved, buff, later discolouring from the margin; gills medium spaced to distant, not deliquescent; stem 30-100

x 0.5-4 mm, cylindrical, sometimes slightly widened at base, downy, greyish white. Sp 9.5-11.5 x 6-7.5 μm , ellipsoid to ovoid, with central to eccentric germ pore; pileocystidia 50-100 x 12-22 μm , lageniform with tapering neck; without velar spherocysts. On soil in grass and forests; summer to autumn; occasional in temp., rare in hemib., only two records from NO (Hord: Askøy, Oslo) and one from FI (A: Brändö); DK (LC), FI (DD), NO (LC), SE (LC). – B&K 4:283, FAD 156B, Jordst 7(2), Lud 93.21, Phil 259i.

C. impatiens (Fr.: Fr.) J.E. Lange (*Coprinus i.* (Fr.: Fr.) Quél.)

20. With velar spherocysts on the cap. Cap up to 12 x 8 mm, ellipsoid, later expanded, becoming radially grooved, orange to orange brown, granulose-flocculose; gills medium spaced to distant, not deliquescent; stem 20-50 x 0.5-1.5 mm, cylindrical, downy, white. Sp 7-9.5 x 4.5-6 μm , ovoid to ellipsoid, with eccentric germ pore; pileocystidia 40-150 x 14-24 μm , lageniform with tapering neck. On sawdust, etc.; spring to late autumn; rare in suba., few records from NO (LC, Oppl, Troms). – Lud 93.39.
C. pyrranthes (Romagn.) Redhead, Vilgalys & Moncalvo (*Coprinus p.* Romagn.)
- Without velar spherocysts on the cap 21
21. Sp Q = 1.1-1.4. Cap 10-15(-30) mm, subcylindrical, later conical to convex, becoming radially grooved, deer brown to cinnamon, paler towards margin; gills medium spaced to distant; stem 50-90 x 0.2-1 mm, cylindrical or widened downwards, downy, white. Sp 8.5-10.5 x 6.5-8.5 μm , broadly ovoid, with eccentric germ pore; pileocystidia 40-70(-90) x 9-16 μm , lageniform with tapering neck; sclerocystidia scanty, lageniform with acute neck; without velar spherocysts. On branches; rare in temp.; DK (DD), SE.
C. eurysporus (M. Lange & A.H. Sm.) Redhead, Vilgalys & Moncalvo (*Coprinus e.* M. Lange & A.H. Sm.)
- Sp Q = 1.5-2 22
22. Cheilocystidia in majority spherical. Cap 6-18 x 4-12 mm, narrowly ellipsoid or ovoid, later convex to expanded, becoming radially grooved, at first reddish brown, later discolouring greyish from the margin; gills medium spaced to distant, not strongly deliquescent; stem 25-65 x 0.5-2 mm, cylindrical or widened downwards, downy, white. Sp 9.5-13 x 5.5-7 μm , ellipsoid to ovoid, with eccentric germ pore (fig. 565D); pileocystidia 60-150(-200) x 6-25 μm , lageniform with tapering neck; sclerocystidia usually present, lageniform with acute neck; without velar spherocysts. On soil, twigs or wood chips; spring to late autumn; occasional in temp.-hemib.; DK (DD), FI (DD), NO (LC), SE (LC). – Bol Bres 46:16, Lud 93.22, ZM 56:24.
C. callinus (M. Lange & A.H. Sm.) Vilgalys, Hopple & Jacq. Johnson var. *callinus* (*Coprinus c.* M. Lange & A.H. Sm.)
var. *limicola* Uljé differs in smaller frb and grows (sub)solitary, and smaller pileo- and caulocystidia. Very rare in hemib.; NO (STr: Trondheim).
- Cheilocystidia in majority lageniform with tapering neck 23
23. Neck of pileocystidia distinctly tapering, 3-6 μm broad at apex see *C. impatiens* 19
- Neck of pileocystidia cylindrical to slightly tapering, 5-10 μm broad at apex see *C. subimpatiens* 30
24. With velar spherocysts or cylindrical velar elements on the cap 25
- Without velar spherocysts or cylindrical velar elements on the cap 27
25. With velar spherocysts on the cap; mostly occurring in very large numbers. Cap 6-15 x 6-15 mm high, ovoid to convex, becoming radially grooved, buff, later grey towards margin; gills medium spaced to distant, finally black and not deliquescent; stem 15-40 x 0.5-2.5 mm, cylindrical or widened downwards, downy, hyaline to greyish white. Sp 6.5-9.5 x 4-6 μm , ellipsoid to ovoid or amygdaloid (fig. 565E), with central germ pore; pileocystidia 50-200 x 15-24 μm , lageniform with cylindrical neck. On and near deciduous stumps or buried wood; spring to autumn; very common in temp.-hemib., common in southern bore., rare in



Spores, sclerocystidia and pileocystidia: A: *Coprinellus sclerocystidiosus*, B: *C. plagioporus*, C: *C. subpurpureus*, D: *C. subimpatiens*, E: *C. subdisseminatus*.

middle bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:272, Lud 93.42, Phil 260a, R&H 427, Ves 295, ☉.

C. disseminatus (Pers.: Fr.) J.E. Lange (*Coprinus d.* (Pers.: Fr.) Gray)

- With cylindrical velar elements on the cap; mostly not in very large numbers 26

26. Cheilocystidia 20-45 x 9-13 μm , lageniform. Cap up to 10 x 8 mm, ovoid to conical, later expanded, becoming radially grooved, reddish brown, later more sordid brown; gills medium spaced to distant, finally black and slowly deliquescent; stem 20-50 x 0.5-1.5 mm, cylindrical, downy, whitish. Sp 8.5-10(-12) x 5-6 μm , ovoid to ellipsoid, with central to slightly eccentric germ pore (fig. 565F); pileocystidia 50-110 x 11-20 μm , lageniform with subclavate neck; veil of cylindrical elements. On soil and mossy branches; spring to autumn; rare in temp.; SE. – B&K 4:282, End 395, Lud 93.40, RdM 48:56.

C. heterothrix (Kühner) Redhead, Vilgalys & Moncalvo (*Coprinus h.* Kühner)

- Cheilocystidia 15-70 x 15-40 μm , ellipsoid to subglobose or broadly cylindrical. Cap 10-20 mm high, conical, soon bell-shaped to expanded, grey to buff, pruinose, becoming radially grooved; gills medium spaced, finally black and \pm deliquescent; stem 35-65 x 1-2 mm, cylindrical, downy, whitish. Sp 10.5-13.5 x 6.5-8 x 6-7 μm , ellipsoid to ovoid, with eccentric germ pore; pileocystidia 65-115 x 10-30 μm , lageniform with cylindrical neck; veil of cylindrical, somewhat diverticulate elements. On sawdust, small pieces of wood and soil, on composts and in greenhouses; summer to autumn; rare in hemib., only known from FI (DD, U). – BKMP 5:80, Lud 93.41.

C. velatopruinatus (Bender) Redhead, Vilgalys & Moncalvo (*Coprinus v.* Bender)

27. With numerous brown sclerocystidia on the cap (fig. 567A). Cap 6-22 x 4-16 mm, ellipsoid to ovoid, later expanded, becoming radially grooved, buff, paler towards margin; gills medium spaced to distant; stem 20-100 x 1-3(-4) mm, cylindrical, downy, white. Sp 10.5-14 x 6.5-8.5 μm , ellipsoid to ovoid, with eccentric germ pore; pileocystidia 40-120 x 8-16 μm , lageniform with cylindrical neck; sclerocystidia lageniform with a narrow neck; without velar spherocysts. On soil and wood chips, mostly fasciculate; summer to autumn; rare in temp.-hemib.; DK (DD), FI (DD, U), SE (LC, Gbg). – RdM 31:251, ZM 56:40.

C. sclerocystidiosus (M. Lange & A.H. Sm.) Vilgalys, Hopple & Jacq. Johnson (*Coprinus s.* M. Lange & A.H. Sm.)

- Sclerocystidia rare or absent 28

28. Some pileocystidia with a capitate neck (fig. 567B). Cap 4-12 x 3-5 mm, ovoid to ellipsoid,

later bell-shaped, becoming radially grooved; yellowish brown to reddish brown, discolouring greyish from the margin; gills medium spaced to distant, slightly deliquescent; stem 20-60 x 0.5-1 mm, cylindrical, downy, hyaline to white. Sp 10.5-14 x 6-7.5 μm , ellipsoid to ovoid, with eccentric germ pore; pileocystidia lageniform; without velar spherocysts. On small twigs, sawdust, compost, leaves, etc.; spring to autumn; rare in temp.-hemib.; DK (DD), FI (LC), NO (LC, Oslo, Vestf: Re), SE (NE, Sk). – Lud 93.26, M&J *Coprinus* 22, RdM 31:253.
C. plagioporus (Romagn.) Redhead, Vilgalys & Moncalvo (*Coprinus p.* Romagn.)

- Pileocystidia with a \pm cylindrical to subclavate neck 29
- 29. Cap purplish brown or purplish grey, sometimes paler towards margin; cheilocystidia spheropedunculate. Cap 8-15 x 7-12 mm, ovoid to ellipsoid, later convex to expanded, becoming radially grooved; gills medium spaced to distant; stem 40-100 x 1-2.5 mm, cylindrical, downy, whitish, later discolouring to brown with a purplish hue. Sp 9-14 x 5.5-8 μm , ellipsoid, with eccentric germ pore (fig. 567C); pileocystidia 45-100 x 7-14 μm , lageniform with a cylindrical to clavate neck; sclerocystidia rare; without velar spherocysts. On damp mull, leaves or compost; rare in temp.-bore.; DK (DD), FI (DD), NO (NE). – Lud 93.25.
C. subpurpureus (A.H. Sm.) Redhead, Vilgalys & Moncalvo (*Coprinus s.* A.H. Sm.)
- Cap buff to pale brown or reddish brown; at least some cheilocystidia lageniform 30
- 30. Cheilocystidia partly lageniform, partly spheropedunculate to ellipsoid. Cap 15-23 x 10-18 mm, ellipsoid to ovoid, later bell-shaped to expanded, becoming radially grooved, buff to reddish brown; gills medium spaced to distant, only slightly deliquescent; stem 25-100 x 1.5-3 mm, cylindrical, downy, white. Sp 9.5-14 x 6-8 μm , ellipsoid to ovoid, with \pm eccentric germ pore (fig. 567D); pileocystidia 60-120 x 13-24 μm , lageniform with cylindrical or tapering neck; sclerocystidia uncommon; without velar spherocysts. On soil, rotting litter, or buried pieces of wood; summer to autumn; occasional in temp., rare in hemib.-suba.; DK (LC), FI (LC), NO (LC, Oppl: Vågå), SE (LC). – End 400, Lud 93.23, RdM 31:255, ZM 48:80.
C. subimpatiens (M. Lange & A.H. Sm.) Redhead, Vilgalys & Moncalvo (*Coprinus s.* M. Lange & A.H. Sm.)
- Cheilocystidia lageniform. Cap 3-8 x 3-6 mm, convex to ovoid, later expanded, becoming radially grooved, buff to pale brown, later more greyish towards margin; gills medium spaced to distant, hardly deliquescent; stem 30-45 x 0.5-1.5 mm, cylindrical, downy, hyaline to white. Sp 9-13.5 x 5.5-6.5 μm , ellipsoid to ovoid, with a \pm eccentric germ pore (fig. 567E); pileocystidia 60-90(-120) x 10-22 μm , lageniform with a cylindrical neck; without sclerocystidia; without velar spherocysts. On soil, small twigs, etc., sometimes on burnt ground, often in humid places; summer to autumn; occasional in temp.-hemib.; DK (DD), FI (DD), SE (LC, Sk). – Lud 93.36, M&J *Coprinus* 5.
C. subdisseminatus (M. Lange) Redhead, Vilgalys & Moncalvo (*Coprinus s.* M. Lange)

Coprinopsis P. Karst.

JAN VESTERHOLT

Coprinus Pers. s. lato p.p.

Frb with blackish sp deposit, often short lived and/or deliquescent, in some species emerging from sclerotia. Cap conical, ovoid, convex, hemispherical or bell-shaped, later expanding with or without an umbo, often becoming radially grooved, dry, white, grey, yellow, buff, brown or black. Universal veil fibrillose, powdery or forming wool-like patches, white, grey, brown, buff, yellow, orange or red. Gills free, medium spaced to very crowded. Stem ± cylindrical, dry. Smell mostly indistinct, but in some species fetid or yeast-like. Taste insignificant or unknown. Sp deposit black.

Sp ellipsoid, ovoid, cylindrical, amygdaloid, citriform, rhomboid, subfusiform, subglobose or subangular, in some species broader in face view than in side view, and in such cases the spore size is given in three dimensions, with a central to slightly eccentric germ pore, smooth, less often verrucose, in some species with loosening perispore, dark brown to black. Basidia mostly 4-spored, less often 2- or 3-spored. Cheilocystidia present or absent, spheropedunculate, ellipsoid, ovoid, utriform, lageniform or cylindrical. Pleurocystidia present or absent, spheropedunculate, ellipsoid, ovoid, utriform, lageniform or cylindrical. Veil of ± globose elements, of chains of elongate elements or of branched, diverticulate elements. Pileipellis a cutis. Clamps present, less often absent.

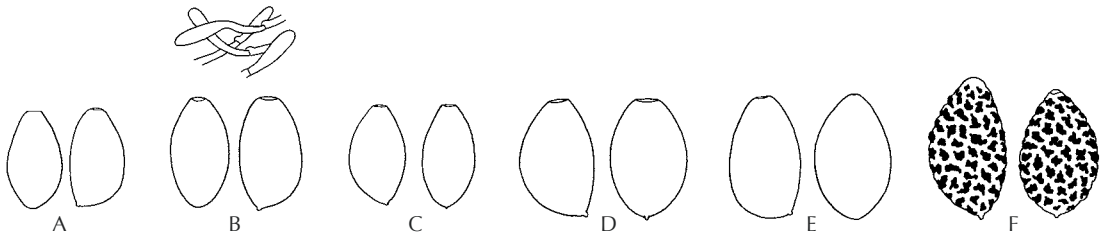
Saprotrophic. On soil, wood, stems, dung, vegetable refuse, burnt ground, etc. Spring to autumn.

57 species in the Nordic countries, 67 species in the key. Some species which morphologically fit in *Coprinopsis*, are placed here temporarily being, though their generic affinities still remain uncertain.

Lit.: Kits van Waveren 1968, Orton & Watling 1979, Uljé 1988, 1992, Uljé & Bas 1993, Uljé in Noordeloos et al. 2005, Uljé & Noordeloos 1993, 1997, 1999.

Main key

- | | | |
|----|--|---------------------|
| 1. | Veil forming small, tightly adhering scales on the cap | Key A p. 569 |
| - | Veil forming loosely attached powdery, granulose, fibrillose or wool-like patches on the cap | 2 |
| 2. | Veil of elongate elements, leaving fibrillose to wool-like patches on the cap | 3 |
| - | Veil of ± globose elements, sometimes in addition with ± cylindrical elements, appearing powdery to granulose on the cap | 4 |
| 3. | Veil of chains of elongate elements, leaving a fibrillose cover on the cap | Key B p. 570 |
| - | Veil of branched, diverticulate hyphae, leaving fibrillose to wool-like patches on the cap | Key C p. 573 |
| 4. | Elements with persistent warts not dissolving in HCl; sp with or without loosening perispore | Key D p. 577 |
| - | Elements of veil smooth or with crystal dissolving in HCl; sp without loosening perispore | Key E p. 580 |



Spores and veil elements: A: *Coprinopsis romagnesiana*, B: *C. atramentaria*, C: *C. acuminata*, D: *C. erythrocephala*, E: *C. ammophilae*, F: *C. insignis*.

Key A: Veil forming small, tightly adhering scales on cap

- 1. Sp verrucose, 11-14.5 x 7-8 μm (fig. 569F); veil whitish see *C. insignis* B4
 - Sp smooth, 8-11 x 4-6 μm ; veil orange brown to greyish brown 2
- 2. Veil orange brown, conspicuous on cap and lower half of the stem. Cap 30-40 x 30-45 mm, ellipsoid to conical, later expanding, grey to sepia; gills crowded, finally black and deliquescent; stem 60-95 x 5-15 mm, cylindrical or widened near the base, white. Sp 8-9.5 x 4.5-5.5 μm , ellipsoid, with central germ pore (fig. 569A). Caespitose near roots of old trees or stumps; spring to autumn; rare in temp.-hemib.; DK (DD), FI (DD), NO (NE), SE (LC). – C&D 775.
 - *C. romagnesiana* (Singer) Redhead, Vilgalys & Moncalvo (*Coprinus r.* Singer) 3
 - Veil brown, fugacious

3. Sp 8-11 x 5-6 μm (fig. 569B); unexpanded cap 30-60 x 30-70 mm. Cap conical to convex, later bell-shaped to expanded, grey; gills very crowded, finally black and deliquescent; stem 50-170 x 10-15 mm, cylindrical, smooth, with a fine ring zone in the lower part, white. Sp ellipsoid to amygdaloid, with central germ pore. Solitary or fasciculate around dead wood; spring to autumn; very common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:265, Däh 541, Phil 258ab, R&H 424, Ves 291, ☉.
C. atramentaria (Bull.: Fr.) Redhead, Vilgalys & Moncalvo (*Coprinus a.* (Bull.: Fr.) Fr.)
- Sp 8-10.5 x 4-5 μm (fig. 569C); unexpanded cap 10-35 x 10-25(-30) mm. Cap narrowly conical to ellipsoid with a small umbo, later expanded with upturned margin, grey, towards the centre more brown; gills very crowded, finally black and deliquescent; stem 20-70 x 3-7 mm, cylindrical or widened downwards, finely silky fibrillose, white. Sp ellipsoid to amygdaloid, with central germ pore. Mostly fasciculate on buried wood, sawdust or soil, rarely on dung; summer to autumn; occasional, but locally common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – End 389, Ger 01:351, Lud 93.2, R&H 424.
C. acuminata (Romagn.) Redhead, Vilgalys & Moncalvo (*Coprinus a.* (Romagn.) P.D. Orton)

Key B: Veil of chains of elongate elements, leaving a fibrillose covering on the cap

1. Veil with vivid colours, yellow, buff, yellow, orange or red 2
 - Veil white, brownish, greyish or pale buff 3
2. Veil yellow to buff yellow. Cap 10-40 x 8-20 mm, ovoid to conical, later expanded, at first pale grey; veil fibrillose, present on cap and stem base; gills crowded; stem 30-80 x 1.5-5.5 mm, widened downwards, sometimes rooting down to 12 mm, fibrillose, whitish to pale greyish; smell unpleasant, like dung. Sp 8.5-14 x 5.5-7.5 μm , ellipsoid to ovoid, with central germ pore; veil of chains of \pm fusiform, incrusting hyphae. Fasciculate or gregarious on soil, small pieces of wood or rotten roots of e.g. *Populus* and *Malus*; spring; rare in hemib.-southern bore.; FI (DD, U). – Lud 93.49, ZM 61:35.
C. ochraceolanata (Bas) Redhead, Vilgalys & Moncalvo (*Coprinus o.* Bas, *Coprinus citrinovelatus* E. Ludwig & P. Roux)
- Veil orange to red. Cap 10-20 x 5-9 mm, ellipsoid to ovoid, later expanded, orange brown to buff; veil fibrillose, present on cap and stem base; gills crowded, finally blackish and deliquescent; stem 35-80 x 1-4 mm, cylindrical, widened at base, whitish; smell indistinct. Sp 8-13 x 5-7.5 μm , ellipsoid to ovoid, with central germ pore (fig. 569D); veil of chains of \pm cylindrical, incrusting hyphae. Gregarious on twigs, sawdust, wood chips or vegetable refuse; spring to autumn; rare in temp., very rare in hemib.-southern bore.; DK (LC), FI (LC), NO (LC, Oslo), SE (LC). – Bon 271, C&D 773, FAD 157A (as *Coprinus dilectus*), Lud 93.53, ZM 54:48, ☉.
C. erythrocephala (Lév.) Redhead, Vilgalys & Moncalvo (*Coprinus e.* (Lév.) Fr.)
3. In sand dunes on dead leaves of *Ammophila arenaria*. Cap 5-15 x 3-13 mm, ellipsoid to ovoid, becoming bell-shaped, greyish buff to greyish brown; veil hairy-floccose, whitish to pale buff; gills crowded, finally black and deliquescent; stem up to 35 x 1.5-4 mm, \pm cylindrical with slightly widened base, white. Sp 8.5-12.5 x 6-9.5 x 6-8 μm , ellipsoid to ovoid, with central germ pore (fig. 569E); veil of chains of cylindrical to \pm ellipsoid elements. Summer to autumn; very rare in temp.; DK (NA, EJyl: Klitmøller). – C&D 777, Lud 93.54.
C. ammophilae (Courtec.) Redhead, Vilgalys & Moncalvo (*Coprinus a.* Courtec.)
- On wood, soil, burnt ground, dung, rotten straw, vegetable refuse or compost heaps 4
4. Sp verrucose (fig. 569F). Cap 40-150 x 20-70 mm, ovoid to conical, later expanded with upturned margin, whitish or grey, brownish around the centre; gills very crowded, finally black and deliquescent; stem 80-200 x 7-15 mm, cylindrical or slightly widened downwards, floccose, white; veil whitish. Sp 11-14.5 x 7-8 μm , amygdaloid, with central germ pore. On deciduous wood, often in wounds of living trees; summer to autumn; very rare in temp.-

hemib.; DK (VU), NO (Østf: Fredrikstad), SE (NT). – Cet 1286, Ger 01:353, Lud 93.8, M&H 4:296, M&J *Coprinus* 3.

C. insignis (Peck) Redhead, Vilgalys & Moncalvo (*Coprinus i.* Peck, *C. alopecia* Lasch s. auct.)
- Sp smooth 5

5. Basidia 2-spored 6
- Basidia 4-spored 7

6. On cow or horse dung; sp 9-12.5 x 6-8.5 μm , on av < 7.5 μm broad. Cap up to 8 x 5 mm, cylindrical to ellipsoid, later conical to bell-shaped, white, soon becoming grey to greyish brown; veil becoming hairy-fibrillose, white, later greyish to greyish brown; gills crowded; stem 30-50 x 1-1.5 mm, slightly widened downwards, whitish, hairy-flocculose. Sp ellipsoid to ovoid, with central germ pore; veil of chains of cylindrical to fusiform, ellipsoid or sub-globose elements. NL.

C. bicornis (Uljé & Horvers) Redhead, Vilgalys & Moncalvo (*Coprinus b.* Uljé & Horvers)

- On compost or sawdust; sp 9.5-14 x 7-10 μm , on av > 8 μm broad. Cap 5-20 x 3-14 mm, ellipsoid, later expanded, grey to greyish brown; veil fibrillose; gills very crowded; stem up to 100 x 2-5 mm, slightly widened downwards, with bulbous base, white. Sp broadly ellipsoid to ovoid, with central germ pore; veil of chains of cylindrical to fusiform or inflated elements. NL, UK.

C. scobicola (P.D. Orton) Redhead, Vilgalys & Moncalvo (*Coprinus s.* P.D. Orton)

7. Sp 14-23 x 9-14 μm , with strongly eccentric germ pore (fig. 573A). Cap 18-25 x 18-35 mm, ovoid with small, uplifted scales, later bell-shaped, becoming plane, white; gills medium spaced; stem 40-65 x 2-3.5 mm, with a small basal bulb, almost glabrous, white. Sp ellipsoid; basidia 4-spored, sometimes conspicuously brown pigmented; veil of chains of ellipsoid to fusiform elements. In dry, calcareous grassland; early summer; very rare in temp.; SE (Sk: Gyetorp).

Coprinus xerophilus Bogart

- Sp \leq 15 μm long, with central germ pore 8
8. On wood, soil or burnt ground 9
- On dung, rotten straw, vegetable refuse or compost heaps 13

9. On deciduous trees, typically emerging from wounds of living trees. Cap 15-50 x 11-30 mm, narrowly conical to ovoid, later expanded with upturned margin; veil fibrillose, white to greyish; gills crowded, finally black and deliquescent; stem 35-100 x 2-5 mm, cylindrical or widened to 8 mm at base, flocculose, white. Sp 8-11.5 x 6.5-8 x 5.5-7 μm , rhomboid-ellipsoid to subamygdaloid, with central germ pore; veil of chains of inflated, elongate elements. Solitary or subfasciculate; summer to autumn; rare in temp.-hemib.; DK (EN), FI (DD, V: Mietoinen), SE (LC). – Cet 53, 2175, Lud 93.48, Svp 20:81.

C. spelaiophila (Bas & Uljé) Redhead, Vilgalys & Moncalvo (*Coprinus s.* Bas & Uljé, *Coprinus extinctorius* (Bull.) Fr. s. auct.)

- On burnt ground, soil or wood chips 10
10. Sp on av > 10 μm long 11
- Sp on av < 10 μm long 12

11. Sp 10-14 x 6-8.5 μm (fig. 573B); veil hairy-fibrillose, rather abundant. Cap 10-35 x 7-20 mm, conical to narrowly ellipsoid, later expanded, white to greyish, sometimes brownish around the centre; veil white to grey, later brownish; gills crowded, finally black and deliquescent; stem 65-130 x 2-5 mm, cylindrical or widened to up to 8 mm at base, hairy flocculose, white. Sp ellipsoid to amygdaloid, with central germ pore; veil of chains of inflated, elongate elements. Solitary or subfasciculate on soil, wood chips, compost heaps or vegetable refuse, rarely on burnt ground; spring to autumn; very common in western temp., common in eastern temp.-bore., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:288, Däh 545,

Lud 93.52, Phil 259e, Ves 295, ☉.

C. lagopus (Fr.: Fr.) Redhead, Vilgalys & Moncalvo var. *lagopus* (*Coprinus l.* (Fr.: Fr.) Fr.)
Coprinus lagopus (Fr.: Fr.) Fr. var. *vacillans* Uljé differs in having a very fragile stem, bending down before the cap expands, and the habitat in lawns; very rare or overlooked in temp.-hemib.; DK, NO (Tel: Bamble), SE. – SMT 28(2).

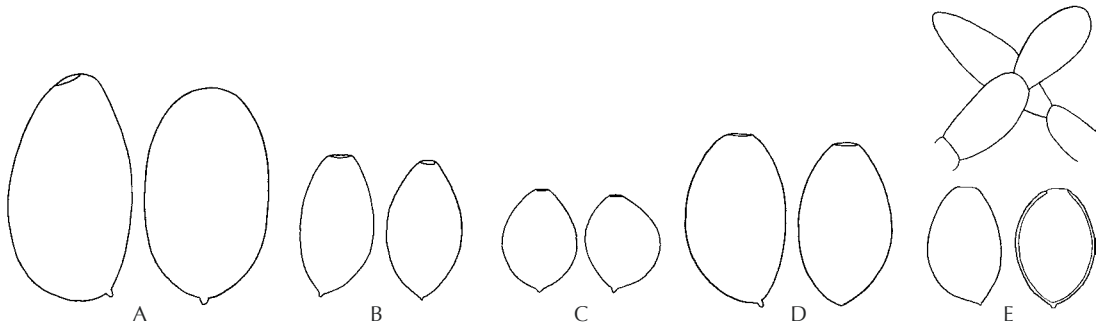
- Sp 9.5-14 x 6-7 μm ; veil thin and cobweb-like. Cap 8-20 x 4-7 mm, cylindrical to ellipsoid, later expanded, whitish to pale grey with dark brown centre; veil whitish to greyish; gills crowded, finally black and \pm deliquescent; stem 50-90 x 1-4 mm, cylindrical, pale greyish, flocculose, sometimes rooting. Sp ellipsoid to ovoid, with central germ pore; veil of short chains of \pm cylindrical elements. On soil or wood chips; *DE, NL.* – BKMP 3:216, Lud 93.47.
C. kriegsteineri (Bender) Redhead, Vilgalys & Moncalvo (*Coprinus k.* Bender)

- 12. Unexpanded cap up to 9 x 8 mm. Cap ellipsoid to conical, later expanded, white, later grey to greyish brown; veil fibrillose, white, later grey to greyish brown; gills crowded; stem 15-45 x 1-2 mm, slightly widened towards base, whitish. Sp 5.5-10.5 x 4.5-7 μm , ovoid to subrhomboid, with central germ pore; veil of chains of \pm inflated elements. Solitary or fasciculate on soil, wood chips, etc.; *NL.* – Bol Bres 46:18.
C. geesterani (Uljé) Redhead, Vilgalys & Moncalvo (*Coprinus g.* Uljé)
- Unexpanded cap 15-60 x 10-35 mm. Cap narrowly conical to ellipsoid, later expanded, white to greyish; veil fibrillose, white, later greyish brown; gills crowded, finally black and deliquescent; stem 30-110 x 3-12 mm, cylindrical or slightly widened at base, flocculose, white. Sp 6.5-9.5 x 6-8 μm , broadly ellipsoid to broadly ovoid, with central germ pore (fig. 573C); veil of chains of inflated, elongate elements. Solitary or subfasciculate on burnt ground, soil or wood chips, rarely indoors in cellars, etc.; spring to autumn; occasional, but locally common in temp.-bore., occasional in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:287, C&D 778, Lud 93.51, R&H 425, Phil 259d.
C. jonesii (Peck) Redhead, Vilgalys & Moncalvo (*Coprinus jonesii* Peck, *C. funarium* Métrod, *C. lagopides* P. Karst. 1882 non 1879)

- 13. Unexpanded cap 2-10 x 1-6 mm 14
- Unexpanded cap 10-50 x 4-30 mm 15

- 14. Sp 13.5-15 x 7.5-8.5 μm . Cap 2-10 x 1-6 mm, ellipsoid to ovoid, later expanded, greyish brown; veil fibrillose, whitish to pale grey; gills crowded, finally black and deliquescent; stem 20-50 x 0.5-1 mm, cylindrical or slightly widened at base, hairy flocculose, white. Sp ellipsoid, with central germ pore; veil of chains of \pm inflated, elongate elements. Solitary or subfasciculate on dung or soil-dung mixture; spring to late autumn; common in temp.-bore., rare in suba.; DK (LC), FI (LC), IS, NO, SE (LC). – Bon 271, Cet 876, FAD 158C, Lud 93.56.
C. radiata (Bolton: Fr.) Redhead, Vilgalys & Moncalvo (*Coprinus r.* (Bolton: Fr.) Fr.)
- Sp 7.5-9.5 x 5-5.5 μm . Cap up to 6 x 4 mm, ellipsoid to narrowly ovoid, later expanded, greyish brown; veil fibrillose, whitish to pale grey; gills crowded; stem 20-50 x 0.5-1 mm, slightly widened downwards, minutely hairy flocculose, whitish. Sp ellipsoid to subcylindrical, with central germ pore; veil of chains of inflated, elongate elements. Solitary or fasciculate on dung of horse and elk or on soil-dung mixture; spring to autumn; rare in temp.-arc./alp.; FI (LC), IS (Mi), NO (LC), SE (LC).
C. pseudoradiata (Watling) Redhead, Vilgalys & Moncalvo (*Coprinus p.* Watling)

- 15. Sp on av \geq 8.2 μm broad (fig. 573D). Cap 10-30 x 4-18 mm, narrowly ellipsoid to \pm cylindrical, later expanded with upturned margin, pale to dark greyish brown; veil fibrillose, pale grey to greyish brown; gills crowded, soon black and deliquescent; stem 40-150 x 2-7 mm, cylindrical or slightly widened at base, hairy flocculose, whitish. Sp 12-17 x 8-10 μm , ellipsoid to ovoid, with central germ pore; veil of chains of \pm inflated, elongate elements. Solitary or fasciculate on mixed dung, rotten hay or vegetable refuse; spring to autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FO, IS, NO (LC), SE (LC). – FAD 158B, Jo13(3), Lud



Spores and veil elements: A: *Coprinus xerophilus*, B: *Coprinopsis lagopus*, C: *C. jonesii*, D: *C. macrocephala*, E: *C. cinerea*.

93.55, Phil 257f, Svp 36 cover, ☉.

C. macrocephala (Berk.) Redhead, Vilgalys & Moncalvo (*Coprinus m.* (Berk.) Berk.)

- Sp on av $\leq 7.8 \mu\text{m}$ broad

16


16. Sp on av $\geq 11.3 \mu\text{m}$ long see *C. lagopus* 10

- Sp on av $\leq 10.6 \mu\text{m}$ long (fig. 573E). Cap 10-30 x 6-20 mm, narrowly ovoid to ellipsoid, later expanded, greyish brown; veil fibrillose, white, later greyish to brownish; gills crowded, finally black and deliquescent; stem 40-120 x 2-6 mm, cylindrical or widened towards base, sometimes rooting, hairy flocculose, white; smell faint like coumarin. Sp 8.5-12 x 6-8 μm , ellipsoid to ovoid, with central germ pore; veil of chains of elongate, \pm inflated elements. Solitary or fasciculate on dung, mixed dung, rotten hay or vegetable refuse; spring to autumn; common in temp.-bore., occasional in suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:269, C&D 779, FAD 158G (as *Coprinus fimetarius*), Ger 01:355, Lud 93.57.

C. cinerea (Schaeff.: Fr.) Redhead, Vilgalys & Moncalvo (*Coprinus c.* (Schaeff.: Fr.) Gray)

Key C: Veil of branched, diverticulate hyphae, leaving fibrillose-woolly patches

1. Stem 4-15 mm wide 2
 - Stem 0.3-4 mm wide 6
2. On sclerotia in dung. Cap up to 18 x 13 mm, globose to ellipsoid, later conical to bell-shaped, white, later pale to dark greyish brown, finally black; veil breaking up into patches, white; gills very crowded, finally black and deliquescent; stem up to 120 x 5-6 mm, slightly widened downwards, with a bulbous base, white; sclerotia 10-35 x c. 10 mm, subglobose to elongate or irregular, very dark brown. Sp 13.5-17.5 x 10.5-12.5 x 9-10.5 μm , rounded angular in face view, ellipsoid to cylindrical in side view, with central, hardly visible germ pore; veil of thin-walled, filamentous to diverticulate elements. *DE, NL*. – Lud 93.94, Mic Due 539. *C. sclerotiorum* (Horvers & de Cock) Redhead, Vilgalys & Moncalvo (*Coprinus s.* Horvers & de Cock)
 - Not on sclerotia 3
3. Sp rounded 4-angular with an apical papilla. Cap 20-30 x 10-18 mm, obtusely conical to convex, later expanded, white, later greyish; veil breaking up into patches, white, often somewhat yellow brown at centre; gills crowded, finally black and deliquescent; stem up to 95 x 5-9 mm, with a 8-15 mm broad, bulbous base, silky striate, white. Sp 8-10.5 x 6-9 x 5-6.5 μm , with central germ pore; veil of thin-walled, slightly diverticulate elements. Among leaves of deciduous trees, rarely on old fire-places; late summer to autumn; rare in temp.-hemib.; FI (DD, V: Korppoo), NO (LC, Tel: Bamble), SE. – B&K 4:276, Bol Bres 40:41, Lud 93.87. *C. episcopalis* (P.D. Orton) Redhead, Vilgalys & Moncalvo (*Coprinus e.* P.D. Orton)

- Sp ellipsoid to ovoid 4
- 4. Sp 7-9 x 4.5-6 μm ; fasciculate on deciduous wood. Cap 15-40 x 10-25 mm, ellipsoid to ovoid, later bell-shaped to expanded, greyish to ochraceous brown; veil breaking up into patches, white to cream or sordid yellow at centre; gills very crowded, finally black and slightly deliquescent; stem up to 120 x 4-10 mm, \pm cylindrical, white to pale yellowish, with scattered veil remnants. Sp ellipsoid to ovoid, with central germ pore; veil of thin-walled, slightly diverticulate elements. In the area found on wood of *Fagus*; summer; very rare in hemib.; NO (Østf: Rygge). – Bol Bres 44:7, 10, Lud 93.86, RdM 43:316.
C. strossmayeri (S. Schulz.) Redhead, Vilgalys & Moncalvo (*Coprinus* s. S. Schulz.)
- Sp $\geq 10 \mu\text{m}$ long; solitary on soil in forests or dry grassland 5
- 5. Sp 14-19 x 9.5-13 μm (fig. 577A); in deciduous forests on rich, often calcareous soil, especially with *Fagus*. Cap 50-80 x 30-40 mm, ovoid to narrowly ellipsoid, later bell-shaped to expanded, greyish brown to black; veil breaking up into patches, sordid cream to buff; gills very crowded, finally black and deliquescent; stem 90-300 x 5-15 mm, slightly widened downwards, flocculose, white; smell unpleasant, like scatol. Sp ellipsoid to ovoid, with central germ pore; veil of thin-walled, diverticulate elements. Autumn; common in temp., rare in hemib.; DK (LC), NO (VU), SE (LC). – B&K 4:297, Lud 93.50, Phil 259c, R&H 425, Ves 291, .
C. picacea (Bull.: Fr.) Redhead, Vilgalys & Moncalvo (*Coprinus* p. (Bull.: Fr.) Gray)
- Sp 10-12.5 x 6.5-8.5 μm ; in the area found on living and rotten wood of *Fraxinus*. Cap 15-40 x 10-25 mm, ellipsoid to ovoid, buff to brown; veil breaking up into patches, whitish to greyish buff; gills very crowded, finally black and deliquescent; stem up to 120 x 4-10 mm, slightly widened downwards, flocculose, white to greyish white. Sp ellipsoid to ovoid, with central germ pore; veil of thin-walled, diverticulate elements. Outside the area recorded from dry calcareous grassland and coniferous forests; autumn; very rare in hemib.; FI (EN). – End 399, Lud 93.85, Myc 7:87, OPN 4A, ZM 54:64.
C. stangliana (Enderle, Bender & Gröger) Redhead, Vilgalys & Moncalvo (*Coprinus* s. Enderle, Bender & Gröger)
- 6. On dung 7
- Not on dung, but sometimes on substrates mixed with dung 10
- 7. Veil with thick-walled, ascending elements and thin-walled, diverticulate elements. Cap about 6 x 4 mm, rounded conical, later expanding; veil breaking up into small hairy-floccose scales, white, but at centre often sepia; gills crowded; stem up to 30 x 0.5-1 mm, cylindrical, minutely fibrillose-floccose, whitish. Sp 8.5-13.5 x 6-9 μm , ellipsoid or ovoid, with central germ pore. On dung of various herbivores; summer; very rare in suba.; FO.
C. vermiculifer (Dennis) Redhead, Vilgalys & Moncalvo (*Coprinus* v. Dennis)
- Veil only with thin-walled or slightly thick-walled, diverticulate elements 8
- 8. Sp 6.5-8.5 x 5-6.5 μm , cylindrical, 4-angled in face view. Cap 7-10 x 4-5.5 mm, subglobose to ellipsoid or ovoid, white, later grey; veil hairy-floccose, white to grey; gills crowded, finally black and deliquescent; stem up to 100 x 1-1.5 mm, cylindrical with a somewhat clavate base, whitish. Sp with central germ pore; veil of thin-walled, diverticulate elements. On dung of various herbivores; autumn; very rare in temp.-suba.; FI (DD), FO, NO (LC), SE (LC). – Lud 93.84.
C. filamentifer (Kühner) Redhead, Vilgalys & Moncalvo (*Coprinus* f. Kühner)
- Sp 9.5-14.5 x 5-8 μm , ellipsoid 9
- 9. Cap sulphur to lemon yellow when young. Cap 8-18 x 6-16 mm, ellipsoid to ovoid, later expanding; veil fibrillose-scurfy, yellow; gills crowded, finally black, not or slightly deliquescent; stem up to 60 x 1-1.5 mm, widened to 2-3 mm at base, hyaline or slightly brownish. Sp 9.5-12 x 5.5-7 μm , ellipsoid to amygdaloid, with central germ pore; veil of slightly thick-walled, diverticulate elements. On dung; summer; very rare in temp.; SE (Sk: Immeln).

– Lud 93.91, RdM 48:326.

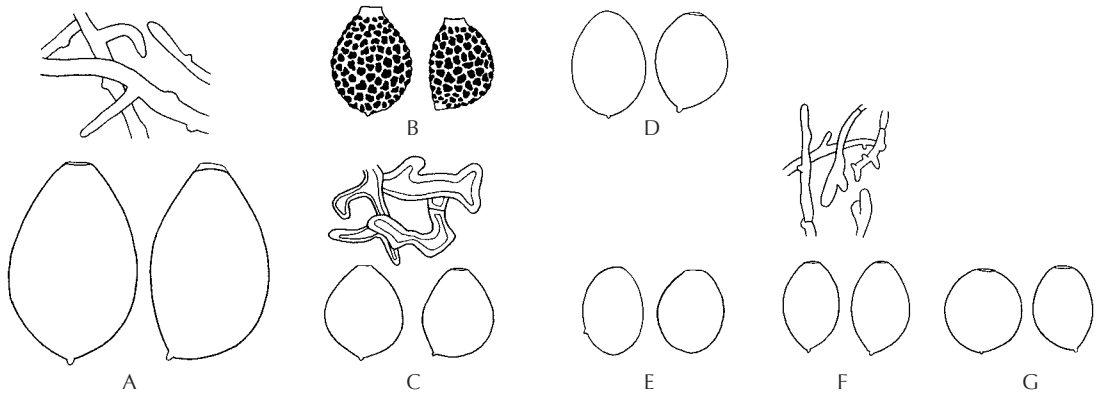
C. luteocephala (Watling) Redhead, Vilgalys & Moncalvo (*Coprinus l.* Watling)

- Cap white when young. Cap 2-7(-14) x 2-4(-8) mm, subglobose, ellipsoid or ovoid, later expanding, white, often with clay-coloured centre, later greyish; veil hairy-floccose, whitish; gills crowded, finally black and deliquescent; stem up to 40 x 0.3-2(-2.5) mm, cylindrical, flocculose, watery white. Sp 9.5-14.5 x 5-8 μm , ellipsoid, with central germ pore; veil of thin-walled, diverticulate elements. On cow and elk dung; spring to autumn; very rare in hemib.-southern bore.; FI (LC), NO (LC). – Lud 93.97.

C. xenobia (P.D. Orton) Redhead, Vilgalys & Moncalvo (*Coprinus x.* P.D. Orton)

- | | | |
|-----|--------------|----|
| 10. | Sp verrucose | 11 |
| - | Sp smooth | 12 |
11. Sp citriform to amygdaloid (fig. 577B). Cap 10-20 x 5-10 mm, ovoid, later expanded, white to greyish; veil fibrillose, white to grey; gills crowded, finally black and deliquescent; stem 40-100 x 1-4 mm, cylindrical or slightly widened at base, white. Sp 8.5-12 x 6-8 μm , with central germ pore; veil of thin-walled, diverticulate elements. On trunks, branches and twigs, often in connection with guano, waste from mussel industries, etc.; summer to autumn; rare in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:274, Ger 01:353, Lud 93.10, Svp 20:64, ZM 45:25, ☉.
- C. echinospora* (Buller) Redhead, Vilgalys & Moncalvo (*Coprinus e.* Buller)
- Sp citriform to amygdaloid. Cap 5-20 x 3-15 mm, ovoid to ellipsoid, later expanded, white, soon turning greyish; veil hairy-fibrillose, white to grey; gills crowded, finally black and deliquescent; stem up to 80 x 1-3 mm, cylindrical or slightly clavate, whitish. Sp 7.5-11 x 5.5-8 μm , with central germ pore; veil of thin-walled, diverticulate elements. On branches, once in FI recorded on partridge dung; very rare in hemib.-southern bore.; FI (DD, V: Parainen, EH: Tammela). – B&K 4:274, Ger 01:353, Lud 93.9, Svp 20:64, ZM 45:25, ☉.
- C. phlyctidiospora* (Romagn.) Redhead, Vilgalys & Moncalvo (*Coprinus p.* Romagn., *C. lagopides* P. Karst. 1879 non 1882)
- | | | |
|-----|---|----|
| 12. | Veil elements partly with > 0.5 μm thick walls | 13 |
| - | Veil elements with < 0.5 μm thick walls | 18 |
13. Veil elements partly with walls > 2 μm thick (fig. 577C). Cap 3-8 x 2-6 mm, conical, ellipsoid or ovoid, later expanded, whitish with a buff centre; veil breaking up into patches, cream to buff; gills crowded, finally dark brown and strongly deliquescent; stem 10-35 x 0.5-1.5 mm, cylindrical with a clavate base, flocculose at base, white to greyish white. Sp 6-9.5 x 5.5-8 μm , broadly ovoid to slightly rhomboid, with central germ pore; veil of diverticulate elements. On grasses and herbs; summer to autumn; very common in temp., occasional in hemib.-suba.; DK (LC), FI (LC), FO, IS (Na), NO (LC), SE (LC). – C&D 781, End 395, Lud 93.100, M&J Coprinus 7, ☉.
- C. friesii* (Quél.) P. Karst. (*Coprinus f.* Quél., *C. rhombisporus* P.D. Orton)
- | | | |
|---|--|----|
| - | Veil elements with walls up to 1.5(-2) μm thick | 14 |
|---|--|----|
- | | | |
|-----|-------------------|----|
| 14. | Sp Q on av > 1.25 | 15 |
| - | Sp Q on av < 1.25 | 16 |
15. Veil on cap dark brown. Cap 4-7 x 3-7 mm, ovoid to ellipsoid, later expanded, whitish with a sepia centre; veil breaking up into woolly scales; gills crowded; stem 15-60 x 1-2 mm, cylindrical or slightly widened at base, flocculose at base, greyish white. Sp 5.5-10.5 x 4-8 μm , broadly ovoid to broadly ellipsoid, with central to slightly eccentric germ pore (fig. 577D); veil of thick-walled, diverticulate elements. On dead stems of *Phragmites*, *Carex*, etc.; summer to autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (DD), NO (LC), SE (Sk). – B&K 4:304, OPN 5D, Sienil 42:50.
- C. tigrinella* (Boud.) Redhead, Vilgalys & Moncalvo (*Coprinus t.* Boud.)

- Veil on cap white to buff. Cap 5-10 x 3-8 mm, ellipsoid to ovoid or conical, later expanding, whitish with a pale brown to buff centre; veil breaking up into patches; gills crowded, finally black, not deliquescent; stem up to 60 x 1-2 mm, cylindrical, flocculose at base, white to greyish white. Sp 6-10 x 5-8 μm , broadly ovoid to broadly ellipsoid, with central germ pore; veil of thick-walled, diverticulate elements. On wood, grasses and herbs; summer to autumn; very rare in temp.; SE (Sk). – Lud 93.98.
C. pseudofriesii (Pilát & Svrček) Redhead, Vilgalys & Moncalvo (*Coprinus p.* Pilát & Svrček)
- 16. Sp with a c. 3 μm broad germ pore. Cap 10-20 x 8-15 mm, globose to broadly ellipsoid or ovoid, later expanding, white, later grey with a buff centre; veil fibrillose to woolly-felty, white to buff; gills very crowded, finally brownish black and strongly deliquescent; stem 40-80 x 2.5-3.5 mm, cylindrical or widened downwards, with a bulbous base, minutely fibrillose, white to slightly brownish. Sp 7.5-9.5 x 7-9.5 μm , subglobose to rounded 4-angled in face view, with a central to slightly eccentric germ pore; veil of thick-walled, diverticulate and thick-walled, ascending elements. On soil and saw dust; early summer to autumn; rare in temp.-hemib.; FI (DD), NO (NE), SE (LC). – BCat 112, Jordst 18(3), Lud 93.89.
C. spilospora (Romagn.) Redhead, Vilgalys & Moncalvo (*Coprinus s.* Romagn.)
- Sp with c. 1-1.5 μm broad germ pore 17
- 17. Sp distinctly broader in face view than in side view, with eccentric germ pore (fig. 577E); pleurocystidia 10-30 μm broad. Cap 5-15(-20) x 3-12 mm, subglobose to ellipsoid or ovoid, white; veil forming velvety, buff coloured patches, mostly around centre; gills crowded, finally dark brown and deliquescent; stem up to 120 x 0.5-2 mm, cylindrical, almost glabrous, white to greyish white. Sp 5.5-8 x 4.5-7 x 4.5-6 μm , subcircular in face view, broadly ellipsoid in side view; veil of thick-walled, diverticulate elements. On plant remains, mainly of *Fabaceae*; summer; very rare or overlooked in temp.-southern bore.; DK (LC), FI (LC), NO (LC, Vestf: Nøtterøy and Tjøme), SE (Sk). – Ger 01:355, Lud 93.99.
C. phaeospora (P. Karst.) P. Karst. (*Coprinus p.* P. Karst.)
- Sp not distinctly broader in face view than in side view, with a central to slightly eccentric germ pore; pleurocystidia 25-40 μm broad. Cap 8-10 x 4-5 mm, cylindrical to ellipsoid or ovoid, later conical, whitish with a buff centre; veil breaking up into felty scales, buff; gills crowded; stem up to 60 x 1-1.5 mm, cylindrical, white to greyish white. Sp 5-7 x 4.5-6 μm , short ovoid, truncate, with central to slightly eccentric germ pore; veil of thick-walled, diverticulate elements. On grasses and herbs; NL.
C. xantholepis (P.D. Orton) Redhead, Vilgalys & Moncalvo (*Coprinus x.* P.D. Orton)
- 18. Sp $Q_{av} > 1.25$ 19
- Sp $Q_{av} < 1.25$ 20
- 19. Sp 7-10 x 4.5-6 μm , $Q_{av} = 1.55-1.7$; on deciduous wood. Cap 5-12 x 4-9 mm, ellipsoid to ovoid, later expanded, white to greyish; veil breaking up into hairy scales, white; gills crowded; stem 20-40 x 1-1.5 mm, cylindrical or widened at base, flocculose, white to greyish white. Sp ellipsoid to ovoid, with central germ pore; veil of thin-walled, diverticulate elements. DE, NL. – Pers 15:364.
C. goudensis (Uljé) Redhead, Vilgalys & Moncalvo (*Coprinus g.* Uljé)
- Sp 5.5-9 x 4.5-6.5 μm , $Q_{av} = 1.25-1.45$ (fig. 577F); on grasses and herbs, rarely on wood. Cap 3-8 x 2-4 mm, ovoid to conical, later expanded, white; veil breaking up in small, woolly-hairy scales, white; gills crowded, finally black and deliquescent; stem 5-40 x 0.2-1 mm, cylindrical, white, flocculose at base. Sp ellipsoid to ovoid, with central germ pore; cheilocystidia 30-65 x 10-14 μm , utriform to conical; veil of thin-walled, diverticulate elements. Summer to autumn; common in temp., occasional in hemib.-southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:306, Cet 1724, Lud 93.95, M&J Coprinus 11, Sienil 42:49.
C. urticicola (Berk. & Broome) Redhead, Vilgalys & Moncalvo var. *urticicola* (*Coprinus u.* (Berk. & Broome) Buller)
var. *salicicola* Uljé & Noordel. differs in having a dark grey cap when young. NL.



Spores and veil elements: A: *Coprinopsis picacea*, B: *C. echinospora* (veil elements $\times 600$), C: *C. friesii*, D: *C. tigrinella*, E: *C. phaeospora*, F: *C. urticicola* var. *urticicola*, G: *C. gonophylla*.

20. Young cap whitish; on burnt ground, sandy or clayey soil, rarely in flower-pots. Cap 4-15(-20) \times 3-12 mm, globose to ellipsoid or conical, later convex, white; veil breaking up into patches, white, becoming brownish; gills crowded, finally black and deliquescent; stem 20-65 \times 0.5-3 mm, cylindrical or slightly widened at base, flocculose, whitish. Sp 6-8.5 \times 5.5-8 \times 5-6.5 μm , broadly ovoid to subcircular in face view, ellipsoid in side view, with central germ pore (fig. 577G); veil of thin-walled, diverticulate elements. Summer; occasional in temp.-hemib., rare or overlooked in southern-middle bore.; DK (LC), FI (LC), SE. – B&K 4:278, Lud 93.92, Mic Due 381.

C. gonophylla (Quél.) Redhead, Vilgalys & Moncalvo (*Coprinus* g. Quél.)

- Young cap buff to dark grey brown or sepia; on soil, dead stems or rotten straw 21
21. Young cap buff to grey brown; on dead stems or rotten straw. Cap 3-6(-10) \times 2.5-5(-8) mm, subglobose to ellipsoid or ovoid, later expanded, becoming greyish; veil flocculose; gills crowded; stem up to 30 \times 0.5-1.5 mm, with a bulbous base, flocculose, white. Sp 7-11.5 \times 6-10.5 μm , subglobose to broadly ellipsoid, with central to slightly eccentric germ pore; veil of thin-walled, diverticulate elements. Summer to autumn; rare in temp.-bore.; FI (DD), NO (LC, Vestf: Tønsberg, Tjøme), SE (NA, Sk). – Jordst 23(1):69, Lud 93.96.

C. kubickae (Pilát & Svrček) Redhead, Vilgalys & Moncalvo (*Coprinus* k. Pilát & Svrček)

- Young cap dark grey brown to sepia; in lawns or on naked soil. Cap 3-6 \times 2-5 mm, subglobose to ovoid, late expanded; veil breaking up into small, hairy flocks, sepia, paler grey to almost white; gills crowded, finally black and slightly deliquescent; stem up to 30 \times 0.5-1 mm, cylindrical, greyish white. Sp 7-10 \times 6.5-9 \times 6.5-8 μm , subcircular in face view, broadly ellipsoid in side view, with central germ pore; veil of thin-walled, sparsely diverticulate elements. Summer to autumn; very rare in hemib., only two records from NO (Tel: Bamble, STr: Trondheim).

C. epichloea (Uljé & Noordel.) Redhead, Vilgalys & Moncalvo (*Coprinus* e. Uljé & Noordel.)

Key D: Veil with \pm globose elements with persistent warts not dissolving in HCl

1. Basidia in majority 2- or 3-spored 2
- Basidia in majority 4-spored 4
2. Basidia in majority 3-spored; smell fetid; sp 7-10 \times 4.5-6 μm (fig. 579A). Cap 5-18 \times 7-8 mm, ovoid to ellipsoid or cylindrical, later convex to expanded, becoming radially grooved, whitish, often greyish to clay buff at centre; veil powdery to floccose, white; gills finally black and deliquescent; stem 10-25 \times 2-3.5 mm, base widened to 3.5-4.5 mm, white to grey-

ish. Sp ellipsoid to ovoid, with central germ pore, with \pm loosening perispore; veil of globose to ellipsoid, verruculose elements and cylindrical elements. On dung of horse, cow or elk, sometimes on rotting straw, rarely on soil; spring to summer; rare in temp., occasional in hemib.-bore.; DK (NA, EJyl: Randers), FI (LC), NO, SE (LC). – Lud 93.66, ZM 56:40.


C. trispora (Kemp & Watling) Redhead, Vilgalys & Moncalvo (*Coprinus t.* Kemp & Watling)

- Basidia 2-spored; smell yeast-like or insignificant; sp $> 11 \mu\text{m}$ long 3
3. Sp 15-18 \times 8-10 μm ; smell yeast-like. Cap 7-15 \times 5-7 mm, ovoid, later conical to expanded, becoming radially grooved, pale grey; veil powdery to flocculose, grey, at centre to clay buff; gills finally black and slowly deliquescent; stem 24-62 \times 1-2 mm, \pm cylindrical, whitish to hyaline-greyish. Sp ellipsoid to ovoid, with central germ pore, sometimes with slightly loosening perispore; veil of globose to ellipsoid or pyriform, verruculose elements and fusiform to cylindrical elements. On naked soil or in grass; spring to autumn; very rare in hemib.-suba.; FO, NO (LC, AA: Arendal, STR: Malvik), SE (Sk). – B&K 4:300, Lud 93.64.

Coprinus saccharomyces P.D. Orton

- Sp 11-15 \times 7-9 \times 5.5-7 μm ; smell insignificant. Cap 11-22 \times 8-20 mm, ellipsoid to ovoid or conical, later expanded, becoming \pm radially grooved, pale grey; veil powdery to granulose, grey to buff; gills crowded, finally black and slowly deliquescent; stem 60-100 \times 1-6 mm, cylindrical or widened downwards, white to pale grey. Sp ellipsoid to amygdaloid, tapering towards apiculus, with loosening perispore; veil of globose to ellipsoid, verruculose elements and fusiform to cylindrical elements. On soil or litter, sometimes in grass; rare in hemib.-suba.; FI (DD), NO (LC). – B&K 4:268, Lud 93.62A.

C. cinereofloccosa (P.D. Orton) Redhead, Vilgalys & Moncalvo (*Coprinus c.* P.D. Orton)

4. Sp 6-8 \times 3.5-4.5 μm (fig. 579B). Cap 1-12 \times 0.5-4 mm, ovoid to ellipsoid, later expanded, becoming radially grooved, white to greyish; veil powdery, white to grey or clay buff; gills finally black and \pm deliquescent; stem 10-40 \times 0.5-1 mm, cylindrical, sometimes slightly widened and hairy at base, hyaline to whitish. Sp ellipsoid to cylindrical or slightly phaseoliform, perispore rarely slightly loosening, with \pm central germ pore; veil of \pm globose, verruculose elements and \pm branching, diverticulate hyphae. On dung; autumn; common in temp.-bore.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:303, FAD 159C, Lud 93.67, RdM 32:121, .

C. stercorea (Fr.) Redhead, Vilgalys & Moncalvo (*Coprinus s.* Fr., *C. velox* Godey s. auct.)

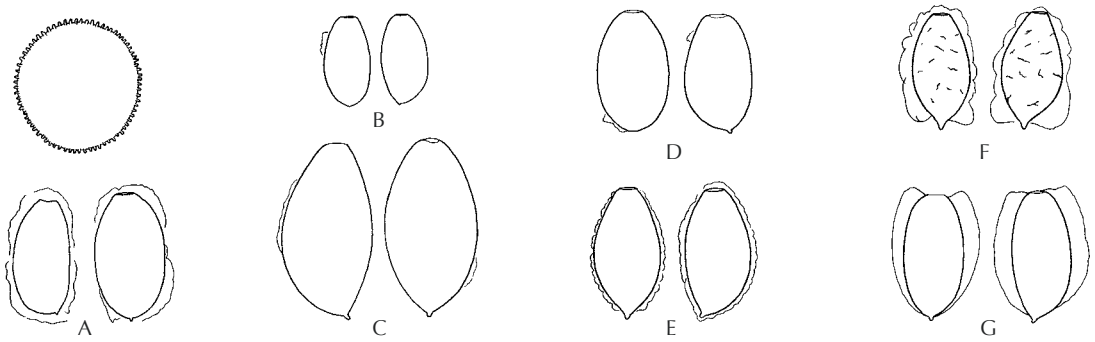
- Sp $> 8 \mu\text{m}$ long 5
5. Sp on av $> 7.5 \mu\text{m}$ broad 6
- Sp on av $< 7.5 \mu\text{m}$ broad 7

6. On remnants of *Juncaceae* or *Cyperaceae*, often in inundated habitats; smell faint. Cap 5-22 \times 3-8 mm, ovoid to cylindrical, later expanding, becoming radially grooved, grey; veil powdery, grey; gills crowded, finally black and deliquescent; stem 32-60 \times 1.5-2 mm, cylindrical with widened base, pale grey; smell insignificant. Sp 13-17 \times 7.5-8.5 μm , ellipsoid to amygdaloid, with loosening perispore and central germ pore (fig. 579C); veil of globose to ellipsoid, verruculose elements and branching, often diverticulate hyphae. Spring to autumn; occasional in temp.-arc./alp.; DK (DD), FI (DD), FO, IS, NO (LC), SE (LC). – B&K 4:293, Lud 93.65.

C. martinii (P.D. Orton) Redhead, Vilgalys & Moncalvo s.l. (*Coprinus m.* P.D. Orton)

Note: there is a considerable variation in spore size, and more than one species may be involved.

- On compost heaps, soil or dung; smell strong, gas-like. Cap 10-30 \times 7-25 mm, cylindrical to ovoid, later expanded, becoming radially grooved, grey to brownish grey; veil powdery to floccose, grey; gills crowded, finally black and deliquescent; stem 30-80 \times 1.5-3 mm, cylindrical, sometimes slightly widened at base, rooting, whitish. Sp 13-17 \times 8.5-10.5 μm , ellipsoid to amygdaloid, tapering towards apiculus, with slightly loosening perispore, with central germ pore; veil of \pm globose, verruculose elements and \pm cylindrical hyphae. On compost



Spores and veil elements (x 600): A: *Coprinopsis trispora*, B: *C. stercorea*, C: *C. martinii*, D: *Coprinus tuberosus*, E: *Coprinopsis narcotica*, F: *C. laanii*, G: *C. semitalis*.

heaps, soil or dung; rare in temp.-hemib.; DK (DD), NO (LC), SE (Sk). – Lud 93.60.

C. radicans (Romagn.) Redhead, Vilgalys & Moncalvo (*Coprinus r.* Romagn.)

7. Sp with rounded base (fig. 579D) 8
 - Sp tapering towards apiculus (figs 579E-G) 9
8. Unexpanded cap 3-22 x 2-11 mm; frb emerging from up to 15 mm broad sclerotia; stem often rooting; smell faint or like raw potatoes. Cap narrowly ellipsoid to ± cylindrical, later expanded with upturned margin, pale grey, slightly darker around the centre; veil powdery, grey; gills crowded, finally black and deliquescent; stem 10-90 x 1-4 mm, cylindrical, finely downy, white or whitish. Sp 8-11 x 5-6.5 μm, ellipsoid, with central germ pore, sometimes with loosening perispore (fig. 579D); veil of globose to ellipsoid, verruculose elements and ± cylindrical hyphae. On dung, dung-soil mixture or rotten straw, sometimes in flower-pots; all year; occasional in temp.-southern bore.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 4:305, FAD 159A, Lud 93.61, M&J *Coprinus* 12, RdM 33:68, ☉.
Coprinus tuberosus Qué. (*C. sclerotiger* Watling, *C. stercorarius* (Bull.) Fr. s. auct.)
 - Unexpanded cap 1-4 x 0.5-2 mm; frb not emerging from a sclerotia; stem not rooting; smell strong, fetid. Cap ellipsoid to ± cylindrical, later expanded, becoming radially grooved pale grey; veil forming powdery to flocculose, grey or tinged buff; gills finally black and slowly deliquescent; stem 28-60 x 0.2-0.5 mm, cylindrical, pale grey. Sp 9-11 x 5.5-6 μm, ellipsoid, with slightly loosening perispore and central germ pore; veil of ± globose, verruculose elements and filamentous hyphae. On dung; spring to autumn; very rare in temp.-hemib.; NO (Østf: Fredrikstad), SE (Lc, Bl: Olofström). – Lud 93.63.
Coprinus foetidellus P.D. Orton
9. Smell strong and fetid; on compost heaps, soil, dung, etc. Cap 8-15 x 5-10 mm, ellipsoid to ovoid, later expanded, becoming radially grooved, pale to dark grey; veil powdery, whitish grey; gills crowded; stem 15-70 x 1.5-3 mm, cylindrical, sometimes slightly widened at base, whitish. Sp 11-13.5 x 5.5-7 μm, ellipsoid to amygdaloid, tapering towards apiculus, with loosening perispore, with central germ pore (fig. 579E); veil of ± globose, verruculose elements and branching hyphae. Summer to autumn; rare in temp.-bore.; DK (LC), FI (DD), NO (LC), SE (LC). – Bon 273, Däh 551, FAD 159D, M&H 4:310, Phil 259f.
C. narcotica (Batsch: Fr.) Redhead, Vilgalys & Moncalvo (*Coprinus n.* (Batsch: Fr.) Fr.)
 - Smell pleasant or insignificant; on wood on soil 10
10. Sp with lines and dots (fig. 579F); on stumps, wood chips, sawdust, etc. Cap 5-22 x 3-12 mm, ellipsoid, later convex to bell-shaped or expanded, becoming radially grooved, pale grey to grey; veil powdery, grey; gills crowded, finally black and ± deliquescent; stem 20-55 x 1-4

mm, cylindrical, sometimes slightly widened at base, hyaline to greyish. Sp 10-11.5 x 5-6 μm , ellipsoid to amygdaloid, tapering towards apiculus, with strongly loosening perispore, with central germ pore; veil of globose to ovoid, verruculose elements and branching, often diverticulate hyphae. Autumn; rare in temp.; DK (LC), SE (LC, Sk). – B&K 4:286, C&D 765, Lud 93.68, OPN 4D, Svp 20:82.

C. laanii (Kits van Wav.) Redhead, Vilgalys & Moncalvo (*Coprinus l.* Kits van Wav.)

- Sp without lines or dots (fig. 579G); on soil in forests and in open land. Cap 13-22 x 6-10 mm, ovoid, later expanded, whitish to grey; veil powdery, grey to buff or pale sepia; gills crowded; stem 50-100 x 1.5-3 mm, cylindrical, sometimes slightly widened at base, hyaline to greyish. Sp 10.5-13.5 x 6.5-8 x 4.5-5.5 μm , ellipsoid to amygdaloid, tapering towards apiculus, with strongly loosening perispore, with central germ pore; veil of globose to ellipsoid, verruculose elements and branching, often diverticulate hyphae. Spring to autumn; rare in temp.-bore.; DK (LC), FO, NO (LC), SE (LC). – B&K 4:301, Lud 93.62B, ☉.

C. semitalis (P.D. Orton) Redhead, Vilgalys & Moncalvo (*Coprinus s.* P.D. Orton)

Key E: Veil with \pm globose elements which are smooth or with crystals dissolving in HCl

1. Basidia 2-spored 2
 - Basidia 4-spored 4
2. Sp 13.5-16.5 x 12.5-15.5 x 8.5-10 μm . Cap up to 30 x 18 mm, ellipsoid to hemispherical, later conical to plane or with upturned margin, white; veil powdery to \pm scaly, grey to creamy grey, to sepia at top of scales; gills crowded, finally black and deliquescent; stem up to 110 x 4 mm, widened downwards, floccose, whitish. Sp citriform in face view, ellipsoid in side view, with \pm eccentric germ pore; veil of \pm globose elements. On cow dung; autumn; rare in hemib.-bore.; FI (LC), NO (LC, Nordl: Træna), SE (LC). – Lud 93.71, OPN 5B, Phil 259g.

C. pachysperma (P.D. Orton) Redhead, Vilgalys & Moncalvo (*Coprinus p.* P.D. Orton)

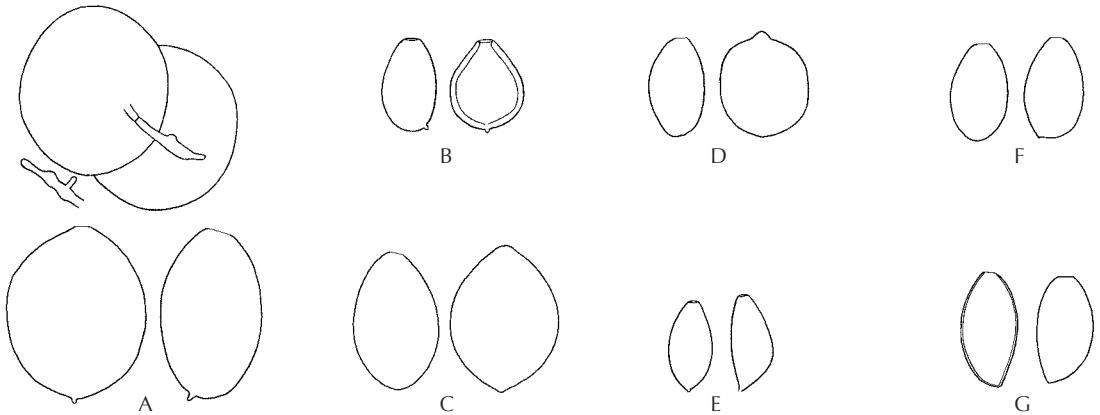
 - Sp < 11.5 μm long 3
3. Sp ellipsoid to ovoid or amygdaloid; in scrubs or lawns. Cap up to 12 x 9 mm, hemispherical to ellipsoid, later expanded; veil powdery, white; gills crowded, finally black and deliquescent; stem up to 80 x 2.5 mm, gradually widened towards base, whitish-hyaline to pale brownish. Sp 7.5-10.5 x 6-8 x 5-7 μm , with central germ pore; veil of \pm globose elements. *DE, NL*. – End 392, Lud 93.81, RdM 40:203, 48:53, ZM 56:24.

Coprinus bellulus Uljé

 - Sp \pm 5-angled in face view; on dung see *C. cordisporus* 10
4. Sp on av > 12 μm long 5
 - Sp on av < 12 μm long 6
5. Sp \pm citriform in face view, 12-19 x 11-15.5 x 7.5-9 μm (fig. 581A). Cap 15-30 x 9-17 mm, ellipsoid to ovoid or narrowly conical, later bell-shaped to plane with upturned margin, white; veil powdery to \pm scaly, white; gills crowded, finally black and deliquescent; stem 30-100 x 1-4 mm, widened towards base, white. Sp ellipsoid in side view, with central germ pore; veil of \pm globose elements. On dung, especially of horse and cow; summer to autumn; common in temp.-hemib., occasional in bore.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:289,295, Lud 93.78, Phil 259h, R&H 427, Ves 294, ☉.

C. nivea (Pers.: Fr.) Redhead, Vilgalys & Moncalvo (*Coprinus n.* (Pers.: Fr.) Fr., *Coprinus latissporus* P.D. Orton)

 - Sp \pm 6-angled in face view, 9.5-15.5 x 6.5-8.5 x 7-7.5 μm . Cap up to 20 x 13 mm, ellipsoid, later convex to plane, white; veil powdery, white; gills crowded, soon black and deliquescent; stem up to 100 x 3-5 mm, widened towards base, white. Sp ellipsoid in side view, with \pm central germ pore; veil of globose or subglobose elements. On horse or cow dung and rotting straw; spring to autumn; rare in temp.-southern bore.; FI (LC), SE (LC). – Cet 1719, End



Spores and veil elements (x 600): A: *Coprinopsis nivea*, B: *Coprinus ephemeroides*, C: *Coprinopsis pseudonivea*, D: *Coprinus cordisporus*, E: *Coprinopsis coniophora*, F: *Coprinus cortinatus*, G: *C. candidatus*.

392, Ger 01:355, Lud 93.80, M&J *Coprinus* 16, ☉.

C. cothurnata (Godey) Redhead, Vilgalys & Moncalvo (*Coprinus c.* Godey)

6. Stem with a ring. Cap 3-7 x 1.5-3 mm, cylindrical to ovoid, later bell-shaped to plane or with upturned margin, becoming radially grooved, whitish grey; veil powdery, yellowish to pale pinkish brown; gills medium spaced, finally black, but mostly not deliquescent; stem 15-70 x 0.5-1.5 mm, cylindrical, sometimes slightly widened and hairy at base, hyaline to whitish. Sp 6-9 x 5.5-8 x 4.5-5 μm , citriform to 5-angled in face view, ellipsoid in side view, with central germ pore (fig. 581B); veil of \pm globose elements. On dung, especially horse and elk dung; all year; occasional in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – BCat 1007, FAD 159H, Lud 93.69, M&H 4:311, M&J *Coprinus* 7, ☉.

Coprinus ephemeroides (DC.: Fr.) Fr.


- Stem without a ring 7
- 7. Sp \pm pyriform, citriform or 5-angled in face view 8
- Sp ellipsoid to cylindrical, ovoid, amygdaloid or subfusiform 11
- 8. Sp \pm pyriform to heart-shaped in face view. Cap up to 7 x 4 mm, cylindrical to ellipsoid, later expanded, becoming radially grooved, white; veil powdery, cream to pinkish buff; gills rather crowded; stem up to 35 x 0.5-1 mm, cylindrical with a slightly widened base, hyaline-white. Sp 5.5-8.5 x 5-6.5 x 3.5-4.5 μm , ellipsoid in side view, with central germ pore; veil of globose to ellipsoid elements. On compost heaps or dung; DE, NL.

Coprinus cardiasporus Bender

- Sp citriform to 5-angled in face view 9
- 9. Unexpanded cap 12-20 x 6-12 mm; sp citriform to bluntly 5-angled in face view. Cap ellipsoid, later conical to plane with upturned, splitting margin, white; veil powdery, white to greyish; gills crowded, finally black and deliquescent; stem 50-120 x 3-5 mm, widened towards base, white; smell aromatical. Sp 9-12.5 x 7.5-11.5 x 6-8 μm , ellipsoid in side view, with \pm central germ pore (fig. 581C); veil of \pm globose elements. On cow dung and compost heaps; summer to autumn; occasional, but locally common in temp.-hemib.; DK (NA), SE (LC). – Lud 93.79, SMT 28(2):14.

C. pseudonivea (Bender & Uljé) Redhead, Vilgalys & Moncalvo (*Coprinus p.* Bender & Uljé)

- Unexpanded cap up to 12 x 6 mm; 5-angled in face view 10

10. Some cheilocystidia utriform; on dung of various animals. Cap 4-12 x 3-6 mm, ellipsoid, later conical to expanded, becoming radially grooved, whitish to pale buff; veil powdery, pale pinkish brown; gills finally black, mostly not deliquescent; stem 15-60 x 1-2 mm, cylindrical, smooth, hyaline to white. Sp 7-11.5 x 6.5-10 x 5-7 μm , 5-angled in face view, ellipsoid in side view, with central germ pore (fig. 581D); veil of globose to ellipsoid elements. Autumn; common in temp.-hemib., occasional in suba.; DK (LC), FO, IS, NO (LC), SE (LC). – B&K 4:296, FAD 159E, M&J *Coprinus* 5, ZM 52:128.
Coprinus cordisporus T. Gibbs (incl. *C. patouillardii* Quél. s. auct. p.p.)
- All cheilocystidia spheropedunculate to ellipsoid; on compost heaps. Cap up to 5 x 4 mm, cylindrical to ellipsoid or hemispherical, later expanded, becoming radially grooved, whitish to grey; veil powdery, pale pinkish brown; gills crowded; stem up to 50 x 0.5-1 mm, cylindrical, hyaline-white. Sp 6-9 x 6-8 x 3.5-5 μm , \pm 5-angled in face view, ellipsoid in side view, with central germ pore; veil of globose to ellipsoid elements. Spring to autumn; occasional in temp.-bore.; DK (LC), NO (LC), SE (LC). – Lud 93.70, M&J 15.
Coprinus patouillardii Quél.
11. On soil or wood 12
- On dung 14
12. Sp 6.5-9 x 4-5 μm , amygdaloid to subfusiform (fig. 581E); veil dark greyish brown. Cap up to 7 x 5 mm, hemispherical to ellipsoid, later expanded, white; veil powdery; gills crowded, not deliquescent; stem up to 30 x 0.5-1 mm, cylindrical with widened base, whitish-hyaline, often brownish flocculose. Sp with central germ pore; veil of globose to ellipsoid or fusiform elements. On and around stumps of deciduous trees; summer to autumn; rare in temp.-hemib.; DK (DD, SJ: Fakse Kalkværk), NO (LC). – Lud 93.72, M&J *Coprinus* 17.
C. coniofhora (Romagn.) Redhead, Vilgalys & Moncalvo (*Coprinus* c. Romagn.)
- Sp on av \geq 5 μm broad, ellipsoid to ovoid; veil white to cream 13
13. Without differentiated cheilocystidia; sp Q_{av} = 1.4-1.6 (fig. 581F). Cap up to 6 x 5 mm, hemispherical to ellipsoid, later expanded, white with a cream to pale buff centre; veil powdery, white; gills medium spaced, finally black, slightly deliquescent or not; stem up to 40 x 0.5-1 mm, cylindrical, sometimes with small basal bulb, whitish-hyaline. Sp 6-9.5 x 4.5-6 μm , ellipsoid to ovoid, with central germ pore; veil of \pm globose elements. On naked soil, dung or among grass and moss; summer to autumn; occasional in temp.-hemib., rare in southern-middle bore.; DK (LC), FI (DD), SE (LC). – C&D 771, FAD 159B, Lud 93.82, M&J *Coprinus* 16, SMT 28(2):10, .
- Coprinus cortinatus* J.E. Lange
- With clavate to utriform, ellipsoid or spheropedunculate cheilocystidia; sp Q_{av} = 1.7-1.9 (fig. 581G). Cap up to 8 x 6 mm, hemispherical to ovoid, later expanded, whitish; veil powdery to floccose; gills crowded; stem up to 50 x 1.5 mm, cylindrical or widened towards base, whitish, often whitish flocculose. Sp 7.5-11.5 x 4.5-6 μm , ellipsoid, with central germ pore; veil of \pm globose elements. On soil, old cow dung or among twigs; summer; rare in temp.-hemib. and suba. in IS; DK (DD), IS (Su), NO (LC, Tel: Bamble), SE (LC).
Coprinus candidatus Uljé
14. Sp on av \geq 7.5 μm long 15
- Sp on av \leq 7.5 μm long 16
15. Young cap and veil white see 13
- Young cap and veil grey. Cap up to 5 x 3 mm, ellipsoid to cylindrical, later expanded or with upturned margin, whitish to greyish; veil powdery to hairy-floccose; gills medium spaced, finally blackish and slowly deliquescent; stem up to 20 x 0.5 mm, cylindrical with small basal bulb. Sp 7.5-9.5 x 5-6 μm , ellipsoid, with central germ pore; veil of cylindrical to fusiform and \pm globose elements. On dung, especially of cow; spring to autumn; rare in temp.; DK (LC), SE (NE). – Lud 93.102, M&J *Coprinus* 15, RdM 40:207.
Coprinus poliomallus Romagn.

16. Unexpanded cap up to 13 x 3-8 mm. Cap ellipsoid to cylindrical, later expanded, becoming radially grooved, whitish, becoming brown; veil powdery, grey to brown; gills crowded; stem up to 50 x 1-2 mm, cylindrical, sometimes slightly widened and hairy at base, whitish to greyish. Sp 6-7.5 x 4-5 x 4-4.5 μm , ellipsoid to broadly cylindrical, with central germ pore; veil of \pm globose elements. On dung; rare in hemib.-southern bore.; FI (DD).
C. utrifer (Watling) Redhead, Vilgalys & Moncalvo (*Coprinus u.* Watling)
- Unexpanded cap up to 0.3-4 x 0.2-2.5 mm. Cap globose to subglobose or ellipsoid, later expanded, becoming radially grooved, at first white; veil powdery, white; gills medium spaced, finally black and deliquescent; stem up to 20 x 0.1-0.7 mm, cylindrical, whitish, sub-transparent. Sp 6-7.5(-8) x 3.5-4.5(-5) μm , ellipsoid to ovoid, with central germ pore; veil of \pm globose elements. On dung; spring to autumn; rare in temp.-hemib.; NO (Østf: Fredrikstad), SE. – Lud 93.83.
Coprinus pseudocortinatus Cacialli, Caroti & Doveri

Coprinus Pers.

JAN VESTERHOLT

Frb whitish, soon with black, deliquescent gills. Cap cylindrical to ellipsoid or ovoid, later bell-shaped to expanded with upturned margin, scaly, dry, white with buff yellow centre, deliquescent. Gills free, crowded to very crowded. Stem \pm cylindrical or widened downwards, with a basal bulb, dry, whitish. Veil forming a loose, narrow ring on the lower part of the stem. Smell indistinct. Taste indistinct. Sp deposit black.

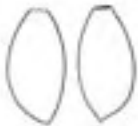
Sp ellipsoid to ovoid or amygdaloid, with central to slightly eccentric germ pore, smooth, at first pink, but soon dark reddish brown to black. Basidia 4-spored. Cheilocystidia ellipsoid to ovoid, oblong, utriform or subcylindrical. Pleurocystidia absent. Pileipellis a cutis to a trichoderm. Clamps absent, but clamp-like structures sometimes present.

Saprotrophic. On soil or dung. Early summer to autumn.

2 species in the Nordic countries.

Molecular studies (Hopple & Vilgalys 1999) have shown that the genus belongs to the *Agaricaceae*, whereas most of the former species in the genus now are placed in *Coprinellus*, *Coprinopsis* and *Parasola* in *Psathyrellaceae*.

Lit.: Orton & Watling 1979.



Spores: *Coprinus comatus*.

1. On soil; sp 10-13 \times 6.5-8 μ m (fig. 533C). Cap 40-150 \times 20-70 mm, at first narrowly ovoid to cylindrical, later bell-shaped, smooth at centre, outwards fibrillose and breaking up into scales, white, tinged buff at centre; gills very crowded, first white, then pink and finally black and deliquescent; stem 50-300 \times 10-25 mm, widened downwards, with a basal bulb, smooth, white, with a loose, narrow ring. Sp ellipsoid to amygdaloid, with central to slightly eccentric germ pore. In open land, often in lawns, stubble-fields and other fertilized areas, less often in forests, often in large groups; summer to autumn; very common in temp.-bore., occasional in suba.-arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:270, C&D 772, Däh 542-543, Phil 257de, Ves 290, ⊙. – Edible.
C. comatus (O.F. Müll.: Fr.) Pers.
- On dung and rotting plant debris; sp 16-23 \times 11-14 μ m. Cap 20-60 \times 15-30 mm, narrowly ovoid, later bell-shaped to expanded with upturned margin, scaly, white with yellowish buff centre; gills crowded, strongly deliquescent; stem 60-150 \times 3-10 mm, widened downwards, with a basal bulb, smooth, white, upper part turning brown, with a loose, narrow ring. Sp ellipsoid to ovoid, with a slightly eccentric germ pore. Rare in temp.-bore.; DK (DD), FI (LC), NO (LC), SE (LC). – Bon 271, FAD 157F, Lud 93.3, MHK 4:293, ⊙.
C. sterquilinus (Fr.: Fr.) Fr.

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Key E, section *Brunnei*, *Cinnabarini*, *Colymbadini*, *Disjungendi* and *Uracei* [p. 734](#)

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Key K, section *Acetosi* and *Obtusi* [p. 755](#)

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Key M, section *Renidentes* [p. 762](#)

Key N, section *Hinnulei* and *Safranopedes* [p. 762](#)

Key O, section *Incrustati*, *Helvelloides*, *Paleacei* and *Saniosi* [p. 764](#)

Key P, section *Hydrocybe* [p. 770](#)

Key Q, section *Anthracini* [p. 775](#)

Key R, section *Fulvoescentes* and *Laeti* [p. 776](#)

A note on the pdf-links

The key to *Cortinarius* is divided into a main key to the subgenera and secondary keys to the sections and groups. In this pdf-version we have linked down this hierarchy to the sections. To go back up there are two arrows at the base of each page, the large linking to the main key, the small to the start of the keys to the sections of the present subgenus.

Cortinarius (Pers.) Gray

TUULA NISKANEN, ILKKA KYTÖVUORI,
 EGIL & KATRIINA BENDIKSEN, TOR ERIK BRANDRUD,
 TOBIAS GULDBERG FRØSLEV, KLAUS HØILAND,
 THOMAS STJERNEGAARD JEPPESEN, KARE LIIMATAINEN & HÅKAN LINDSTRÖM

Frb mycenoid, collybioid or tricholomatoid, with rusty sp-deposit and fugacious veil. Cap (5-)20-140(-200) mm, usually convex to low convex, silky smooth to rarely scaly, dry to glutinous, hygrophanous or not. Gills emarginate or adnate, variously coloured when young, soon becoming brown. Stem usually cylindrical, clavate or abruptly bulbous. Universal veil present, in some species very sparse, white, yellow, red, blue, greenish, brownish or blackish. Partial veil cobweb-like, remains often as loose threads on upper part of stem, becoming cinnamon brown from the fallen sp. Smell indistinct or significant, often best observed in gills, sometimes in flesh, gills and flesh may have a different smell. Flesh variously coloured. KOH reaction on surface or flesh is an important character, especially in subgen. *Phlegmacium*. Taste mild, sometimes bitter, seldom farinaceous. Since a few *Cortinarius* species are toxic, even in only small quantities, tasting them is not recommended for beginners. Sp deposit cinnamon brown to fulvous.

Sp subglobose, ellipsoid, amygdaloid, citriform or fusiform, weakly to strongly verrucose, without a germ pore, pale ochre fulvous to rusty, in most species dextrinoid. Marginal cells often basidiiform, rarely with true cheilocystidia, but cheilocystidia prominent in some few species. Pleurocystidia mostly absent. Pileipellis a cutis or an ixocutis, subpellis present or not. Clamps present, rarely absent.

Ectomycorrhizal, on soil, in association with trees and shrubs, one *Dermocybe* species reported to grow with *Carex*; often late summer to autumn. *C. orellanus*, *C. rubellus* and possibly also *C. splendens* are deadly poisonous, some slightly poisonous, e.g. species in sect. *Dermocybe*, some edible and some good for dyeing.

Cortinarius is the biggest genus of *Agaricales*, and many species are still very poorly known or not known at all. Based on recent phylogenetic studies it is assumed that at least 900 species occur in the Nordic countries, but many are poorly known, 369 species in the key. The infrageneric classification of *Cortinarius* will change during the coming years, but here the classification in subgenera largely follows Brandrud et al. 1989.

Lit.: Bidaud et al. 1992, 1993, 1994ab, 1995, 1996, 1997, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, Brandrud et al. 1989, 1992, 1994, 1998, Consiglio et al. 2003, 2004, 2005, 2006, Moëgne-Loccoz et al. 1990ab, 1991, Moser 1983, Soop 2006.

Key to subgenera

1. Universal veil forming on stem a distinct, protruding ring which comes off easily. Cap 50-130 mm, hemispherical, then low convex to almost plane, sometimes with a low and broad umbo, often radially wrinkled and rimy at the centre, pale ochraceous brown, sometimes with violet tints, not hygrophanous; gills crowded to medium spaced, first pale greyish, later brownish; stem 70-150 x 10-20 mm, cylindrical, dirty whitish fibrillose, often with zigzag pattern above the ring; universal veil whitish or sometimes pale violet; flesh whitish; smell weak, pleasant; taste mild. Sp 12-13.5 x 7-8(-8.5) μm , citriform (fig. 663A), moderately to fairly strongly verrucose, fairly strongly dextrinoid; gill trama hyphae smooth, some with granulose contents. In coniferous forests with *Picea* and *Pinus*, in deciduous forests with *Fagus* or *Quercus*, in subalpine forests with *Betula*, and in alpine areas with *B. nana*; late summer to autumn; common, locally very common in hemib.-arc./alp., but rare in IS, rare in temp.; DK (vu), FI (lc), IS, NO (lc), SE (lc). – Lud 78.1, Nyl 521, R&H 524, Sieniop 250, Ves 343, ☉.
C. caperatus (Pers.: Fr.) Fr. (*Rozites caperatus* (Pers.: Fr.) P. Karst.)
 - Universal veil indistinct or forming girdles or zones on the stem 2
2. Cap viscid to glutinous when moist 3
 - Cap dry or faintly viscid when moist 4
3. Stem viscid to glutinous, often cylindrical or tapering at base subgen. *Myxaciium* p. 672
 - Stem dry, often with bulbous base subgen. *Phlegmacium* p. 680
4. Taste \pm bitter in cap cuticle; cap whitish, ochraceous to greyish ochraceous subgen. *Myxaciium* p. 672
 - Taste mild in cap cuticle; cap white to yellowish, brown or black 5
5. KOH-reaction yellow subgen. *Phlegmacium* p. 680
 - KOH-reaction different, not yellow 6
6. Cap and stem with bright colours: red, yellow, orange, olive, green or dark violet subgen. *Cortinarius* p. 662
 - Cap and stem without bright colours, but can be very blue, or the stem may have bright coloured universal veil belts subgen. *Telamonia* p. 721

Subgen. *Cortinarius* TUULA NISKANEN, ILKKA KYTÖVUORI & KLAUS HØILAND

Cap and stem dry. Frb entirely dark violet, or with bright colours: red, yellow, orange, olive or green, sometimes in gills only. Cap 20-110 mm, often tomentose or scaly, often not hygrophanous. Universal veil brightly coloured and most often also mycelium. Smell indistinct, raphanoid, like cedar-tree or iodoform. Sp subglobose, ellipsoid or amygdaloid.

31 species included in the key, but the real number of the species in the Nordic countries is not known.

1. Frb dark violet, fleshy; cap usually 50-110 mm; sp > 11 μm long; true cheilo- and pleurocystidia present Key A sect. *Cortinarius* p. 663
 - Frb not dark violet; cap 10-100 mm; sp usually < 11 μm long; only with small, basidioform marginal cells 2
2. Cap 10-60(-70) mm, not or only slightly hygrophanous; young gills bright orange, yellow or red; sp ellipsoid to amygdaloid Key D sect. *Dermocybe* p. 667
 - Cap (20-)40-100 mm, hygrophanous or not; young gills white, yellowish white, brownish yellow, olivaceous or reddish brown, but not bright; sp subglobose, amygdaloid, ellipsoid or fusiform 3



Spores: A: *Cortinarius caperatus*, B: *C. violaceus*, C: *C. hercynicus*, D: *C. cotoneus*.

- | | | |
|-----|---|--|
| 3. | Sp broadly ovoid to subglobose | 4 |
| - | Sp amygdaloid, ellipsoid or fusiform | 7 |
| 4. | Frb olivaceous green, olivaceous yellow to yellowish brown | Key B sect. <i>Veneti</i> p. 664 |
| - | Frb yellow, yellowish red to red brown | 5 |
| 5. | Universal veil absent or very thin; cap 20-60 mm; sp 6-7 x 4.5-5.5 μm , subglobose | <i>see Telamonia key M, sect. <i>Renidentes</i> p. 762</i> |
| - | Universal veil present; cap usually 30-110 mm; sp usually bigger | 6 |
| 6. | Smell indistinct, like raw potatoes, faintly of cedar wood, a just extinguished candle or warm iron or faintly raphanoid; universal veil yellow to orange; with deciduous or coniferous trees | Key C sects <i>Limonii</i>, <i>Orellani</i> & <i>Humicolae</i> p. 665 |
| - | Smell strong, raphanoid or earthy; universal veil usually white, sometimes yellow, rarely bright orange; with deciduous trees | <i>see Telamonia key N, sect. <i>Hinnulei</i> etc. p. 762</i> |
| 7. | Flesh staining distinctly yellow when cut, initially whitish; sp on av < 4.5 μm wide | <i>see C. rubicundulus</i> p. 715 |
| - | Flesh not staining yellow when cut, initially \pm brownish; sp on av > 4.5 μm wide | 8 |
| 8. | Whole frb cinnabar red | <i>see C. cinnabarinus</i> p. 736 |
| - | Whole frb not cinnabar red | 9 |
| 9. | Stem < 5 mm wide | <i>see Telamonia key Q, sect <i>Anthracini</i> etc. p. 775</i> |
| - | Stem usually > 5 mm wide | 10 |
| 10. | Sp broadly ovoid to amygdaloid; smell indistinct, like cedar-wood or faintly raphanoid | Key C sects <i>Limonii</i>, <i>Orellani</i> & <i>Humicolae</i> p. 665 |
| - | Sp subglobose, ellipsoid or obovoid; smell raphanoid or earthy | <i>see Telamonia key N, sect. <i>Hinnulei</i> etc. p. 762</i> |

Key A: Subgen. *Cortinarius* sect. *Cortinarius* TUULA NISKANEN & ILKKA KYTÖVUORI

Two species in the Nordic countries. Ecology and distribution of the species not fully known.

Suppl. lit.: Brandrud 1983.

- Sp 11.5-13.5 x 7.5-8(-8.5) μm , amygdaloid, moderately verrucose (fig. 663B); presumably in deciduous forests with *Populus tremula*, *Betula* or *Fagus*. Cap 50-120 mm, hemispherical then low convex, sometimes with a low and broad umbo, tomentose to finely scaly, not hygrophanous, violet; gills medium spaced to distant, rather broad, dark violet, later purplish brown; stem 60-140 x 10-20 mm, clavate to bulbous, violet; universal veil dark grey, forming incomplete girdles and zones on the stem; flesh violet; smell rather strong, recalling pen-

cil; KOH-reaction blood red on flesh. Cheilo- and pleurocystidia 60-95 × 15-25 μm, usually lageniform-fusiform to weakly lageniform, with bluish to brownish content, abundant. Autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP C37, Ves 343, ☉.

C. violaceus (L.: Fr.) Gray

Note: photos of *C. violaceus* s. lato: GCI B199, Nyl 434, Phil 186b, R&H 488, Sieniop 223.

- Sp 11-13.5 × (7.5-)8-9 μm, broadly ovoid, strongly verrucose (fig. 663C); presumably in *Picea*-dominated forests, often on rich soil. Cap 50-120 mm, hemispherical, then low convex, sometimes with a low and broad umbo, tomentose to finely scaly, not hygrophanous, violet; gills medium spaced to distant, rather broad, dark violet, later purplish brown; stem 60-140 × 10-20 mm, clavate to bulbous; universal veil dark grey, forming incomplete girdles and zones on the stem, violet; flesh violet; smell rather strong, recalling pencil; KOH-reaction blood red on flesh. Cheilo- and pleurocystidia 60-95 × 15-25 μm, usually lageniform-fusiform to weakly lageniform, with bluish to brownish content, abundant. Autumn; occasional in hemib.-bore.; FI, SE. – CFP A21.
- C. harcynicus* (Pers.) M.M. Moser ('*harcynicus*')

Key B: Subgen. *Cortinarius* sect. *Veneti* Konrad & Maubl.

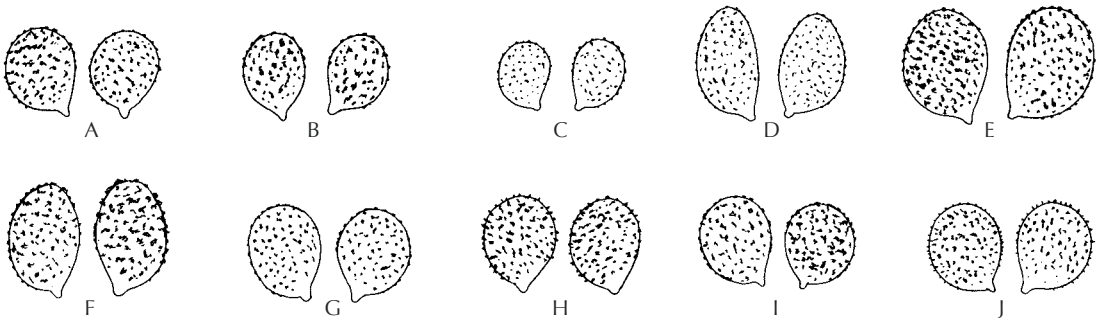
TUULA NISKANEN & ILKKA KYTÖVUORI

Frb with yellowish, olivaceous or greenish colours; cap (20-)40-100 mm, tomentose to scaly, not or only slightly hygrophanous; stem cylindrical or clavate; universal veil olivaceous yellow, olivaceous green or blackish brown; sp subglobose; KOH-reaction in most species red to red brown on flesh; fluorescence yellow.

1. Sp 8.5-9.5(-10) × (7-)7.5-8 μm; with thermophilous deciduous trees; frb stout; cap (40-)50-100 mm. Cap hemispherical then convex to low convex, tomentose to finely scaly, margin often down-curved, olivaceous greenish yellow to olivaceous brown, not hygrophanous; gills medium spaced, olivaceous yellow; stem 50-110 × 8-20 mm, clavate to bulbous, up to 30 mm broad at base, pale olivaceous greenish; universal veil olivaceous green to olivaceous brown, forming zones and girdles on the lower 2/3 of the stem; flesh pale olivaceous to yellowish brownish; smell distinctly of radish; KOH-reaction red on cap, flesh and gills; fluorescence yellow; exsiccates with yellow-brown cap, olivaceous-yellowish brown gills and yellow stem. Sp subglobose, strongly and coarsely verrucose (fig. 663D), thick-walled, strongly dextrinoid. In deciduous forests with *Corylus*, *Fagus*, *Quercus* and *Tilia*, often on calcareous soil; late summer to late autumn; rare in temp.-hemib., more rare towards the northern parts, very rare in southern bore.; DK (vu), NO (vu), SE (LC). – CFP B01, M&J 110, Nyl 435, Ves 345, ☉.

C. cotoneus Fr.

- Sp < 8 × 7 μm; most often with coniferous trees; frb usually more slender; cap 30-70 mm 2
- 2. Cap without dark scales but can be tomentose or with small, concolorous scales; universal veil olivaceous yellow, often sparse, forming incomplete girdles on stem; sp subglobose (fig. 665A). Cap 20-70 mm, hemispherical later low convex, olivaceous green to olivaceous brown later more red brown, slightly hygrophanous; gills medium spaced, pale olivaceous greenish, later more brownish; stem 40-80 × 5-10 mm, cylindrical to somewhat clavate, olivaceous yellow; flesh pale olivaceous-yellowish-brownish; smell faintly of radish; KOH-reaction red to brown red on cap and flesh; fluorescence yellow; exsiccates with yellowish-greenish brown cap, pale yellowish-brownish stem, olivaceous-brownish gills and yellow mycelium. Sp 6.5-7.5 × 5.5-6 μm, moderately to strongly verrucose, moderately to strongly dextrinoid. In mesic *Picea* forests, or rarely with *Pinus*, very rarely with *Fagus* (SE: Sk) or *Tilia* (west NO), on calcareous soil; late summer to autumn; rare in hemib.-bore., locally abundant; DK (LC), FI (NT), NO (LC), SE (NT). – CFP A15 C55, R&H 489, Nyl 435.
- C. venetus* (Fr.: Fr.) Fr.
- Cap with dark scales; universal veil dark, blackish brown, abundant, forming



Spores: A: *Cortinarius venetus*, B: *C. melanotus*, C: *C. phrygianus*, D: *C. humicola*, E: *C. rubellus*, F: *C. orellanus*, G: *C. limonius*, H: *C. tofaceus*, I: *C. callisteus*, J: *C. citrinofulvescens*.

distinct incomplete girdles and zones; sp obovoid-subglobose

3

3. Smell of parsley or radish; cap tomentose to finely dark scaly, olivaceous brown to olivaceous green, at centre dark blackish brown; stem with blackish brown veil remnants; sp 6.5-7.5(-8) × 5-6 μm (fig. 665B). Cap 30-80 mm, hemispherical, later low convex, margin often down-curved, not hygrophanous; gills medium spaced, pale olivaceous yellowish brownish; stem 30-80 × 6-12 mm, cylindrical to tapering downwards, firm, whitish yellowish; flesh whitish yellow to pale olivaceous yellowish; KOH-reaction red brown on flesh; fluorescence yellow; exsiccates with dark olivaceous brown cap, olivaceous-brownish gills, olivaceous-yellowish stem and yellow mycelium. Sp strongly verrucose, strongly dextrinoid. In *Pinus* forests on calcareous soil; late summer to autumn; very rare in hemib.; SE (VU, Gtl, Öl: Halltorps Hage). – CFP D56, M&J 1.

C. melanotus Kalchbr.

- Smell indistinct; cap distinctly dark scaly, ground colour olivaceous yellow to reddish yellow; stem with olive-brown veil girdles; sp 5.5-6.5 × 4.5-5 μm (fig. 665C). Cap 30-70 mm, hemispherical later low convex, not hygrophanous; gills crowded to medium spaced, ochraceous yellow; stem 40-80 × 6-12 mm, cylindrical to clavate, whitish yellowish; KOH-reaction greenish yellow or negative on flesh; fluorescence yellow; exsiccates with dark brown cap, brown gills and yellowish brown stem. Sp fairly finely to moderately verrucose, moderately dextrinoid. In dry to mesic coniferous forests with *Pinus*, often on calcareous soil; late summer to autumn; very rare in hemib.-bore.; FI (NT), NO (EN), SE (VU). – CFP A30, Ny1 436, Sieniop 212.

C. phrygianus (Fr.) Fr.

Key C: Subgen. *Cortinarius* sects *Limonii* Nezdobjm., *Orellani* M.M. Moser, *Humicola* Liimat. & Niskanen in press and *Callistei* Liimat. & Niskanen in press

TUULA NISKANEN, HÅKAN LINDSTRÖM & ILKKA KYTÖVUORI

Frb yellowish, dull orange or red brown; cap usually 40-90(-110) mm; sp broadly amygdaloid to subglobose. Seven species in the key, but at least a few more species, still not fully known, occur in the Nordic countries.

- | | | |
|----|---|-------------------------------|
| 1. | Stem usually < 6 mm broad; cap 30-60 mm, strongly hygrophanous | see <i>C. gentilis</i> p. 735 |
| - | Stem usually > 6 mm broad; cap 40-90(-110) mm, less or not hygrophanous | 2 |
| 2. | Cap greyish to yellowish white, with red scales | see <i>C. bolaris</i> p. 730 |
| - | Cap yellow, yellowish brown to red brown, without red scales | 3 |

3. Cap and stem distinctly recurved scaly; in *Fagus* forests, often on somewhat richer soil. Cap 20-60 mm, conical, then convex with an acute umbo, dull yellow, not hygrophanous; gills medium spaced, yellowish white, later pale brownish yellow; stem 40-100 x 5-10 mm, cylindrical to tapering downwards, ochre yellow, whitish at the top; universal veil yellowish brown, forming distinct scales on the stem; flesh whitish at stem top, darker yellow brown towards the base; smell faint of cedar wood; exsiccates entirely ochraceous red brown. Sp 8.5-9.5 x (5-)5.5-6 μm , broadly ovoid to amygdaloid, fairly finely to moderately verrucose (fig. 665D), moderately dextrinoid. Late summer to autumn; very rare in temp.-hemib.; DK (EN), NO (CR, Tel: Kragerø), SE (VU). – CFP C17, GCI D111, M&J 111, Nyl 440, Phil 188a, ☉.
C. humicola (Quél.) Maire
- Cap small scaled to smooth; stem not scaly; in deciduous or coniferous forests 4
4. Sp > 9 μm long; young gills saturated red brown to orange brown, distant 5
 - Sp < 9 μm long; young gills whitish yellow to yellowish brown, medium spaced 6
5. In hemib.-bore. in damp to mesic, oligotrophic *Picea* forests, in western Norway also in mixed *Betula-Pinus* forests, rarely with *Fagus*; cap often with an acute umbo; universal veil forming distinct zones on the stem; sp > 7 μm wide, Q < 1.4 (fig. 665E). Cap 30-80 mm, conical, then low convex, tomentose to finely scaly, saturated reddish to orange brown, not hygrophanous; gills distant and broad, saturated red brown; stem 50-130 x 7-15 mm, clavate and often pointed at the base, sometimes cylindrical, ochraceous yellow, then reddish brown; universal veil yellow, contrasting with the darker stem; flesh pale yellowish white to more red brown; smell faintly of radish; exsiccates with red brown, somewhat dark cap, brown gills and red brown stem. Sp 9-10.5(-11) x 7-8(-8.5) μm , ovoid to obovoid-subglobose, fairly finely to moderately and densely verrucose, weakly dextrinoid. Often in *Sphagnum*, but especially in coastal areas also with other mosses; autumn; common in hemib.-middle bore., occasional in northern bore., most frequent in oceanic areas, rare in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A58, Nyl 438, R&H 491, Sieniop 214, Ves 344, ☉. – Deadly poisonous
C. rubellus Cooke (*C. speciosissimus* Kühner & Romagn., *C. orellanoides* Rob. Henry)
- In temp.-hemib. in dry, thermophilous, deciduous forests, mainly with *Quercus*, *Tilia* and *Corylus*, but also with *Fagus*; cap usually without an umbo; universal veil sparse; sp < 7 μm wide, Q > 1.4 (fig. 665F). Cap 30-80 mm, hemispherical, then low convex, tomentose to finely scaly, saturated orange red brown to ochraceous brown, darkening with age, not hygrophanous; gills distant and broad, saturated orange red brown; stem 40-100 x 7-15 mm, cylindrical to somewhat tapering downwards, yellowish, later more red brown; universal veil yellowish; flesh pale yellowish, darker at the base; smell indistinct or faintly of radish; exsiccates with red-brown, somewhat dark cap, brown gills and red-brown stem. Sp 9-10(-10.5) x 6-6.5 μm , amygdaloid to broadly amygdaloid, fairly finely to moderately and densely verrucose, weakly dextrinoid. Often on acid soil, thermophilous; late summer to autumn; very rare in temp.-hemib., less rare in southernmost NO, very rare in DK; DK (VU), NO (LC), SE (LC). – CFP A20, M&J 63, Nyl 438, R&H 490, Ves 344. – Deadly poisonous.
C. orellanus Fr.
6. Cap when young orange to orange brown, smooth, hygrophanous; stem cylindrical or often tapering downwards. Cap 30-80 mm, hemispherical, then low convex to almost plane, often with a low and broad umbo, with age slightly scaly towards the margin and more reddish brown, as dry yellowish; gills medium spaced, yellow, then brownish yellow; stem 50-110 x 6-18 mm, yellow, fibrillose; universal veil yellow to orange brown, forming incomplete girdles on the stem; flesh yellowish, reddish brown towards the base; smell indistinct; exsiccates with red-brown cap, brown gills and yellow-brown stem. Sp 7.5-8.5 x 6-6.5 μm , subglobose, often somewhat more elongate, fairly finely to moderately verrucose (fig. 665G), weakly dextrinoid. In mesic to damp *Picea* forests and in *Pinus* forests on shallow soil; summer to autumn; common in hemib.-bore., rare in the north, rare in temp.; DK (LC), FI (LC), NO (LC),

SE (LC). – CFP B34, Nyl 439, R&H 493, Sieniop 205, Ves 345.

C. limonius (Fr.: Fr.) Fr.

- Cap when young yellow, golden yellow to brownish yellow, scaly or almost smooth, not or somewhat hygrophanous; stem clavate to cylindrical 7
- 7. Cap distinctly and minutely scaly to almost tomentose; stem cylindrical to slightly clavate; smell like raw potatoes or old cellar; sp subglobose to somewhat more elongate, $Q_{av} > 1.25$. Cap 40-110 mm, hemispherical, then low convex to almost plane, golden to orange yellow, scales and later the whole cap orange brown, not hygrophanous; gills medium spaced to distant, yellowish brown to more brown with age; stem 40-100 x 7-15(-20) mm, yellowish, with age more brownish; universal veil orange yellow, later more brownish, forming incomplete girdles; flesh ochre yellow to almost white in the cap, orange brown in stem base; exsiccates with orange-brown cap, brown gills and yellow-brown stem. Sp 7.5-8 x 5.5-6.5 μm , subglobose to somewhat elongate, moderately verrucose (fig. 665H), moderately dextrinoid. In deciduous forests with *Fagus*, *Quercus* and *Corylus*, but also in coniferous forests; very rare in temp.-hemib.; DK (EN), FI, NO (EN), SE (NT).

C. tofaceus Fr.

- Cap smooth or punctulate to very finely scaly; stem clavate; smell often strong, like a just extinguished candle (ozone) or like apples; sp subglobose, $Q_{av} < 1.25$ 8
- 8. Cap dull yellow, soon brownish yellow to orange brown; in exsiccates red brown to fairly dark yellow brown; universal veil yellowish, soon yellow brown; smell usually strong, like just extinguished candle (ozone), more seldom like apples; sp 7-7.5(-7.7) x 5.5-6.5 μm subglobose to obvoid-subglobose, moderately verrucose (fig. 665I). Cap 30-90 mm, hemispherical, later low convex, punctulate to very finely scaly at the centre, not hygrophanous; gills moderately crowded, light yellow, later brownish yellow; stem 40-120 x 8-15 mm, light yellow at the top, downwards yellow brown; universal veil forming zones on the stem; flesh yellow, orange brown towards the base. Sp fairly weakly dextrinoid. In mesic coniferous forests, usually with *Picea*, sometimes with *Pinus*, on rich to calcareous soil; rare in hemib.-bore., more rare towards the north, very rare in temp.; DK (RE), FI (LC), NO (LC), SE (LC). – CFP E22.

C. callisteus (Fr.: Fr.) Fr.

- Cap bright yellow, often with an orange tint at the centre; exsiccates lighter, with golden yellow to somewhat more brownish cap; universal veil persistently yellow; smell often faint and then more like apples, sometimes stronger, like a just extinguished candle (ozone); sp 7.5-8.2 x 6-6.5 μm , ovoid-subglobose, finely and sharply verrucose (fig. 665J). Cap 30-90 mm, hemispherical, later low convex, smooth to punctulate or very finely scaly, somewhat hygrophanous; gills medium spaced, whitish yellow, later more brownish yellow; stem 40-120 x 8-15 mm, light yellow, often almost white at the top; universal veil forming incomplete girdles on the stem; flesh whitish yellow, golden yellow to yellowish brown towards the base. Sp weakly dextrinoid. In mesic *Picea* forests, often on rich soil; occasional in bore., more common towards the north, rare in hemib.; FI, SE. – CFP E23, Soop 04:6, Sieniop 193 (as *callisteus*).

C. citrinofulvescens M.M. Moser (*C. callisteus* (Fr.: Fr.) Fr. s. auct. p.p.)

Key D: Subgen. *Cortinarius* sect. *Dermocybe* Pers.

KLAUS HØILAND

Frb with central stem. Cap 10-80(-100) mm, conical, convex to plane, smooth, felty to depressed scaly, yellowish to red or brownish. Gills as young vivid yellow, orange, olivaceous, red or carmine, as older more rust coloured by the spores. Stem yellowish to red or brownish. Veil insignificant or forming belts on stem and remnants on cap margin. Smell indistinct or like radish. Taste mild. Sp deposit rusty brown.

Sp ellipsoid to amygdaloid, verrucose, but nearly smooth and cylindrical in one species, verrucose, brown. Cystidia not present, but sterile cells usually present on gill edge. Pileipellis usually

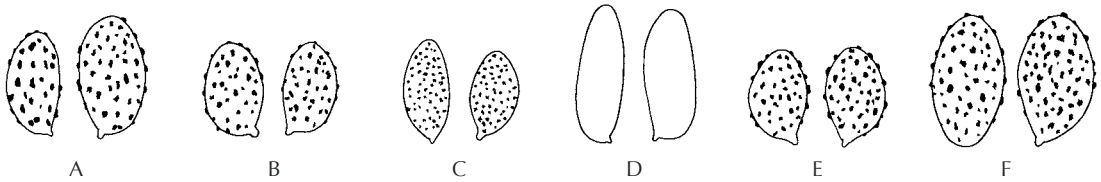
an epicutis of more or less parallel hyphae, subpellis weakly developed, except in *C. olivaceofuscus* that has a distinct subpellis of swollen hyphae. Clamps present.

Ectomycorrhizal, most common in forests on poor soil, in mires or in alpine vegetation.

18 species in the Nordic countries. The species contain pigments in the form of variously coloured anthraquinones, which have played an important role in chemotaxonomy. These colours can be used in dyeing of wool.

Suppl. lit.: Høiland 1981, 1984, Moser 1972, 1973, 1974a, 1974b, 1976.

- | | | |
|----|--|--|
| 1. | Young gills red, red brown or carmine red | 2 |
| - | Young gills yellow, olivaceous or orange | 8 |
| 2. | Cap hygrophanous | 3 |
| - | Cap not hygrophanous | 4 |
| 3. | Entire frb cinnabar red | see <i>C. cinnabarinus</i> p. 736 |
| - | Cap dull purple brown to dull purple | see <i>C. anthracinus</i> and <i>C. danicus</i> p. 775 |
| 4. | Cap and stem dark red to carmine | 5 |
| - | Cap and stem ochraceous to brownish | 6 |
| 5. | Cap when young without a brownish tint; entire frb deep carmine. Cap 25-45 mm, umbonate to plane; stem 30-85 x 3-7 mm. Sp (6-)6.5-8.5(-10) x (4-)4.5-5.5(-6) μm , usually ovoid (fig. 669A). On rather moist, mossy soil in dense <i>Picea</i> forests, rarely with deciduous trees; late summer to autumn; common in hemib.-bore., north to Finnm and InL, occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A57, Däh 710, Phil 205e, R&H 486, Ves 346, ☉. – Excellent for dyeing. | |
| | <i>C. sanguineus</i> (Wulfen: Fr.) Fr. var. <i>sanguineus</i> | |
| - | Cap when young somewhat brownish; frb elsewhere deep carmine. Sp usually amygdaloid. In other characters like the main variety. On rather moist, mossy soil in dense <i>Picea</i> forests; late summer to autumn; occasional in hemib.-bore.; FI, NO, SE. – Excellent for dyeing. | |
| | <i>C. sanguineus</i> (Wulfen: Fr.) Fr. var. <i>vitiosus</i> M.M. Moser | |
| 6. | Gills when young deep orange red brown to rusty red. Cap 19-85 mm, conical to plane, bright red brown to purplish chestnut; stem 29-105 x 3-12 mm, with orange, red or red-brown veil remnants, at the base with bright orange-yellow to orange mycelial felt. Sp 6-8.5(-10) x 4-5.5(-6) μm , ovoid to amygdaloid. In damp <i>Picea</i> forests on intermediate to rich soil, rarely under <i>Pinus</i> ; summer to autumn; occasional in hemib.-suba., rare in temp., not in western NO; DK (DD), FI (LC), NO (LC), SE (LC). – CFP A14, Svp 4:70. – Excellent for dyeing. | |
| | <i>C. fervidus</i> P.D. Orton | |
| - | Gills when young blood red to carmine | 7 |
| 7. | Cap when young pale olivaceous brown to ochraceous brown; stem pale with ochraceous veil remnants, reddish at base. Cap 20-82 mm, conical to plane; stem 33-70 x 5-10 mm. Sp (5-)5.5-7.5(-9) x 3.5-5(-6) μm , ovoid to amygdaloid (fig. 669B). On raw humus, needle litter or among mosses in poor coniferous forests, often on sandy soil in open <i>Pinus</i> forests, rarely in other forest types, occasionally with <i>Picea</i> , rarely with <i>Betula</i> or <i>Fagus</i> ; summer to autumn; very common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A13, Däh 709, Phil 205f, R&H 486, Ves 347, ☉. – Excellent for dyeing. | |
| | <i>C. semisanguineus</i> (Fr.: Fr.) Fr. | |
| - | Cap when young red brown; stem ochraceous with red veil zones. Cap 15-80 mm, conical to plane; stem 30-80 x 5-12 mm. Sp (5.5-)6-8(-9.5) x 3-4.5(-5) μm , usually amygdaloid (fig. 669C). Often on sandy soil with <i>Pinus</i> , sometimes and especially in the western parts on mossy soil in <i>Picea</i> forests, seldom with other trees; late summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:161, CFP C47, Phil 206d, Svp 4:71, Ves | |



Spores: A: *Cortinarius sanguineus* var. *sanguineus*, B: *C. semisanguineus*, C: *C. phoeniceus*, D: *C. aureifolius*, E: *C. cinnamomeus*, F: *C. cinnamomeoluteus*.

347. – Excellent for dyeing.

C. phoeniceus (Vent.) Maire (*C. purpureus* (Pers.) Fuckel s. auct.)

8. Sp narrow, cylindrical, nearly smooth, reminiscent of *Inocybe lacera* (fig. 669D). Cap c. 55 mm, convex to plane, brown to dark brown; gills yellow orange to ochraceous orange when young; stem 40-50 x 10-12 mm, with rather coarse, brown veil remnants. Sp 10-14 x 3.5-4.5 μm . On sandy soil in open *Pinus* forests; autumn; very rare in hemib.-bore.; FI (NT), SE (NE).

C. aureifolius Peck

- Sp ovoid, ellipsoid or amygdaloid, verrucose 9
- 9 Sp rarely > 9.5 μm long 10
- Some sp always > 9.5 μm long 18
- 10. Gills orange when young 11
- Gills yellow, orange yellow or olivaceous when young 14
- 11. Veil bright orange; cap margin covered with orange veil remnants. Cap 17-51 mm, conical to plane, ground colour red brown, yellow brown or hazel brown; gills bright orange to ochraceous orange; stem 24-44 x 5-10 mm, covered with yellow veil remnants; flesh olivaceous. Sp (5-)5.5-7(-7.5) x 3.5-4.5(-5) μm , ovoid to amygdaloid. In coniferous forests, usually with *Picea* and often also with *Alnus*, seldom with other trees, often on rich soil; summer to autumn; occasional in temp.-bore., north to Finnm and KiL; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A56, FAD 95D, R&H 485, Svp 4:70, Ves 348. – Excellent for dyeing.

C. malicorius Fr.

- Veil brownish, ochraceous or nearly lacking, but not bright orange, cap margin covered with indistinct, not orange veil remnants 12
- 12. Gills when young deep orange red brown to rust red see *C. fervidus* 6
- Gills when young orange to ochraceous orange 13
- 13. Gills bright orange when young; cap yellow brown to orange when young. Cap 12-60 mm, umbonate to convex, yellow brown to dark red brown or chestnut brown; stem 18-65 x 4-10 mm, pale yellow, olivaceous yellow or yellow brown, base usually orange-red felty, covered with \pm significant red brown, ochraceous brown or grey brown veil remnants. Sp (5.5)-6-8.5(-9.5) x (3.5)-4-5(-6) μm , ovoid to amygdaloid (fig. 669E). On sandy soil, humus or among mosses in forests, heathland, or along roadsides or tracks in forests, mycorrhizal with *Picea*, *Pinus* or *Betula*, seldom with other trees; summer to autumn; very common in temp.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – CFP B39, Däh 709, Phil 206a, R&H 485, Ves 349. – Good for dyeing.

C. cinnamomeus (L.: Fr.) Gray

- Gills ochraceous orange when young; cap dull ochraceous brown to chestnut brown when young, often with darker, concentric zones. Cap 13-70 mm, conical to convex; stem 38-80 x 5-9 mm, pale ochraceous to pale ochraceous yellow, base usually ochraceous yellow felty,

covered with pale red-brown, ochraceous brown or dirty brown veil remnants. Sp (6-)6.5-8.5 (-9.5) x 4-5(-5.5) μm , ovoid to amygdaloid. Usually in damp, shady coniferous forests, usually with *Picea*, seldom with *Pinus*; late summer to autumn; common in hemib.-bore., north to NT and SoL, occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:164, Svp 4:70, CFP A44. – Good for dyeing.

C. sommerfeltii Høil.

14. Gills olivaceous when young; cap usually acute and smooth; in rich deciduous forests, usually on calcareous soil. Cap 12-41 mm, umbonate to almost convex; stem 25-55 x 3-10 mm, olivaceous green with grey brown veil remnants. Sp 6.5-8(-9) x (3.5-)4-5(-5.5) μm , usually amygdaloid. With *Fagus*, *Quercus*, *Corylus*, *Carpinus*, possibly also *Tilia*, more seldom in rich *Picea* forests; late summer to autumn; rare in temp.-hemib., north to M&R; DK (LC), FI (CR), NO (LC), SE (LC). – C&D 1123, CFP A16, Svp 4:66, Ves 348.
C. olivaceofuscus Kühner
- Gills yellow when young; cap usually obtuse and felty to somewhat scaly; usually on poor soil 15
15. Lower fifth to third of stem bright orange. Cap 14-42 mm, umbonate to convex, fibrillose felty, pale ochraceous to ochraceous brown with an olivaceous tint; stem 60-125 x 3-7 mm, at base with an orange mycelial felt. Sp (6.5-)7.5-9.5(-10.5) x (4-)4.5-5.5(-6) μm , ovoid to ellipsoid. Among mosses, often *Sphagnum*, on moist soil in coniferous forests, seldom on drier soil, mycorrhizal with *Picea*, *Pinus* or *Betula*; late summer to autumn; occasional in temp.-bore., in NO north to NTr; DK (LC), FI (LC), NO (LC), SE (LC). – CFP C18, Svp 4:67.
C. bataillei (M.M. Moser) Høil.
- Lower part of stem not bright orange 16
16. Cap 22-100 mm. Cap umbonate to convex, fibrillose felty, pale olivaceous yellow or yellow brown, margin usually paler than centre; gills usually pure yellow, seldom orange yellow or with an olivaceous tint; stem 52-108 x 4-9 mm, lemon yellow to pale ochraceous yellow, base pale olivaceous yellow. Sp 6-9 x 4-5.5 μm , ovoid to amygdaloid. On moist soil in rich *Picea* forests mixed with *Betula*, seldom *Pinus*, usually on higher elevations or north facing slopes, seldom in conifer plantations; autumn; occasional in (hemib.-)bore.; NO (NE), SE.
C. sylvae-norvegicae Høil.
- Cap usually < 50 mm 17
17. Cap fibrillose felty, pale yellow brown to dark brown or red brown, seldom with curved margin; gills usually pure yellow, but varying from mustard yellow to yellow with an orange tint. Cap 14-60 mm, umbonate to convex; stem 30-80 x 3-10 mm, yellow to ochraceous grey, base usually yellow to pale orange, felty, covered with yellow to brown veil remnants. Sp (5.5-)6.5-9(-11) x (3.5-)4-5.5(-6) μm , ovoid to amygdaloid. On humus or mossy soil in forests with *Picea*, *Pinus* and *Betula*, but also with various broadleaved deciduous trees, in heathland, mires, or along roadsides or tracks in forests; summer to late autumn; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 5:155, C&D 1119, CFP B16, Svp 4:66, Ves 349. – Good for dyeing.
C. croceus (Schaeff.: Fr.) Gray subsp. *croceus*
- Cap strongly fibrillose, reddish cinnamon brown to red brown, usually with curved margin; gills ochraceous yellow to orange yellow, soon cinnamon brown. In other characters like the main subsp. In heathland, usually with *Betula nana*, in alpine environments, seldom in upper boreal *Betula* forests, seldom with *Pinus* or *Picea*, possibly also with *Salix*; summer to autumn; common in suba.-arc./alp.; FI (LC), IS (Na, Au), NO (NE), SE (NA). – CFP A54, Svp 4:66.
C. croceus (Schaeff.: Fr.) Gray subsp. *norvegicus* (Høil.) Brandrud & H. Lindstr.
18. Gills olivaceous when young 19
- Gills yellow to orange when young 20

19. KOH-reaction on gills usually red brown to carmine; some basidia contain yellow, granular pigment. Cap dark olivaceous brown to hazel brown; gills olivaceous when young. In other characters like the main variety. Usually among *Sphagnum* in fens, bogs or swamp forests, most frequent under *Pinus*, more seldom *Picea* or *Betula*; summer to autumn; occasional in hemib.-suba., rare in temp.; FI, NO, SE. – B&K 5:158, Däh 705, Svp 4:66.
C. huronensis Ammirati & A.H. Sm. var. *olivaceus* Ammirati & A.H. Sm. (*Hydrocybe palustris* M.M. Moser, *C. palustris* (M.M. Moser) Nezdobjm. nom. inval.)
- KOH-reaction on gills always dark brown, the basidia without yellow, granular content. Cap 11-28 mm, shape, radially fibrillose felty, seldom scaly, yellow brown to reddish brown; stem 25-115 x 3-6 mm, usually long and slender, with or without grey-brown veil remnants. Sp (7.5-)8-12(-13.5) x (4.5-)5-6.5(-7.5) μm , ellipsoid. Always among *Sphagnum* in fens, bogs or swamp forests, most common under *Betula*, seldom with *Picea* or *Pinus*; summer to autumn; occasional in hemib.-suba., rare in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:165, Svp 4:70 (too dark).
C. tubarius Ammirati & A.H. Sm. (*C. sphagnetii* P.D. Orton)
20. Cap when young red to brick red; stem covered with red veil remnants. Cap 16-85 mm, first conical, then umbonate, often with an acute umbo, radially fibrillose, smooth, silky; gills first bright yellow, then orange brown to rust brown; stem 30-70 x 3-13 mm. Sp (7-)8-11.5 (-12) x (4.5-)5-6.5(-7) μm , ovoid to ellipsoid. On moist soil in rich forests, scrubs, on riverbanks, near lakes or on dune slacks, mostly under *Salix*, but also under *Alnus* or *Fagus*; late summer to autumn; common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:166, CFP D49, D50, Phil 204d, Svp 4:67, Ves 348, ☉. – Good for dyeing.
C. uliginosus Berk. f. *uliginosus*
- Cap when young red brown to yellow brown, dark brown or yellowish, if red to brick red, then not under *Salix* on moist soil; stem without distinct red veil remnants 21
21. Cap olivaceous yellow or pale yellow brown to orange yellow when young 22
- Cap orange brown, red brown, brown, or olivaceous brown when young 24
22. The lower part of stem bright orange see *C. bataillei* 15
- The lower part of stem not bright orange 23
23. Cap when young olivaceous yellow to pale ochraceous yellow. Cap 14-35 mm, often with an acute umbo, radially fibrillose, with age more brown; stem 35-95 x 3-7 mm, sulphur yellow, with insignificant pale yellow veil remnants. Sp (7-)7.5-10.5(-12) x (4.5-)5-6.5(-7) μm , ovoid to broadly ellipsoid (fig. 669F). On moist soil in mires, swamp forests, scrubs, riverbanks, or snow beds, mostly under *Salix*, but also under *Alnus*, most frequent at higher elevations; summer to autumn; rare, but locally occasional in temp.-arc./alp.; DK (LC), FI (LC), IS, NO, SE (LC). – Däh 706, Svp 4:67.
C. cinnamomeoluteus P.D. Orton
- Cap when young pale yellow brown, golden brown or dirty orange yellow. Stem with pale yellow brown to somewhat rose veil remnants. In other characters like the main variety. On moist soil in rich forests, scrubs, on riverbanks, near lakes or on dune slacks, mostly under *Salix*, but also under *Alnus* or *Fagus*; late summer to autumn; rare in temp.-bore.; DK, FI, NO, SE. – Svp 4:67.
C. uliginosus Berk. f. *luteus* (Gabriel & Lamoure) Nezwiak
24. In arc./alp. among *Salix herbacea*, *S. polaris* or *S. reticulata*. Cap 5-45 mm, conical to convex, very early expanded, fibrillose felty to appressed scaly, dark chestnut brown to dark hazel brown; gills first mustard yellow, then more rust brown; stem 15-30 x 2-5 mm, with brown veil remnants. Sp (7-)7.5-12(-13) x (4.5-)5-6.5(-7) μm , ovoid to ellipsoid. In snow beds, on open ridges or tundra among dwarf *Salix*; summer to autumn; common on SvB, elsewhere occasional or rare, most frequent in the middle arctic zone; IS, NO, SE (LC). – AAF 1:31.
C. polaris Høil.

- In the lowlands, or if in alpine environments, then not among *Salix herbacea*,
S. polaris or *S. reticulata* 25
- 25. Cap red brown to orange brown when young 26
- Cap brown to olivaceous brown when young 27
- 26. Cap usually conical with a persistent umbo; gills when young yellow to orange yellow. Cap 10-40 mm, radially fibrillose, first tawny brick red, red brown or orange brown, then darker red brown to chestnut; stem 23-80 x 2-8 mm, silky fibrillose, with pale reddish to red-brown veil remnants. Sp (6.5-)7-10.5(-12.5) x (4-)4.5-6(-7) μm , ovoid to ellipsoid. Among mosses, often *Sphagnum*, on moist soil with *Picea* and *Pinus*, rarely under *Betula*; late summer to autumn; common in hemib.-suba., occasional in temp.; DK (LC), IS, FI (LC), NO, SE (LC). – CFP C13, Svp 4:67. – Good for dyeing.
***C. croceoconus* Fr.**
Note: may be similar to *C. uliginosus*, from which it differs by duller colour, usually smaller size, and its ecology.
- Cap hemispherical, convex or plane; gills when young orange. Cap 15-60 mm, radially fibrillose felty, often covered with minute, appressed scales, cinnamon brown to mahogany red brown; stem 31-45 x 2-7 mm, with red brown veil remnants. Sp (6.5-)7-10(-10.5) x (4-)4.5-5.5(-6) μm , ovoid to ellipsoid. On dry, sandy soil, often on established sand dunes, or on heathland and grasslands, sometimes without any woody plants, sometimes probably mycorrhizal with *Salix*; late summer to autumn; rare in temp.-suba.; DK (DD, Fyn: Helnæs), FO, NO. – C&D 1124, Svp 4:66.
***C. pratensis* (Bon & Gaugué) Høil.**
- 27. KOH-reaction on gills usually red brown to carmine; some basidia contain yellow, granular pigment. Cap 13-45 mm, convex, plane or umbonate, radially fibrillose felty, sometimes with minute, appressed scales, dark yellow brown to hazel; stem 32-100 x 2-6 mm, with or without grey-brown veil remnants. Sp (7-)7.5-11(-14) x (4-)4.5-6(-7.5) μm , ovoid to ellipsoid. Usually among *Sphagnum* in fens, bogs or swamp forests, mycorrhizal with *Picea*, *Pinus*, *Betula*, or more seldom *Salix*; summer to autumn; common in hemib.-arc./alp., rare in temp.; DK (DD), FI (LC), IS, NO, SE (LC). – B&K 5:158, Svp 4:67.
C. huronensis* Ammirati & A.H. Sm. var. *huronensis
- KOH-reaction on gills always dark brown; basidia without yellow, granular content see *C. tubarius* 19

Subgen. *Myxacium* (Fr.) Trog

EGIL BENDIKSEN, KATRIINA BENDIKSEN,
TUULA NISKANEN & ILKKA KYTÖVUORI

Cap and stem glutinous when moist, or if faintly viscid then with bitter taste. Cap (10-)25-130 mm. Gills pale ochre, pale bluish or whitish when young. Stem usually clavate or cylindrical, base sometimes tapering downwards. Universal veil white, yellow or bluish violet, in some species very sparse. Flesh whitish to pale ochre. Smell in many species indistinct, unpleasant or like radish, honey or iodoform.



Sp 10-16 x 5.5-9.5 μm , citriform, amygdaloid to slightly fusiform, or 5.5-9.5 x 4-8 μm and subglobose to ellipsoid, in most species dextrinoid. Marginal cells clavate or basidioform. Pileipellis forming an ixocutis. Clamps present or absent.

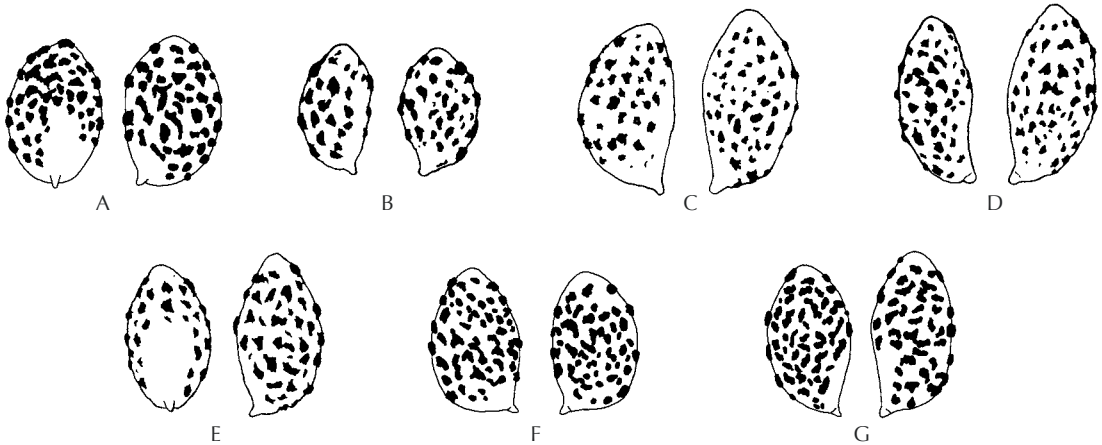
25 species in the key. The subgenus has been divided in four sections. Sections *Defibulati* and *Myxacium* are monophyletic, but phylogenetic analyses confirm that members in other sections are more closely allied with other subgenera. The current taxonomy needs revision to reflect phylogenetic relationships.

Suppl. lit.: Bendiksen et al. 1993, Seidl 2000, Kärcher 2004.

1. Sp subglobose; cap and universal veil yellowish or bluish Key C, sect. *Delibuti* p. 675
 - Sp amygdaloid, ellipsoid, broadly ellipsoid or citriform; cap yellow, brown or bluish; universal veil whitish or bluish 2
2. Taste bitter; cap 10-60 mm; sp < 9.5 μm long Key D, sect. *Vibratiles* p. 677
 - Taste mild; cap 60-130 mm; sp > 9.5 μm long 3
3. Sp amygdaloid, ellipsoid or slightly fusiform, coarsely verrucose; clamps present; marginal cells small, basidioform; smell indistinct; stem turning brown at the base Key A, sect. *Myxaciium* p. 673
 - Sp \pm citriform, densely verrucose; clamps absent; marginal cells large, clavate to spheropedunculate, abundant; usually with smell of honey when thumbed; stem not turning brown at the base Key B, sect. *Defibulati* p. 674

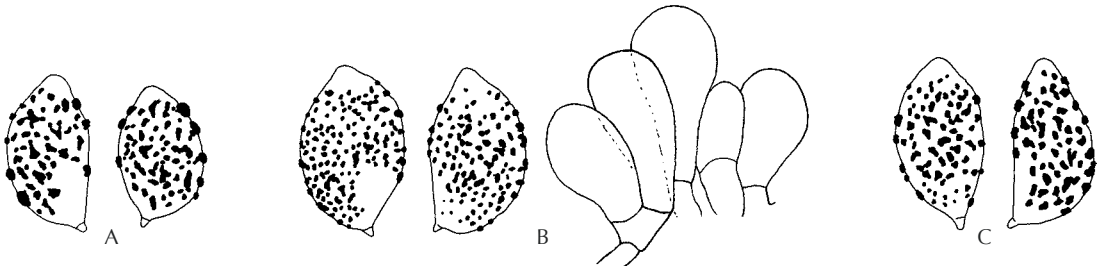
Key A: Subgen. *Myxaciium* sect. *Myxaciium* EGIL BENDIKSEN & KATRIINA BENDIKSEN

1. With dwarf *Salix* in arc./alp. Cap 15-45 mm, convex to low convex, sometimes obtusely umbonate, glutinous, somewhat hygrophanous, but soon drying, dark golden red brown to rusty brown, sometimes with an olivaceous tinge, often with dark centre; gills pale greyish, sometimes with a violet tinge when young; stem 22-55 x 3-10(-12) mm, white, sometimes with a faint reflex of violet, often soon drying and veil cracking. Sp 11.5-14 (-14.5) x 7-8.5 μm , ellipsoid to faintly amygdaloid, strongly and coarsely verrucose (fig. 674A). In poor and rich snow bed vegetation; summer to autumn; common; FI (LC), IS, NO (LC), SE (LC). – AAF 1:33, B&K 5:279, R&H 512, 
C. alpinus Boud. (*C. favrei* D.M. Hend.)
 - Not with dwarf *Salix* species, if in alpine zones, then with *Betula* or in thickets of larger *Salix* species 2
2. Stem with thick veil remnants cracking in separate annulate scales or girdles or a net-like structure; young gills violet grey to greyish blue, more rarely pale ochraceous grey; with deciduous trees or shrubs. Cap 40-70 mm, convex to low convex, sometimes with a broad umbo, strongly glutinous, slightly hygrophanous, colour variable, pale to dull ochraceous, olivaceous brown to vividly red brown, especially in arc./alp. often bicoloured with pale honey-coloured centre and vivid ochraceous colours in outer part; stem 60-135 x 6-20 mm, exposed surface between veil remnants becoming ochraceous, with pale ochraceous, sometimes olivaceous veil. Sp 10.5-12.5(-13) x 6-7.5 μm , amygdaloid to ellipsoid or citriform, strongly and coarsely verrucose (fig. 674B, *Populus* form). Mainly under *Salix* and *Populus*, but also e.g. *Betula*, *Quercus* and *Fagus*, on poor and rich soil; late summer to autumn; common in temp.-low arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – AC 10:287, CFP A36, Däh 784, R&H 513, Ves 367.
C. trivialis J.E. Lange s.l.
 Note: a complex of more taxa, but until further treated as a collective species.
 - Veil on stem not cracking into annulate scales or net-like girdles; gills without violet or bluish tinges; with coniferous trees 3
3. Sp 13-16 x 7.5-9.5 μm ; in poor subxeric and submesic coniferous forests under *Picea*. Cap 30-100 mm, convex to low convex, sometimes with a broad umbo, often hygrophanous at margin, strongly glutinous, red brown, often rather dark; gills pale greyish; stem 50-100 x 6-23 mm, violet from universal veil, which cracks in irregular girdles. Sp amygdaloid, coarsely verrucose (fig. 674C). In poor coniferous forests, often under smaller trees of *Picea* in forests where *Pinus* dominates; late summer to autumn; very common in hemib.-bore. and coniferous part of suba., common in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:283 (as *musciigenus*), CFP A34, Nyl 482, Phil 170a, R&H 513, 
C. collinitus (Sowerby: Fr.) Gray
 - Sp \leq 14 μm long; under *Pinus* or deciduous trees 4



Spores: A: *Cortinarius alpinus*, B: *C. trivialis* (*Populus* form), C: *C. collinitus*, D: *C. mucosus*, E: *C. septentrionalis*, F: *C. fennoscandicus*, G: *C. absarokensis*.

4. Sp narrowly amygdaloid, $Q_{av} = c. 2$; under *Pinus*. Cap 40-100 mm, hemispherical to low convex, glutinous, sienna to orange brown with dark centre, sometimes with an olivaceous tinge; gills pale greyish or ochraceous; stem white, very seldom violet. Sp $11.5-14 \times 5.5-7(-7.5) \mu\text{m}$, narrowly amygdaloid to citriform, coarsely verrucose (fig. 674D). In poor, often very dry, lichen-dominated sites; autumn; common in more continental parts of bore., from eastern NO and eastwards, occasional in temp. and more oceanic parts of bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:282, CFP B33, M&J 72, Nyl 482, R&H 512.
C. mucosus (Bull.: Fr.) J.J. Kickx
- Sp broader, $Q = 1.6-1.7$; under deciduous trees 5
5. Cap vividly orange to golden yellow with darker centre. Cap 35-100 mm, hemispherical to convex, later low convex, typically with a broad umbo, strongly glutinous, the bright part of the cap sometimes with darker, red-brown spots, slightly hygrophanous in outer part; gills pale greyish or ochraceous; stem 60-125(-180) \times 7-25 mm, white or pale violet, with age cracking in irregular girdles. Sp $11-13(-13.5) \times 6.5-8.5 \mu\text{m}$, amygdaloid, less often ellipsoid-citriform, coarsely verrucose (fig. 674E). With *Betula*, including *B. nana*, in subxeric and submesic (to mesic) sites; late summer to autumn; common in suba. and low arc./alp., rare but locally occasional in bore.; FI (LC), IS, NO (LC), SE (LC). – CFP B04, Jordst 11(2), Nyl 483.
C. septentrionalis Bendiksen, K. Bendiksen & Brandrud
- Cap without orange or golden yellowish colours 6
6. In mountain *Betula* woods and dry low alpine *Betula nana* heathland; stem mostly taller than cap diam. Cap 25-75(-100) mm, hemispherical to obtusely umbonate, later plane, sometimes with a faint umbo, strongly glutinous, sometimes translucently striate at margin, dull ochraceous with olivaceous tinge, when moist often fairly dark, at least centre, but may also be pale ochraceous, even when moist, often strongly hygrophanous; gills greyish beige to ochraceous; stem 40-100 \times (4-)6-15(-20) mm, white, sometimes violet, with peronate veil, sometimes cracking in narrow, appressed girdles. Sp $11-13(-13.5) \times 6.5-8.5 \mu\text{m}$, mostly amygdaloid, coarsely verrucose (fig. 674F). Preferably on poor soil, subxeric and submesic habitats, also in mixed *Pinus-Betula*-woods; late summer to autumn; common in suba.-low arc./alp., rare in bore., occasional in IS; FI (LC), IS, NO (LC), SE (LC). – CFP B36, Jordst 11(2), Nyl 483.
C. fennoscandicus Bendiksen, K. Bendiksen & Brandrud



Spores and cheilocystidia: A: *Cortinarius elatior*, B: *C. stillatitius*, C: *C. mucifluus*.

- In moist, alpine *Salix* scrubs; stem mostly shorter than cap diam. Cap (30-)50-110(-130) mm, irregularly hemispherical, finally plane and somewhat depressed, glutinous, not translucently striate, pale ochraceous to fulvous, sometimes with darker spots; gills pale greyish; stem 30-65 x 10-22 mm, white, with peronate veil, sometimes cracking in narrow, appressed girdles. Sp 12-16.5 x 7-9 μm , amygdaloid, coarsely verrucose (fig. 674G). The species was recently reported from NO (Hord, Busk) in low arc. / alp. in late summer, but it belongs to a difficult complex which is under revision – M&J 27.

C. absarokensis M.M. Moser & McKnight

Key B: Subgen. *Myxacium* sect. *Defibulati* M.M. Moser

EGIL BENDIKSEN & KATRIINA BENDIKSEN

1. Cap conical, strongly sulcate when old, becoming bell-shaped or convex and finally plane with an umbo. Cap 40-130 mm, strongly glutinous, colour from dark brown, often olivaceous to pale ochraceous, partly because of being hygrophanous; gills somewhat wrinkled, pale greyish; stem 70-150(-200) x 10-22 mm, tapering and slightly rooting, distinctly striate above cortina zone, violet, peronate from universal veil, often cracking to belts in lower part; smell honey-like. Sp 11-14 x 6.5-9 μm , citriform, verrucose, with mixed coarse and fine ornamentation (fig. 675A). With deciduous and coniferous trees, mostly in poor *Fagus* or *Quercus* forests and coastal *Picea* forests or even dry *Pinus* forests; autumn; very common in temp., occasional, but locally common in hemib., rare in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – AC 10:264, 265, CFP A41 (as *lividoochraceus*), Däh 789, Mar 755, Ves 366, Ⓞ. *C. elatior* Fr. (incl. *C. pumilus* J.E. Lange, *C. lividoochraceus* (Berk.) Berk. s. auct.)
- Cap not or only slightly conical and sulcate 2
2. Stem violet; cap dark olivaceous red brown (water-soaked) to paler ochraceous. Cap 30-80 mm, convex to plane, sometimes with an umbo, strongly glutinous; gills pale greyish; stem 60-100 x (8-)10-15(-20) mm, with peronate veil; smell honey-like. Sp 13-16 x 7-9 μm , citriform, densely verrucose (fig. 675B). Mainly in *Vaccinium myrtillus*-*Picea* forests, more rarely with *Pinus*, in mountain *Betula* forests or in *Fagus* forests; summer to autumn; common in hemib.-bore., occasional in temp. and suba.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A33, Däh 786 (as *collinitus*), 788, Mar 756, Nyl 485, R&H 515. *C. stillatitius* Fr. (*C. integerrimus* Kühner nom. inval., *C. pseudosalor* J.E. Lange s. auct.)
- Stem white, sometimes with a very faint tinge of violet when young; cap normally paler ochraceous, probably because of hygrophanity and often dry habitat, when young and in moister habitats close to the colour of *C. stillatitius*. Cap 30-120 mm convex to plane, sometimes with an umbo, strongly glutinous; gills pale greyish; stem 60-120(-200) x (8-)10-15 mm, often rooting deeply in soil, with peronate veil, in lower part typically cracking in 2-4 broad girdles; smell honey-like. Sp 12-16(-17) x 7-8.5(-9) μm , citriform, densely verrucose (fig. 675C). With *Pinus* and *Picea*, in the southern part mainly in poor dry and subxeric *Pinus*

forests, but also in wooded ombrotrophic bogs, in central NO and SE also common in *Vaccinium myrtillus*-*Picea* forests; summer to autumn; common in hemib.-bore., presumably less common in the eastern part, occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – M&J 72, R&H 514, Ves 367.

C. mucifluus Fr. (*C. pinicola* P.D. Orton)


Key C: Subgen. *Myxacium* sect. *Delibuti* (Fr.) Sacc.

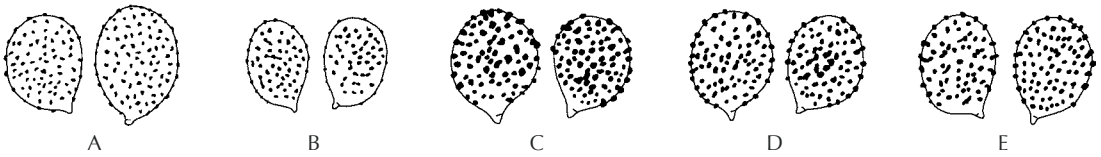
EGIL BENDIKSEN & KATRIINA BENDIKSEN

1. Cap ochraceous, normally not violet in any part. Cap 20-80 mm, hemispherical to broadly convex, glutinous, yellow to ochre with paler greyish ochre margin, sometimes with tinge of olivaceous, or in extreme forms also violet; gills from distinctly violet to pale greyish violet and in rare cases pale flesh to clay coloured (sometimes separated as *C. illibatus* Fr.); stem 50-100 x 5-10 mm, with mostly clavate up to 22 mm broad base, pale violet when young, remaining for longest time at the top, with yellow veil, sometimes with an olivaceous tinge in the irregular, appressed belts. Sp 7-9 x 6-8 μm , subglobose, densely verrucose (fig. 677A). With a very wide ecology, from poor *Fagus* forests via boreal and subalpine forests under *Picea* or *Betula*, mostly in rich forest types, to heathland with *Betula* and *Salix* in the mountains; summer to autumn, mostly not numerous but common in temp.-arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – AC 3:70, CFP C11, Nyl 479, R&H 516, Ves 365.

C. delibutus Fr.

Note: a variable species, possibly a complex of closely related taxa.

- Cap violet, at least in outer part as young 2
2. Whole frb persistently pale greyish violet to steel blue without contrast between cap and stem; with long-lasting, glutinous universal veil. Cap 30-70 mm, convex, bell-shaped, later plane with a broad umbo, often irregular, glutinous, slowly fading to pale greyish ochre; gills greyish violet when young; stem 60-100 x 7-12 mm, cylindrical or more often with a \pm clavate base, strongly glutinous for a long time. Sp 6.5-8.5 x 5.5-7 μm , subglobose, densely verrucose (fig. 677B). Mostly in coniferous forests, mostly herb-rich, submesic and mesic *Picea* forests, but also in deciduous forests with *Quercus*, *Tilia* or *Corylus* (south and west NO), mountain *Betula* forests and low alpine *Betula nana* heathland (FI); summer to autumn; rare in temp.-suba.(-arc./alp.); DK (EN), FI (LC), NO (LC), SE (NA). – AC 1:9b (as *epipoleus*), B&K 5:278 (as *epipoleus*), CFP A03, Nyl 481, Sieniop 200.
- C. emunctus* Fr. (*C. griseoilacinus* Britzelm., *C. griseoviolaceus* A.H. Sm.)
- With a distinct contrast between cap colour and the paler stem, soon fading to ochraceous from cap centre; universal veil not so persistently glutinous 3
3. Cap dominantly deep violet when young; stem paler, but with the same tinge of deep violet when young. Cap 40-90 mm, hemispherical to broadly convex, glutinous, becoming ochraceous from centre; gills violet, later greyish; stem 60-120 x 5-15 mm, base normally clavate, up to 23 mm broad, with veil fading to pale ochraceous, sometimes appressed belted. Sp 7.5-10 x 6-8.5 μm , subglobose, rather strongly and densely verrucose (fig. 677C). On calcareous soil in deciduous forests with *Fagus*, *Quercus*, *Tilia* and *Corylus* and in herb rich *Picea* forests; autumn; rare in temp.-southern bore.; FI (DD), IS, NO (VU), SE (LC). – AC 1:9, B&K 5:285, CFP A02, Mar 758, .
- C. salor* Fr.
- Colours more greyish violet 4
4. Cap often with an olivaceous tinge, (30-)40-90 mm, hemispherical to convex, later plane with a broad umbo, glutinous, soon becoming brownish ochre to yellowish from centre, keeping a bluish-lilac component for a while; gills with a faint violet tinge when young, very soon more greyish or flesh-coloured; stem 40-140 x 5-20(-25) mm, cylindrical or more often a with clavate base, with veil forming appressed belts, at first with a tinge of violet,



Spores: A: *Cortinarius delibutus*, B: *C. emunctus*, C: *C. salor*, D: *C. transiens*, E: *C. betulinus*.

later ochraceous on a pale background. Sp 7.5-10 x 6-8.5 μm , subglobose, densely verrucose (fig. 677D). Mostly in mesic and submesic, eutrophic *Picea* forests, also in mountain *Betula* forests (SE); summer to autumn; occasional in upper part of middle and northern bore., rare in southern bore. and suba.; FI (LC), IS, NO (DD), SE (LC). – CFP A39, Nyl 480, R&H 516, Sieniop 218.

C. transiens (Melot) Soop (*C. epipoleus* Fr. s. auct.)

- Cap not olivaceous, 20-50(-75) mm, broadly convex to plane with a faint umbo, glutinous, outer part pale greyish violet or pale greyish when young, ochraceous yellow in inner part, with age spreading to entire surface, sometimes darker ochraceous at centre; gills pale bluish grey or greyish ochre; stem 40-90 x 3-8 mm, with a faintly bulbous, up to 12 mm broad base, pale greyish, sometimes with very faint bluish tinge, with veil becoming slightly ochraceous, sometimes as faint belts. Sp 8-10 x 6.5-8.5 μm , subglobose, rather densely verrucose (fig. 677E). In poor forests with *Picea* and in mountain *Betula* forests, in DK in lowland mires; late summer to autumn; common, but mostly not numerous in hemib.-suba., possibly most frequent in the north, very rare in temp.; DK (VU), FI (LC), NO (LC), SE (LC). – CFP C32, Fav 48:3.4-6, Jordst 10(1).

C. betulinus J. Favre

Key D: Subgen. *Myxacium* sect. *Vibratiles* Melot

TUULA NISKANEN & ILKKA KYTÖVUORI

Cap 10-75 mm, in most species 20-60 mm, glutinous to viscid when moist; stem whitish, glutinous to viscid when moist; universal veil very sparse, often white; taste usually bitter, sp often < 9 μm long. 10 species in the key, but the real number of the species in the Nordic countries might double that.

1. Cap violaceous to lilac, at least when young. Cap 20-45 mm, hemispherical, then low convex, first violaceous, later at least partly ochraceous, viscid, not hygrophanous; gills crowded to medium spaced, pale greyish, sometimes with a bluish tint, later yellowish brown; stem 40-90 x 4-8 mm, cylindrical to clavate with a tapering base, white, later somewhat ochraceous, slightly viscid; universal veil white to violaceous; fairly sparse; flesh pale yellowish; smell sweetish; taste very bitter; exsiccates with greyish-yellowish to yellowish-brownish cap and whitish stem. Sp 7.5-8.5 x 4.5-5(-5.5) μm , ovoid-ellipsoid, moderately and coarsely verrucose (fig. 679A), weakly to moderately dextrinoid. With deciduous trees, especially *Fagus*, on calcareous soil; autumn; rare in temp., very rare in hemib.; DK (NT), NO (EN), SE (VU). – AC 10:290, CFP B49, GCI D59, M&J 28, Ves 364.

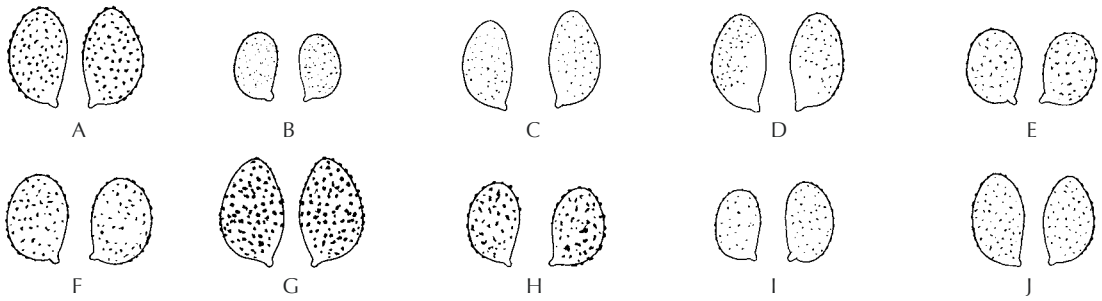
C. croceocaeruleus (Pers.: Fr.) Fr.

- Cap without violaceous or lilac colours or tints 2
- 2. Taste in the cap cuticle mild or rarely slightly bitter; most sp < 4 μm wide. Cap 30-60 mm, hemispherical, then low convex to almost plane, sometimes rimy at the centre, apricot yellowish to apricot brownish, slightly viscid to viscid but soon drying, hygrophanous; gills medium spaced, first pale greyish yellowish, later apricot yellowish; stem 50-100 x 5-10 mm,

cylindrical to clavate, sometimes tapering downwards, white, practically dry; universal veil white, almost indistinct; flesh yellowish; smell indistinct; exsiccates with greyish yellowish to pale brownish cap and white stem. Sp 5-6 x (3-)3.5-4 μm , ellipsoid to very slightly ovoid (fig. 679B), smooth to very finely verrucose, without iodine reactions to weakly dextrinoid. In dryish to mesic coniferous forests with *Picea* and *Pinus*; late summer to autumn; very rare in temp., occasional in hemib.-bore.; DK (DD), FI (LC), NO (NE), SE (LC). – AC 10:292, FAD 199D, GCI B99, Soop 04:65

C. microspermus J.E. Lange

- Taste in the cap cuticle \pm bitter; most sp > 4 μm wide 3
 - 3. Cap whitish when young 4
 - Cap yellowish to reddish brown when young 5
 - 4. Cap covered with a white to greyish white coating, often soon becoming ochraceous, very slightly viscid to almost dry; taste slightly bitter to bitter in the cuticle, often mild in the flesh. Cap 30-70 mm, hemispherical, then low convex to almost plane, not or only slightly hygrophanous; gills medium spaced, pale greyish yellowish, later yellowish brownish; stem 40-70 x 5-10 mm, cylindrical to tapering downwards, whitish, weakly viscid; universal veil white, sparse; flesh white to somewhat yellowish; smell indistinct; exsiccates with whitish to pale brownish, mat cap and whitish stem. Sp 7-8(-8.5) x 4.2-4.7 μm , narrowly amygdaloid to narrowly ellipsoid, almost smooth to finely verrucose (fig. 679C), weakly dextrinoid. In mixed forests of *Fagus*, *Quercus*, *Picea*, *Pinus* and *Abies*; autumn to late autumn; rare, but locally occasional in temp.-hemib.; DK (NT), SE. – AC 10:295, FAD 93D (as *ochroleucus*), M&J 128 (as *causticus*).
- C. emollitoides* Bidaud, Moëgne-Loec. & Reumaux (*C. causticus* Fr. s. auct., possibly also *C. galeobdolon* Melot)
- Cap white when young, later often only slightly ochraceous, glutinous when young, later viscid; taste bitter in cap cuticle and flesh. Cap 30-70 mm, hemispherical, then low convex, hygrophanous; gills crowded to medium spaced, greyish white, later brownish yellow; stem 40-80 x 6-14 mm, cylindrical to tapering downwards, white, later slightly ochraceous, viscid when young; universal veil white, very sparse; flesh first white, later somewhat yellowish; smell unpleasant, sweetish-raphanoid; exsiccates with pale whitish grey brown cap and whitish stem. Sp 7.5-8(-8.5) x 4.5-5 μm , amygdaloid, finely to moderately verrucose (fig. 679D), weakly dextrinoid. In deciduous forests with *Quercus*, *Fagus* and *Carpinus*; autumn; occasional in temp., rare in hemib.; DK (LC), NO (NT), SE (LC). – CFP B56, M&J 128 (as *eburneus*), Ves 364, ☉.
- C. barbatus* (Batsch: Fr.) Melot
- 5. With *Salix* or *Alnus*; cap 8-20 mm. Cap conical, later low convex, often with a small umbo, sometimes narrowly pellucid-striate, slightly viscid, pale apricot yellow, with whitish margin, hygrophanous; gills crowded to medium spaced, pale yellowish brown; stem 20-40 x 1.5-5 mm, cylindrical to slightly clavate, white, almost dry; universal veil white, very sparse; flesh yellowish; smell sweetish, unpleasant; taste bitter; exsiccates with brownish cap and whitish stem. Sp 6-7 x 4.5-5 μm , ellipsoid to broadly ellipsoid, moderately and coarsely verrucose (fig. 679E), weakly dextrinoid. In damp mixed forests; late summer to autumn; rare in hemib.-bore., poorly known; FI, SE. – AC 10:298.
- C. croceocrystallinus* Rob. Henry var. *alneti* Bidaud
- With *Quercus*, *Fagus* or coniferous trees; cap often > 15 mm broad. 6
 - 6. Most sp > 5 μm wide 7
 - Most sp < 5 μm wide 8
 - 7. Cap and stem very glutinous when moist; sp 7-7.5(-8) x 5-5.5 μm (fig. 679F). Cap 20-45 mm, hemispherical, then low convex to almost plane, sometimes with a very low and broad umbo, apricot yellowish brown, but drying very pale yellowish, hygrophanous; gills



Spores: A: *Cortinarius croceocaeruleus*, B: *C. microspermus*, C: *C. emollitoides*, D: *C. barbatus*, E: *C. croceocrystallinus* var. *alneti*, F: *C. vibratilis* s. Brandrud et al., G: *C. lustrabilis*, H: *C. causticus* s. Brandrud et al., I: *C. pluvius* s. Brandrud et al., J: *C. vibratilis* s. Kytövuori et al.

crowded to medium spaced, greyish white, later pale brownish yellow; stem 50-100 x 3-6 mm, cylindrical to slightly clavate, whitish, soon yellowish due to age or handling; universal veil white, very sparse; flesh yellowish; smell fairly strong, especially in flesh, sweetish-raphanoid, unpleasant; taste bitter; exsiccates with greyish-brownish to brownish cap and whitish stem. Sp broadly ellipsoid to ellipsoid, moderately and fairly coarsely verrucose, weakly dextrinoid. In mesic coniferous forests with *Picea*; late summer to autumn; common in hemib.-bore.; FI, SE. – CFP D26.

C. vibratilis (Fr.: Fr.) Fr. s. Brandrud et al. 1998 (*C. pluvius* (Fr.: Fr.) Fr. s. auct.)

- Cap slightly viscid to almost dry when moist; stem dry; sp 8.5-9.5 x 5-6 μm (fig. 679G). Cap 35-60 mm, hemispherical, then low convex, sometimes depressed in the middle, vivid apricot yellow to more reddish brown, hygrophanous, at least at first rimy fibrillose due to drying, in contrast with the wet and darker background; gills crowded to medium spaced, yellowish brown, later brownish; stem 60-100 x 7-12 mm, cylindrical or tapering downwards to slightly clavate, thinly covered with white silky fibrils which soon disappear revealing the yellow flesh; universal veil white, sparse, presumably slightly viscid; flesh yellow; smell sweetish; taste slightly bitter, at least in the cap context; exsiccates with greyish brown to more vivid reddish brown cap and greyish white stem. Sp ovoid to amygdaloid, finely to moderately and separately verrucose, more strongly at apex, weakly dextrinoid. In dry to mesic coniferous forests; autumn; very rare in hemib.-bore.; FI, NO (NE). – AC 10:294, Kar 46:14, Sienil 58(4):105.

C. lustrabilis Moëgne-Locc.

8. Cap apricot yellow to vivid red brown, very finely papillose or rugulose, especially at centre; with *Pinus*; sp ovoid-ellipsoid, moderately and coarsely verrucose (fig. 679H). Cap 20-45 mm, hemispherical, then low convex to almost plane, sometimes narrowly pellucid-striate, viscid, hygrophanous; gills crowded to medium spaced, greyish white, later pale greyish brown; stem 40-90 x 4-9 mm, cylindrical to clavate, white, slightly glutinous; universal veil white, sparse; flesh whitish; smell faint; taste very bitter; exsiccates with reddish brown cap and whitish stem. Sp 6.5-7.5 x 4.3-4.8 μm , weakly dextrinoid. In dry, sandy heath forests but also in mixed coniferous forests, with *Pinus*; autumn; common in hemib.-bore., occasional in suba. in IS, very rare in temp.; DK (DD), FI (LC), IS, SE. – CFP D24.

C. causticus Fr. s. Brandrud et al. 1998

- Cap greyish yellow to yellowish red brown, smooth; with deciduous or coniferous trees; sp ellipsoid to amygdaloid, finely verrucose

9

9. Cap 12-30 mm; sp < 7 μm long, ellipsoid to very slightly ovoid (fig. 679I), fairly weakly to moderately dextrinoid. Cap conical to hemispherical, later low convex to almost plane,

often with a small and low, but acute umbo, pale greyish brown to ochraceous brown, with whitish edge, sometimes pellucid-striate 1/3 to 1/2 from margin, very slightly viscid and soon drying, weakly hygrophanous; gills medium spaced, pale greyish when young, later yellowish brown; stem 35-70 x 3-5 mm, cylindrical to slightly clavate, first whitish fibrillose, later pale yellowish brownish with age or handling, slightly viscid to almost dry; universal veil white, fairly sparse; flesh yellowish to pale brownish yellowish; smell slightly sweet, sometimes iodoform-like; taste bitter to slightly bitter at least in the cuticle; exsiccates with pale greyish yellowish to brownish cap and whitish stem. Sp (5.5-)6-7 x (3.7-)4-4.5 μm , finely verrucose. In dry sandy *Pinus* heath forests, and in submesic to mesic coniferous forests with *Pinus*; late summer to autumn; occasional in hemib.-bore.; FI (LC), NO, SE. – CFP D23, D25.

C. pluvius (Fr.: Fr.) Fr. s. Brandrud et al. 1998 (*C. pluviorum* (Jul. Schäff.) M.M. Moser s. auct.)

- Cap 30-75 mm; sp > 7 μm long, amygdaloid, weakly dextrinoid 10
- 10. Cap saturated apricot yellow to yellowish red brown, glutinous; in hemib.-bore. Cap 35-75 mm, conical to hemispherical, then low convex with, sometimes with a low umbo, hygrophanous; gills crowded to medium spaced, greyish white, later pale brownish yellow; stem 50-150 x 5-12 mm, cylindrical to clavate, often with a pointed base, white, somewhat glutinous; universal veil white, very sparse; flesh whitish; smell slightly raphanoid to sweetish; taste very bitter, sometimes first sweet; exsiccates with ochraceous to reddish brown cap and whitish stem. Sp 7-8 x 4.3-4.8 μm , amygdaloid, very finely verrucose (fig. 679J), almost without iodine reaction. In dry to mesic coniferous forests with *Picea* and presumably also with *Pinus*; late summer to autumn; common in hemib.-bore., occasional in suba. in IS; FI (LC), NO, SE. – Soop 04:66, M&J 28.

C. vibratilis (Fr.: Fr.) Fr. s. Kytövuori & Niskanen, Moser and possibly also Soop

- Cap greyish ochraceous to ochraceous, very slightly viscid; in temp.-hemib. see *C. emollitoides* 4

Subgen. *Phlegmacium* (Fr.) Trog

THOMAS STJERNEGAARD JEPPESEN,

TOBIAS GULDBERG FRØSLEV & TOR ERIK BRANDRUD

Cap glutinous to almost dry and stem dry. Cap (15-)30-140(-200) mm, hemispherical to low convex, viscid, glutinous to almost completely dry, glabrous, tomentose or innate fibrillose, with universal veil remnants or not, white, grey, olivaceous, green, yellow, violaceous, blue or brown. Gills emarginate, crowded to \pm distant, serrulate or not, narrow to broad, white, grey, olivaceous, green, yellow, violaceous, blue or brown. Stem 20-200 x 5-50 mm, radicating, cylindrical, clavate or \pm abruptly bulbous, white, grey, olivaceous, green, yellow, violaceous, blue or brown, often with conspicuous partial veil (cortina) remnants becoming cinnamon to rust brown from spores, with or without girdles of universal veil. Flesh white, grey, olivaceous, green, yellow, violaceous, blue or brown, in many species with a malt-like or slightly earth- or dust-like smell, some species with smell of banana peel, honey, flour, radish, marjoram, lemon cake, *Prunus padus* flowers (cf. *Hebeloma sacchariolens*), parsley, plums, celery or very strong and unpleasantly earthy.

Sp citriform, amygdaloid, ellipsoid or subglobose, with fine to coarse ornamentation, rarely smooth and pale. Cap cuticle of two types, either: a) simplex: one-layered of thick epicutis and hyphae often with intracellular (more rarely incrusting) pigment, 2-5(-8) μm wide; or b) duplex: two-layered, with thin epicutis, hyphae often hyaline, 4-8 μm wide, and subpellis of \pm subcellular 10-25(-30) μm wide hyphae, often with incrusting pigment.

On soil, forming ectomycorrhiza with *Fagus*, *Quercus*, *Tilia*, *Corylus*, *Carpinus*, *Betula*, *Populus*, *Picea*, *Pinus* or more rarely with *Salix*, *Dryas* or *Helianthemum*, most species associated with one or only a few coniferous or deciduous host species. Many species calciphilous and restricted to habitats with long continuity and/or habitats with a high species diversity, and therefore considered

valuable indicators of important habitats/localities in terms of natural conservation. *C. splendens* has been reported to cause deadly poisoning, and it is generally recommended not to consume species of subgen. *Phlegmacium*, as species identification is difficult and our knowledge of potential toxic substances is scarce.

162 species in the key of which 154 are recorded from the Nordic countries.

Suppl. lit.: Brandrud 1996, 1998, Frøslev et al. 2005, 2006, 2007, Garnica et al 2003, Moser 1960, Orton 1955.

- | | | |
|----|---|-------------------------------|
| 1. | Stem bulbous with a rounded bulb to abruptly bulbous with a ± margined bulb | 2 |
| - | Stem cylindrical, clavate or rooting | 5 |
| 2. | Gills and/or flesh initially yellow, green or olivaceous | Key A p. 681 |
| - | Gills and/or flesh whitish, violaceous, brownish, cream or ochraceous, not yellow, green or olivaceous | 3 |
| 3. | Cap cuticle initially violaceous or blue, at least at margin | Key B p. 689 |
| - | Cap cuticle initially without violaceous or blue colours, but sometimes with violaceous veil remnants | 4 |
| 4. | Gills initially with violaceous or blue colours <i>and/or</i> bulbipellis distinctly pink with KOH | Key C p. 694 |
| - | Gills initially with whitish, cream or ochraceous colours; bulbipellis unchanging or brownish with KOH, not distinctly pink | Key D p. 701 |
| 5. | Gills initially dark olivaceous brown; flesh bitter; sp subglobose | Key E p. 707 |
| - | Gills initially white, cream, violaceous, blue, yellow to greenish; flesh mild; sp ellipsoid, amygdaloid or citriform, rarely subglobose | 6 |
| 6. | Gills yellow or greenish | 7 |
| - | Gills whitish, brownish or bluish to violaceous | 8 |
| 7. | Pileipellis simplex; cap not hygrophanous, at centre purplish, red or olivaceous with KOH; smell like banana-peel, apple or marjoram | Key F p. 708 |
| - | Pileipellis duplex; cap often bicoloured hygrophanous, at centre negative to brownish with KOH; smell indistinct to honey-like in flesh | see <i>C. scaurus</i> key A 2 |
| 8. | Cap cuticle finely to coarsely granulate-diffracted at centre, appearing minutely cracked, towards margin glabrous, centre often ± purplish brown or olivaceous to olivaceous brown with KOH; stem with appressed, ± glutinous veil girdles; smell like maize, mown grass or banana-peel; gills ochraceous white or slightly whitish rose | Key F p. 708 |
| - | Cap cuticle innately fibrillose to glabrous, not granulate-diffracted; not minutely cracked, but maybe coarsely cracked with age or with small spot-like veil remnants; centre negative or brownish with KOH; stem with or without veil girdles, not glutinous; smell trivial, unpleasantly earthy, like honey, farinaceous or like old cheese; gills whitish, brownish or bluish to violaceous | 9 |
| 9. | KOH in flesh yellow, sometimes as a ring | Key G p. 710 |
| - | KOH in flesh unchanging to brownish, not yellow | Key H p. 713 |

Key A: Subgen. *Phlegmacium*: Stem bulbous; gills and/or flesh initially yellow, green or olivaceous

- | | | |
|----|---|---|
| 1. | Cap ± hygrophanous, often bicoloured, or with dark, hygrophanous spots; pileipellis duplex, with a ± cellular subpellis; smell honey-like; sp ellipsoid | 2 |
| - | Cap not hygrophanous; pileipellis simplex, without a subpellis; smell not honey-like; sp amygdaloid-citriform | 3 |

2. Stem 40-80 x 5-10 mm; cap 25-60 mm. Cap hemispherical to convex, then expanded, brown with an olivaceous tinge, at centre dark brown, at margin greyish green tinged when young; gills greenish to olivaceous, soon brownish; stem with a ± marginate bulb, initially pale bluish to bluish green, with age yellowish grey, lower part of stem/bulb with pale greenish veil remnants; flesh brownish-whitish, in stem initially greenish blue to olivaceous. Sp 9-11 x 6-7 μm, ellipsoid, densely verrucose (fig. 687A). With conifers on silicious soil; summer to autumn; common in hemib.-bore., rare in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP C21, Däh 759, FAD 84B.

C. scaurus (Fr.: Fr.) Fr.

- Stem 40-80 x 10-20 mm; cap 40-90 mm. Cap hemispherical to convex, then expanded, rather pale ochraceous brown to greyish ochre, then olivaceous brown, at margin first greyish green; gills greenish to olivaceous, often also with a distinct bluish tinge; stem with ± marginate bulb, initially distinctly violaceous, at least in upper part, lower half ± olivaceous, bulb covered with pale greenish veil; flesh whitish in cap, in stem distinctly violaceous to bluish green. Sp 9-10.5 x 6-7 μm, ellipsoid, densely verrucose. Mostly with conifers, often in young plantations, but rarely also with *Betula* and *Fagus*, on silicious to ± eutrophic soil; summer to autumn; occasional in hemib.-suba., very rare in temp.; DK (DD, EJyl: Rold Skov 1900), FI, NO (LC), SE (LC). – CFP C08, Däh 760, FAD 83C.

C. herpeticus Fr.

3. Smell strong and sweet like *Prunus padus* flowers and *Hebeloma sacchariolum*, also with a component of black pepper when bruised / cut. Cap 30-70 mm, hemispherical to convex, then expanded, green, greenish yellow to olivaceous green, sometimes with small, appressed, dark olivaceous green to blackish velar scales at centre; gills pale yellowish green when young, then olivaceous to olivaceous green, sometimes with a violaceous tinge towards cap margin; stem 40-70 x 10-15 mm, with a marginate bulb, greenish yellow; veil at bulb margin and basal mycelium greenish yellow; flesh white, often with a violaceous tinge in stem top when young, greenish in bulb; KOH on cap initially brownish to olivaceous brown, becoming purplish brown within minutes, in flesh negative. Sp 9.5-11 x 5.5-6.5 μm, amygdaloid (to citriform), coarsely verrucose. In deciduous forests, mainly *Carpinus* and *Fagus* on calcareous soil; autumn; very rare in temp.-hemib.; DK (EN), SE (VU). – Svp 27:46, 40:19, Ves 374.

C. odoratus (M.M. Moser) M.M. Moser (*C. joguetii* Melot)

- Smell faint, weak malty, farinaceous, like black pepper, boiled potatoes, aniseed, radish, unripe banana, apple, marjoram or lemon cake 4
4. KOH on cap distinctly red, purplish red to purplish brown or blackish 5
 - KOH on cap negative, brownish to ± red brown, or weakly olivaceous 20
5. Smell like black pepper 6
 - Smell faint, weak malty, like boiled potatoes or aniseed 7
6. Gills greenish yellow to olivaceous yellow; with conifers. Cap 50-100 mm, hemispherical to convex, then expanded, at margin green, often with darker fibres, towards centre olivaceous green, olivaceous brown to blackish; stem 40-80 x 12-20 mm, with a marginate bulb, greenish yellow; veil at bulb margin and basal mycelium greenish yellow; flesh bright greenish yellow in bulb and stem cortex, paler in cap and stem centre; KOH on cap black, in flesh olivaceous green. Sp 9.5-11 x 5.5-6.5 μm, amygdaloid, coarsely verrucose. On calcareous soil; autumn; rare in hemib.; NO (NTr: Frosta), SE (VU, Gtl). – CFP B27, Däh 763, Nit 257.

C. atrovirens Kalchbr.

- Gills greyish to violaceous; with *Quercus*, rarely *Fagus*. Cap 50-80 mm, hemispherical to convex, then expanded, at margin green, often with darker fibres, towards centre olivaceous green, olivaceous brown to blackish; stem 40-70 x 10-15 mm, with a marginate bulb, greenish yellow; veil at bulb margin and basal mycelium greenish yellow; flesh bright greenish

yellow in bulb and stem cortex, paler in cap and stem centre; KOH on cap black, in flesh olivaceous green. Sp 9.5-11 x 5.5-6.5 μm , amygdaloid, coarsely verrucose. On warm, dry calcareous soil; autumn; DE. – CFP D06.

C. ionochlorus Maire

7. Gills, cap, stem and flesh initially yellow without greenish yellow or olivaceous tinges; cap red with KOH and still red after 15 min.; exsiccates not vinaceous or purplish 8
 - Gills, cap, stem or flesh initially with greenish yellow or olivaceous tinges; cap purplish red, purplish brown, greenish or red and then becoming dark purplish red to \pm blackish after 15 min; exsiccates usually distinctly vinaceous or purplish 9
8. Cap centre usually covered with numerous small umber-brown to purplish brown velar scales; frb not becoming saffron orange with age; sp amygdaloid to slightly citriform. Cap 50-100 mm, hemispherical to convex, then expanded, yellow at margin, with age golden yellow to yellow brown; gills curry yellow; stem 40-80 x 10-20 mm, with a marginate bulb, pale yellow, often with pale yellow mycelial strands; flesh pale yellow to almost whitish in cap, persistently yellow in bulb; KOH on cap blood red, in flesh greyish rose, darker red in base of bulb. Sp 10-11.5 x 5.5-6.5 μm , coarsely verrucose. In deciduous forests on \pm calcareous soil, mainly with *Fagus*, but also *Corylus*; autumn; rare in temp., very rare in hemib.; DK (LC), SE (VU). – CFP D19, Däh 766 (as *guttatus*), Svp 40:14, Ves 371.
C. alcalinophilus Rob. Henry (*C. majusculus* Kühner, *C. fulmineus* (Fr.) Fr. s. Moser)
 - Cap usually without, or only with few velar scales at centre; frb becoming saffron orange with age, especially on bulb margin and in damages; sp distinctly citriform. Cap 50-140 mm, hemispherical to convex, then expanded, yellow, becoming \pm saffron orange from centre with age; gills bright yellow; stem 40-100 x 12-25 mm, with a marginate bulb, pale yellow; flesh yellow, pale yellow to almost whitish, in bulb becoming \pm saffron orange; KOH on cap red, in flesh greyish rose, more reddish in base of bulb. Sp 9-11 x 5.5-6.5 μm , coarsely verrucose. In open forests, scree forests (west NO), parks and wooded meadows, in rich to calcareous soil, mainly with *Corylus*, more rarely *Quercus* or *Fagus*; autumn; very rare in temp., rare in hemib.; DK (NT), FI, NO (VU), SE (NT). – CFP D02, Nit 252, Phil 174a, R&H 506, Svp 40:14.
C. olearioides Rob. Henry (*C. subfulgens* P.D. Orton, *C. fulmineus* (Fr.) Fr. s. Brandrud, Ryman)
9. Smell distinct of aniseed. Cap 40-100 mm, hemispherical to convex, then expanded, at margin olivaceous grey, yellowish green to bluish green, towards centre olivaceous brown, with age red brown; gills greenish yellow; stem 50-100 x 10-20 mm, with a marginate bulb, olivaceous green to greenish yellow; cap flesh not with a distinct violaceous line below cap cuticle; KOH on cap deep red, becoming dark purplish, in flesh red. Sp 10.5-12 x 6.5-7.5 μm , amygdaloid to slightly citriform, coarsely verrucose. With conifers on calcareous soil; autumn; rare in hemib.-bore., and with an eastern distribution; FI (NT), SE (LC). – CFP C15, Däh 761, Nit 255, R&H 504.
C. odorifer Britzelm.
 - Smell not of aniseed 10
10. Cap margin on young frb greenish yellow 11
 - Cap margin on young frb green, olivaceous or \pm violaceous 15
11. Sp > 11.5 μm long 12
 - Sp < 11.5 μm long 13
12. With *Fagus*; flesh in stem without violaceous tinges. Cap 70-130(-150) mm, hemispherical to convex, then expanded, bright yellow to slightly greenish yellow, with age often turning warm orange to orange brown from the centre; gills greenish yellow; stem 60-120 x 15-30 mm, with a marginate bulb, greenish yellow; flesh whitish, in bulb and stem cortex with

greenish yellow tinges; KOH on cap deep red, becoming dark purplish within minutes, in yellow parts of flesh red, otherwise negative. Sp 12.5-15 x 8-9.5 μm , citriform, coarsely verrucose. On calcareous soil; autumn; rare in temp.; DK (VU), SE (EN). – CFP C54, Nit 249, Phil 173d, Svp 40:22, Ves 371, ☉.

C. elegantissimus Rob. Henry (*C. aurantioturbinatus* (Secr.) J.E. Lange s. auct., nom. illeg.)

- With conifers; flesh in cap and/or stem violaceous, at least in young specimens (or with KOH). Cap 50-90 mm, hemispherical to convex, then expanded, bright greenish yellow, with age often warm orange, orange brown to red brown from centre; gills greenish yellow; stem 40-70 x 10-20 mm, with a marginate bulb, greenish yellow, sometimes with a violaceous tinge in upper part; flesh violaceous to whitish, in bulb and cortex with greenish yellow tinges; KOH on cap deep red, becoming dark purplish within minutes. Sp (11.5-)12-13.5(-14) x 7.5-9 μm , amygdaloid to slightly citriform, coarsely verrucose. On calcareous, sandy soil; autumn; very rare in bore.-hemib.; SE (EN).

C. cedretorum Maire

13. Gills olivaceous, towards edge \pm wax yellow, sometimes also with a violaceous tinge; with *Quercus* or *Carpinus* see *C. prasinus* 18

- Gills greenish yellow, without violaceous tinge; with *Fagus* or conifers 14

14. With *Fagus*; flesh in cap and/or stem violaceous, at least in young specimens (or with KOH). Cap 50-90 mm, hemispherical to convex, then expanded, bright greenish yellow, with age often warm orange, orange brown to red brown from centre; gills greenish yellow; stem 40-70 x 10-20 mm, with a marginate bulb, greenish yellow, sometimes with a violaceous tinge in upper part; flesh violaceous to whitish, in bulb and cortex with greenish yellow tinges; KOH on cap deep red, becoming dark purplish within minutes, in yellow parts of flesh reddish. Sp 9.5-11.5 x 5.5-7 μm , amygdaloid to slightly citriform, coarsely verrucose. On calcareous soil; autumn; very rare in temp.; DK (EN), SE (EN). – Svp 40:23.

C. caesiolatus Bidaud & Reumaux (*C. cedretorum* Maire var. *suberetorum* Maire s. auct., *C. cedretorum* Maire s. auct. p.p.)

- With conifers; flesh in cap and stem whitish. Cap 40-80 mm, hemispherical to convex, then expanded, at margin \pm greenish yellow, at centre darker ochraceous yellow, with age orange brown to red brown from centre; gills greenish yellow; stem 40-90 x 8-15 mm, with a marginate bulb, greenish yellow; flesh in bulb and cortex with \pm greenish yellow tinges; KOH on cap deep red, becoming dark purplish within minutes, somewhat reddish in yellow parts of flesh. Sp 10-11.5 x 6-7 μm citriform, coarsely verrucose. On \pm calcareous soil; autumn; rare in hemib.-bore.; FI (LC), NO (NT), SE (VU). – CFP C36, Nit 256.

C. aureofulvus M.M. Moser

15. With conifers. Cap 50-120 mm, hemispherical to convex, then expanded, at margin greyish green to olivaceous grey, sometimes with a \pm bluish tinge, at centre olivaceous brown, and soon becoming deep brownish red to copper red; gills olivaceous green to olivaceous yellow, rarely slightly violaceous towards cap margin when young; stem 50-100 x 12-25 mm, with a marginate bulb, pale greyish green to olivaceous, sometimes with bluish tinges, veil at bulb margin greyish green, becoming purplish brown; KOH on cap blackish purple, in flesh initially greenish yellow, becoming vinaceous red brown. Sp 10-11.5 x 6.5-7.5 μm , amygdaloid-citriform, coarsely verrucose. On calcareous soil; autumn; rare in hemib.-bore., very rare in temp.; FI (LC), NO (NT), SE (NT). – CFP C42, Nit 256, R&H 504, Sieniop 197.

C. cupreorufus Brandrud (*C. orichalceus* (Batsch) Fr. s. Moser)

- With deciduous trees, thermophilous 16

16. Stem and cap initially grey to violaceous grey, without greenish or greenish yellow tinges, sometimes with an olivaceous tinge. Cap 50-100 mm, hemispherical to convex, then expanded, oxidizes intensely vinaceous, reddish to violet red from centre, sometimes \pm scaly at centre; gills olivaceous green; stem 40-80 x 10-20 mm; with a marginate bulb, universal

veil on bulb margin oxidizes intensely vinaceous/purplish; KOH on cap and flesh initially olivaceous green, becoming dark reddish to blackish after few minutes. Sp (10.5-)11-12.5 x 6.5-7.5 μm , strongly citriform, coarsely verrucose. Thermophilous, with deciduous trees on calcareous soil; autumn; rare in temp.-hemib.: DK (VU), NO (CR), SE (NT). – CFP B23, Nit 254, Phil 178a, Svp 40:19, Ves 375, ☉.

C. rufolivaceus (Pers.: Fr.) Fr.

- At least stem, usually also cap initially with greenish yellow to greenish tinges 17
- 17. Flesh in stem pale greyish yellow to pale greenish yellow or almost whitish, sometimes with a violaceous tinge in top; cap initially blood red with KOH, becoming dark purplish brown to blackish within minutes; veil at bulb margin becoming vinaceous to purplish red with age or when exposed; exsiccates \pm vinaceous to purplish 18
- Stem flesh bright yellow to greenish yellow, not violaceous; KOH on cap initially olivaceous brown, red brown to \pm purplish brown, but not blackish within minutes; veil at bulb margin unchanging or somewhat brownish to red brown with age; exsiccates \pm brownish 19
- 18. Flesh with a distinct violaceous line below cap cuticle; cap usually also with distinct violaceous tinges when young; gills bright greenish yellow. Cap 40-100 mm, hemispherical to convex, then expanded, margin olivaceous green to distinctly violaceous blue, at centre bluish grey to olivaceous grey when young, becoming red brown to copper red with age; stem 40-80 x 10-20 mm, with a marginate bulb, greenish yellow, distinctly rooting below bulb margin; flesh yellowish white in cap, more greyish yellow to greenish yellow in stem, turning purplish brown in base of bulb with age; smell faint, somewhat like boiled potatoes; KOH on cap deep red, becoming dark purplish within minutes, in flesh reddish to purplish red, sometimes initially greenish. Sp 9-11 x 5.5-7 μm , citriform, coarsely verrucose. With *Quercus*, mainly in open woodland on calcareous soil; autumn; very rare in hemib.; SE (VU, Gtl, ÖI). – Mar 710, M&J 23.

C. xanthophyllus (Cooke) Rob. Henry

- Cap and cap flesh without lilac tinges; gills greyish green, olivaceous grey, \pm wax yellow towards edge, sometimes with a violaceous tinge towards cap margin. Cap 50-100 mm, hemispherical to convex, then expanded, pale greyish green to olivaceous green, from centre olivaceous brown, with age often \pm red brown; stem 40-80 x 12-22 mm, with a marginate bulb, pale greenish, bulb margin with pale greenish yellow to \pm violaceous universal veil; flesh whitish, initially sometimes slightly greenish in cap and bulb, sometimes \pm violaceous in stem; KOH on cap reddish to purplish red, in flesh rose, red to deep red brown. Sp 10-11.5 x 6-7 μm , amygdaloid to slightly citriform, coarsely verrucose. With *Quercus*, *Carpinus*, *Corylus* and possibly also *Tilia*, mainly in open, \pm grassy woodland meadows, on calcareous soil; autumn; very rare in hemib.; NO (CR), SE (EN). – CFP B11.

C. prasinus (Schaeff.: Fr.) Fr.

- 19. With \pm fugacious violaceous tinges on stem and/or gill edge; cap not blushing reddish from centre; flesh uniformly yellow in all parts. Cap 40-100 mm, hemispherical to convex, then expanded, olivaceous green to greyish green, becoming chestnut brown to purplish brown from centre, sometimes with \pm fugacious violaceous tinges, with distinct, small umber brown to purplish brown velar scales, slightly innately fibrillose; gills yellow to olivaceous yellow or olivaceous green, sometimes with \pm violaceous edge; stem 40-80 x 10-20 mm, yellow to olivaceous green, and often with \pm violaceous tinges; flesh becoming slightly saffron orange in bulb when exposed. Sp 9-10.5(-11) x 5.5-6.5 μm , amygdaloid, coarsely verrucose. With *Quercus* on warm and dry calcareous soil; autumn; DE. – FND 29:52.

C. splendificus Chevassut & Rob. Henry

- Without violaceous tinges on stem and gill edge; cap blushing \pm reddish from centre; flesh in cap and bulb pale yellowish, in stem yellow to greenish yellow, strongest in cortex. Cap 50-100 mm, hemispherical to convex, then expanded, yellow to ochraceous, margin initially

olivaceous green to olivaceous yellow, centre olivaceous brown, becoming ± reddish striate from centre, slightly innately fibrillose; gills olivaceous yellow; stem 40-80 x 10-20 mm, yellow to yellow green; smell and taste indistinct, mild. Sp (9.5-)10-12(-13) x 6-7.5 µm, amygdaloid to ± citriform, coarsely verrucose. With *Carpinus*, *Quercus* and possibly also *Fagus* on warm and dry calcareous soil; autumn; DE. – JEC 2006:92.

C. glaucescens (Jul. Schäff.) M.M. Moser

20. Young gills brown; flesh brown in stem top, otherwise greenish yellow. Cap 40-80 mm, hemispherical to convex, then expanded, greenish yellow to greenish, becoming olivaceous brown from centre, sometimes with brownish velar scales; stem 40-70 x 8-15 mm, pale yellow in upper part, towards base more greenish yellow; bulb very distinctly marginate, recalling that of *C. calochrous*, with greenish yellow veil, basal mycelium greenish yellow; KOH on cap indistinctly olivaceous, in cap and bulb flesh olivaceous, in stem flesh dark red brown to purplish black. Sp 9-10.5 x 5.5-6.5 µm, amygdaloid, fairly coarsely verrucose. With *Fagus* on calcareous soil; autumn; very rare in temp.; DK (EN), SE (EN). – CFP D03.

C. fulvocitrinus Brandrud

- Young gills greenish yellow, flesh in stem top not brownish when young 21
- 21. Flesh in both bulb and cap bright yellow or greenish yellow (K&W 1A5-A8 or 2A5-A8); frb intensely coloured 22
- Flesh at least in the cap less bright coloured; frb intensely coloured or not 24
- 22. With conifers. Cap 40-100 mm, hemispherical to convex, then expanded, strongly yellow, at centre olivaceous yellow brown, darkening, with numerous small, distinct, chestnut brown to almost purplish black velar scales; gills bright yellow; stem 40-70 x 12-20 mm, with a marginate bulb, bright yellow, yellow veil on bulb margin soon becoming dark amber to olivaceous brown; flesh strongly yellow; smell strong of black pepper; KOH on cap olivaceous green to olivaceous brown. Sp 9.5-11 x (5.5-)6-6.5 µm, citriform to amygdaloid, coarsely verrucose. On calcareous soil; autumn; rare in hemib., very rare in bore.; FI (VU), NO (VU), SE (NT). – CFP A50, Däh 764 (as *vitellinus*), Nit 257.

C. meinhardii Bon (*C. vitellinus* M.M. Moser non (Pers.: Fr.) Bigeard & H. Guill.)

- With *Fagus* or very rarely *Tilia* 23
- 23. Frb bright greenish yellow when young. Cap 40-80 mm, hemispherical to convex, then expanded, sometimes slightly innately fibrillose, greenish yellow to greenish, soon becoming olivaceous grey brown from centre, sometime olivaceous to purplish black with age, without or with few distinct velar scales; gills bright sulphur to greenish yellow when young; stem 35-70 x 8-15 mm, with a marginate bulb, greenish yellow, greenish yellow veil at bulb margin soon becoming olivaceous/purplish brown; flesh greenish yellow; smell somewhat of malt/black pepper. KOH negative to very weakly olivaceous on cap, in flesh negative. Sp 8.5-10 x 5-5.5(-6) µm, amygdaloid to slightly citriform, coarsely verrucose. With *Fagus* on ± calcareous soil; autumn; rare in temp.; DK (LC), SE (NT). – CFP D05, FAD 84E, 85B, Svp 40:18, Ves 370.

C. citrinus (J.E. Lange) P.D. Orton (*C. pseudosulphureus* P.D. Orton)

- Frb bright yellow, hardly with any greenish tinges when young. Cap 30-70 mm, hemispherical to convex, then expanded, bright lemon yellow, soon with more yellow to fulvous brown centre, sometimes becoming ± orange to red brown at centre, sometimes with small dark brown to blackish scales at centre; gills bright lemon yellow when young; stem 30-70 x 8-15 mm, with a marginate bulb, bright lemon yellow; flesh bright yellow, smell indistinct; KOH on cap olivaceous, in flesh indistinctly reddish. Sp 9.5-11.5 x 5.5-6 µm, amygdaloid, coarsely verrucose. With *Fagus*, rarely with *Tilia cordata*, in deep litter on calcareous soil; autumn; very rare in temp.-hemib.; DK (VU), NO (EN), SE (VU). – CFP B57, Däh 765, Nit 252, Svp 40:15, Ves 370, ☉. – Reported to be deadly poisonous.

C. splendens Rob. Henry



Spores: A: *Cortinarius scaurus*, B: *C. elegantior*, C: *C. flavovirens*, D: *C. sulfurinus*, E: *C. xanthochlorus*, F: *C. eucaeruleus*.

24. KOH in bulb flesh rose to reddish 25
 - KOH in bulb flesh negative 28
25. Sp 12.5-15 x 7.5-9 μm (fig. 687B). Cap 60-150 mm, hemispherical to convex, then expanded, often somewhat innately fibrillose, yellow brown, sometimes with an olivaceous tinge, then darker brown, often with pale yellow to brownish velar scales at centre; gills wax yellow to straw yellow when young; stem 60-120 x 15-30 mm, with a marginate bulb, pale yellow, flesh pale yellow, often slightly saffron yellow to salmon pink in bulb; KOH negative on cap and in stem and cap flesh, in bulb flesh reddish to vinaceous. Sp citriform, very coarsely verrucose. On calcareous soil, mostly with conifers, but sometimes with *Betula*, *Corylus* or *Quercus*; autumn; rare but locally occasional in hemib., very rare in bore.; FI (EN), NO (LC), SE (NT). – CFP D01, Däh 768, 769.
C. elegantior (Fr.) Fr.
 - Sp 11-12.5 x 6.5-8 μm 26
26. Smell distinct like lemon cake, apple or marjoram, *C. percomis* smell
 - Smell faint like unripe banana see *C. majoranae* key F3 27
27. Cap lemon yellow, almost uniformly coloured, not oxidizing red brown to purplish brown from centre with age; basal mycelium pale yellow to whitish. Cap 40-80 mm, hemispherical to convex, then expanded, sometimes indistinctly and finely granulate-diffracted at centre, with age often with darker innate fibrils; gills greenish yellow to sulphur yellow; stem 40-70 x 10-20 mm, with a \pm marginate bulb, greenish yellow to sulphur yellow, veil at bulb margin at first greenish yellow, becoming orange yellow to honey yellow; flesh pale greenish yellow, stronger in stem cortex and almost whitish in cap; smell like unripe banana; KOH greenish to olivaceous on cap, in bulb flesh indistinctly reddish, otherwise negative. Sp (10.5-)11-12.5 x 6.5-7.5 μm , amygdaloid, coarsely verrucose. On calcareous soil with *Tilia*, *Corylus* and possibly also *Quercus*; autumn; very rare in hemib.; SE (Öl, Vg). – Svp 56:55.
C. xanthosuavis Bon & Trescol
 - Cap lemon yellow with greenish yellow margin, soon becoming red brown to chestnut brown at centre; basal mycelium saffron orange. Cap 50-100 mm, hemispherical to convex, then expanded, \pm granulate-diffracted at centre; gills greenish yellow to olivaceous yellow; stem 50-80 x 10-25 mm, greenish yellow, with a \pm marginate bulb, veil at bulb margin yellow, becoming orange yellow to honey yellow, without reddish brown to umber or purplish brown veil girdles; flesh greenish yellow. Sp (10-)10.5-12(-12.5) x 6.5-7.5 μm , amygdaloid, coarsely verrucose. With *Quercus* on warm calcareous soil; autumn; DE.
C. aurilicis Chevassut & Trescol (*C. nanceiensis* Maire var. *bulbopodius* Chevassut & Rob. Henry)
28. Smell and taste distinctly farinaceous or or radish to earthy 29
 - Smell and taste indistinct, slightly malty or parsley-like 31
29. Smell and taste farinaceous; sp 9-10.5 x 5-6 μm (fig. 687C). Cap 50-100(-120) mm, hemispher-

ical to convex, then expanded, at margin pale greenish yellow to olivaceous, at centre olivaceous brown, with age brownish, somewhat innately fibrillose; gills pale olivaceous, straw yellow to almost greyish; stem 40-80 x 10-20 mm, with a marginate bulb, pale olivaceous yellow, bulb margin more greenish; flesh whitish; KOH negative. Sp amygdaloid, coarsely verrucose. On calcareous soil, mostly with *Quercus*, *Corylus* and *Tilia*, but also found with *Fagus*; autumn; very rare in temp., rare in hemib.; DK (EN), FI (VU, V: Lohja), NO (EN), SE (VU). – CFP A29, Nit 253, Svp 40:23.


C. flavovirens Rob. Henry

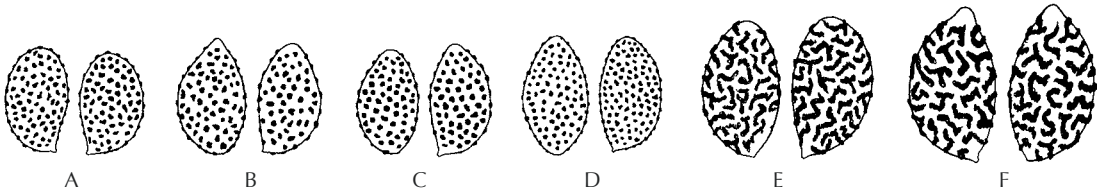
- Smell and taste not farinaceous; sp > 10 μ m long 30
- 30. Sp 10-11.5 x 6-7 μ m; cap initially pale greenish yellow to olivaceous grey brown. Cap 50-120 mm, hemispherical to convex, then expanded, at centre pale olivaceous brown with age; gills pale straw yellow; stem 50-90 x 15-23 mm, pale straw yellow, when young sometimes slightly greenish yellow, with a broad and flattened bulb, veil at bulb margin whitish to yellowish, rarely faintly violaceous spotted; flesh whitish; smell radish-like/earthy, sometimes also slightly sweetish; KOH negative. Sp citriform, coarsely verrucose. With *Fagus* and *Quercus* in deep litter, on calcareous soil; autumn; very rare in temp.-hemib.; DK (EN, Lol: Maribo Sønderø), SE. – CFP D07.
C. humolens Brandrud (*C. claroflavus* Rob. Henry s. Moser)
- Sp 11-12.5 x 6.5-7.5 μ m; cap initially pale yellowish. Cap 30-70 mm, hemispherical to convex, then expanded, often becoming ochraceous brown at centre, sometimes with whitish veil patches; gills pale straw yellow; stem 40-70 x 8-15 mm, with a marginate bulb, whitish, when young slightly yellowish white, veil at bulb margin pale yellowish; flesh whitish; smell radish-like/earthy; KOH negative. Sp citriform, coarsely verrucose. With *Tilia cordata* and possibly also *Corylus* in mixed *Tilia-Corylus* forests on calcareous soil; autumn; very rare in hemib.; NO (CR, Oslo, Tyrifjord).
C. osloensis Brandrud, T.S. Jeppesen & Frøslev
- 31. Basal mycelium and mycelial strands distinctly pink to blood red with KOH. Cap 50-120 mm, hemispherical to convex, then expanded, olivaceous yellow, with a greenish yellow to greyish green tinge towards margin when young, at centre becoming olivaceous brown, often with small, dark brown velar scales; gills pale greenish yellow; stem 50-100 x 10-22 mm, with a marginate bulb, pale yellow to pale greenish yellow, veil greenish yellow on bulb margin when young; flesh pale greenish yellow to almost white when young; smell like parsley or carrot; KOH negative on cap and in flesh. Sp 11.5-13 x 6.5-7.5 μ m, amygdaloid to slightly citriform, coarsely verrucose (fig. 687D). On \pm calcareous soil in mossy coniferous forests, rarely with *Fagus* or *Tilia*; autumn; rare in hemib.-bore.; FI (LC), NO (LC), SE (NT). – CFP A25, Sieniop 217.
C. sulfurinus Quél. (incl. *C. sulfurinus* Quél. var. *fageticola* Brandrud)
- Basal mycelium and mycelial strands negative with KOH 32
- 32. Sp (9-)9.5-10.5(-11) x 5.5-6.5 μ m; cap with thick whitish to pale greenish yellow veil patches. Cap 30-80 mm, hemispherical to convex, olivaceous green, margin greenish yellow when young, with age sometimes slightly innately fibrillose towards margin; gills olivaceous green to pale greenish yellow or greyish, most distinctly coloured towards edge, adnexed to slightly emarginate; stem 30-70 x 10-15 mm, with a broad and flattened bulb, pale greenish yellow to almost whitish, sometimes with a violaceous tinge at top; flesh whitish, in stem cortex greenish yellow, sometimes slightly violaceous in stem top; smell and taste indistinct; KOH on cap brownish, in cap flesh yellow brown, in flesh otherwise pale rose brownish to negative. Sp amygdaloid, fairly coarsely verrucose. With *Quercus* in warm and dry, calcareous soil; autumn; DE. – Cons 3:C139, FND 22:35.
C. natalis D. Antonini & M. Antonini
- Sp > 11 μ m; cap without thick whitish to pale greenish yellow veil patches 33

33. Cap 60-140 mm, often with numerous chestnut brown velar scales, \pm copper brown with age and when growing exposed; sp 11-13 \times 6.5-8 μm , on av $<$ 12.5 μm long. Cap hemispherical to convex, then expanded, olivaceous to greenish when young, margin persistently greenish to olivaceous; gills yellow, with an olivaceous tinge; stem 60-100 \times 15-30 mm, with a marginate bulb, greenish yellow to olivaceous yellow, veil at bulb margin greenish yellow; basal mycelium yellowish white to greenish yellow; flesh in stem cortex greenish yellow, otherwise whitish; KOH on cap negative to \pm brownish, in flesh negative. Sp citriform to amygdaloid, coarsely verrucose. With *Quercus* in warm and dry calcareous soil; autumn; very rare in hemib.; SE (VU). – CFP D18.
C. quercilicis (Chevassut & Rob. Henry) Rob. Henry (*C. eufulmineus* Rob. Henry s. auct., *C. cereifolius* M.M. Moser s. auct.)
- Cap 40-80 mm, rarely with velar scales and then scales whitish becoming dark olivaceous brown to purplish black; sp 12-14 \times (6.5-)7-8 μm , on av $>$ 12.5 μm long (fig. 687E). Cap hemispherical to convex, then expanded, somewhat innately fibrillose, bright greenish yellow, centre olivaceous green, soon becoming dark olivaceous brown to almost blackish from centre; gills bright yellow with an olivaceous tinge; stem 40-60 \times 10-20 mm, with a marginate bulb, greenish yellow; basal mycelium whitish, rarely with a fugacious violaceous tinge; flesh in stem greenish yellow, otherwise whitish; KOH on cap negative to \pm brownish, in flesh negative. Sp citriform to amygdaloid, very distinctly and rather densely verrucose. With *Quercus* in warm and dry, calcareous soil; autumn; very rare in temp.-hemib.; DK (CR, EJyl: Elbæk Skov), SE (EN). – FND 28:25, Jordst 17(3):62, Svp 56:48.
C. xanthochlorus Rob. Henry (*C. olivascentium* Rob. Henry s. auct)

Key B: Subgen. *Phlegmacium*: Stem bulbose; cap cuticle initially violaceous or blue, at least at margin

1. Pileipellis duplex; bulbipellis not distinctly pink with KOH; sp distinctly verrucose with isolated warts; cap often innately radially fibrillose 2
 - Pileipellis simplex; bulbipellis in most species distinctly pink with KOH; sp coarsely verrucose, with irregular warts; cap rarely distinctly radially fibrillose 8
2. Sp ellipsoid 3
 - Sp amygdaloid or citriform 4
3. Cap very strong and deep violaceous blue; sp 9.5-12 \times 6-7 μm (fig. 687F). Cap 40-110 mm, hemispherical to convex, then expanded, finely innately fibrillose, with age sometimes discolouring ochraceous yellowish from centre; gills violaceous when young, becoming violaceous grey; stem 40-80 \times 10-20 mm, with a marginate bulb, pale bluish white, soon becoming greyish white, somewhat ochraceous yellow with age, with distinctly violaceous blue veil at bulb margin; flesh greyish white, often violaceous to violaceous grey in stem top when young; smell somewhat *Scleroderma*-like. Sp ellipsoid, distinctly and densely verrucose. With *Quercus*, *Carpinus*, *Tilia* and *Corylus*, rarely with *Fagus*, on calcareous soil; autumn; rare in hemib., very rare in temp.; DK (CR), NO (CR), SE. – CFP B24, Svp 27:43, Ves 369.
C. eucaeruleus Rob. Henry (*C. terpsichores* Melot var. *calosporus* Melot, *C. terpsichores* Melot s. auct. p.p.)
- Cap at margin with light blue colours, at centre ochraceous yellow, even in young frb; sp 8.5-10 \times 5.5-6.5 μm (fig. 691A). Cap 40-90 mm, hemispherical to convex, then expanded, (finely) innately fibrillose; frb becoming \pm yellowish when handled or damaged; stem 40-80 \times 8-15 mm, with a marginate bulb, pale blue, strongest towards base; gills greyish to slightly violaceous grey; flesh greyish, becoming yellowish in bulb; smell somewhat *Scleroderma*-like. Sp ellipsoid, finely and densely verrucose. On calcareous soil, with *Pinus*, in central Europe also with deciduous trees; autumn; very rare in Gtl; SE (VU). – AC 5:111 (as *caesioflavescens*).
C. terpsichores Melot (*C. caesioflavescens* Reumaux)

4. Gill edge distinctly violaceous and contrasting the almost greyish gill surface; sp distinctly citriform. Cap 30-70 mm, hemispherical to convex, then expanded, violaceous blue to dark violaceous grey, with radial hygrophanous streaks when young, soon becoming greyish with darker, grey brown centre and \pm hygrophanous appearance, without or with a very thin and indistinct frosty veil, becoming yellow brown under adhering grass, leaves, etc.; stem 40-60 x 8-15 mm, with a marginate bulb, blue at first, discolouring whitish from below, with violaceous blue veil at bulb margin; flesh whitish, in stem bluish at first, soon becoming whitish; smell and taste indistinct to slightly malt-like. Sp 8.5-11 x 5-6 μm , distinctly and densely verrucose. With *Fagus* and *Quercus* on calcareous or clayey soil; autumn; very rare in temp.; DK (CR, EJyl: Vosnæs, Elbæk Skov). – FND 28:25 (as *imperialis*), Svp 43:21 (as *camptoros*).
- C. lepistooides* T.S. Jeppesen & Frøslev in press
- Gill edge not distinctly violaceous, not contrasting the gill surface; sp citriform to amygdaloid 5
5. With *Corylus* and possibly also *Quercus* in open woodland; stem with a \pm conspicuous volva, which is often violaceous on the inner side; cap blue with radial brownish, hygrophanous streaks or spots; often with persistently whitish, thick, skin-like patches of veil at centre. Cap 40-90 mm, hemispherical to convex, then expanded, often with a low umbo, discolouring greyish with age; gills greyish, to slightly violaceous; stem 40-80 x 8-15(-20) mm, with a marginate bulb, bluish, fibrillose; flesh whitish, becoming somewhat orange yellow, distinctly violaceous in stem cortex; smell and taste indistinct to slightly malty. Sp 9.5-10.5 x 5.5-6.5 μm , amygdaloid, verrucose (fig. 691B). On calcareous soil; autumn; very rare in Gtl, Vgl and Öi; SE. – AC 5:102, Svp 56:51.
- C. moënneloccozii* Bidaud (*C. volvatus* A.H. Sm. s. auct.)
- With *Fagus* or conifers; stem rarely with volva-like veil remnants, volva-like remnants not violaceous on the inner side; cap blue, without brownish, hygrophanous spots/streaks, often with \pm abundant, thin, appressed, whitish veil remnants, that discolour ochre yellow 6
6. With *Fagus*. Cap 50-100 mm, hemispherical to convex, then expanded, often with a low umbo, blue, becoming paler bluish to greyish blue with age, innately fibrillose, with abundant, appressed whitish to yellowish veil patches at centre; gills grey to bluish grey; stem 40-80 x 10-20 mm, with a marginate bulb, pale bluish, discolouring yellow brown with age, with whitish to yellowish veil at bulb margin; flesh blue in stem, whitish in cap and bulb, in bulb often becoming \pm yellowish; smell and taste indistinct to slightly malty, with age unpleasant. Sp 8.5-10 x (4.5-)5-5.5 μm , amygdaloid, verrucose (fig. 691C). On \pm calcareous or clayey soil, often in litter; autumn; rare in temp.; DK (LC), SE (EN). – CFP B51, Phil 176c, Ves 368, .
- C. caerulescens* (Schaeff.) Fr.
- In coniferous forests 7
7. Sp 8.5-9.5 x 5-6 μm , amygdaloid, densely verrucose; cap rarely with sparse whitish veil patches. Cap 40-90 mm, hemispherical to convex, then expanded, bluish to blue grey when young, centre ochraceous brown to dark brown, innately fibrillose; gills grey to bluish grey; stem 40-70 x 10-20(-25) mm, with a marginate bulb, pale bluish, with age becoming whitish; veil initially bluish tinged, later whitish to yellowish; flesh whitish, in stem cortex bluish, often becoming \pm yellowish to yellow brown in bulb; smell and taste indistinct to slightly malty, with age unpleasant. With *Pinus* and *Picea* on calcareous soil, in Central Europe with *Abies*; autumn; very rare in hemib.-bore.; FI (VU), NO (EN), SE (VU, Gtl). – AC 5:102, CFP B42.
- C. caesiocanescens* M.M. Moser
- Sp (9-)9.5-10.5 x 5-6 μm , acutely amygdaloid to citriform, distinctly and densely verrucose (fig. 691D); cap with fairly abundant, whitish to ochraceous yellow veil patches. Cap 40-90 mm, hemispherical to convex, then expanded, bluish to dark violaceous when young, centre



Spores: A: *Cortinarius terpsichores*, B: *C. moënneloccozii*, C: *C. caerulescens*, D: *C. aurantiobasilis*, E: *C. insignibulbus*, F: *C. aureopulverulentus*.

ochraceous brown to dark brown, innately fibrillose; gills grey to bluish grey; stem 40-70 x 10-20 mm, with a marginate bulb, fairly distinctly blue, with age becoming paler; veil initially tinged bluish, later whitish to yellowish; flesh whitish, in stem cortex bluish, becoming \pm yellowish to yellow brown in bulb; smell and taste indistinct to slightly malty, with age unpleasant. With *Picea* on calcareous soil; autumn; very rare in bore.; NO. – AC 5:101.
C. aurantiobasilis Bidaud

8. KOH on bulbipellis negative 9
- KOH on bulbipellis distinctly pink 12
9. With an intense and sweet smell, like *Hebeloma sacchariolens* or *Prunus* flowers; sp (11-)11.5-13(-13.5) x 6.5-7.5(-8) μ m. Cap 40-100 mm, hemispherical to convex, then expanded, pinkish violaceous, discolouring yellowish white from centre, centre often with appressed white veil, discolouring yellowish; stem 40-80 x 10-18 mm, with a marginate bulb, pinkish violaceous, discolouring from below; gills pinkish grey to violaceous grey; flesh whitish, pinkish violaceous in stem cortex; KOH negative in all parts. Sp citriform to amygdaloid, coarsely verrucose. With deciduous trees on calcareous soil; autumn; very rare in temp.-hemib.; DK (CR), NO (EN), SE (CR). – Cons B163, B103, M&J 54, Mos 101.
C. suaveolens Bataille & Joachim
- Smell trivial or faintly earthy; sp on av < 11 x 6.5 μ m 10
10. Cap cream, pale olivaceous to pale yellowish, with a violaceous tinge, glabrous; sp on av. < 10 x 6 μ m see *C. lilacinovelatus* key B 21
- Cap predominantly grey, pale brown to date brown, with a reddish to violaceous tinge, often somewhat innately fibrillose; sp on av > 10 x 6 μ m 11
11. Many pileipellis hyphae with incrusting, yellow-brown pigment, \pm zebra striate; cap red brown with KOH. Cap 50-70 mm, hemispherical to convex, then expanded, initially greyish, soon becoming darker red brown to date brown, sometimes with indistinct brownish veil patches; gills persistently violet; stem 40-70 x 10-15 mm, entirely violaceous, with a marginate bulb; veil on bulb margin violaceous on young specimens, staining brownish; flesh whitish; smell and taste indistinct; KOH on cap red brown. Sp 10-11.5 x 6-7 μ m, amygdaloid, coarsely verrucose. With *Corylus* in \pm open woodland on calcareous soil; autumn; very rare in hemib.; SE (Öl). – JEC 7:52,53.
C. ionodactylus Knutsson & Soop
- Pileipellis hyphae smooth or with sparse epiparietal granules; cap almost unchanging with KOH see *C. vesterholtii* key C 22
12. KOH in flesh distinctly pink; gill edge \pm sterile with conspicuous sterile elements. Cap 60-100 mm, hemispherical to convex, then expanded; initially violaceous, sometimes \pm rose at margin, centre soon becoming violaceous grey; gills grey to pale greyish violaceous; stem 50-100 x 12-20 mm, with a relatively narrow, not sharply marginated bulb, distinctly violaceous; flesh whitish, in stem cortex distinctly violaceous; smell indistinct or slightly malty,

taste distinctly bitter; KOH on cap slowly \pm pinkish. Sp 9.5-11(-11.5) \times 6-7 μm , amygdaloid, coarsely verrucose. With *Abies alba* on \pm calcareous soil, also found with sclerophyllous *Quercus* spp. on eutrophic, but not calcareous soil; autumn; DE. – CFP C26.

C. dibaphus Fr.

- KOH in flesh negative to greyish rose; gill edge \pm fertile, without conspicuous sterile elements 13
- 13. KOH on cap weakly rose; cap predominantly cream to ochraceous, usually only with a weak pinkish tinge or only slightly bluish at margin; with frondose trees; microchemical pileipellis reaction pink in a few isolated areas, with abundant extracellular crystals see *C. selandicus* key C 7
- KOH on cap usually distinctly pink to red, at least on blue areas of cap; cap usually with more distinct blue or grey to violaceous grey colours, at least at margin; with frondose or coniferous trees; microchemical pileipellis reactions without pink colours or distinctly and predominantly pink 14
- 14. With conifers 15
- With deciduous trees 16
- 15. Cap almost whitish, pale ochraceous to greyish brown, later more ochraceous brown from centre, sometimes with \pm distinct violaceous to lilaceous colouration in patches, at margin grey white to violaceous to lilaceous cream. Cap 60-120 mm, hemispherical to convex, then expanded; gills grey with a lilaceous edge to persistently lilaceous; stem 50-80 \times 15-22 mm, greyish white, sometimes with faint violaceous tinges at top; flesh whitish; smell and taste indistinct or \pm earthy; KOH on cap blood red, on bulbipellis pink, in flesh weakly rose. Sp (10.5-)11-13 \times (6.5-)-7-8(-8.5) μm , amygdaloid to citriform, coarsely verrucose. With *Pinus* on calcareous soil; autumn; very rare in hemib.; NO (EN), SE (NE, Gtl). – Mos 102.
- C. spectabilis* M.M. Moser
- Cap mottled with dark violaceous blue, bluish to olivaceous colours, at least margin, olivaceous grey to grey blue at centre, with age ochraceous grey brown to brown. Cap 50-80 mm, hemispherical to convex, then expanded, sometimes with sparse dark velar scales at centre; gills greyish to pale violaceous grey, edge sometimes more distinctly violaceous; stem 30-60 \times 11-17 mm, whitish to pale violaceous; veil at bulb margin violaceous to olivaceous; flesh whitish; smell and taste indistinct or \pm earthy; KOH on cap blood red, on bulbipellis pink, in flesh weakly rose. Sp 10.5-12(-12.5) \times 6-7(-7.5) μm , amygdaloid to slightly citriform, coarsely verrucose. With *Picea* on calcareous soil; autumn; rare in bore.; FI, NO, SE (NE). – BCat 662 (as *caesiocanescens*), Mic Due 66.
- C. caesiocinctus* Kühner
- 16. Sp (10.5-)11-12(-12.5) \times 6-7.5 μm . Cap 40-70 mm, hemispherical to convex, then expanded, mottled with violaceous, blue-green to greyish colours like *Russula cyanoxantha*, with age becoming ochraceous grey to brownish, \pm covered with appressed, initially yellowish white veil that discolours brownish and cracks into small scales, margin slightly fibrillose with age; gills violaceous; stem 30-70 \times 6-12 mm, with marginate, \pm flattened bulb, violaceous blue, discolouring yellowish white from below with age; veil at bulb margin olivaceous grey to violaceous; flesh whitish, in stem cortex violaceous; smell and taste indistinct or \pm earthy, cap cuticle \pm bitter; KOH on cap brownish where covered with veil, on violaceous areas of cap dark rose to vinaceous, on bulbipellis pink, in flesh negative. Sp amygdaloid, coarsely verrucose. With *Tilia cordata* on calcareous scree soil, possibly also with *Quercus* and *Corylus*; autumn; very rare in hemib.; NO, SE.
- C. cordatae* T.S. Jeppesen, Brandrud & Frøslev in press
- Sp on av < 11 μm long 17
- 17. Microchemical KOH reaction of all pileipellis hyphae pale brownish; cap initially and

especially with time mottled in dark blue, brown and grey colours, often with abundant appressed, yellowish to brownish, fairly thick universal veil or with numerous small brown velar scales. Cap 50-100(-130) mm, low convex, then expanded; gills greyish to violaceous; stem 50-90 x 9-20 mm, with flattened bulb, violaceous, discolouring yellowish white from below with age, veil at bulb margin whitish to somewhat violaceous, staining brownish with age; flesh whitish, in stem cortex violaceous, often with a distinct violaceous line below cap cuticle; smell and taste indistinct or \pm earthy, sometimes slightly bitter in cap cuticle; KOH pinkish on violaceous areas of cap, but with fairly slow onset compared to *C. sodagnitus*, on bulbipellis pink, in flesh negative to slightly rose. Sp (9-)9.5-10.5(-11) x 5.5-6.5(-7) μm , amygdaloid to almost ellipsoid, coarsely verrucose. With *Quercus* on calcareous soil; autumn; very rare in temp.-hemib.; SE. – AC 6:122 (as *caesiocinctus*), 11:343, Cons B103 (lower, as *molochinus*).

C. violaceipes Bidaud & Consiglio (*C. parasuaveolens* (Bon & Trescol) Bidaud, Moëgne-Locc. & Reumaux s. auct.)

- Microchemical KOH reaction of most pileipellis hyphae pink, usually no or few brownish reacting hyphae; cap initially with \pm clean, pinkish, violaceous or pale to deep blue colours 18

- 18. Sp 9.5-11 x 5.5-6.5 μm ; cap pinkish violaceous when young, at least at margin; frb often fairly large. Cap 55-100 mm, hemispherical to convex, then expanded, with age often turning \pm brownish at centre, margin discolours cream to ochraceous white, often with small patches of whitish veil at centre; gills pinkish violet to violaceous grey; stem 45-75 x 12-20 mm, with a flattened bulb, whitish, sometimes with a pinkish to violaceous tinge at stem top when young, with yellowish veil at bulb margin, discolouring ochraceous brown; bulbipellis often slightly violaceous when young; flesh whitish; smell and taste indistinct or \pm earthy; KOH pink on cap and bulbipellis, weakly rose in flesh. Sp amygdaloid, coarsely verrucose. With deciduous trees on calcareous soil, mainly *Quercus*; autumn; very rare in hemib.; NO, SE. – AC 6:124, 11:350 (middle, as *subarquatus*).
C. molochinus Bidaud & Ramm
- Sp (8.5-)9-10(-10.5) x 5-6(-6.5) μm ; cap violaceous blue to distinctly blue; frb often fairly small 19

- 19. Cap initially uniformly, distinctly and deep blue, when young usually with drop-like spots at margin, without patches of universal veil. Cap 40-70(-80) mm, hemispherical to convex, then expanded, discolouring whitish, yellowish to \pm brass brown with age; gills greyish to violaceous; stem 40-70 x 7-15 mm, with a flattened bulb, whitish with violaceous top to entirely violaceous, discolouring yellowish to brass brown with age; veil at bulb margin usually sparse, whitish to violaceous; flesh whitish, sometimes violaceous in stem cortex; smell and taste indistinct or \pm earthy, sometimes slightly bitter in cap cuticle; KOH on cap distinctly pink to blood red, on bulbipellis pink, in flesh negative to pale rose. Sp 9-10(-10.5) x 5-6(-6.5) μm , amygdaloid, coarsely verrucose. On calcareous soil with *Fagus*, more rarely *Quercus*; autumn; very rare in temp.; DK (VU), NO (CR), SE (EN). – CFP B19, M&J 17, Phil 176b.
C. sodagnitus Rob. Henry
- Cap margin initially pale violaceous blue, centre cream to pale ochraceous yellow; margin without drop-like spots, often with sparse whitish veil patches at centre. Cap 35-50(-60) mm, hemispherical to convex, then expanded, discolouring whitish to yellow brown from centre; gills greyish to pale violaceous; stem 30-50 x 7-12 mm, with a flattened bulb, whitish, often with violaceous top; veil at bulb margin whitish, becoming somewhat yellowish; flesh whitish; smell and taste indistinct or \pm earthy; KOH on cap and bulbipellis distinctly pink, in flesh negative. Sp 8.5-10 x (5-)5.5-6 μm , ellipsoid to amygdaloid, coarsely verrucose. With *Fagus* and *Quercus* on calcareous soil; autumn; very rare in temp.-hemib.; DK (CR, Lol: Møns Klint), NO (CR). – AC 5:151, Phil 126 (as *rickenianus*).
C. nymphicolor Reumaux (*C. rickenianus* Maire s. auct. p.p.)

Key C: Subgen. *Phlegmacium*: Stem bulbous; gills initially with violaceous or blue colours and/or bulbipellis distinctly pink with KOH

1. Bulbipellis or flesh distinctly pinkish with KOH *or* universal veil on bulb edge with a red to deep red-brown reaction with KOH; sp on av > 9 μm long 2
 - Bulbipellis and flesh not distinctly pink with KOH; KOH negative to brownish on universal veil on bulb edge; sp on av < 9 μm long or not 16
2. Flesh distinctly pink with KOH; gill edge \pm sterile with conspicuous sterile elements. Cap 50-120 mm, hemispherical to convex, then expanded, uniformly orange brown to rose brown, rarely with whitish or violaceous veil patches; gills greyish white, sometimes with a violaceous edge; stem 40-120 x 12-20 mm, whitish, rarely slightly violaceous, often with distinctly violaceous veil at bulb margin; flesh whitish; smell weak, malt-like; taste bitter. Sp (9-)9.5-10.5 x 6-7 μm , amygdaloid, coarsely verrucose. Mainly with *Quercus*, but also with *Corylus* and *Fagus*, on calcareous soil, mostly in open woodland; autumn; rare in hemib., very rare in temp.; DK (CR), NO, SE (VU). – AC 6:123, Däh 738, GCI 2:B15, M&J 54.
C. arcuatorum Rob. Henry
 - Flesh not distinctly pink with KOH, but may be faintly greyish rose; gill edge \pm fertile, without conspicuous sterile elements 3
3. Cap whitish, cream or pale olivaceous, at least towards margin 4
 - Cap more lively coloured or darker brownish 8
4. In coniferous forests. Cap 40-70 mm, hemispherical to convex, then expanded, cream to pale yellowish towards margin, towards centre yellow brown to pale ochraceous brown, often \pm conspicuously bicoloured, sometimes with indistinct whitish to ochraceous brown veil patches; gills violaceous grey to grey with a slightly violaceous edge; stem 40-70 x 7-12 mm, whitish, with whitish veil, becoming \pm ochraceous at bulb margin; flesh whitish; KOH on cap \pm rose/reddish to brownish, on bulbipellis pink. Sp (9.5-)10-11(-11.5) x 6-7 μm , amygdaloid to slightly citriform, coarsely verrucose. Calciphilous, probably associated with *Pinus*, in Central Europe with *Abies*; autumn; very rare in hemib.-bore.; SE (Gtl).
C. subgracilis Moëgne-Loec. (*C. parvus* Rob. Henry s. lato)
 - In deciduous forests 5
5. KOH on cap distinctly pink to blood red; gills cream to very pale violaceous. 6
 - KOH on cap negative, brownish to pale rose; gills often distinctly violaceous, at least on edge 7
6. Cap whitish to pale ochraceous white. Cap 40-100 mm, hemispherical to convex, then expanded, with age often irregularly brownish spotted or striate at centre; gills greyish white, rarely faintly violaceous; stem 35-100 x 7-14 mm, whitish, with a flattened bulb; flesh whitish; KOH on bulbipellis pink. Sp 9.5-11 x 5.5-6.5(-7) μm , amygdaloid, coarsely verrucose. With *Fagus* and *Quercus* on calcareous soil; autumn; very rare in temp.; DK (CR, EJyl: Vosnæs). – MyR 110:1048.
C. albertii Dima, Frøslev & T.S. Jeppesen (*C. parvus* Rob. Henry s. lato)
 - Cap pale olivaceous to pale yellow see 14
7. Sp 10-11.5 x 6-7 μm , amygdaloid (fig. 691E); gills often distinctly and persistently violaceous lilac. Cap 25-55 mm, hemispherical to convex, then expanded, almost persistently pale cream, becoming slightly brownish towards centre, often with small dark brown velar scales at centre; stem 25-50 x 5-10 mm, entirely violaceous lilac when young, with a flattened bulb; flesh whitish, violaceous in stem cortex; KOH on cap negative to weakly brownish, on bulbipellis pink. Sp coarsely verrucose. With *Fagus*, possibly also *Carpinus*, on calcareous soil; autumn; very rare in temp.; DK (EN, Sj: Allindelille, Lol: Møns Klint). – AC 11:342, 330 (as

calochrous f. *violascens*), 341 (as *subamethystinus*).

C. insignibulbus Bidaud & Moënne-Locc.

- Sp 9-10.5 x 5.5-6.5 μm , (ellipsoid-)amygdaloid; gills often very pale violaceous to almost greyish white, but often with a more distinctly violaceous edge. Cap 35-80 mm, hemispherical to convex, then expanded, initially olivaceous cream, becoming \pm olivaceous brown, sometimes even with faint pinkish to violaceous streaks on the least exposed parts, often with larger patches of veil; stem 35-60 x 6-11 mm, whitish to entirely violaceous, but most often violaceous at top; flesh whitish, violaceous in stem cortex; KOH on cap pale rose to rose brown, on bulbipellis pink. Sp coarsely verrucose. With *Fagus* on calcareous soil; autumn; very rare in temp.; DK (EN). – MyR 110:1048.

C. selandicus Frøslev & T.S. Jeppesen

- 8. Cap brown, olivaceous brown to greyish, without yellow tinges 9
- Cap yellow, olivaceous or yellow brown 11
- 9. Bulb narrow and root-like tapering; KOH on bulbipellis negative, but deep red to red brown on veil at bulb margin. Cap 25-50 mm, hemispherical to convex, brown, towards margin sometimes with an olivaceous tinge, at centre \pm red brown with age, sometimes with small patches of pale yellow veil; gills violaceous to violaceous grey; stem 35-65 x 7-12 mm, whitish, sometimes slightly violaceous in upper part, with sparse yellow veil at bulb margin; flesh whitish. Sp 10.5-11.5 x 6-7 μm , amygdaloid-citriform, coarsely verrucose; pileipellis slightly duplex, basally with broader hyphae. With *Fagus* on calcareous soil; autumn; very rare in temp.; DK (EN). – JEC 5:30, Svp 51:37.
- C. aureocalceolatus* M.M. Moser & Peintner
- Bulb broad, not root-like tapering; KOH on bulbipellis distinctly pink 10
- 10. In coniferous forests see *C. caesiocinctus* key B16
- In deciduous forests see *C. cordata* key B 16 and *C. violaceipes* key B 17
- 11. Sp (11.5-)12-14 x 7-8.5 μm ; with conifers 12
- Sp 9.5-11.5(-12) x 5.5-7.5 μm ; with deciduous trees or conifers 13

- 12. Cap with \pm innate, radial striae or fibres, with a distinctly mottled appearance of olivaceous to brown, golden yellow or rarely bluish colours; veil on bulb margin and cap margin glutinous in young frb, yellow, becoming \pm orange; sp distinctly citriform. Cap 35-80 mm, hemispherical to convex, then expanded, margin bright lemon yellow to olivaceous, towards centre olivaceous to \pm olivaceous brown; gills distinctly but rarely deeply violaceous or greyish violaceous; stem 40-70 x 10-18 mm, whitish to pale violaceous; flesh in stem greyish violet, otherwise whitish; cap and universal veil at bulb instantly blood red with KOH. Sp 12.5-14 x 7-8.5 μm , with very coarse ornament (fig. 691F); pileipellis slightly duplex, basally with bundles of wider, brown incrustated hyphae. With *Picea* on calcareous soil, often in ant-hills; autumn; occasional in hemib., rare in bore.; FI (LC), NO (LC), SE (vu). – M&J 58, Sieniop 190.

C. aureopulverulentus M.M. Moser

- Cap without radial striae or fibres, yellow; veil on bulb margin not distinctly glutinous, not becoming orange; sp amygdaloid to citriform. Cap 40-90 mm, hemispherical to convex, then expanded, yellow at first, sometimes with bright lemon-yellow margin, but discolouring ochraceous yellow to ochraceous with age, with whitish to brownish veil patches or scales; gills distinctly, but rarely deeply violaceous or greyish violaceous; stem 40-100 x 10-18 mm, whitish, sometimes violaceous in upper part, sometimes entirely violaceous when young; KOH on cap pinkish red, on veil pinkish to rose brown, on bulbipellis pink; flesh whitish. Sp (11.5-)12-13(-13.5) x 7-8.5 μm , coarsely verrucose. With conifers, mainly *Picea* on calcareous soil; autumn; very rare in hemib.-bore.; FI, NO, SE. – CFP A48 (as *calochrous* var. *barbaricus* [originally as var. *haasii*]).

C. barbaricus (Brandrud) Frøslev, T.S. Jeppesen & Brandrud

13. KOH on bulbipellis negative to weakly rose, on bulb margin distinctly red brown. Cap 45-80 mm, hemispherical to convex, then expanded, yellow, brownish yellow, sometimes with pale greenish yellow margin, sometimes with \pm diffuse whitish veil patches, without small dark scales; gills violaceous lilac; stem 35-70 x 10-14 mm, whitish, sometimes violaceous at top; flesh whitish. Sp (9.5-)10-11(-11.5) x 6-7 μm , amygdaloid(-citriform), coarsely verrucose. With deciduous trees in open woodland on calcareous soil or with *Helianthemum* in alvars; autumn; rare in hemib., very rare in temp.; DK (CR, Sj: Vejlø Skov), SE. – CFP A18 (as *calochrous* var. *caroli*), MyR 110:1048.
C. cisticola Frøslev & T.S. Jeppesen
- KOH on bulbipellis and bulb margin distinctly pink 14
14. Gills greyish white. Cap 40-100 mm, hemispherical to convex, then expanded, usually ochraceous yellow to yellow, sometimes ochraceous brown, often uniformly colored, sometimes with sparse small velar scales at centre, sometimes with darker spots or striae with age; stem 40-80(-100) x 10-20 mm, whitish, glabrous, universal veil at bulb margin whitish ochraceous yellow to yellow; flesh whitish. Sp (10-)10.5-11.5(-12) x 5.5-6.5(-7) μm , acutely amygdaloid to citriform, fairly coarsely verrucose. With *Picea* on rich, but never strictly calcareous soil, often in deep moss; autumn; very rare in bore.; NO, SE.
C. kristinae Brandrud in press
- Gills violaceous 15
15. With deciduous trees on calcareous soil. Cap 40-70 mm, hemispherical to convex, then expanded, usually pale ochraceous yellow to yellow, almost whitish at margin when young, sometimes cream with a faint olivaceous tinge, with age often with yellow-brown spots or streaks, sometimes with sparse, small velar scales at centre; gills violaceous; stem 30-60 x 7-12 mm, whitish, universal veil at bulb margin whitish ochraceous yellow; flesh whitish. Sp 9.5-10.5 x 5.5-6.5 μm , ellipsoid (to amygdaloid), fairly coarsely verrucose (fig. 697A). Autumn; very rare in temp.-hemib.; DK (EN), NO (EN), SE. – CFP B53, GCI 1:A19 (upper only).
C. catharinae Consiglio (*C. parvus* Rob. Henry s. lato)
- With conifers on calcareous soil. Cap 40-90 mm, hemispherical to convex, then expanded, often yellow at first, sometimes with bright lemon-yellow margin, but discolouring ochraceous yellow to ochraceous with age, with whitish to brownish veil patches or scales; gills distinctly but rarely deeply violaceous lilac or greyish violaceous; stem 40-100 x 10-18 mm, whitish, sometimes \pm violaceous; flesh whitish, sometimes violaceous in cortex. Sp (9.5-)10-11.5(-12) x 6-7.5 μm , amygdaloid-citriform, coarsely verrucose. Autumn; rare in hemib.-bore.; FI, NO (NT), SE. – AC 11:353.
C. barbarorum Bidaud, Moëgne-Locc. & Reumaux (*C. calochrous* (Pers.: Fr.) Gray var. *barbaricus* Brandrud s. lato)
- 16(1) Cap cuticle bitter; smell sweetish plum- to celery-like and often earthy. Cap 50-140 mm, hemispherical to convex, then expanded, initially olivaceous yellow, soon becoming ochraceous yellow to yellow brown, sometimes with \pm whitish veil patches; gills violaceous, soon discolouring; stem 45-90 x 12-25 mm, whitish, often violaceous blue when young, with a rounded bulb with ochraceous yellow veil; flesh whitish, bluish in stem top when young. Sp 10-12 x 6-7 μm , citriform, distinctly and densely verrucose (fig. 697B). With *Fagus*, very rarely *Tilia*, on rich to calcareous soil; autumn; occasional in temp., very rare in hemib.; DK (LC), NO (EN), SE (VU). – CFP B52, Phil 176a (as *amoenolens*), Ves 372.
C. anserinus (Velen.) Rob. Henry
- Cap cuticle mild or bitter; smell not sweetish plum- or celery-like 17
17. Sp subglobose, Qav < 1.3 (fig. 697C). Cap 50-100 mm, hemispherical to convex, then expanded, with age distinctly innately fibrillose, initially greenish olivaceous to olivaceous brown, with age becoming yellow brown from centre; gills persistently violaceous to greyish violaceous; stem 45-80 x 12-22 mm, initially violaceous blue, with age discolouring



Spores: A: *Cortinarius catharinae*, B: *C. anserinus*, C: *C. prasiocyaneus*, D: *C. calochrous*, E: *C. vesterholtii*, F: *C. purpurascens*.

± olivaceous; flesh whitish, sometimes with a faint greenish yellow tinge, in stem cortex ± violaceous. Sp 9.5-11.5 × 8-8.5 μm, coarsely verrucose. With *Corylus*, *Tilia* and *Quercus* on calcareous soil; autumn; very rare in hemib., rare on Öl.; NO (CR), SE (EN). – Svp 56:53.

C. prasinocyaneus Rob. Henry

- Sp ellipsoid, amygdaloid or citriform, Qav > 1.3 18
- 18. Pileipellis simplex, without a (sub)cellular subpellis; sp with a coarse ornamentation of irregular, ± interconnected warts and crusts; cap rarely innately fibrillose, not hygrophanous; smell often slightly earthy 19
 - Pileipellis duplex, with a distinct (sub)cellular subpellis; sp with regular, isolated warts; cap ± innately fibrillose or hygrophanous, smell ± malt-like 24
- 19. Mycelial strands and/or bulbipellis sulphur to lemon yellow 20
 - Mycelial strands and bulbipellis whitish, pale ochraceous or violaceous 21
- 20. Sp 9-10(-10.5) × 5-6 μm (fig. 697D). Cap 35-70 mm, hemispherical to convex, then expanded, bright lemon yellow, later more ochraceous yellow, often with small, dark brown velar scales at centre; gills distinctly and rather persistently violaceous lilac; stem 30-60 × 7-12 mm, with flattened bulb, whitish; bulbipellis and mycelial strands yellow, veil on bulb margin distinctly yellow; flesh whitish, sometimes slightly grey brown at stem top. Sp amygdaloid, coarsely verrucose. In deciduous forests, mainly with *Fagus*, on ± calcareous soil; autumn; occasional in temp., very rare in hemib.; DK (LC), NO (EN), SE (LC). – Däh 739, Mos 109 (as *Phlegmacium citrinolilacinum*), Ves 372, Ⓞ.

C. calochrous (Pers.: Fr.) Gray (*C. citrinolilacinus* M.M. Moser)

 - Sp 10.5-12.5 × 6-7 μm. Cap 40-90 mm, hemispherical to convex, then expanded, olivaceous yellow to yellow brown, with paler yellow to greenish yellow, sometimes more greyish ochre margin when young, often with larger ± whitish veil patches that discolour brownish; gills bright and fairly persistently violaceous lilac to greyish violaceous; stem 40-75 × 10-20 mm, violaceous, at least in upper part, often deeply and persistent at top, otherwise ± whitish; veil on bulb margin whitish, ochre yellow to violaceous, discolouring brownish; flesh whitish, often with a violaceous tinge in stem cortex. Sp amygdaloid to slightly citriform, coarsely verrucose. Probably with *Pinus*; in Central Europe mainly with *Abies*, on calcareous soil; autumn; rare in hemib.; SE (Gtl). – CFP C27 (as *calochrous* var. *haasii*), Mos 114.

C. haasii (M.M. Moser) M.M. Moser
- 21. Cap pale cream to pale olivaceous 22
 - Cap yellow, yellow brown or date brown 23
- 22. Universal veil initially violaceous, often indistinctly so and only visible on young frb as violaceous veil patches on cap or/and as a violaceous bulbipellis. Cap 35-70 mm, hemispherical to convex, then expanded, cream to pale yellowish or olivaceous, becoming ± ochraceous with age; gills violaceous grey; stem 30-60 × 7-12 mm, with a flattened bulb, whitish, sometimes with a violaceous tinge at top, often with violaceous veil at bulb margin, at least if bruised; flesh whitish, with a ± greyish tinge in stem top, and sometimes viola-

ceous in cortex. Sp 8.5-10 x 5-6 μm , amygdaloid, coarsely verrucose. With deciduous trees, mainly *Fagus*, on calcareous soil; autumn; rare in temp.; DK (vu), SE. – AC 11:333, Däh 742 (as *subarquatus*), Svp 27:42 (as *rickenianus*).

C. lilacinovelatus Reumaux & Ramm (*C. parvus* Rob. Henry s. lato p.p.)

- Universal veil cream or pale ochraceous. Cap 40-90 mm, hemispherical to convex, then expanded, cream to pale yellowish or olivaceous grey brown, becoming \pm ochraceous from centre with age, often with veil patches; gills violaceous grey; stem 40-75 x 10-20 mm, with a flattened bulb, whitish, sometimes with a violaceous tinge at top, with whitish to ochraceous white veil at bulb margin; flesh whitish, with a \pm greyish tinge in stem top. Sp (9-)9.5-10.5(-11) x (5-)5.5-6.5 μm , amygdaloid, coarsely verrucose. With deciduous trees, mainly *Fagus*, on calcareous soil; autumn; rare in temp.; DK (DD), SE. – Mos 111.

C. platypus (M.M. Moser) M.M. Moser (*C. parvus* Rob. Henry s. lato p.p.)

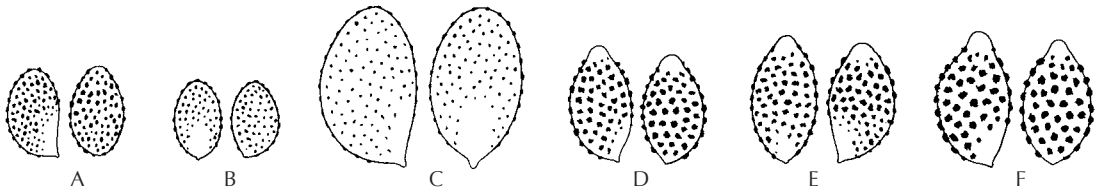
23. Stem distinctly and fairly persistently violaceous, often with violaceous veil at bulb margin; with deciduous trees. Cap 50-90 mm, hemispherical to convex, then expanded, often somewhat innately fibrillose, ochraceous brown to date brown, with somewhat yellow-brown margin, rarely with grey-red tinges, rarely with appressed pale ochraceous veil patches, without small velar scales; gills violaceous lilac; stem 35-70 x 10-17 mm; flesh whitish, often with violaceous tinge in stem cortex. Sp 10-11.5 x 5.5-6.5 μm , amygdaloid to citriform, coarsely verrucose (fig. 697E). On calcareous soil; autumn; very rare in temp.; DK (EN), SE. – AC 11:341, MyR 110:1048, Svp 56:38,42.

C. vesterholtii Frøslev & T.S. Jeppesen (*C. provencalis* M.M. Moser s. auct.)

- Stem whitish, with yellowish veil at bulb margin, without violaceous tinges; with *Picea*, rarely *Pinus*. Cap 35-70 mm, hemispherical to convex, then expanded, yellow to warm yellow brown, sometimes orange brown at centre, often with brownish, radial streaks and numerous small dark brown velar scales; gills faintly violaceous grey; stem 40-70 x 7-12 mm; flesh whitish. Sp 9.5-10.5 x 6-7 μm , amygdaloid to slightly citriform, coarsely verrucose. On calcareous soil; autumn; rare, but locally occasional in hemib.-bore.; FI, NO (NT), SE.

C. piceae Frøslev, T.S. Jeppesen & Brandrud (*C. calochrous* (Pers.: Fr.) Gray var. *coniferarum* (M.M. Moser) Quadr. s. auct.)

24. Cap cream to pale ochraceous see key D 9
 - Cap darker 25
25. Gills and stem becoming violaceous lilac when bruised 26
 - Gills and stem not becoming violaceous lilac when bruised 27
26. Stem with a distinct, marginate bulb; in coniferous forests, rarely with deciduous trees. Cap 40-90 mm, hemispherical to convex, then expanded, innately fibrillose, with small hygrophanous spots or streaks or sometimes a narrow ring near margin, greyish yellow brown, brown to somewhat red brown, at margin grey brown to bluish grey, sometimes violaceous blue when developed after frost; gills violaceous to bluish grey; stem 40-80 x 12-20 mm, initially bluish, discolouring whitish, with violaceous blue veil at bulb margin; flesh whitish, bluish in stem top. Sp 8-9 x 5-6 μm , broadly ellipsoid, very distinctly verrucose (fig. 697F). On rich but rarely calcareous soil, often in young *Picea* plantations; autumn; occasional in hemib.-bore., rare in temp.; DK (LC), FI (DD), NO (LC), SE (LC). – Mos 131a & b.
- C. purpurascens* (Fr.) Fr.
- Stem \pm clavate; in deciduous forests see *C. subpurpurascens* key H 14
27. Sp on av < 8.5 μm long 28
 - Sp on av > 8.5 μm long 30
28. Bulb broad and flattened, often twice as broad as stem; stem base below bulb margin acutely tapering; universal veil thick, seen as appressed olivaceous or ochraceous, fibrillose veil remnants towards cap margin, skin-like patches at cap centre or as a volva at bulb



Spores: A: *Cortinarius glaucopus*, B: *C. pansa*, C: *C. reideri*, D: *C. luhmannii*, E: *C. subhygrophanus*, F: *C. viridicoeruleus*.

margin; in deciduous forests. Cap 60-150 mm, hemispherical to convex, then expanded, very coarsely innately fibrillose, at margin initially green to olivaceous, at centre becoming yellow brown to umber brown; gills deep violaceous to violaceous grey when young, bluish tinges soon fading; stem 40-110 x 14-28 mm, violaceous blue, at least in upper part, discolouring yellow brown, sometimes with a greenish reflex, often with a yellowish white to pale olivaceous tinge, usually with volva from veil at the bulb margin; flesh violaceous blue in stem when young, otherwise whitish, becoming somewhat orange brown in bulb; universal veil olivaceous or ochraceous. Sp (6.5-)7-8 x 4.5-5.5 μm , ellipsoid (to amygdaloid), verrucose. On calcareous soil, mostly in open woodland; autumn; rare in hemib., very rare in temp.; DK (CR), SE (NA). – Phil 172c (as *glaucopus*), Svp 43:20 (bottom, as *glaucopus*).

C. magicus Eichhorn

- Bulb fairly narrow, rarely twice as broad as stem; stem base below bulb margin not acutely tapering; universal veil normally thin and appressed, leaving the cap centre with a frosty appearance, rarely with volva at bulb margin; mainly in coniferous forests
- 29
29. Sp 7-8.5 x 4.5-5.5 μm , ellipsoid (to amygdaloid), verrucose (fig. 699A). Cap 50-120 mm, hemispherical to convex, then expanded, finely to more irregularly innately fibrillose, yellow brown to brown, at margin pale greyish yellow to olivaceous green when young, usually with thin and appressed universal veil, leaving the cap centre with a frosty appearance; gills deep violaceous to violaceous grey when young, bluish tinges soon fading; stem 40-90 x 12-25 mm, violaceous blue, at least in upper part, discolouring whitish to yellow brown, sometimes with a greenish reflex; flesh violaceous blue in stem when young, otherwise whitish, becoming somewhat orange brown in bulb. On nutrient rich to \pm calcareous soil, mainly with conifers, more rarely with deciduous trees; autumn; occasional, but locally common in hemib.-bore.: FI (LC), NO (LC), SE (LC). – CFP C30, C52, Däh 724 (as *fulminoides*), 741 (as *glaucopus* var. *olivaceus*).
- C. glaucopus* (Schaeff.: Fr.) Fr.
- Sp (6-)6.5-7.5 x 4-5 μm , ellipsoid, finely verrucose (fig. 699B). Cap 40-90 mm, hemispherical to convex, then expanded, margin pale greyish yellow to more olivaceous green, at centre yellow brown to warm orange brown or red brown, finely to irregularly innately fibrillose or hygrophanously veined, sometimes with larger hygrophanous patches or a dark, hygrophanous marginal zone, without or with very thin frosty veil at centre; gills greyish blue, but bluish tinges soon fading; stem 30-80 x 12-20 mm, cylindrical with bulb reduced to a \pm sharp margin at the very base, pale bluish at first, colour strongest at top, sometimes with a greenish yellow reflex, with age discolouring brass brown; flesh whitish with a bluish tinge in stem cortex, yellowish at base. In \pm oligotrophic coniferous forests, often in plantations, at roadsides or somewhat disturbed soil; autumn; occasional in hemib.-bore.; FI, NO, SE.
- C. pansa* Fr.
30. Sp on av > 11 μm long, ellipsoid; bulb rounded 31
- Sp on av < 11 μm long or citriform to amygdaloid; bulb marginate 32

31. Cap orange brown, towards margin yellow brown, sometimes with a slight olivaceous tinge; in coniferous forests. Cap 50-110 mm, hemispherical to convex, then expanded, innately fibrillose, sometimes with whitish fibrillose veil at margin; gills violaceous blue; stem 60-120 x 12-22 mm, with rounded bulb, violaceous blue in upper part, downwards discolouring brownish, sometimes with a greenish reflex; flesh violaceous blue in stem when young, otherwise whitish. Sp 12-13.5 x (7.5-)8-9 μm , broadly ellipsoid, distinctly verrucose (fig. 699C). In \pm oligotrophic forests; autumn; occasional in hemib.-bore.; FI (LC), NO (LC), SE. – AC 9:216 (as *fulvo-ochraceus* var. *umbrinus*), 217 (as *fulvo-ochraceus* var. *marginato-ochraceus*).
- C. riederi* (Weinm.) Fr. (*C. fulvo-ochraceus* Rob. Henry)
- Cap pale grey brown to pale ochraceous, appearing silvery grey due thin appressed veil; with *Quercus*, *Tilia* and possibly also *Betula*, *Populus* and *Corylus*, often steep scree forests. Cap 40-90 mm, hemispherical to convex, then expanded, dry; gills violaceous blue to pale violaceous grey; stem 60-90 x 12-22 mm, with a rounded bulb, bluish to pale bluish white; flesh whitish, in stem top violaceous blue. Sp 11-13.5 x 7.5-9 μm , broadly ellipsoid, distinctly verrucose. Often on calcareous ground; autumn; rare in hemib.-bore.; FI (DD), NO (VU), SE (EN). – Mos 96.
- C. argenteolilacinus* M.M. Moser
32. Taste and smell distinctly farinaceous. Cap 40-80 mm, hemispherical to convex, then expanded, finely, innately fibrillose, grey brown to dark greyish, sometimes with a faint olivaceous tinge at margin, with age becoming ochraceous brown; gills inpersistently violaceous to violaceous grey, with a whitish edge; stem 40-90 x 10-15 mm, violaceous blue to violaceous grey, at least in upper part, with age discolouring yellowish white; flesh violaceous blue in stem, otherwise whitish. Sp 8.5-10.5 x 5-6 μm , citriform, distinctly and densely verrucose. In coniferous forests on calcareous soil; autumn; rare in hemib.-bore., with an eastern distribution; FI (VU), SE (NT). – CFP B50.
- C. dionysae* Rob. Henry
- Taste and smell not farinaceous 33
33. Sp amygdaloid; cap evenly hemispherical to low convex, usually with fairly thick veil remnants seen as patches on cap centre 34
- Sp citriform; cap often unevenly wavy, with age often radially wrinkled, usually without veil remnants 35
34. Universal veil at bulb margin olivaceous grey to ochraceous; sp 9-10 x 5-6 μm , amygdaloid, distinctly verrucose (fig. 699D). Cap 30-65 mm, hemispherical to convex, then expanded, initially pale grey olivaceous, becoming olivaceous grey to olivaceous brown, reminiscent of the colours of *C. infractus*, eventually yellow brown, with large and distinct, skin-like, ochraceous yellow veil patches, not hygrophanous; gills with deep, but fugacious violaceous to violaceous grey colours; stem 35-70 x 8-15 mm, violaceous blue in upper part when young, otherwise olivaceous to greyish; flesh violaceous blue in stem when young, otherwise whitish, becoming somewhat orange brown in bulb; taste \pm bitter in cap cuticle when young. In *Fagus* forests on calcareous soil, rarely also with *Tilia*; autumn; rare in temp.; DK (LC), NO (CR), SE (VU). – Svp 43:21 (as *caesiogriseus*).
- C. luhmannii* Münzmay, Saar & Oertel
- Universal veil at bulb margin pale bluish; sp (9.5-)10-11.5 x 5.5-6.5 μm , amygdaloid, verrucose (fig. 699E). Cap 35-80 mm, hemispherical to convex, then expanded, initially brown with an olivaceous grey margin and chestnut-brown, hygrophanous spots or streaks, at margin sometimes with fibrillose, appressed violaceous veil, at centre with appressed ochraceous yellow veil patches, hygrophanous; gills violaceous to violaceous grey; stem 35-80 x 8-18 mm, violaceous blue in upper part when young, otherwise greyish white, sometimes with a greenish reflex; flesh violaceous blue in stem when young, otherwise yellowish white, becoming somewhat orange brown in bulb; taste mild. With *Corylus* and possibly

Quercus, often in open forests or wooded meadows on calcareous soil; autumn; very rare in hemib., (Vg, Öl); SE. – FND 29:34, Svp 56:52 (both as *subhygrophanus*).

C. acrifolius Rob. Henry

35. Cap innately fibrillose see *C. multiformium* D 32
 - Cap not innately fibrillose 36
36. Gill greyish with a distinctly violaceous blue edge. Cap 40-70 mm, hemispherical to convex, then expanded, often with a low umbo, at margin olivaceous grey at first, towards centre olivaceous ochre brown to grey brown, at centre often grey brown, yellow brown to orange brown, often conspicuously bicoloured with hygrophanous outer part, often with rust brown spots or streaks; stem 40-70 x 8-15 mm, violaceous blue in upper part, towards base discolouring yellowish white; flesh in stem violaceous blue when young, otherwise whitish. Sp 10-11.5 x 6-7 μm , citriform, distinctly and densely verrucose (fig. 699F). With *Fagus* and *Quercus* on calcareous soil; autumn; very rare in temp.-hemib.; SE. – Svp 56:49.
C. viridocoeruleus Chevassut & Rob. Henry (*C. camptoros* Brandrud & Melot s. lato p.p.)
 - Gills very pale and fugacious violaceous grey, without distinctly violaceous edge. Cap 40-70 mm, hemispherical to convex, then expanded, often with a low umbo, often bicoloured with hygrophanous outer part, towards margin grey brown to dark olivaceous brown, warmer yellow brown to sometimes red brown at centre; stem 40-70 x 8-15 mm, violaceous blue in upper part, soon discolouring yellowish white; flesh in stem violaceous blue when young, otherwise whitish. Sp 9.5-11.5 x (5.5-)6-7 μm , citriform, distinctly and densely verrucose. On calcareous, often scree soil with *Tilia* and possibly also *Corylus*; autumn; very rare in hemib.; NO (EN), SE (VU). – CFP C24.
C. camptoros Brandrud & Melot

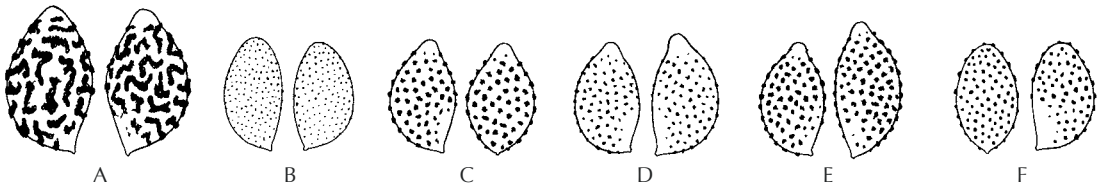
Key D: Subgen. *Phlegmacium*: Stem bulbose; gills and flesh whitish, cream or ochraceous

1. Basal mycelium or universal veil at stem base whitish at first, becoming rose when exposed; sp < 8.5 μm , almost smooth and very pale see *C. turmalis* and *C. variegatus* key H 15
 - Basal mycelium universal veil at stem base not becoming rose when exposed; sp > 8.5 μm long and/or distinctly ornamented and/or not very pale 2
2. Stem, bulb margin or flesh with violaceous to greyish blue tinges, at least when young 3
 - Stem, bulb margin and flesh without violaceous to greyish blue tinges 9
3. Pileipellis duplex 4
 - Pileipellis simplex 5
4. Universal veil at bulb margin greenish yellow; cap brown to dark brown, with radial hygrophanous streaks or spots, sometimes entirely hygrophanous see *C. sphagnophilus* key H 31
 - Universal veil at bulb margin whitish, ochraceous yellow or violaceous; cap ochraceous white, greyish to grey brown, not hygrophanous see 18
5. With conifers 6
 - With deciduous trees 7
6. Sp 11-13 x 7-8 μm , amygdaloid to citriform (fig. 703A); with distinct radish-like smell and taste. Cap 40-100 mm, hemispherical to convex, then expanded, olivaceous grey to olivaceous brown, with age somewhat innately fibrillose; gills pale ochraceous grey, often with an olivaceous tint; stem 40-80 x 10-20 mm, with a marginate bulb, pale violaceous grey, olivaceous grey or pale greenish yellow, with violaceous veil at bulb margin; flesh whitish to olivaceous grey, often with a violaceous tinge in stem top when young. Sp coarsely ver-

rurose. With *Pinus*, more rarely *Picea* in dry calcareous forests; autumn; rare in hemib.-bore.; FI (NT), NO (EN), SE (VU). – CFP A43.

C. pseudoglaucopus (M.M. Moser) Quadr.

- Sp 10-11.5 x 6-7 μm , ellipsoid to slightly amygdaloid; smell and taste indistinct. Cap 40-90 mm, hemispherical to convex, then expanded, orange brown to yellow brown, rarely slightly violaceous from veil at margin, glutinous, sometimes with few hygrophanous streaks or spots, with age sometimes \pm granulate-diffracted at centre; gills greyish white; stem 40-90 x 8-15 mm, with a marginate bulb, violaceous at first, soon discolouring whitish or ochraceous yellow, universal veil at bulb margin violaceous; flesh whitish. Sp distinctly verrucose. With *Pinus* on chalk; autumn; very rare in hemib.; SE (DD, Gtl).
- C. pseudoarcuatorum* Rob. Henry (*C. delaportei* Rob. Henry)
- 7. Sp 8.5-10 x 5-6 μm see *C. lilacinovelatus* key C 22
- Sp (9.5-)10-12.5 x 6-7.5(-8) μm 8
- 8. Cap uniformly whitish to cream see *C. caroviolaceus* 17
- Cap uniformly olivaceous, olivaceous yellow to olivaceous brown. Cap 70-120 mm, hemispherical to convex, then expanded, becoming \pm ochraceous brown with age, often fibrillose from cortina at margin, centre with patches of veil; gills greyish white, rarely with a violaceous tinge near cap margin; stem 60-100 x 15-25 mm, with a marginate bulb, initially violaceous to almost whitish, but often with a persistent violaceous tinge; flesh whitish, sometimes violaceous in stem cortex; smell and taste indistinct to \pm malt-like. Sp (10.5-)11-12.5 x 6.5-7.5(-8) μm , amygdaloid to slightly citriform, coarsely verrucose. With *Quercus*, *Carpinus*, *Tilia* and *Corylus* on dry, calcareous soil; autumn; very rare in hemib.; SE (Vgl). – AC 16:1100.
- C. flavidolilacinus* Bidaud
- 9. Cap whitish, cream, pale ochraceous or pale grey brown 10
- Cap yellow, yellow brown, orange brown to brown 21
- 10. Sp on av < 7.5 μm long, ellipsoid and very pale; in dry *Pinus* forests, less often with *Picea* see *C. leucophanes* key H 9
- Sp on av > 7.5 μm long, ellipsoid or not, cinnamon brown; with coniferous or deciduous trees 11
- 11. KOH in flesh \pm yellow; with *Pinus*, more rarely *Picea*, on acid, sandy soil 12
- KOH in flesh not yellow; with deciduous or coniferous trees, on acid, sandy soil or not 13
- 12. Frb slender; stem < 15 mm thick, longer than cap diam.; stem becoming \pm yellowish when bruised see *C. pinophilus* key H 8
- Frb robust; stem > 15 mm thick, shorter than cap diam.; stem not becoming yellowish when bruised see *C. areni-silvae* key G 18
- 13. Smell and taste distinctly farinaceous. Cap 60-120 mm, hemispherical to convex, then expanded, white to silvery grey, with age pale ochraceous at centre and finely innately fibrillose towards margin, usually with abundant cortina remnants at margin, sometimes with appressed whitish veil patches at centre; gills greyish; stem 40-90 x 15-30 mm, white, with a broad \pm rounded bulb, veil at bulb margin abundant and fairly thick, ochraceous white, becoming slightly brownish with age; flesh whitish. Sp 10.5-12.5 x 6-7(-7.5) μm , citriform, distinctly and densely verrucose. With *Quercus* on warm calcareous soil; autumn; DE.
- C. aleuriosmus* Maire
- Smell and taste not farinaceous 14
- 14. Pileipellis simplex 15
- Pileipellis duplex 18
- 15. With a strong and sweet smell, like *Hebeloma sacchariolens*. Cap 40-80 mm, hemispherical to convex, then expanded, initially whitish to cream, soon becoming pale ochraceous yellow,



Spores: A: *Cortinarius pseudoglaucopus*, B: *C. multiformis*, C: *C. multiformium*, D: *C. luteoimmarginatus*, E: *C. gracilior*, F: *C. xanthoochraceus*.

with age often becoming \pm ochraceous to brownish, often as spots or streaks, without veil remnants; gills greyish white; stem 40-60 x 7-15 mm, whitish, with a broad, flattened bulb; veil at bulb margin whitish; flesh whitish. Sp 8.5-10 x 5-6 μ m, amygdaloid to citriform, coarsely verrucose. On calcareous soil, mainly with *Fagus*, but also *Quercus* and *Tilia*; autumn; very rare in temp.-hemib.; DK (EN), NO (EN). – Phil 174c, Ves 374.

C. osmophorus P.D. Orton

- Smell different 16
- 16. Cap margin finely tomentose when young, somewhat innately fibrillose from appressed cortina towards margin. Cap 35-80 mm, hemispherical to convex, then expanded, whitish to cream at first, soon discolouring \pm yellow brown to ochraceous brown from centre, sometimes with sparse whitish veil patches; gills pale greyish white; stem 40-60 x 10-18 mm, with a marginate bulb, whitish, with whitish veil remnants at bulb margin; flesh whitish, when young with a greyish tinge in stem top; smell and taste indistinct. Sp (9-)9.5-11 x 6-7 μ m, amygdaloid to citriform, coarsely verrucose. With *Quercus*, mostly in \pm open woodlands, on calcareous soil; autumn; very rare in hemib.; SE. – Svp 56:54.
C. rapaceotomentosus Delaporte & Eyssartier
- Cap margin glutinous to viscid when young, not innately fibrillose 17
- 17. With *Picea*. Cap 50-100 mm, hemispherical to convex, then expanded, initially pale ochraceous to café-au-lait, with age becoming paler ochraceous white to cream, sometimes with dark orange brown velar scales; gills pale greyish white, often serrulate; stem 40-80 x 15-25 mm, with a marginate bulb, whitish, with whitish to pale yellowish veil at bulb margin; flesh whitish, when young with a greyish tinge in stem top; smell and taste indistinct. Sp (9.5-)10-11.5(-12) x 6-7(-7.5) μ m, amygdaloid, coarsely verrucose. On calcareous soil; autumn; rare in hemib.-bore.; FI (LC), NO (NT), SE (VU). – Mos 13, M&J 101.
C. corrosus Fr.
- With *Quercus* or *Fagus*. Cap 50-100 mm, hemispherical to convex, then expanded, white to cream, later more ochraceous, usually very uniformly colored; gills greyish white; stem 60-80 x 10-20 mm, with a broad, marginate bulb, whitish, sometimes \pm violaceous blue at the top, veil at bulb margin fairly abundant, whitish, staining somewhat brownish; flesh whitish, sometimes \pm violaceous blue in stem top; smell indistinct to somewhat sweetish, taste mild. Sp (9.5-)10-11.5 x 6-7 μ m, citriform, coarsely verrucose. On calcareous, warm soil; autumn; DE. – Cons B127 (as *rapaceus*), JEC 7:27.
C. caroviolaceus P.D. Orton (*C. rapaceus* Fr. s. auct., *C. albidus* Peck subsp. *europaeus* (M.M. Moser) Quad., *C. aleuriosmus* Maire var. *aphanosmus* M.M. Moser)
- 18. Sp amygdaloid to slightly citriform 19
- Sp ellipsoid to slightly amygdaloid 20
- 19. Cap cuticle mild; cap pale brownish or grey brown, but most often covered with abundant, appressed, whitish to ochraceous yellow universal veil or with large patches at centre. Cap 40-100(-120) mm, hemispherical to convex, then expanded, sometimes with a low umbo,

innately fibrillose; gills greyish or sometimes violaceous; stem 40-90 x 10-22 mm, with a marginate bulb, greyish, often with a violaceous tinge at the top, discolouring ± ochraceous yellow; flesh whitish, with a greyish tinge in stem top, sometimes with distinct violaceous colours in stem; smell and taste initially ± malt-like, with age unpleasant. Sp 9.5-10.5 x 5.5-6.5 μm, amygdaloid to ± citriform, distinctly verrucose. With *Fagus* on ± calcareous soil; autumn; occasional in temp.; DK (LC), SE (EN). – Mos 78, 72 (as *boudieri*).

C. foetens M.M. Moser (*C. subalbescens* Reumaux, *C. boudieri* Rob. Henry s. Moser et al.)

- Cap cuticle bitter; cap whitish, cream or pale ochraceous yellow, sometimes with a greyish tinge, without abundant appressed universal veil. Cap 40-80 mm, hemispherical to convex, then expanded, innately fibrillose; gills greyish white, sometimes with a faint bluish tinge when young; stem 40-80 x 10-15 mm, with a marginate but narrow bulb, whitish, rarely pale bluish when young; flesh whitish, sometimes with a bluish tinge in stem top; smell indistinct. Sp 7.5-9.5 x 4.5-5.5 μm, amygdaloid to citriform, distinctly verrucose. Mostly in coniferous forests, but also found with deciduous trees, on ± calcareous soil; autumn; very rare in temp., rare in hemib.-bore.; DK (EN), FI (LC), NO (LC), SE (NT). – CFP A28, Däh 723, Sieniop 193.

C. caesiostramineus Rob. Henry

20. Sp ellipsoid, 9-11 x 5.5-6.5 μm; in deciduous forests on calcareous soil. Cap 35-90 mm, hemispherical to convex, then expanded, pale greyish, with grey brown centre, often with a slightly bluish tinge towards margin when young; gills grey, sometimes with a bluish tinge; stem 40-70 x 10-20 mm, with a marginate bulb, greyish to ± greyish blue or violaceous, becoming ochraceous yellow with age; flesh whitish, often with a violaceous blue tinge in stem top when young; smell somewhat *Scleroderma*-like. Sp distinctly verrucose. With *Quercus*, *Corylus*, *Carpinus* and *Tilia*, rarely *Fagus*; autumn; rare in hemib., very rare in temp.; DK (CR, EJyl: Trelde), NO (EN), SE (VU). – CFP B17, Ves 368.

C. coerulescentium Rob. Henry

- Sp ellipsoid to slightly amygdaloid, 10.5-12 x 6.5-7.5 μm; in mesic, herb-rich *Picea* forests, on ± siliceous soil. Cap 40-90 mm. hemispherical to convex, then expanded, innately fibrillose, cream, sometimes ochraceous brownish with age; gills violaceous blue to pale violaceous grey; stem 50-90 x 10-18 mm, with a somewhat marginate bulb, bluish to pale bluish, sometimes only at top, and then otherwise whitish; flesh pale bluish in stem, at least when young, otherwise whitish. Autumn; rare in hemib.-bore.; FI (LC), SE.

C. anomaloochrascens Chevassut & Rob. Henry

21. With conifers 22
 - With deciduous trees 28
22. KOH in flesh ± yellow; cap almost dry; with *Pinus* on acid, sandy soil see 11
 - KOH in flesh not yellow; cap distinctly viscid; with *Pinus* or not, rarely on acid, sandy soil 23
23. In May-June. Cap 60-110 mm, hemispherical to convex, then expanded, with ochraceous brown margin, at centre streaking to dark red brown, innately fibrillose; gills pale greyish white; stem 50-80 x 15-30 mm, whitish, with a rounded bulb, with a red brown veil girdle on or above bulb margin; flesh whitish; smell distinctly malt-like. Sp 10.5-12.5 x 6.5-7 μm, amygdaloid, distinctly verrucose. In dry, calcareous coniferous forests, often buried in litter; very rare in bore.; NO (EN), SE (VU). – CFP A10.

C. inexpectatus Brandrud

- In ultimo July to October 24
24. Sp 8-9.5 x 5-5.5 μm (fig. 703B); smell in flesh ± honey-like; cap often with hygrophanous spots or streaks, and with age often ± hygrophanous towards margin; pileipellis duplex. Cap 40-80 mm, hemispherical to convex, then expanded, homogeneously dark ochraceous yellow, orange yellow to red brown; gills greyish white, often somewhat serrulate; stem 40-

80 x 10-15 mm, with a small rounded bulb, initially whitish, staining somewhat brass brown with age; cortina very sparse; flesh whitish. Sp ellipsoid to amygdaloid, weakly verrucose. In coniferous forests; autumn; common in hemib.-bore., rare in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A45.

C. multiformis (Fr.) Fr.

- Sp (9.5-)10-12 x (5.5)6-7(-7.5) μm ; smell in flesh indistinct, earth-like to \pm malty; cap not hygrophanous; pileipellis simplex to slightly duplex 25
- 25. Cap with abundant, small velar scales; KOH on cap and universal veil distinctly brown to red brown 26
- Cap without small velar scales or rarely with few at centre; KOH on cap and universal veil negative 27
- 26. Cap initially yellow with small, dark brown scales see *C. piceae* key C 23
- Cap pale brown to ochraceous brown, centre \pm orange brown to chestnut brown with age, at margin rarely \pm yellow brown, with small brown scales. Cap 40-80 mm, hemispherical to convex, then expanded, frequently with radial brown streaks or striae, pale brown to ochraceous brown, centre \pm orange brown to chestnut brown with age; gills pale greyish white, sometimes with violaceous margin; stem 30-60 x 10-15 mm, with a marginate bulb, whitish, with \pm brown veil at bulb margin; flesh whitish, sometimes with slightly brownish tinges in stem top or below cap cuticle; smell and taste indistinct to \pm earthy. Sp 9.5-11 x (5.5-)6-7 μm , citriform, coarsely verrucose. In calcareous coniferous forests; autumn; very rare in bore.; NO (EN), SE (NE). – CFP B38.

C. dalecarlicus Brandrud

- 27. Cap \pm fibrillose, chestnut brown at centre, towards margin orange brown to pale brown. Cap 60-100 mm, hemispherical to convex, then expanded; gills greyish white; stem 60-100 x 8-18 mm, whitish, with age discolouring \pm brownish, with a rounded to slightly marginate bulb; basal mycelium whitish to bright yellow; flesh whitish; smell indistinct to \pm earthy when older. Sp 10-12 x 6-7(-7.5) μm , amygdaloid to citriform, weakly and not very coarsely verrucose. In \pm calcareous *Picea* forests, also in fairly young plantations; autumn; rare in hemib.-bore.; FI (LC), NO (LC), SE (VU). – Mos 14.

C. napus Fr.

- Cap not fibrillose, uniformly coloured, pale ochraceous brown see *C. corrosus* 17
- 28. Sp subglobose. Cap 40-120 mm, hemispherical to convex, then expanded, bright yellow towards margin, centre orange yellow, becoming orange brown or yellow brown with age, often as radial streaks or flames, sometimes with sparse, orange-brown velar scales at centre, often with abundant cortina remnants at margin; gills greyish white, often serrulate; stem 50-100 x 10-25 mm, with a characteristic, arrow-head shaped bulb; whitish, discolouring ochraceous yellow with age; flesh whitish, in young specimens becoming yellow with KOH; smell and taste \pm malt-like. Sp 8.5-10 x 7-8 μm , very coarsely verrucose. In preferably \pm open deciduous forests on calcareous soil; autumn; rare in temp.-hemib.; DK (EN), NO (EN), SE (VU). – Mos 115a,b, 116, Svp 32:33.

C. caesiocortinatus Jul. Schäff.

- Sp ellipsoid, amygdaloid to citriform 29
- 29. Bulbipellis greenish yellow to sulphur yellow; cap distinctly red to red brown with KOH. Cap 60-120(-140) mm, hemispherical to convex, then expanded, yellow to ochraceous yellow, with age becoming yellow brown; with appressed, pale to greenish yellow universal veil, or sometimes with small brownish velar scales; gills greyish white; stem 50-100 x 10-25 mm, with a marginate bulb, whitish, with greenish yellow or sulphur-yellow veil at bulb margin; flesh whitish; smell malt-like to faintly curry-like when older; taste mild. Sp 11-12.5(-13) x 6.5-8 μm , citriform, coarsely verrucose. With *Fagus* on bare \pm sandy, calcareous soil; autumn; very rare in temp.; DK (EN), SE. – MyR 110:1048.

C. langeorum Frøslev & T.S. Jeppesen

- Bulbipellis whitish; KOH on cap negative or indistinctly brownish 30
- 30. Cap 70-120(-140) mm, with thick, concentric, whitish to ochraceous brown velar patches; pileipellis simplex. Cap hemispherical to convex, then expanded, yellow-brown to orange brown, with age sometimes more red brown at centre; gills greyish white, often serrulate; stem 60-100 x 15-25 mm, whitish, with a broad, but rounded bulb, veil at bulb margin brown; flesh whitish; smell and taste malty. Sp 10-12 x 6-7 μm , amygdaloid, coarsely verrucose. In deciduous forests on calcareous soil; autumn; rare in temp.-hemib.; DK (EN), NO (EN), SE (VU). – CFP B44, Phil 174b.
C. saporatus Britzelm.
- Cap 15-100 mm, without concentric, whitish to ochraceous brown velar patches; pileipellis simplex or duplex 31
- 31. Sp citriform to slightly amygdaloid 32
- Sp ellipsoid to amygdaloid 34
- 32. Stem 10-18 mm broad; cap distinctly innately fibrillose. Cap 40-80 mm, hemispherical to convex, then expanded, often with a low umbo, yellow brown to brown, often with appressed fibrillose, whitish veil at margin, and often with frosty appearance at centre; gills greyish white, rarely with a fugacious violaceous tinge; stem with a rounded bulb, whitish, staining slightly brass brown with age; veil at bulb margin indistinct, whitish, sometimes with a viscid, yellow girdle; flesh whitish, rarely with a fugacious violaceous tinge; smell and taste indistinct to slightly malty; KOH on cap red brown, in flesh negative. Sp 10-11 x 6-7 μm , citriform, distinctly verrucose (fig. 703C). With deciduous trees on calcareous soil; autumn; rare in temp.-hemib.; DK (EN), NO (EN), SE (EN). – Cons B123, FND 29:55 (as *polymorphus* var. *luteoimmarginatus*).
C. multiformium Consiglio & Moënné-Locc. (*C. proteus* Consiglio & Moënné-Locc., *C. polymorphus* Rob. Henry s. auct. p.p.)
- Stem < 10 mm broad; cap only slightly innately fibrillose 33
- 33. Cap 30-60 mm, unevenly wavy, often slightly depressed at centre when older; stem becoming slightly yellowish with age, bulb distinctly marginate, with ochraceous yellow veil at margin. Cap ochraceous yellow, centre \pm yellow brown; gills greyish white; stem 30-60 x 5-10 mm, whitish; flesh whitish; smell and taste indistinct to \pm malt-like; KOH on cap red brown, in flesh negative. Sp 10-11 x 5.5-6.5 μm , citriform to slightly amygdaloid, distinctly verrucose (fig. 703D). With deciduous trees on calcareous soil; autumn; very rare in temp.-hemib.; DK (EN), NO, SE.
C. luteoimmarginatus Rob. Henry (*C. polymorphus* Rob. Henry s. auct. p.p.)
- Cap 15-40 mm, hemispherical to convex, then expanded; stem unchanging with age, bulb rounded, with indistinct whitish veil at margin. Cap pale yellow brown to ochraceous yellow, finely innately fibrillose, sometimes slightly hygrophanous, rarely with veil, and if so, then with an indistinct frosty appearance; gills greyish white; stem 20-40 x 4-7 mm, whitish with a rounded bulb; veil whitish, thin and fibrillose at bulb margin; flesh whitish; smell and taste indistinct to slightly malty; KOH on cap red brown, in flesh negative. Sp 10-12 x (5.5-)6-7 μm , citriform, distinctly verrucose (fig. 703E). In deciduous forests on calcareous soil; autumn; very rare in temp.-hemib.; DK (EN, Sj: Allindelille, Lol: Møns Klint), NO (CR). – JEC 6, 35, Mos 4, Svp 56:45.
C. gracilior (M.M. Moser) M.M. Moser
- 34. Sp 9.5-10.5 μm long 35
- Sp < 9.5 μm long 36
- 35. KOH in flesh negative; stem with a glutinous, yellow to yellow-brown veil girdle on or above the bulb margin; cap uniformly yellow, sometimes with indistinct hygrophanous spots or streaks, at centre sometimes very finely granulate-diffracted, not innately fibrillose.

Cap 50-100 mm, hemispherical to convex, then expanded, often with a low umbo, very glutinous; gills whitish; stem 45-90 x 10-20 mm, whitish, with a ± rounded to slightly marginate bulb; flesh whitish; smell and taste indistinct to slightly malty. Sp 9.5-10.5 x 6-7 μm, amygdaloid, distinctly verrucose. With *Fagus* on calcareous soil; autumn; very rare in temp.; DK (EN, Lol: Maribo Sønderlø). – JEC 7, 26, Svp 56:44.

C. cliduchus Fr. (*C. langei* Rob. Henry s. auct. p.p.)

- KOH in stem flesh yellow, in bulb flesh orange brown; stem without a glutinous, yellow to yellow brown veil girdle on or above the bulb margin; cap innately fibrillose, brown to yellow brown, darkest at centre. Cap 35-80 mm, hemispherical to convex, then expanded, rarely with veil, and if so, then with an indistinct 'frosty' appearance; gills whitish; stem 35-65 x 8-20 mm, whitish, with a sharply marginate bulb; flesh whitish, when young with ± greyish tinge in stem top, becoming ± yellow in damages. Sp 9-10.5 x (5-)5.5-6.5 μm, amygdaloid to ellipsoid, distinctly verrucose. With *Fagus* on calcareous soil; autumn; very rare in temp.; DK, SE.

C. aquilanus T.S. Jeppesen & Frøslev in press (*C. langei* Rob. Henry s. auct. p.p.)

36. Smell malty or yeast-like; stem with a sharply marginate, often fairly wide bulb; cap without hygrophanous spots. Cap 40-90 mm, hemispherical to convex, then expanded, yellow, homogeneously coloured, with little discolouration, smooth or very finely innately fibrillose, often with appressed, white veil patches; gills greyish white; stem 40-70 x 12-20 mm, whitish, with age discolouring ± ochraceous yellow brown; flesh whitish. Sp (7.5-)8-9(-9.5) x (4.5-)5-6 μm, amygdaloid to ellipsoid, distinctly verrucose (fig. 703F). With *Fagus* on calcareous soil; autumn; rare in temp.; DK. – ADC 11, 345 (as *aurantiotinctus*), V&K 29 (as *langei*).

C. xanthoohraceus P.D. Orton (*C. langei* Rob. Henry s. auct.)

- Smell honey-like in bulb flesh and when bruised; bulb rounded to slightly marginate; cap often with hygrophanous spots. Cap 40-80 mm, hemispherical to convex, then expanded, ochraceous yellow to pale yellow, sometimes with whitish, very thin and appressed, frosty veil at centre; gills greyish white, often somewhat serrulate; stem 40-80 x 10-15 mm, initially whitish, becoming somewhat brass-brown spotted, cortina very sparse; flesh whitish, with a distinct, honey-like smell. Sp 7.5-9.5 x 4.5-5.5 μm, amygdaloid to ellipsoid, indistinctly verrucose. With *Quercus*, *Fagus* and *Betula* on oligotrophic to ± eutrophic soil; autumn; common in bore., occasional, but locally common in hemib. and suba., very rare in temp.; DK (vu), FI (LC), IS (Au, Na), NO (LC), SE (LC). – CFP B47, Däh 726 (as *allutus*), Sieniop 218.

C. talus Fr.

Key E: Subgen. *Phlegmacium*: Stem ± cylindrical; gills dark olivaceous brown; flesh bitter; sp subglobose

1. Young gills olivaceous ochre; pleuro- and cheilocystidia present, ± lageniform, with epiparietal pigment; smell like cedar wood; pileipellis ± simplex. Cap 40-100 mm, hemispherical to convex, then expanded, innately fibrillose, initially olivaceous, soon becoming ochraceous brown to yellow brown from centre, with hygrophanous spots; stem 50-100 x 10-18 mm, cylindrical, somewhat tapering at base, whitish, with appressed, fibrillose, whitish to ochraceous yellow veil; flesh in cap pale yellow brown, in stem greyish. Sp 7.5-9 x 5.5-6.5 μm, distinctly verrucose (fig. 709A). In moist *Picea* forests on poor soil, often in bog margins, rarely also with *Fagus* on poor soil; summer to autumn; common in hemib.-bore., rare in temp.; DK (NT), FI (LC), NO (LC), SE (LC). – ADC 2:44, Däh 754, 755, GCI A155, M&J 21, Ves 377.

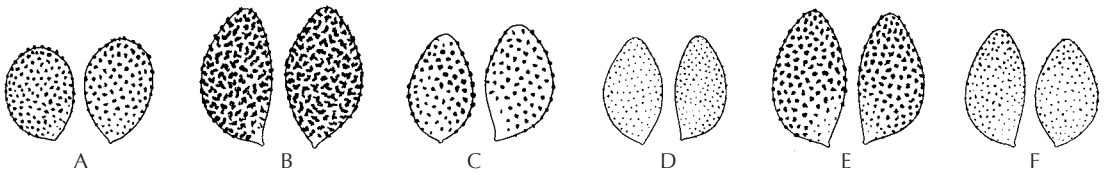
C. subtortus (Pers.) Fr.

- Young gills dark olivaceous brown, to almost olivaceous black; cystidia absent or inconspicuous; smell not like cedar wood; pileipellis duplex. Cap 40-100 mm, hemispherical to convex, then expanded, olivaceous grey, dark olivaceous brown to umber brown, often becoming ochraceous brown to yellow brown with age, innately fibrillose; stem 40-80

x 10-25 mm, cylindrical to clavate, whitish to olivaceous grey, veil appressed fibrillose, initially whitish becoming ochraceous yellow; flesh whitish to olivaceous grey, sometimes violaceous in stem top. Sp 7-8.5 x 5.5-6.5 μm , subglobose, distinctly and densely verrucose. Mostly in deciduous forests, with e.g. *Fagus* and *Quercus*, but also with conifers on calcareous ground; autumn; common in temp.-hemib., rare in bore.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A09, Däh 752, 753 (as var. *olivellus*), GCI B73, M&J 94, Phil 180a, Ves 376, ☉. *C. infractus* Berk.

Key F: Subgen. *Phlegmacium*: Stem \pm cylindrical; cap cuticle finely to coarsely granulate-diffracted at centre, appearing minutely cracked; stem with appressed, \pm glutinous veil girdles

1. Gills greenish yellow to sulphur yellow 2
- Gills whitish to greyish, rarely with a slight rose tint 5
2. Smell strong, like marjoram or apples; stem with inconspicuous pale greenish yellow veil girdles that become slightly ochraceous yellow to pale ochraceous brown 3
- Smell initially faint and pleasant, like banana peel, but may become strong and unpleasant with age; stem with viscid, olivaceous grey brown, reddish brown to purplish brown veil girdles 4
3. With *Picea*; cap orange yellow to yellow brown, when young with a greenish yellow tinge. Cap 40-90 mm, hemispherical to convex, then expanded, sometimes weakly granulate-diffracted into orange-brown scales at centre, sometimes with darker innate fibres with age, fairly uniformly coloured; gills greenish yellow to olivaceous yellow; stem 40-90 x 10-20 mm, cylindrical to slightly clavate, pale greenish yellow, with inconspicuous pale greenish yellow veil girdles that become slightly ochraceous yellow to pale ochraceous brown; flesh bright greenish yellow; smell strong, like marjoram or apples. Sp 11-12.5 x 6-7 μm , amygdaloid to slightly ellipsoid, distinctly verrucose (fig. 709B); pileipellis pigment yellow to yellow brown, mainly incrusting. In coniferous forests on \pm calcareous soil; autumn; occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – CFP C56, Däh 767, GCI A119, Nit 247. *C. percomis* Fr.
- With *Tilia*, *Corylus* and possibly also *Quercus*; cap at first bright lemon yellow, olivaceous to olivaceous brown at centre, when young with a greenish yellow tinge at margin. Cap 50-100 mm, hemispherical to convex, then expanded, often distinctly granulate-diffracted; gills greenish yellow to sulphur yellow; stem 50-80 x 15-25 mm, \pm bulbous, bulb rarely distinctly marginate, pale greenish yellow to sulphur yellow, in lower half with pale orange yellow to brownish veil remnants; bulb not distinctly marginate; flesh greenish yellow; KOH greenish to olivaceous on cap, in bulb flesh indistinctly reddish, in stem and cap flesh indistinctly olivaceous. Sp 11-12.5 x (6.5-)7-8 μm , ellipsoid to slightly amygdaloid, coarsely verrucose. On calcareous soil; autumn; very rare in hemib.; SE (ÖI). *C. majoranae* Frøslev & T.S. Jeppesen in press
4. KOH in flesh olivaceous, sometimes slightly reddish in stem base; stem with olivaceous grey brown veil girdles in lower half; smell initially faint, like unripe banana, becoming strong and unpleasant with age. Cap 40-100 mm, hemispherical to convex, then expanded, yellow, at margin greenish yellow, at centre becoming orange brown to red brown with an olivaceous tinge, at centre often coarsely granulate-diffracted into dark purple-brown to blackish scales; gills greenish yellow to olivaceous yellow; stem 50-90 x 8-35 mm, cylindrical, clavate to fusiform, greenish yellow; flesh greenish yellow. Sp 10-12.5 x 6.5-7.5 μm , amygdaloid to slightly ellipsoid, strongly verrucose; pileipellis with incrusting-intracellular yellow to olive pigment. With coniferous trees on calcareous soil; autumn; rare in hemib.-bore.; FI (LC), NO (NT), SE (NT). – CFP D20, GCI A139, M&J 104, Sieniop 209. *C. mussivus* (Fr.) Melot (*C. russeus* Rob. Henry, *C. russeoides* M.M. Moser)



Spores: A: *Cortinarius subtortus*, B: *C. percomis*, C: *C. olidus*, D: *C. papulosus*, E: *C. varicolor*, F: *C. saginus*.

- KOH in flesh reddish; stem with reddish brown to umber or purplish brown veil girdles in lower half; smell faint, like unripe banana, not becoming strong and unpleasant with age. Cap 40-70 mm, hemispherical to convex, then expanded, yellow brown, with greenish yellow margin, soon becoming red brown to chestnut brown, at centre often \pm granulate-diffracted; gills greenish yellow to olivaceous yellow; stem 30-80 x 10-15 mm, cylindrical to clavate, sometimes slightly bulbous, greenish yellow; flesh greenish yellow; basal mycelium saffron orange. Sp 10-12 x 6-7 μ m, amygdaloid, strongly and rather coarsely verrucose; pileipellis with incrusting-intracellular, yellow to olive pigment, in exsiccates red brown. With deciduous trees on calcareous soil, sometimes in mixed stands with conifers, in Central Europe also with *Abies*; autumn; rare in hemib., very rare in temp.; DK (CR, S; Allindelle), FI, NO (VU), SE (NT). – CFP B21, M&J 104.
C. nanceiensis Maire
- 5. Sp > 12 μ m long; flesh in stem pale olivaceous green to greenish yellow, pale greenish with KOH. Cap 40-70 mm, hemispherical to convex, then expanded, at margin initially yellowish green, at centre granulate-diffracted, olivaceous grey brown, becoming darker olivaceous brown with age; gills greyish white to ochraceous grey, rarely with a faint bluish tinge; stem 40-70 x 10-20 mm, pale whitish yellow to olivaceous yellow, with dark olivaceous grey to olivaceous brown veil girdles. Sp 12-13.5 x 6.5-8 μ m, amygdaloid, strongly and coarsely verrucose. With *Pinus* on calcareous soil, in Central Europe with *Abies*; autumn; very rare in hemib.; SE (Gtl). – Mos 163a,b.
C. citrinoolivaceus M.M. Moser
- Sp < 12 μ m long; flesh in stem whitish, negative with KOH 6
- 6. Sp. 9.5-10.5 x 5.5-6.5 μ m (fig. 709C); with deciduous trees. Cap 40-100 mm, hemispherical to convex, then expanded, pale yellow, ochraceous yellow to yellow brown, often with an olivaceous tinge, at centre granulate-diffracted into small olivaceous brown scales; gills greyish white, rarely with a slightly rose tinge; stem 40-100 x 10-20 mm, cylindrical to slightly clavate, whitish, with pale yellowish to ochraceous yellow veil girdles; flesh whitish; smell like maize or mown grass. Sp amygdaloid to slightly ellipsoid, distinctly verrucose. Autumn; occasional in temp.-hemib., rare in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – JEC 8:29, Phil 181c, Svp 48:57, Ves 377.
C. olidus J.E. Lange (*C. cephalixus* Fr. s. auct., *C. cliduchus* Fr. s. auct.)
- Sp on av < 9.5 μ m long; with coniferous trees 7
- 7. Cap red brown to chestnut brown at centre, towards margin pale ochraceous brown to almost ochraceous white; stem with red-brown to chestnut-brown veil girdles. Cap 30-80 mm, hemispherical to convex, then expanded, at centre finely granulate-diffracted; gills greyish white; stem 30-80 x 10-15 mm, cylindrical to slightly clavate, whitish; flesh whitish; smell distinct, like maize or mown grass. Sp 8-9.5 x 4.5-5.5 μ m, amygdaloid to slightly ellipsoid, weakly verrucose (fig. 709D). With conifers, often on calcareous soil; autumn; occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – ADC 9:224, CFP A35, M&J 55, Svp 48:55.
C. papulosus Fr.

- Cap olivaceous yellow to yellow brown at centre, at margin greenish yellow, sulphur yellow to almost whitish; stem with greenish yellow to sulphur-yellow veil girdles. Cap 30-80 mm, hemispherical to convex, then expanded, at centre finely granulate-diffracted; gills greyish white, rarely with a slightly rose tinge; stem 30-80 x 10-15 mm, cylindrical to slightly clavate, whitish; flesh whitish; smell weak, like unripe banana. Sp 8.5-9.5 x 5.5-6 μm , amygdaloid to slightly ellipsoid, weakly verrucose. With conifers, mainly mossy, \pm calcareous *Pinus* forests; autumn; occasional in hemib.-bore.; FI, NO, SE. – AC 9:225.
C. olidoamethysteus Rob. Henry & Ramm

Key G: Subgen. *Phlegmacium*: Stem \pm cylindrical; KOH on flesh yellow, sometimes as a ring

1. Cap margin with violaceous or bluish colours, at least when young 2
 - Cap margin without violaceous or bluish colours 5
2. Gills greyish white 3
 - Gills \pm violaceous 4
3. Cap centre dry, even on young frb, often cracked at centre, often with tomentose margin; in dry coniferous forests. Cap 50-120(-180) mm, hemispherical to convex, fibrillose, bluish at margin when young, \pm brownish at centre; gills narrow, crowded, greyish white; stem 50-90 x 10-30 mm, whitish, with sparse, whitish veil remnants; flesh whitish. Sp 9.5-11.5 x 5-6.5 μm , amygdaloid to slightly citriform, verrucose. Summer to autumn; common in hemib.-bore., very rare in temp.; DK (NA, Bornh: Almindingen), FI (LC), NO (LC), SE (LC). – CFP C60, M&J 108, GCI A7.
C. balteatus (Fr.) Fr.
 - Cap initially glutinous or viscid, centre not cracked, not with tomentose margin; with deciduous trees, mainly *Quercus*. Cap 60-150(-200) mm, hemispherical to convex, violaceous to violaceous grey at margin, brown to violaceous brown at centre; gills greyish white; stem 50-90 x 15-40 mm, whitish, with distinct violaceous veil remnants, that discolour brownish with age; flesh whitish. Sp 9.5-11 x 5-6 μm , amygdaloid to slightly citriform, verrucose. Often in parks, cemeteries or old gardens, calciphilous; autumn; occasional in temp.-hemib., rare in southern bore.; DK (NT), FI (LC), NO (LC), SE (LC). – GCI A3.
C. balteatocumatilis P.D. Orton
4. Smell very strong and unpleasant, earthy, or to some people like banana peel; gelatinous hyphae in cap cuticle 4-6 μm wide. Cap 50-110(-140) mm, hemispherical to convex, then expanded, with age innately fibrillose, initially with violaceous blue margin and greyish brown centre, soon discolouring to chestnut brown; gills violaceous to violaceous grey; stem 50-100(-140) x 15-25 mm, pale bluish grey to violaceous, with (sometimes indistinct) violaceous blue veil remnants, becoming brownish spotted with age or when handled; flesh pale violaceous grey in stem, otherwise whitish. Sp 10-11.5 x 5.5-6.5 μm , amygdaloid to slightly citriform, verrucose (fig. 709E). In coniferous and deciduous forests on \pm calcareous soil; autumn; common in hemib.-bore., less common in the eastern part, occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – AC 8:177, CFP B20, Däh 745, 749 (as *nemorensis*), GCI B181, C175, M&J 15.
C. varicolor (Pers.: Fr.) Fr.
 - Smell indistinct; gelatinous hyphae in cap cuticle 2.5-4 μm wide. Cap 50-110 mm, hemispherical to convex, then expanded, with age sometimes slightly innately fibrillose, initially pale to distinctly bluish at margin, pale greyish brown at centre, soon discolouring to ochre brown; gills violaceous; stem 50-100 x 15-25 mm, whitish or bluish white, becoming brownish spotted with age or when handled; flesh bluish white to violaceous grey, often more distinctly violaceous in stem base. Sp (9.5-)10-11.5 x 5.5-6.5 μm , amygdaloid to slightly citriform, verrucose. In deciduous forests on \pm calcareous soil, mostly with *Fagus*; autumn;

occasional in temp.-hemib.; DK (LC), FI (DD), NO (LC), SE (LC). – CFP D22, Däh 748, GCI B77, Phil 179f, ☉.

C. largus Fr. (*C. nemorensis* (Fr.) J.E. Lange)

5. Flesh staining yellow when exposed or bruised 6
- Flesh unchanging when exposed or bruised 7

6. Sp 11.5-13.5 x 6.5-7.5 μm see *C. pseudovulpinus* key H 33
- Sp 6.5-9.5 x 3.5-5 μm see *C. rubicundulus* key H 12

7. Stem with distinct, flocculose, yellow brown to ochraceous brown veil girdles. Cap 60-120 mm, hemispherical to convex, then expanded, persistently glutinous, yellow, yellow brown to orange brown, towards margin ochraceous yellow; gills greyish white to pale bluish grey; stem 70-120 x 15-25 mm, whitish with a yellowish tinge towards base; flesh whitish; sp 10.5-12.5 x 6-7 μm , amygdaloid, verrucose; pileipellis duplex. With *Betula pendula* on rich to \pm calcareous soil, often in parks, pastured woodlands and forest margins; autumn; locally common in hemib.-southern bore., occasional in middle bore., rare in temp. and northern bore., occasional in IS; DK (LC), FI (LC), IS, NO (LC), SE (LC). – AC 9:219, CFP A49, Däh 736, 737 (as *crocolitus*), Phil 185e, Svp 48:45, ☉.

C. triumphans Fr. (*C. crocolitus* Quél.)

- Stem without distinct, flocculose, yellow brown to ochraceous brown veil girdles 8
8. Gills violaceous 9
- Gills greyish, whitish or brownish 11

9. Cap pale grey brown to ochraceous when young, sometimes almost whitish at margin, viscid, but soon dry. Cap 30-90 mm, hemispherical to convex, then expanded, with age brownish and innately fibrillose; gills pale violaceous blue to greyish white; stem 50-100(-120) x 8-15 mm, whitish blue to almost whitish grey, becoming distinctly vinaceous brown to brownish when handled, with indistinct, pale bluish veil remnants; flesh bluish white to greyish white, sometimes bluish green in stem base. Sp 10-11.5 x 5.5-6.5 μm , amygdaloid, verrucose. With *Picea* in moist oligotrophic forests; summer to autumn; rare in hemib.-bore.; FI (LC), NO (LC), SE. – CFP D09, M&J 16.

C. patibilis Brandrud & Melot

- Cap of young frb yellow, yellow brown, ochraceous brown to buff, persistently glutinous 10
10. Stem greyish white with a violaceous tinge when young, becoming \pm brownish when bruised; cap ochraceous brown to fulvous brown, slightly innately fibrillose with age. Cap 40-80 mm, hemispherical to convex, then expanded; gills pale violaceous blue to greyish white; stem 50-100 x 10-15(-20) mm; flesh greyish white, often with a bluish tinge in stem top. Sp 9.5-11 x (5.5-)6-6.5 μm , amygdaloid to slightly citriform, verrucose. With *Picea* in mesotrophic-eutrophic forests; autumn; rare in hemib.-bore.; FI (DD), NO (LC), SE (NE). – CFP D10.

C. spadiceus (M.M. Moser) Brandrud

- Stem whitish, not becoming brownish when bruised; cap yellow to yellow brown, sometimes slightly orange brown at centre, not innately fibrillose. Cap 40-100 mm, hemispherical to convex, then expanded, gills distinctly lilac-violaceous; stem 40-100 x 10-20 mm, with indistinct, whitish fibrillose veil, often with an ochraceous white veil girdle; flesh whitish, sometimes slightly yellowish in stem top. Sp 9.5-11.5 x 5.5-6.5 μm , amygdaloid, verrucose; pileipellis duplex. With *Picea*, calciphilous; autumn; occasional but locally common with a mainly southern distribution in hemib.-bore.; FI (LC), NO (LC), SE (LC). – AC 9:210, CFP B14, Däh 750, GCI B191, Sieniop 222, Svp 48:47.

C. varius (Schaeff.: Fr.) Fr.

11. In subalpine *Betula* forests and alpine heathland with *Betula nana* or dwarf *Salix* 12

- With conifers or thermophilous deciduous trees such as *Corylus* and *Fagus* 13
- 12. With *Betula*; cap 50-120 mm. Cap hemispherical to convex, then expanded, initially whitish to whitish brown, at least towards margin, partly due to thin whitish, appressed fibrillose veil, with age becoming more ochraceous brown to dark brownish; gills greyish white; stem 60-150 x 10-30 mm, cylindrical to clavate, greyish white to pale ochraceous brown, with fairly sparse, whitish to ochraceous veil; flesh whitish, ± pale ochraceous grey in stem top, normally yellowish with KOH. Sp 10.5-12.5 x 5.5-6.5 μm, amygdaloid to citriform, distinctly verrucose. Mainly in mesotrophic-eutrophic, low herb vegetation; summer to autumn; rare in suba.-arc./alp., very rare in bore.; FI (DD), IS, NO (LC), SE.
C. durus P.D. Orton var. *durus* (*C. errabundus* Melot)
- With alpine dwarf *Salix*; cap 40-60 mm. Cap hemispherical to convex, then expanded, pale ochraceous brown with slightly darker centre and whitish margin; gills greyish white; stem 30-40 x 10-15 mm, clavate at base and slightly tapering below, persistently whitish; flesh not yellowish with KOH. Sp 12-13 x 6-6.5 μm, amygdaloid, finely verrucose. Summer to autumn; very rare in suba.-arc./alp.; IS, NO.
C. durus P.D. Orton var. *chamaesalicis* (Bon) Brandrud
- 13. Sp 10-12.5 x 5.5-7 μm 14
- Sp 8-10.5 x 4.5-6 μm 15
- 14. Cap 40-100 mm, pale ochraceous brown with (ochraceous) white margin, soon warm ochraceous to fulvous brown; sp 11-12.5 x 6-7 μm. Cap hemispherical to convex, then expanded, sometimes with bluish veil patches at margin, appressed tomentose from veil at centre, rivulose / fibrillose; gills greyish white; stem 60-120 x 8-15 mm, whitish, becoming pale ochraceous brown from base, with sparse, whitish, fibrillose veil, often turning ochraceous brown; flesh whitish, slightly greyish in stem top. Sp acutely amygdaloid to slightly citriform, verrucose. In oligotrophic-mesotrophic *Picea* forests, often with *Vaccinium myrtillus* and *Dicranum* mosses; summer to autumn; rare in bore.-suba.; NO (LC), SE (NA). – Mos 34 (as *Phlegmacium latum*).
C. vacciniophilus Brandrud
- Cap 30-70 mm, ochraceous brown to umber brown, outer half with appressed bluish veil; sp 10-11.5 x 5.5-6.5 μm. Cap hemispherical to convex, then expanded, innately fibrillose, often appressed tomentose to scaly diffracted at centre, often with appressed, bluish veil at margin when young; gills greyish white, sometimes with a violaceous tinge towards cap margin; stem 40-70 x 8-12 mm, whitish with a greyish or bluish tinge at top; flesh whitish, sometimes with a bluish to blue-green tinge in stem when young. Sp amygdaloid to slightly citriform, verrucose. With *Picea* in oligotrophic forests, often in young plantations; summer to autumn; rare in bore.; NO (LC), SE (NA).
C. acidophilus Brandrud
- 15. Stem of young frb turning distinctly vinaceous brown when bruised; cap grey brown, buff, red brown to umber brown 16
- Stem of young frb unchanging or yellowish when bruised; cap pale ochraceous to ± yellow brown 17
- 16. Stem with conspicuous violaceous spots in lower half. Cap 40-90 mm, hemispherical to convex, then expanded, somewhat fibrillose towards margin, uniformly greyish brown, with age ± umber brown; gills greyish white; stem 50-90 x 10-20 mm, greyish white or bluish white, becoming ± brownish when handled; flesh whitish or grey brown, often distinctly violaceous in lower part of stem. Sp 8.5-10 x (4.5-)5-5.5 μm, amygdaloid-ellipsoid, distinctly verrucose. With *Pinus* or *Picea* on calcareous soil, in mossy forests; autumn; rare in hemib.-bore.; NO (VU), SE (NE).
C. violaceomaculatus Brandrud
- Stem without conspicuous violaceous spots in lower half. Cap 30-90 mm, somewhat

tomentose, completely dry, even when young, ochraceous brown to dark brown, innately fibrillose; gills brownish white; stem 50-120 x 8-20 mm, whitish, with whitish veil; flesh whitish, turning vinaceous brown, especially when bruised. Sp 9-10.5 x 5.5-6 μm , acutely amygdaloid to slightly citriform, distinctly verrucose. With *Picea* on eutrophic to \pm calcareous soil, in mossy forests; summer to autumn; rare and with a continental distribution in hemib.-bore.; FI (LC), NO (VU), SE (NT). – CFP C35, C44.

C. russus Fr.

17. Stem < 15 mm broad, longer than cap diam., becoming \pm yellowish when bruised see *C. pinophilus* key H 8
 - Stem usually > 15 mm broad, shorter than cap diam., not becoming yellowish when bruised 18
18. Sp 7.5-9.5 x 4.5-5 μm , amygdaloid to fusiform. Cap 50-100 mm, hemispherical to convex, often slightly tomentose at the involute margin, often completely dry, whitish cream at first, soon becoming \pm ochraceous, sometimes \pm hygrophanous; gills narrow, crowded, whitish; stem 30-50 x 18-25 mm, clavate or with a rounded bulb, whitish cream; flesh whitish. Sp finely verrucose; cap cuticle simplex. Mainly in dry, sandy *Pinus* heathland, often with *Cladonia*, rarely in sandy plantations with *Picea*; autumn, rare but locally occasional in hemib.-bore., in FI with northern distribution, very rare in temp.; DK (VU), FI (LC), NO, SE. – Jordst 17(1):26.
C. areni-silvae (Brandrud) Brandrud
 - Sp 9-10.5 x 5-5.5 μm , irregularly amygdaloid to \pm citriform. Cap 40-100 mm, hemispherical to convex, with involute margin, often completely dry, whitish cream at first, soon becoming \pm ochraceous; gills narrow, crowded, greyish white; stem 40-70 x 10-30 mm, clavate or with a rounded bulb, whitish cream; flesh whitish. Sp finely verrucose; cap cuticle simplex. With thermophilous deciduous trees such as *Corylus* and *Fagus* on rich soil, more rarely with *Picea* in plantations; autumn; rare in temp.-hemib.; FI (DD), NO (EN), SE (NA). – CFP D21.
C. balteatoalbus Rob. Henry

Key H: Subgen. *Phlegmacium*: Stem \pm cylindrical; KOH on flesh unchanging to brownish

1. Flesh staining violaceous or reddish-vinaceous when bruised; stem violaceous 2
 - Flesh not staining violaceous or reddish-vinaceous when bruised; stem violaceous or not 5
2. Cap fibrillose, viscosity very fugacious; gills and stem unchanging when bruised. Cap 40-100 mm, hemispherical to convex, viscid when young, but soon dry and fibrillose, violaceous grey, becoming dark grey brown from centre, at margin violaceous blue when young, with darker innate fibres; gills violaceous blue to blue grey; stem 50-100 x 10-25 mm, violaceous to blue grey, at base with blue mycelial felt; flesh initially bluish to bluish grey, becoming vinaceous-reddish on exposure, especially when bruised. Sp 8.5-10.5 x 5.5-6.5 μm , ellipsoid to amygdaloid, verruculose; pileipellis \pm simplex. Mostly in rich and fairly moist *Picea* and *Betula* forests, but also with *Quercus*; autumn; occasional in hemib.-southern bore., rare in middle-northern bore., very rare in temp.; DK (EN), FI (LC), IS, NO (LC), SE (LC). – CFP B02, M&J 93, Sieniop 198.
C. cyanites Fr.
 - Cap smooth, persistently viscid-glutinous; gills and stem staining distinctly violaceous when bruised 3
3. Sp 10-12 x 5.5-7 μm ; cap 15-40 mm; stem \leq 5 mm broad. Cap hemispherical to convex, then expanded, violaceous grey to pale violaceous, with a somewhat silvery appearance, with

age ± ochraceous grey; gills deep violet at first; stem 25-50 x 2-5 mm, violaceous blue in upper part, below cortina zone covered with pale violaceous blue veil, soon discolouring to ± ochraceous grey; flesh pale violaceous, in stem cortex more distinctly violaceous, in lower part of stem also with a vinaceous tinge; gills, stem and flesh becoming vinaceous violet when touched; smell honey-like. Sp broadly ellipsoid, distinctly verrucose; pileipellis duplex. With *Quercus*, *Corylus*, *Fagus* and *Tilia* on somewhat acid to mesotrophic, not calcareous soil; autumn; rare in temp.-hemib.; DK (DD), NO (VU), SE (LC). – M&J 19, RdM 42:315, Svp 35:53.

C. subporphyropus Pilát

- Sp on av < 10 µm long; cap > 40 mm; stem often > 5 mm broad 4
- 4. Cap pale ochraceous to silvery clay, rarely with a violaceous tinge, 40-70 mm. Cap hemispherical to convex, then expanded, margin somewhat innately fibrillose or with darker hygrophanous spots or streaks; gills violaceous to violaceous grey; stem 40-90 x 10-15 mm, violaceous in upper part, downwards whitish grey with whitish to slightly violaceous veil; flesh violaceous in cap and upper part of stem, otherwise whitish; gills, stem and flesh becoming vinaceous violet when touched; smell honey-like. Sp 8-9.5 x 5-6 µm, broadly ellipsoid, distinctly verrucose; pileipellis duplex. With *Betula* on mesotrophic, often moist soil; summer to autumn; common in hemib.-suba., rare in temp.; DK (VU), FI (LC), IS, NO (LC), SE (LC). – CFP B55, M&J 19.

C. porphyropus (Alb. & Schwein.) Fr.

- Cap ochraceous brown to chestnut brown, sometimes with slightly violaceous grey margin when young, 50-120(-140) mm. Cap hemispherical to convex, then expanded, innately fibrillose, often with hygrophanous spots or streaks; gills violaceous to violaceous grey; stem 50-120 x 12-20(-25) mm, violaceous in upper part, downwards whitish grey with whitish to slightly violaceous veil; clavate to bulbous; flesh whitish with a violaceous tinge in stem cortex; smell honey-like; gills, stem and flesh becoming vinaceous violet when touched. Sp 8.5-10 x 5-6.5 µm, broadly ellipsoid, coarsely verrucose; pileipellis duplex. With *Fagus*, *Quercus*, *Corylus* and *Tilia*, on rich to ± calcareous soil; autumn; occasional in temp.-hemib., rare in southern bore.; DK (LC), FI (LC), NO, SE. – Däh 756, 757, M&J 18.

C. subpurpurascens (Batsch) Fr. s. auct. (*C. purpurascens* Fr. var. *largusoides* Rob. Henry)

- 5. Stem with distinct, often somewhat woolly girdles of ochraceous brown to dark brown veil; in coniferous forests. Cap 60-120(-140) mm, hemispherical to convex, then expanded, yellow brown to orange brown, distinctly glutinous, with easily distinguishable brownish veil patches; gills greyish white; stem 50-100(-120) x 15-25 mm, whitish; flesh whitish; KOH in flesh dark red brown, in cap pale rose brown to negative. Sp 8-10 x 5-6 µm, ellipsoid, finely verrucose (fig. 709F); pileipellis simplex. Autumn; locally common in hemib.-southern bore., occasional in middle-northern bore, rare in coniferous suba.; FI (LC), NO, SE (LC). – CFP A01, Däh 735 (as *subvalidus*), GCI A159, M&J 10, Svp 48:45.

C. saginus (Fr.: Fr.) Fr. (*C. subvalidus* Rob. Henry)

- Veil girdles on stem absent or pale whitish, ochraceous or violaceous or associated with deciduous trees 6
- 6. Sp on av < 9.5 µm long; associated with coniferous trees or *Populus* 7
- Sp on av > 9.5 µm long or associated with deciduous trees 20
- 7. Cap whitish to pale ochraceous 8
- Cap yellow brown to brown 10
- 8. Sp 8-9.5 x 5.5-6.5 µm; stem becoming ± yellowish when bruised. Cap 35-75 mm, hemispherical to convex, then expanded, hardly viscid, pale ochraceous to yellow brown, when young with yellow margin, covered with thin, frosty whitish veil, with age ochraceous brown; gills pale greyish white; stem 40-100 x 6-14 mm, clavate or with a rounded bulb, whitish to pale yellowish ochre, covered with a thin whitish veil, becoming more yellow when bruised;

flesh pale greyish white, with a yellow tinge; KOH in flesh slightly yellowish. Sp ellipsoid, verruculose; pileipellis duplex. With *Pinus* on sandy soil, often in *Cladonia* heathland; autumn; occasional in continental bore., most common in northeast Fennoscandia; FI (LC), NO (VU), SE (LC). - JEC 5:9, Jordst 17(1):25.

C. pinophilus Soop

- Sp 5.5-7.5 x 3.5-5 μ m; stem not becoming yellowish when bruised 9
- 9. Smell and taste farinaceous. Cap 20-50 mm, hemispherical to convex, then expanded, finely innately fibrillose, ochraceous at centre, towards margin whitish to cream, sometimes with appressed, whitish fibrillose veil at margin; gills whitish to cream or very pale violaceous grey; stem 30-45 x 6-12 mm, cylindrical to clavate, often slightly rooting at base, whitish, sometimes very pale violaceous at top, with appressed, fibrillose, whitish veil, with age brass-brown spotted; flesh whitish, sometimes slightly violaceous in stem top, becoming slightly yellowish in stem base. Sp 6.5-7.5 x 4.5-5 μ m, ellipsoid, verruculose; pileipellis duplex. With *Picea*, possibly also *Quercus*; autumn; very rare in suboceanic hemib.; NO (VU). - GCI C127, JEC 2:7.

C. lustratus Fr.

- Smell and taste indistinct, not farinaceous. Cap 30-60 mm, hemispherical to convex, then expanded, whitish to yellowish white; gills pale clay, often with a fugacious violaceous to rose tinge when young; stem 40-70 x 5-9 mm, cylindrical, often indistinctly bulbous, whitish, sometimes with violaceous top, with age \pm brass-brown spotted; flesh whitish, sometimes pale violaceous in stem top when young. Sp 5.5-7.5 x 3.5-4.5 μ m, ellipsoid, verruculose (fig. 719A); pileipellis duplex. Mainly in dry, sandy *Pinus* heathland, rarely with *Picea*; autumn; common in continental bore., occasional in hemib., very rare in temp.; DK (VU), FI (LC), NO (LC), SE (LC). - M&J 8, JEC 5:8, Sieniop 205.

C. leucophanes P. Karst.

- 10. Sp very broadly ellipsoid to subglobose. Cap 30-100 mm, hemispherical to convex, then expanded, faintly viscid to dry, ochraceous yellow to ochraceous brown, often with small, rust-brown spots, when young with thin whitish appressed fibrillose veil; gills ochraceous brown to greyish, rarely with a faint violaceous tinge; stem 50-100 x 7-15 mm, whitish, becoming brass-brown spotted with age, with rooting base, usually becoming vinaceous when touched; flesh whitish, with ochre, hygrophanous streaks in stem when young, ochre in bulb; smell somewhat like cedar wood. Sp 6-7 x 4.5-5 μ m, distinctly and densely verrucose; pileipellis duplex. With *Picea*, rarely with *Pinus* or *Fagus*; summer to autumn; occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). - CFP C41, GCI C183, M&J 9.

C. vespertinus (Fr.: Fr.) Fr. (*C. intentus* Fr.)

- Sp ellipsoid to amygdaloid 11
- 11. Gill edge with cylindrical to clavate cystidia or abundant sterile cells; cap dry; without hygrophanous spots, without silky-silvery veil remnants when young 12
- Gill edge without clavate cystidia or abundant sterile cells; cap viscid-glutinous, at least when young, glabrous or becoming fibrillose, often with hygrophanous spots, often with silky-silvery veil remnants when young 13
- 12. Flesh staining distinctly yellow when exposed. Cap 30-80 mm, hemispherical to convex, fibrillose to tomentose, orange yellow, yellow brown to red brown; gills narrow, white; stem 30-80 x 10-30 mm, clavate, white, but staining yellow; flesh initially whitish. Sp 6.5-9.5 x 3.5-5 μ m, ellipsoid to amygdaloid, very finely and indistinctly verrucose; pileipellis simplex to slightly duplex. With *Quercus* and *Fagus* on nutrient poor soil, also with *Picea* and then often on rich soil; summer to autumn; occasional in suboceanic hemib.-bore.; NO (LC), SE (LC). - CFP A24, Däh 716, Phil 187c.

C. rubicundulus (Rea) A. Pearson

- Flesh unchanging when exposed. Cap 40-100 mm, hemispherical to convex, fibrillose to



tomentose, buff, ochraceous brown to red brown; gills narrow, white; stem 40-110 x 10-25 mm, clavate to fusiform, white; flesh whitish with ochraceous hygrophanous streaks in stem when young. Sp 7-9 x 3.5-4.5 μm , ellipsoid to amygdaloid, very finely and indistinctly verrucose; pileipellis simplex to slightly duplex. With *Picea*, rarely *Pinus* on nutrient poor soil, often in *Sphagnum*; summer to autumn; occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – CFP B41, Däh 751, Sieniop 196.

C. crassus Fr.

13. Stem slightly rooting, with conspicuous, thick, white veil girdles. Cap 70-150 mm, hemispherical to convex, then expanded, often radially wrinkled towards margin with age, yellow brown to ochraceous brown, more chestnut brown at centre, often with abundant whitish veil patches; gills greyish white, rarely with a bluish tint; stem 60-130 x 10-30 mm, white, with conspicuous whitish veil girdles; flesh whitish. Sp 7-8.5 x 4-4.5 μm , narrowly amygdaloid, almost smooth (fig. 719B). Mostly in oligotrophic coniferous forests, rarely with *Betula*; autumn; common in bore., occasional in hemib. and suba.; FI (LC), NO (LC), SE (LC). – CFP B48, GCI A29, M&J 109, Sieniop 195, Svp 48:57.
C. claricolor (Fr.) Fr. (*C. turmalis* Fr. s. Moser)
- Stem cylindrical, clavate to \pm bulbous, with more sparse, fibrillose veil remnants, sometimes with pinkish or ochre veil girdles 14
14. Universal veil girdles on stem or basal mycelium becoming pinkish rose to lilac when exposed; cap persistently glabrous; sp < 4 μm broad, smooth and pale 15
- Universal veil not becoming pinkish on stem or basal mycelia when exposed; cap becoming fibrillose; sp > 4 μm broad, verrucose 16
15. Cap pale ochraceous yellow at margin, at centre bright yellow brown to more fulvous brown. Cap 40-100(-120) mm, hemispherical to convex, then expanded, often with some hygrophanous spots, when young with a thin, whitish, appressed, frosty veil at centre; gills greyish white, persistently pale ochraceous yellow; stem 50-90 x 10-15 mm, cylindrical, clavate to almost bulbous, whitish, with whitish veil, mycelial felt usually becoming rose after a while when exposed in air; flesh whitish. Sp 7-8.5 x 3.5-4 μm , narrowly amygdaloid to almost ellipsoid, pale and smooth. In coniferous forests, very rarely in *Fagus* forests on poor soil; autumn; occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – CFP C31, Däh 728 (as *sebaceus*), GCI B179, M&J 9, Svp 48:59.
C. turmalis Fr. (*C. sebaceus* Fr. s. Moser)
- Cap chestnut brown to dark red brown, becoming paler with age. Cap 40-100 mm, hemispherical to convex, then expanded, often with some hygrophanous spots, when young with a thin, whitish, appressed, frosty veil at centre; gills greyish white, persistently pale ochraceous yellow; stem 50-90 x 10-15 mm, clavate or with a faintly marginate bulb, whitish, with whitish veil girdles which become rose when exposed in air; flesh whitish. Sp 6.5-7.5 x 3-4 μm , amygdaloid to ellipsoid, pale and smooth. In coniferous forests, rarely in *Fagus* forests on poor soil; late autumn; occasional in hemib.-bore., rare in temp.; FI (LC), NO (LC), SE (NE). – CFP C58, GCI A183, Sieniop 221.
C. variegatus Bres. (*C. roseolimbatu*s Bigeard & Guillemin)
16. Taste slightly bitter, at least in the cap flesh see *C. lustrabilis* p. 679
- Taste mild 17
17. With *Pinus* on sandy soil; KOH in flesh yellow see 8
- With *Picea* or *Populus*; KOH in flesh red brown or negative 18
18. With *Populus* and *Betula*, rarely *Tilia*; subpellis weakly developed, hyphae rarely > 10 μm wide. Cap 30-100 mm, hemispherical to convex, then expanded, centre sometimes tomentose-cracked with age, glutinous, yellow, ochraceous yellow to yellow brown, with whitish margin; gills ochraceous white to greyish white; stem 50-90 x 8-15(-20) mm, whitish, becom-

ing ochraceous yellow towards base when handled, with whitish to ochraceous yellow, ± glutinous veil girdles; flesh fairly soft, whitish. Sp 7.5-8.5 × 4.5-5 µm, ellipsoid to slightly amygdaloid, finely verrucose. In thermophilous forests on rich to ± calcareous soil; autumn; rare but locally occasional in hemib.-southern bore.; FI (LC), NO (VU), SE (LC). – CFP B46.

C. populinus Brandrud

- With *Picea*; subpellis well developed, hyphae 10-25 µm wide 19
19. KOH in flesh red brown; stem and flesh brownish. Cap 30-80 mm, hemispherical to convex, then expanded, ochraceous brown, yellow brown to buff, centre frequently appressed tomentose-cracked with age, sometimes with buff veil patches near margin; gills greyish white; stem 30-80 × 5-15 mm, initially greyish white, soon becoming ochraceous brown from base; flesh whitish, with an ochraceous brown tinge, especially towards base. Sp 8-9 × 5-6 µm, ellipsoid, verruculose. With *Picea*; autumn; very rare in bore.; FI, (PK: Juuka), NO (VU), SE (VU). – CFP A26.

C. norrlandicus Brandrud

- KOH in flesh negative; stem and flesh whitish see *C. multiformis* key D 24
20. Cap initially ochraceous white, pale ochraceous brown or silvery grey, or covered with appressed, whitish veil 21
- Cap initially yellowish, yellow brown, buff, grey brown, umber brown, violaceous grey to violaceous, not covered with appressed, whitish veil 25
21. Gills violaceous; stem clavate, violaceous at the top see *C. argenteoilacinus* key C 31
- Gills white; stem rooting to ± cylindrical, white at top 22
22. In dwarf *Salix* heathland in arc./alp. see *C. durus* var. *chamaesalicis* key G 12
- Habitat different 23
23. Sp 12.5-14.5 × 7-8 µm; gills conspicuously distant. Cap 30-100 mm, hemispherical to convex, initially whitish or pale ochraceous and often covered with an appressed, silky-fibrillose veil, with age becoming ± ochraceous at centre, and often with larger whitish fibrillose veil patches; gills white; stem 10-20 × 40-110 mm, irregularly cylindrical, sometimes slightly rooting, whitish, with age brownish, often turning vinaceous and then bluish black in damages or where bruised after 1 hour or so; flesh whitish. Sp amygdaloid to slightly citriform, distinctly to coarsely verrucose. With *Picea* on calcareous soil; autumn; rare in hemib.-bore.; NO (NT), SE (NT). – CFP A07, M&J 11, Svp 48:49.

C. fraudulosus Britzelm.

- Sp < 12 µm long; gills not conspicuously distant 24
24. With *Populus*, often clayey, rich to calcareous soil; sp ≤ 6.5 µm wide. Cap 30-100 mm, hemispherical to convex, sometimes with a low umbo, initially whitish or very pale ochraceous, and often covered with an appressed, silky-fibrillose veil, with age becoming ± ochraceous at centre, and often with larger whitish fibrillose veil patches; gills white; stem 40-100 × 10-15 mm, cylindrical, rooting, whitish, with fairly sparse, rarely abundant whitish fibrillose veil, often as girdles, with age ochraceous brown, often turning vinaceous and then bluish black in damaged spots or where bruised after an hour or so; flesh whitish. Sp 9.5-11.5 × 5-6.5 µm, amygdaloid, distinctly verrucose. Autumn; common in hemib.-southern bore., rare but locally occasional in middle bore., very rare in temp.; DK (DD, Fyn: Østre Gulstav, Lol: Flintinge Byskov), FI (LC), NO (LC), SE (LC). – CFP A52, M&J 114, Sieniop 188, Svp 48:49.


C. argutus Fr.

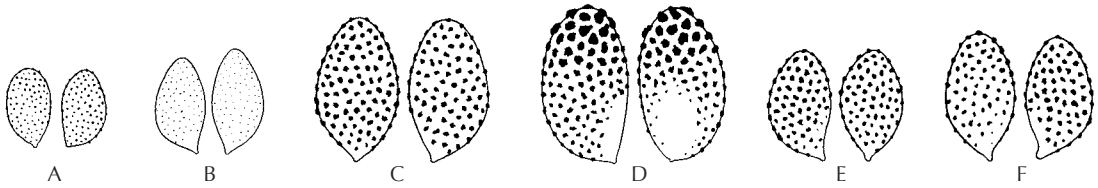
- In oligotrophic-mesotrophic *Picea* forests, often in ant-hills; sp ≥ 6.5 µm wide. Cap 40-70 mm, hemispherical to convex, ochraceous white to uniformly ochraceous yellow, completely fibrillose from veil when young, with age becoming ochraceous brown; gills white; stem 50-90 × 7-15 mm, irregularly cylindrical, sometimes slightly rooting towards base, whitish, with age pale ochraceous brown, often with ± ochraceous veil girdles, turning slightly yel-



low when bruised; flesh whitish. Sp 9.5-12 x 6.5-8 μm , fairly polymorphic, broadly ellipsoid to amygdaloid, sometimes subglobose, distinctly to coarsely verrucose. Autumn; rare but locally occasional in hemib.-bore.; FI (LC), NO, SE.

C. rosargutus Chevassut & Rob. Henry (*C. fraudulosus* Britzelm. var. *rosargutus* (Chevassut & Rob. Henry) Brandrud)

25. Stem \geq 20 mm broad; sp 14-17 x 8-10 μm . Cap 70-200 mm, hemispherical to convex, then expanded, purple brown, umber brown or cocoa brown, sometimes with whitish to pale violaceous veil patches, often radially wrinkled; gills grey, sometimes faintly violaceous when young; stem 70-150(-200) x 20-50 mm, clavate, whitish, with bluish to whitish veil girdles; flesh greyish white, sometimes slightly violaceous in stem top. Sp amygdaloid, coarsely verrucose; pileipellis duplex, with a well-developed, subcellular subpellis, elements with yellow brown walls. With *Quercus*, *Tilia*, *Carpinus* and *Corylus*, in Central Europe also with *Fagus*; summer to autumn; rare in hemib., very rare in temp.; NO (VU), SE (NT). – CFP A42, Däh 744, GCI B119, M&J 116, Svp 48:59, .
- C. praestans* (Cordier) Gillet
- Stem \leq 20 mm broad; sp smaller 26
26. In coniferous forests; stem without or with indistinct whitish to violaceous girdles; cap rarely with veil remnants 27
- In deciduous forests; veil distinct, leaving the stem whitish flocculose or with one or more distinct ochraceous to yellow-brown girdles; cap frequently with veil patches or \pm scaly from veil 32
27. Cap bluish to violaceous grey, at least when young 28
- Cap grey brown, ochraceous brown, fulvous brown to dark brown 29
28. Pileipellis duplex, with a subcellular subpellis; stem 50-100 x 10-20(-25) mm, whitish, with a distinct violaceous blue veil girdle. Cap 50-100(-120) mm, hemispherical to convex, then expanded, initially fairly dark violaceous at centre, brighter violaceous blue at margin, partly due to thin, appressed veil, with some hygrophanous spots or streaks, with age becoming purplish brown and finally somewhat ochraceous yellow at centre; gills grey to greyish white, narrow; flesh whitish, when young sometimes with a greyish to grey-green tinge in stem top. Sp 10-12 x 5-6 μm , narrowly amygdaloid, weakly verrucose. With *Picea*, very rarely *Tilia*, on rich, but rarely on calcareous soil; autumn; occasional in hemib.-bore., in FI very rare in southern bore.; FI (NT, V, U), NO (LC), SE (VU). – CFP A47, Däh 743, GCI C83, M&J 60, Nit 246.
- C. cumatilis* Fr.
- Pileipellis simplex; stem 50-90 x 8-13 mm, whitish, with indistinct, whitish to ochraceous yellow, glutinous veil. Cap 40-90 mm, hemispherical to convex, then expanded, margin initially greyish blue to pale violaceous, with more purplish grey-brown centre, becoming greyish brown with age; gills greyish; flesh whitish; smell when cut somewhat of maize or mown grass, like *C. olidus*. Sp 11-12.5 x 6-7 μm , amygdaloid to slightly ellipsoid, weakly verrucose. With *Picea* on rich or calcareous soil; autumn; rare in hemib.-suba.; FI (LC), NO (LC), SE (NE). – CFP C25.
- C. serarius* Fr.
- 29. Sp > 11.5 μm long 30
 - Sp < 11.5 μm long 31
30. Gills violaceous blue; sp 12-13.5 x (7.5-)8-9 μm , broadly ellipsoid, distinctly verrucose
see *C. riederi* key C 31
- Gills greyish white; sp 11.5-13 x 6.5-7.5 μm , amygdaloid to ellipsoid, weakly verrucose. Cap 25-60 mm, hemispherical to convex, then expanded, innately fibrillose, slightly viscid, soon dry, brownish grey to ochraceous brown; gills greyish white; stem 40-100 x 5-15 mm, whit-



Spores: A: *Cortinarius leucophanes*, B: *C. claricolor*, C: *C. vulpinus*, D: *C. obsoletus*, E: *C. tiliae*, F: *C. variiformis*.

ish, with violaceous veil girdles; flesh whitish, smell slightly honey-like. Pileipellis simplex to slightly duplex, basally with up to c. 15 μm wide elements with amber-brown walls. In oligotrophic coniferous forests, mainly with *Picea*; autumn; rare in bore.-suba., in FI with a southern distribution; FI (LC), NO (VU), SE (VU). – CFP B26, JEC 5:70.

C. borgsjoeënsis Brandrud

31. Sp 10-11.5 \times 6-7 μm , ellipsoid to amygdaloid; stem base without pale greenish mycelial strands. Cap 40-100 mm, hemispherical to convex, then expanded, innately fibrillose, sometimes with few hygrophanous spots, ochraceous grey brown to dark ochraceous brown or pale orange brown, at margin ochraceous grey; gills violaceous, pale violaceous grey to greyish white; stem 60-100 \times 10-20 mm, whitish, when young with a faint greyish blue tinge at top, with whitish to ochraceous yellow, indistinct veil girdles; flesh whitish, bluish grey to ochraceous grey tinge in stem top when young. Sp verrucose. With *Pinus* on calcareous soil; autumn; very rare in hemib.-bore.; NO (VU), SE (VU). – CFP D15, D16.

C. pini Brandrud

- Sp 9-10.5 \times 6-7 μm , broadly ellipsoid; stem base often with pale greenish mycelial strands. Cap 40-70 mm, hemispherical to convex, then expanded, brown to dark brown, with radial hygrophanous streaks or spots, sometimes entirely hygrophanous in outer part; gills initially grey brown or bluish grey; stem 40-100(-120) \times 7-12 mm, \pm bulbous to slightly marginate bulbous, shiny, when young pale violaceous grey, to more distinctly bluish at top, discolouring brass brown; flesh whitish to brownish white, when young with a violaceous tinge in stem top; smell honey-like. Sp verrucose; pileipellis duplex. In coniferous forests on moist, silicious soil, even in ombrotrophic bogs; summer to autumn; common and widespread in hemib.-bore.; FI, NO (LC), SE. – CFP C06 (as *scaurus* var. *sphagnophilus*).

C. sphagnophilus Peck

32. Sp on av > 11 \times 6.5 μm ; with *Fagus*, *Carpinus* or *Corylus* 33
 - Sp on av < 11 \times 6.5 μm ; with *Quercus* or *Tilia* 35
33. Flesh turning yellow on exposure; smell unpleasant with age, like old camembert cheese; with *Carpinus* or rarely *Corylus*. Cap 40-90 mm, hemispherical to convex, sometimes with a low umbo, often \pm dry, initially ochraceous white, soon turning ochraceous brown, darker brown when bruised, with abundant appressed veil, rendering the cap fibrillose-tomentose; gills persistently pinkish lilac, especially towards edge; stem 50-100 \times 8-18 mm, cylindrical, whitish, becoming somewhat brownish from base, with abundant whitish veil girdles that become ochraceous brown; flesh whitish. Sp 11.5-13.5 \times 6.5-7.5 μm , amygdaloid, distinctly verrucose; pileipellis simplex to slightly duplex, basal hyphae strongly yellow brown incrustated. On calcareous soil; autumn; rare in hemib.; NO (CR), SE (EN). – CFP B43, JEC 8:33 (top), Svp 48:53.

C. pseudovulpinus Rob. Henry & Ramm

- Flesh not turning yellow on exposure; smell not like old cheese with age; with *Fagus* 34
- 34. Sp amygdaloid, 11-13 x 6.5-7.5 μm (fig. 719C); stem rooting towards base. Cap 40-100(-120) mm, hemispherical to convex or slightly conical, yellow brown to orange brown, becoming warm red brown with age, often with appressed, whitish to ochraceous fibrillose veil, at least at margin; gills greyish white to pale violaceous grey; stem 50-120 x 8-20 mm, whitish, with abundant whitish veil girdles that become ochraceous brown to yellow brown with age; flesh whitish. Sp distinctly verrucose; pileipellis duplex, subpellis with golden brown, amber-like thick walls. With *Fagus* on rich to calcareous soil; autumn; rare in temp.; DK (LC), SE (NT). – CFP B45, Däh 732, GCI C199, JEC 8:33 (bottom), Svp 48:51, ☉.
C. vulpinus (Velen.) Rob. Henry (*C. rufopalbus* Kühner)
- Sp broadly ellipsoid, 11.5-13.5 x 7-8.5 μm (fig. 719D); stem cylindrical to clavate. Cap 25-60 mm, hemispherical to convex, yellow brown to buff, unchanging with age, often with appressed, white fibrillose veil at margin; gills greyish white to pale violaceous grey; stem 35-70 x 7-15 mm, whitish, with whitish veil girdles, not becoming ochraceous brown with age; flesh whitish. Sp distinctly and densely verrucose, sometimes almost spiny; pileipellis duplex, subpellis with golden brown, amber-like thick walls. In deciduous forests, mainly with *Fagus*, on calcareous soil; autumn; very rare in temp.-hemib.; DK (DD, EJyl: Moesgård Skov, SJ: Allindelille), SE. – AC 9:239, JEC 8:31, M&J 11 (as *flurysi*), Phil 185f (as *fraudulosus*), Svp 56:46.
C. obsoletus Kühner
- 35. Cap with abundant, brown to dark brown, finely scaly-fibrillose to scaly veil remnants, dry; stem finely scaly-fibrillose from abundant, brown veil, base rooting and turning distinctly brownish with age. Cap 30-80 mm, hemispherical to convex, ochraceous brown to dark grey brown; gills violaceous grey; stem 35-70 x 8-15 mm, whitish; flesh whitish. Sp (8.5-9-10 x 5.5-6 μm , broadly amygdaloid to ellipsoid, distinctly verrucose; pileipellis slightly duplex, basal hyphae with yellow, thick walls. With *Quercus* on calcareous, clayey soil; autumn; very rare in temp.; DK (CR, Fyn: Kasmose Skov). – AC 2:30, Svp 48:53.
C. maculosus (Pers.) Fr. (*C. squameoradicans* Cheype)
- Cap not scaly-fibrillose to scaly, slightly viscid; stem with sparse yellow-brown veil girdles, cylindrical to slightly clavate 36
- 36. Sp 8.5-10 x 4.5-5.5 μm (fig. 719E); with *Tilia cordata*. Cap 50-90 mm, hemispherical to convex, distinctly innately fibrillose, viscid, ochraceous yellow to yellow brown, margin pale ochraceous, sometimes with an olivaceous ochre tinge, often with appressed veil at margin; gills initially tinged bluish grey; stem 45-85 x 10-18 mm, whitish with indistinct, ochraceous white to \pm ochraceous brown veil girdles; flesh whitish when young, with a pale greenish yellow tinge in stem top. Sp amygdaloid to more ellipsoid, finely to distinctly verrucose; pileipellis duplex, subpellis subcellular, elements imbedded in yellow brown, amber-like wall pigment. In calciphilous forests; very rare in the Oslofjord area; autumn; very rare in hemib.; NO (EN). – Bendiksen et al. 1998 plate M, JEC 4:109, Svp 48:47 (top, as *variiformis*).
C. tiliae Brandrud
- Sp 9.5-11.5 x 5.5-6.5 μm (fig. 719F); with *Quercus*. Cap 40-100 mm, hemispherical to convex, sometimes finely innately fibrillose, yellow to yellow brown, centre often more brown to red brown; gills initially distinctly and sometimes persistently lilac blue; stem 40-120 x 8-20 mm, whitish with ochraceous yellow to pale brown veil, as girdles or somewhat volva-like; flesh whitish, greyish to bluish grey in stem top when young. Sp amygdaloid to ellipsoid, distinctly verrucose; pileipellis distinctly duplex, with a subcellular subpellis with amber brown, thick walls. On calcareous soil, mostly in open, grazed woodlands; autumn; very rare in temp.-hemib.; DK (CR, EJyl: Elbæk Skov), SE (EN). – CFP D11, D12, GCI B187.
C. variiformis Malençon

Subgen. *Telamonia* (Fr.) TrogTUULA NISKANEN, KARE LIIMATAINEN,
ILKKA KYTÖVUORI & HÅKAN LINDSTRÖM

Cap dry or fairly dry and stem dry. Cap 5-150 mm, hygrophanous or not. Stem cylindrical to clavate, base sometimes tapering downwards. Universal veil white or colourful, forming complete or incomplete girdles, scales or fibrils on stem, often constituting an important character for identification. Smell often indistinct or raphanoid (in a broad sense), in other species like cedar-wood (*Juniperus virginianus*, often very weak), iodoform, earth, aniseed, *Pelargonium*, potatoes, *Viola odorata* or parsley, pungent as in *Lepiota aspera*, etc. In *Telamonia* it is extremely important to observe cap colours from moist frb, because most *Telamonia* species have totally different colours and become very anonymous in dry weather. Exsiccates white to brown or blackish, often diagnostic for the species.

Sp fusiform to subglobose, not citriform. Marginal cells clavate or basidioform, very rarely as true cheilocystidia. Microscopical observations and measurements in Melzer's reagent, except in the most species in the keys O and P where they are in KOH. To describe the differences between species the dextrinoidity of the spores is described in five grade scale: weakly dextrinoid, fairly weakly dextrinoid, moderately dextrinoid, fairly strongly dextrinoid, strongly dextrinoid.

160 species and four varieties in the keys, but the real number of species in the Nordic countries is much higher. The species concept and limits have been confirmed by macro- and microscopic studies, except for the species in keys O and P, by sequencing c. 2-5 Nordic specimens per species. The nomenclature has been confirmed by sequencing type material, or in Friesian species by sequencing the photographed collections of the Cortinarius Flora Photographica (Brandrud et al. 1989-1998), exceptions are marked in the text (except in the keys C, O and P). The sections are based on the revision by Liimatainen, Niskanen & Kytövuori 2009. The vouchers of CFP photo plates have been studied, but the other photo references are just suggestive.

Suppl. lit.: Arnold 1993.

- | | | |
|----|---|---|
| 1. | Upper part of stem usually < 4 mm broad; cap 5-30(-40) mm | 2 |
| - | Upper part of stem usually > 4 mm broad; cap (30-)40-100(-150) mm | 21 |
| 2. | Universal veil whitish, cream, greyish or brownish, can be sparse | 3 |
| - | Universal veil red, reddish, orange, yellow or ochraceous, can be sparse | 6 |
| 3. | Smell at the base of stem iodoform-like (best observed when slightly dried) or raphanoid; frb without blue colours; cap smooth, yellow brown rusty to honey brown; stem white at least when young; flesh colour same as the cap | |
| | Key K, sect. <i>Obtusi</i> p. 755 | |
| - | Not this combination of characters; smell not iodoform-like | 4 |
| 4. | Whole exsiccate black; universal veil white, very sparse, almost absent; whole frb dark brown | |
| | Key E, sect. <i>Brunnei</i> p. 734 | |
| - | Exsiccate pale to dark, not blackish; universal veil white, cream, greyish or brownish, sparse or abundant; whole frb usually not dark brown | 5 |
| 5. | Stem becoming brownish to almost blackish towards base with age and after handling, not reddening, usually not swollen at base; flesh in stem usually with brownish incrusting pigments; cap often ± scaly | Key O, sect. <i>Incrustati</i> etc. p. 764 |
| - | Stem not becoming brownish downwards with age, but often turning red at base and ± swollen; flesh in stem usually not brownish, hyphae without brownish incrusting pigment; cap usually not scaly | Key P, sect. <i>Hydrocybe</i> p. 770 |
| 6. | Whole frb vivid yellow brown, red brown or cinnabar red | 7 |
| - | Whole frb not vivid yellow brown, red brown or cinnabar red | 9 |
| 7. | Sp < 7 µm long | Key M, sect. <i>Reidentes</i> p. 762 |

- Sp > 7 μm long 8
- 8. Frb cinnabar red see *C. cinnabarinus* key E 8
- Frb vivid yellow brown to red brown **Key O, sect. *Incrustati* etc. p. 764**
- 9. Universal veil orange, pale pinkish, red or vinaceous red 10
- Universal veil yellow or ochre 12
- 10. Universal veil light pinkish to vinaceous red; cap mat or innately fibrillose,
with vinaceous brownish tints; flesh yellowish brown **Key R, sect. *Fulvescentes* p. 776**
- Universal veil orange, blood red or red; cap not mat, often \pm glossy, without
vinaceous tints; flesh greyish white, yellow brown, purplish brown or red brown 11
- 11. Universal veil distinct, orange or blood red **Key Q, sect. *Anthracini* p. 775**
- Universal veil sparse, white, turning slowly red **Key P, sect. *Hydrocybe* p. 770**
- 12. Cap scaly 13
- Cap not scaly 16
- 13. Sp > 9.5 μm long 14
- Sp < 9.5 μm long 15
- 14. With *Alnus* see *C. helvelloides* key O 2
- With *Pinus* see *C. bayeri* key R 2
- 15. Smell strong, pungent, chemical; with *Salix* see *C. croceocingulatus* key P 7
- Smell indistinct or raphanoid; with deciduous or coniferous shrubs or trees
Key O, sect. *Incrustati* etc. p. 764
- 16. With deciduous trees 17
- With conifers 18
- 17. Most sp < 8.5 μm long see *C. heterocyclus* key B 2
- Most sp > 8.5 μm long **Key O, sect. *Incrustati* etc. p. 764**
- 18. Flesh in stem darkening towards the base to dark brown **Key O, sect. *Incrustati* etc. p. 764**
- Flesh in stem not darkening towards the base, whitish to yellowish brown 19
- 19. Cap \pm glossy **Key O, sect. *Incrustati* etc. p. 764**
- Cap mat 20
- 20. Flesh \pm whitish; frb often with bluish tints, especially at the top of stem
see *C. anomalellus* key C 4
- Flesh yellowish brown; frb without bluish tints **Key R, sect. *Laeti* p. 776**
- 21(1) Universal veil yellow, red, greenish, grey, brown or blue, sometimes very sparse 22
- Universal veil white, greyish white, brownish white, cream, sometimes very sparse 46
- 22. Cheilocystidia present; smell strong, unpleasant see *C. camphoratus* key G 2
- Without true cheilocystidia; smell indistinct, raphanoid or fruity 23
- 23. Universal veil blue **Key G, sect. *Telamonia* p. 747**
- Universal veil yellow, red, grey, olivaceous or brown 24
- 24. Whole frb cinnabar red see *C. cinnabarinus* key E 8
- Whole frb not cinnabar red 25
- 25. Universal veil indistinct; sp 6-7 \times 5-5.5 μm , subglobose **Key M, sect. *Renidentes* p. 762**
- Universal veil \pm distinct; sp subglobose to fusiform, often larger 26
- 26. Universal veil orange, light pinkish, red or vinaceous red 27
- Universal veil yellowish, brownish, greyish or olivaceous 36

27. Cap completely covered with reddish scales see *C. bolaris* key C 2
 - Cap without reddish scales or rarely with small red scales at the centre 28
28. With *Quercus*, *Fagus* or *Corylus*; universal veil orange, orange red or cinnabar red 29
 - With deciduous or coniferous trees; universal veil light pinkish, red or vinaceous red 30
29. Universal veil orange red, forming girdles on stem; cap yellow to ochre brown see *C. hinnuleoarmillatus* key N 2
 - Base of stem cinnabar red from universal veil; cap saturated red brown see *C. bulliardii* key E 9
30. Cap weakly hygrophanous, innately fibrillose or with small scales 31
 - Cap hygrophanous, not innately fibrillose, nor with small scales 33
31. Universal veil red, often forming small patches, not girdles, on the stem; cap greyish brown, fairly pale **Key C, sect. *Anomali*** p. 730
 - Universal veil pale pinkish, red or vinaceous red, forming complete and/or incomplete girdles on stem; cap reddish brown to ochraceous red brown, sometimes fairly dark 32
32. Cap somewhat silky shiny, smooth; sp obovoid **Key B, sect. *Brunneotinctorum*** p. 728
 - Cap not silky shiny, smooth or sometimes with small scales; sp subglobose, ovoid, amygdaloid or ellipsoid **Key A, sect. *Armillati*** p. 726
33. Cap red brown, ± waxy-glossy when moist, not silky shiny or mat 34
 - Cap greyish brown or with vinaceous red tints, mat or silky-shiny fibrillose 35
34. Universal veil brown red, sparse; sp amygdaloid see *C. aurantiummarginatus* key E 9
 - Universal veil pale pinkish or vivid red, forming incomplete girdles or a thin sheath on the stem; sp subglobose or ellipsoid **Key L, sects *Firmiores* and *Boulderenses*** p. 758
35. Cap greyish brown, silky-shiny fibrillose; universal veil red **Key C, sect. *Anomali*** p. 730
 - Cap red brown to vinaceous red brown, mat; universal veil pale pinkish or vinaceous red **Key R, sect. *Fulvescentes*** p. 776
36. Cap margin with distinct, greyish brown veil patches; universal veil abundant see *C. rusticus* key G 5
 - Cap without veil patches; universal veil abundant or sparse 37
37. Universal veil brownish, without yellowish or olivaceous colours **Key D, sects *Pholidei* and *Fuscoperonati*** p. 734
 - Universal veil yellowish, yellowish brown or olivaceous 38
38. Cap not hygrophanous, or cap weakly hygrophanous and innately fibrillose or with small scales 39
 - Cap hygrophanous, neither innately fibrillose nor with small scales 41
39. Cap not hygrophanous, smooth, without fibrils or small scales; frb without olivaceous tints; gill trama hyphae often with hyaline crystals **Key C, sect. *Anomali*** p. 730
 - Cap weakly hygrophanous, innately fibrillose, sometimes with small scales; frb with or without olivaceous tints; gill trama hyphae without hyaline crystals 40
40. Frb often with olivaceous tints *and/or* cap silky shiny, smooth **Key B, sect. *Brunneotinctorum*** p. 728
 - Frb without olivaceous tints; cap not silky shiny, smooth or sometimes with small scales **Key A, sect. *Armillati*** p. 726
41. Universal veil, stem or sometimes other parts of frb with greenish or metallic tints **Key E, sect. *Uracei*** p. 734
 - Frb without greenish or metallic tints 42

42. In temp.-hemib. with *Corylus* or *Quercus* **Key N, sect. *Himmulei*** p. 762
 - In temp.-suba. with coniferous trees 43
43. Cap mat, greyish ochraceous brown or vivid yellow brown **Key R, sect. *Laeti*** p. 776
 - Cap ± waxy-glossy when moist, not mat, red brown to dark red brown or
 olivaceous yellow brown 44
44. With *Pinus* or *Picea*; sp narrowly fusiform see *C. aureovelatus* key O 3
 - With *Picea*; sp amygdaloid or subglobose 45
45. Cap red brown; stem 6-15 mm broad, without bluish tints; sp subglobose
 see *C. illuminus* key F 15
 - Cap olivaceous yellow brown or fairly dark red brown; stem 4-8 mm broad, top
 sometimes with bluish tints; sp amygdaloid **Key E, sects *Uracei* and *Colymbadini*** p. 734
- 46(21) Cap ± white, brownish white or greyish 47
 - Cap ± brown to almost black 56
47. Smell fruity in gills 48
 - Smell indistinct 51
48. Flesh saturated yellow brown; with *Pinus* see *C. traganus* f. *ochraceus* key G 4
 - Flesh pale; with *Picea* or deciduous trees 49
49. Smell strong, like in *C. traganus*; sp > 10 µm long see *C. niveotraganus* key G 9
 - Smell fruity, not so strong; sp < 10 µm long 50
50. Cap silky shiny, with very thin hygrophanous streaks **Key L, sect. *Urbici*** p. 758
 - Cap not or only slightly silky-shiny, not hygrophanous **Key I, sect. *Niveoglobosi*** p. 751
51. Cap often with big, cream-coloured veil patches near the margin
 see *C. alborufescens* key I 5
 - Cap without veil patches 52
52. Cap finely scaly see *C. malachus* key H 1
 - Cap not scaly 53
53. With deciduous trees **Key L, sects *Firmiores* and *Urbici*** p. 758
 - With coniferous trees 54
54. In mesic *Picea* forests on calcareous soil; frb without bluish tints **Key L, sect. *Urbici*** p. 758
 - In coniferous forests with *Pinus*; frb usually with at least some bluish tints,
 often best seen in stem top 55
55. Cap innately fibrillose; flesh greyish brown to brown; exsiccate with a fairly
 dark, brown, silvery grey or blackish grey cap see *C. suberi* key H 1
 - Cap not innately fibrillose; flesh greyish white; exsiccate pale, greyish to pale
 greyish brown see *C. quarcticus* key L 4
56. Whole frb yellowish brown to ochraceous brown; smell raphanoid or earthy,
 often strong; sp subglobose to ellipsoid, usually strongly verrucose
Key N, sects *Himmulei* and *Safranopedes* p. 762
 - Not this combination of characters; whole frb not yellowish brown 57
57. Smell fruity, as in *C. traganus*; sp ellipsoid to amygdaloid, 8.5-11 × 5-7 µm; frb
 usually with bluish tints; universal veil abundant **Key G, sect. *Telamonia*** p. 747
 - Not this combination of characters; smell not as in *C. traganus* 58
58. Cap weakly hygrophanous or with hygrophanous streaks, sometimes coarsely
 innately fibrillose or with small scales 59

- Cap distinctly hygrophanous, often ± waxy-glossy when moist, without scales or fibrils 67
- 59. In temp.-hemib. in deciduous forests with *Fagus*, *Quercus*, *Carpinus*, *Tilia* or *Corylus* **Key F, sect. *Bovini* etc. p. 740**
- In temp.-suba. in coniferous forests or with *Betula* or *Populus* 60
- 60. Flesh entirely and distinctly violaceous when young see *C. ionophyllus* key G 11
- Flesh sometimes with bluish tints at stem top or without bluish tints 61
- 61. Smell fruity, sometimes as in *C. traganus* 62
- Smell indistinct, raphanoid or faintly aniseed-like 63
- 62. Cap with hygrophanous streaks; sp > 10 µm long see *C. niveotraganus* G 9
- Cap not hygrophanous; sp < 10 µm long **Key I, sect. *Niveoglobosi* p. 751**
- 63. Cap vivid yellow brown to dark brick red; gills pale greyish apricot brown to vivid brick red **Key I, sects *Lanigeri* and *Balaustini* p. 751**
- Cap greyish brown to dark brown; gills greyish brown to dark brown 64
- 64. Cap with small scales see *C. malachus* key H 1
- Cap without scales 65
- 65. Most sp > 9.5 µm long; with *Populus* see *C. lucorum* key F 3
- Most sp < 9.5 µm long; with deciduous or coniferous trees 66
- 66. Cap sand brown; flesh pale greyish brown; with deciduous trees **Key I, sect. *Niveoglobosi* p. 751**
- Cap greyish brown to dark brown; flesh greyish brown to dark brown; with coniferous trees **Key E, sect. *Brunnei* p. 734**
- 67. Smell iodoform-like, especially on drying; stem white, tapering downwards **Key K, sect. *Acetosi* p. 755**
- Smell not iodoform-like; stem clavate to tapering downwards 68
- 68. Stem tapering downwards, cartilaginous **Key J, sect. *Duracini* p. 753**
- Stem clavate to tapering downwards, not cartilaginous 69
- 69. Whole frb vivid yellow brown to red brown; sp obovoid-subglobose, < 5.5 µm broad **Key M, sect. *Renidentes* p. 762**
- Whole frb not vivid yellow brown to red brown; sp amygdaloid to ellipsoid or if subglobose then > 5.5 µm broad 70
- 70. Flesh in whole stem bluish see *C. evernius* key J 7
- Flesh only partly bluish or without bluish tints 71
- 71. Moist flesh in stem ± brown to dark brown, often darkening towards the base, sometimes partly bluish 72
- Moist flesh in stem very pale, greyish white to brownish white, not darkening towards the base, sometimes partly bluish 73
- 72. Exsiccate with greyish black to brownish black cap and stem; cap and flesh usually brown to dark brown **Key E, sect. *Brunnei* etc. p. 734**
- Exsiccate with pale to fairly dark brown cap, stem often paler than the cap, not blackish; cap and flesh honey brown, grey brown, red brown to fairly dark brown **Key F, sect. *Bovini* etc. p. 740**
- 73. Smell fairly strong, cellar-like, earthy, radish-like or recalling parsley or faint and recalling cedar wood 74
- Smell indistinct 76


74. Smell of parsley see *C. phaeosmus* key F 7
 - Smell cellar-like, earthy or recalling cedar wood 75
75. Sp < 4.5 μm broad; cap vivid red brown; frb without bluish tints see *C. odhinnii* key P 5
 - Sp > 4.5 μm broad; cap fairly dark reddish brown to chocolate brown; frb often
 with bluish tints **Key J, sect. *Bicolores* p. 753**
76. Flesh slightly reddening when cut; sp almost smooth, narrowly ellipsoid
 to fusiform see *C. erubescens* key P 12
 - Flesh not reddening when cut; sp weakly to strongly verrucose, subglobose,
 amygdaloid or ellipsoid 77
77. With coniferous trees **Key L, sect. *Firmiores* p. 758**
 - With deciduous trees 78
78. With *Fagus* see *C. turgidus* key L 8
 - With other deciduous trees **Key F, sect. *Bovini* etc. p. 740**

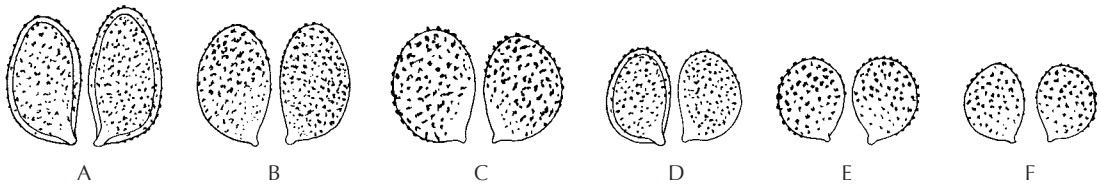
Key A: Subgen. *Telamonia* sect. *Armillati* M.M. Moser

TUULA NISKANEN & ILKKA KYTÖVUORI

Frb fleshy; cap usually 40-110 mm, innately fibrillose, with hygrophanous streaks; universal veil yellowish brown, pinkish, red or vinaceous red; smell indistinct or faintly raphanoid; exsiccates with a fairly dark red brown to greyish brown cap and a greyish stem, \pm red universal veil often still visible on the stem, mycelium white or pinkish; with anthrachinonic pigments; sp subglobose to ellipsoid.

Note: If a species does not match here, see also key B.

1. Sp > 8.5 μm long 2
 - Sp < 8.5 μm long 4
2. Universal veil forming a distinct, cinnabar red girdle and incomplete girdles; sp strongly dextrinoid; with *Betula*. Cap 45-110 mm, hemispherical, soon low convex with a low and broad umbo, often with distinct, small, red scales, especially at the centre, yellowish red brown to yellow brown, with fine dark hygrophanous streaks; gills medium spaced, light brown when young, dark brown with age; stem 80-200 \times 8-15 mm, clavate, up to 25 mm broad at the base, rarely cylindrical, white fibrillose when young, later greyish brown; mycelium white; flesh grey brown; smell slightly raphanoid. Sp 10-12 \times 6-7 μm , amygdaloid to slightly ellipsoid, thick-walled, usually moderately verrucose, sometimes more strongly at apex (fig. 727A). In deciduous and mixed forests, on damp to fairly dry, usually oligotrophic soil; summer to autumn; very common in hemib.-suba., rare in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – AC 7:146 147, CFP B09, R&H 517, Sieniop 189, Ves 350, .
C. armillatus (Fr.: Fr) Fr.
 - Universal veil rose pink to vinaceous red, sometimes yellowish brown, forming complete and/or incomplete girdles; sp weakly to fairly strongly dextrinoid; usually with *Picea* 3
3. Frb with bluish tints on top of the stem and/or in gills, at least when young; sp ellipsoid to amygdaloid, Qav = 1.4-1.65 (fig. 727B). Cap 55-100 mm, hemispherical, soon low convex and often with a low and small umbo, small reddish veil scales especially at the centre, sand brown to more dark brown, with fine, dark hygrophanous streaks; gills medium spaced to distant, bluish brown, with age dark yellowish brown; stem 80-140 \times 7-14 mm, cylindrical or slightly clavate, up to 25 mm broad at the base, whitish fibrillose; mycelium white; universal veil vivid rose pink, sometimes turning vinaceous red with age, rarely yellowish brown, rather easily detectable; flesh marbled brown, later dark brown, bluish at stem top;



Spores: A: *C. armillatus*, B: *C. suboenochelis*, C: *C. luteo-ornatus*, D: *C. roseoarmillatus*, E: *C. paragaudis*, F: *C. pinigaudis*.

smell indistinct. Sp 9-11 x 6-7 μm , moderately verrucose, more strongly at apex, moderately to fairly strongly dextrinoid. In mesic *Picea* forests, often on somewhat rich soil; late summer to autumn; occasional in hemib.-bore.; FI, NO, SE. – AC 7:145.

C. suboenochelis Kytöv., Liimat. & Niskanen in press (*C. subarmillatus* Hongo var. *picetorum* Moëgne-Locc.)

- Frb without bluish tints; sp broadly ovoid to subglobose, Qav = 1.3-1.45 (fig. 727C). Cap 35-100 mm, hemispherical, soon low convex with a low and broad umbo, slightly scaly at the centre, finely fibrillose towards the edge, ochraceous brown, with fine branching hygrophanous streaks; gills medium spaced, pale brown, with age dark brown; stem 60-170 x 8-15 mm, clavate, up to 27 mm broad at the base, rarely cylindrical, rather firm, white fibrillose; mycelium white; universal veil usually pale to more vivid pinkish, rarely yellowish brown, forming some belts or zones on the stem; flesh brown; smell indistinct. Sp 9-10 x 6.5-7.5 μm , thin-walled, moderately verrucose, more strongly at apex, weakly to moderately dextrinoid. In mesic to dry coniferous forests with *Picea*, and in subalpine *Betula* forests, often on somewhat rich soil; summer to autumn; common in hemib.-bore, occasional in suba.; FI (LC), NO (LC), SE. – AC 7:155, CFP B10.

C. luteo-ornatus (M.M. Moser) Bidaud, Moëgne-Locc. & Reumaux (*C. paragaudis* Fr. subsp. *oenochelis* H. Lindstr.)

4. Sp usually strongly dextrinoid, ovoid to obovoid-ellipsoid; universal veil vividly rose red. Cap 35-75 mm, hemispherical, soon low convex with a low and broad umbo, small-scaled at the centre, finely fibrillose towards the edge, rose brown, with fine branching hygrophanous streaks; gills medium spaced, pale brown, with age dark brown; stem 60-90 x 6-13 mm, clavate, up to 27 mm broad at the base, rarely cylindrical, white fibrillose; mycelium white; universal veil forming some belts or zones, usually on the lower half of the stem; flesh brown; smell indistinct. Sp 7-8 x 5-6 μm , thick-walled, rather strongly verrucose, more strongly at apex (fig. 727D). In mesic, mixed forests, and in wooded yards, presumably with *Betula*, often on somewhat rich soil; late summer to autumn; rare in hemib.-bore.; FI, SE. – MycR 2009.

C. roseoarmillatus Niskanen, Kytöv. & Liimat. in press

- Sp not dextrinoid to weakly dextrinoid, subglobose to slightly ovoid; universal veil yellowish brown to vinaceous red
5. Most sp > 5.5 μm wide; universal veil usually vinaceous red, rarely yellowish brown in young frb, forming distinct, incomplete girdles on the stem; in mesic to damp *Picea* and *Pinus* forests and in subalpine *Betula* forests. Cap 30-60(-70) mm, hemispherical, later low convex with a small umbo, surface distinctly fibrillose, ochraceous brown to greyish brown, with hygrophanous streaks; gills medium spaced, pale brown, with age dark brown; stem 60-150 x 6-12 mm, up to 30 mm broad at the base, rarely cylindrical, usually slender, white fibrillose when young, later greyish brown; mycelium white; flesh greyish brown; smell slightly raphanoid. Sp 6.5-7.5 x 5.3-6 μm , subglobose, dark-coloured, moderately verrucose, somewhat more strongly at apex (fig. 727E). Late summer to autumn; common in hemib.-bore., less common in western parts, occasional in suba., very rare in temp.; FI (LC), IS, NO

(LC), SE (LC). – CFP B32, AC7:151.

C. paragaudis Fr. (*C. bresadolianus* Moëgne-Loec. & Reumaux)

- Most sp < 5.5 μm wide; universal veil first yellowish brown, later vinaceous red, forming one or few incomplete girdles; in dry, oligotrophic *Pinus* heath forests. Cap 30-80 mm, hemispherical, later low convex with a low and broad umbo, surface somewhat fibrillose, yellow brown to greyish brown, with hygrophanous streaks; gills medium spaced, pale brown, with age dark brown; stem 70-150 x 8-15 mm, clavate, up to 30 mm broad at the base, rarely cylindrical, rather firm, greyish white fibrillose when young, later greyish brown; mycelium white; flesh greyish brown; smell slightly raphanoid. Sp 6-7 x 4.8-5.5 μm , ovoid-subglobose (fig. 727F), slightly dark-coloured, moderately verrucose, somewhat more strongly at apex. Often on sandy soil; late summer to autumn; common in hemib.-bore., less common in the western parts; FI, NO, SE. – Sieniop 210 (as *paragaudis*).

C. pinigaudis Niskanen, Kytöv. & Liimat. in press

Key B: Subgen. *Telamonia* sect. *Brunneotincti* M.M. Moser

TUULA NISKANEN & ILKKA KYTÖVUORI

Frb often \pm with olivaceous tints; cap usually (25-)40-80 mm, dark innately fibrillose or silky shiny, with dark hygrophanous streaks or spots; universal veil vinaceous red, yellow, yellowish brown, olivaceous brown or brown; smell often raphanoid; sp obovoid, ellipsoid or subglobose.

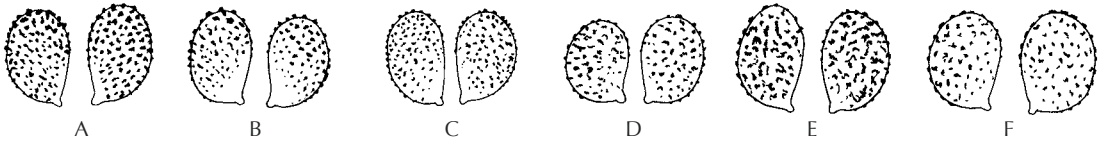
Note: If a species does not match here, see also key A.

1. Sp obovoid; universal veil vinaceous red, at least in old frb, or stem turning vinaceous red; cap usually strongly innately fibrillose with dark, branching fibres seldom not strongly fibrillose; exsiccates with dark cap and often with vinaceous red tints somewhere in the frb 2
 - Sp subglobose or ovoid-ellipsoid; universal veil yellow or olivaceous; stem not turning vinaceous red; cap not or only finely innately fibrillose; exsiccates usually with paler cap and olivaceous tints, often best seen in the stem 4
2. Cap 25-50(-80) mm; stem 3-7 mm broad; with *Betula*. Cap conical to hemispherical, later low convex to almost plane, with an umbo, silky shiny, dark innately fibrillose or not, dark vinaceous red brown to somewhat greyish, sometimes with an olivaceous tint, hygrophanous or with dark hygrophanous streaks; gills crowded to medium spaced, pale yellowish brown, later more brownish; stem 40-70 mm, cylindrical, rather firm, silky whitish grey fibrillose; universal veil vinaceous red, sometimes yellow brown when young, fairly floccose, forming girdles and zones on the stem, or occasionally almost forming a sheath over the lower half of the stem; flesh pale yellowish brown; smell raphanoid. Sp 7.5-8.5 x 5-5.5(-6) μm , obovoid, moderately verrucose, more strongly at apex (fig. 729A), moderately dextrinoid. In mixed and subalpine forests, often in young forests; late summer to autumn; rare in hemib.-suba., in some years more common; FI (DD), NO (NE), SE (NE). – Soop 04:83.

C. heterocyclus Soop

Note: includes three very closely related taxa for which the morphological differences are not known.

- Cap 40-85 mm; stem 5-14 mm broad; with *Betula* or *Populus* 3
- 3. Universal veil olivaceous yellowish brown; cap dark olivaceous brown to more ochraceous brown; exsiccates with a dark olivaceous brown cap, sometimes with vinaceous red tints and with pale, dirty greyish brown to partly on entirely vinaceous red stem. Cap hemispherical, later low convex to almost plane, sometimes with an umbo, with darker centre, usually with hygrophanous streaks or spots; gills crowded to medium spaced, pale olivaceous to yellowish brown when young, yellow brown with age; stem 50-100 mm, cylindrical or slightly clavate, sometimes radicating, whitish silky-fibrillose when young, then greyish yellow brown, turning vinaceous red with age or after handling; universal veil sparse, in zones or forming a thin sheath over the lower half of the stem; flesh whitish to pale yellow



Spores: A: *Cortinarius heterocyclus*, B: *C. caput-medusae*, C: *C. craticius*, D: *C. raphanoides*, E: *C. valgus*, F: *C. fillionii*.

brown, in lower part of the stem or sometimes in the whole stem reddish; smell radish-like. Sp 7-8 x 5-5.5 μm , obovoid, moderately verrucose, somewhat more strongly at apex (fig. 729B), fairly weakly to moderately dextrinoid. In mesic, mixed forests with *Populus tremula*; autumn; rare in hemib.-bore., more rare towards the southern parts; FI (LC), SE (NE). – CFP D59.

C. caput-medusae H. Lindstr.

- Universal veil vinaceous red to orange red; cap red brown to ochraceous red brown, sometimes slightly olivaceous; exsiccates with reddish brown cap, often with vinaceous red tints, often with entirely vinaceous red stem, except for in young frb. Cap 35-70 mm, hemispherical, later low convex to almost plane, with a low and broad umbo, center usually darker, usually with hygrophanous streaks or spots; gills crowded to medium spaced, pale yellowish brown when young, yellow brown with age; stem 50-90 x 5-10 mm, cylindrical or slightly clavate, sometimes radicating, whitish silky-fibrillose when young, later brownish, turning vinaceous red with age or after handling; universal veil sparse to somewhat more abundant, forming belts or zones or a thin continuous coat on the basal part of the stem; flesh pale yellow white to yellow grey, reddish at base of the stem or occasionally entirely reddish; smell slightly radish-like. Sp 7-8.5 x 5-5.5 μm , obovoid to somewhat ellipsoid, moderately verrucose, somewhat more strongly at apex (fig. 729C), fairly weakly to moderately dextrinoid. In mixed forests with *Betula* or *Populus*; rare in hemib.-bore, more rare towards the northern parts; FI, SE (LC).

C. craticius Fr.

4. Frb without olivaceous tints; sp subglobose to somewhat elongate, indextrinoid; gill trama hyphae often with hyaline crystals; with deciduous trees
see key C sect. *Anomali* p. 730
- Frb often with olivaceous tints; sp subglobose, broadly ellipsoid to ovoid-ellipsoid, weakly to strongly dextrinoid; gill trama hyphae without hyaline crystals; with *Betula* or *Picea* 5
5. Cap olivaceous yellow brown; most sp < 8 μm long; exsiccates with fairly dark or paler and not vivid brown gills; large, 3-10 x (3-)5-15 μm , olivaceous spots present deep in the cap cuticle; with *Betula*. Cap 30-70 mm, conical to hemispherical, later low convex, with an umbo, finely innately fibrillose, with dark hygrophanous streaks; gills medium spaced, olivaceous yellow brown; stem 50-100 x 5-10 mm, cylindrical or slightly clavate, whitish silky-fibrillose at the top, lower part olivaceous yellow brown; universal veil olivaceous brown, somewhat floccose, forming girdles and zones on the stem; flesh pale olivaceous yellow brown, darker at the base, sometimes with a bluish tint at stem top; smell strongly raphanoid; exsiccates sometimes fairly dark. Sp 7-8 x 5-5.5(-6) μm , broadly ellipsoid to almost subglobose, moderately to strongly verrucose (fig. 729D), moderately dextrinoid; epicutis hyphae very finely spirally incrustated. In deciduous, mixed and subalpine forests; among mosses or leaf litter; late summer to autumn; very common in hemib.-suba., occasional in suba. in IS and in temp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – CFP B29, M&J 46, Sieniop 214.

C. raphanoides (Pers.: Fr.) Fr. (*C. betuletorum* M.M. Moser)

- Cap fairly dark brown, sometimes with an olivaceous tint; most sp > 8 μm long;

exsiccates with vivid, pale brown to brown gills; with small, 2-4 x 2-6(-10) μm , olivaceous spots deep in the pileipellis; with *Picea* or *Betula*

6

6. Universal veil very sparse; stem cylindrical; most sp < 6 μm wide, fairly broadly ovoid-ellipsoid, fairly weakly to moderately dextrinoid. Cap 35-85 mm, conical to hemispherical, later low convex, with a low and broad umbo, often with concentric depressions, silky shiny fibrillose, with hygrophanous streaks or spots; gills medium spaced, pale grey brown, often with a bluish tint, later brownish; stem 50-100 x 5-13 mm, silky fibrillose, pale brownish, often bluish at the top; universal veil yellowish brown to somewhat olivaceous; flesh pale brownish yellow, darker towards the base of the stem, usually bluish at the top; smell faint, somewhat raphanoid. Sp 8-9 x 5.5-6 μm , fairly strongly verrucose (fig. 729E); epicutis hyphae not or very finely incrustated, few olivaceous spots in the pileipellis. In mesic, coniferous and mixed forests, presumably with *Betula*; late summer to autumn; occasional but locally common in hemib.-bore., rare in temp. and suba.; DK (DD), FI (LC), NO (LC), SE (LC). – CFP B05.

C. valgus Fr.

- Universal veil more abundant, forming girdles and zones on the stem; stem cylindrical to somewhat clavate; sp > 6 μm wide, broadly ellipsoid to almost subglobose, fairly thick-walled, fairly strongly to strongly dextrinoid. Cap 30-80 mm, hemispherical, later low convex to almost plane, sometimes with an umbo, silky shiny fibrillose, hygrophanous or with hygrophanous streaks or spots; gills medium spaced, pale grey brown, often with a bluish tint, later brownish; stem 50-130 x 5-12 mm, whitish silky-fibrillose, often bluish at the top; universal veil yellowish olivaceous to ochraceous yellow; flesh pale brownish yellow, darker towards the base of the stem, usually bluish, at least at the top; smell raphanoid. Sp 8-9 x 6-7 μm , moderately verrucose, more strongly at apex (fig. 729F); epicutis hyphae finely to moderately incrustated, olivaceous spots often abundant in the pileipellis. In mesic *Picea* forests; late summer to autumn; occasional in bore.; FI, SE. – AC 7:149, Kar 48.

C. fillionii Bidaud, Moëgne-Loec. & Reumaux

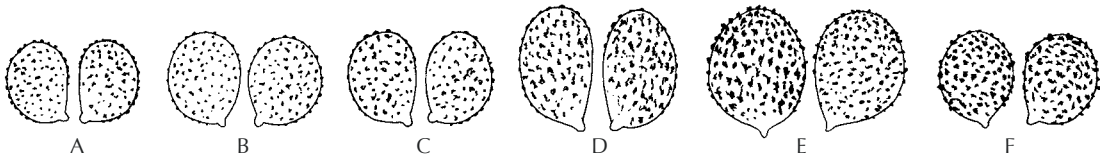
Key C: Subgen. *Telamonia* sect. *Anomali* Konrad & Maubl.

HÅKAN LINDSTRÖM

1. Universal veil vinaceous to rusty or brownish red 2
 - Veil brown, yellow, ochre or ochraceous white 3
2. Cap with brown-red to rusty-red scales or fibres on a white to light yellowish background. Cap 30-60 mm, hemispherical, soon expanded, seldom with a low umbo, with downcurved margin; gills crowded, pale yellowish grey, later ochraceous brown; stem 30-70 x 5-12 mm, cylindrical to somewhat clavate, sometimes tapering, white to yellowish white, reddish brown at base, yellowing when thumbed; universal veil abundant, at first pale, soon reddish, usually rendering the stem flocculose-fibrillose; flesh often hollow, white, becoming yellow when cut; smell faint; taste of pepper. Sp 6.5-7.5 x 5-5.5 μm , subglobose, strongly to moderately verrucose (fig. 731A). Often caespitose in deciduous and mixed forests, mainly with *Quercus*, *Fagus* or *Betula*, often on dry, nutrient-poor soil; autumn; common in temp.-hemib., occasional in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:167, CFP C23, GCI A11, Phil 190a, Ves 350, ☉.

C. bolaris (Pers.: Fr.) Fr.

- Cap greyish brown, more ochraceous at centre. Cap 20-50 mm, hemispherical, convex to expanded, often with a low and broad umbo, as young with a light silky covering, sometimes sticky, weakly hygrophanous, drying greyish ochraceous, seldom with a violet tinge, with remnants of reddish veil at margin; gills crowded, light greyish, sometimes with a violet tinge, later greyish brown; stem 40-100 x 4-10 mm, cylindrical, often compressed or with a somewhat clavate base, fibrous, greyish white, light brownish at base; universal veil usually distinct, brown red to vinaceous, in girdles or scales; flesh often hollow, greyish to yellowish brown; smell faint, raphanoid. Sp (6.5-)7-8 x (5-)5.5-6.5 μm , subglobose, finely verrucose



Spores: A: *Cortinarius bolaris*, B: *C. spilomeus*, C: *C. violaceocinereus*, D: *C. anomalellus*, E: *C. cingulatus*, F: *C. caninus*.

(fig. 731B). In coniferous or mixed forests, mainly with *Picea*, but also *Larix* and *Pinus*, often in young stands on nutrient rich soil; autumn; occasional in temp, common in hemib.-bore.; DK (NT), FI (LC), NO (LC), SE (LC). – CFP C34, GCI B151, FAD 96D, Sieniop 217, Ves 351.

C. spilomeus (Fr.: Fr.) Fr

- 3 Sp broadly ellipsoid, $Q_{av} = 1.3-1.6$; frb stout and tough, recalling *C. torvus*; cap, stem and flesh usually with a dingy lilac (to violet) tinge. Cap 40-65 mm, hemispherical, later low convex, sometimes slightly silky fibrillose, greyish brown, sometimes with lilac (to violet) tinge, weakly hygrophanous in streaks; gills medium spaced, first pale greyish, sometimes with a lilac tinge, soon fairly dark brown; stem 50-100 x 4-10(-20) mm, cylindrical to somewhat clavate, silky-fibrillose, \pm lilac upwards; universal veil light yellowish, in incomplete and complete girdles on stem, sometimes fairly indistinct; flesh lilac-violet, at least in stem top, sometimes turning reddish with age; smell faintly raphanoid. Sp (6.5-)7-8 x 5-6 μm , moderately verrucose (fig. 731C), weakly dextrinoid. In mesic coniferous and mixed forests, mostly known with *Picea* and *Pinus*, also reported with *Betula* and *Fagus*, often on rich soil; autumn; occasional in temp.-southern bore., more frequent in oceanic areas, rare in middle and northern bore.; DK (vU), FI (LC), NO, SE. – FAD 91B,C.

C. violaceocinereus (Pers.: Fr.) Fr

- Sp subglobose to broadly ellipsoid, $Q_{av} < 1.35$ or ellipsoid, $Q_{av} > 1.6$; cap, stem or flesh often with a violaceous-bluish tinge 4
4. Sp ellipsoid, $Q_{av} > 1.6$; with *Pinus*, mostly in sandy or rocky habitats. Cap 10-40 mm, hemispherical to convex, incurved at margin, dry, mat, weakly hygrophanous in a zone, greyish brown to purplish brown, sometimes violet bluish at margin, drying more yellowish brown; gills crowded to medium spaced, dark violet to violet brown; stem 30-50 x 3-6 mm, cylindrical to somewhat clavate at base, finely fibrous, white, but usually \pm violet in upper part, later light yellowish; universal veil moderately abundant, ochraceous yellow to yellowish brown, scattered to flocculose; flesh white but upwards violet blue, sometimes yellowing at base, yellowing; smell faint. Sp 9-10.5 x 6-7 μm , moderately verrucose (fig. 731D). On dry, rich to nutrient-poor soil and in rocky forests; autumn; occasional in hemib.-bore.; FI (LC), SE. – Soop 05:30.

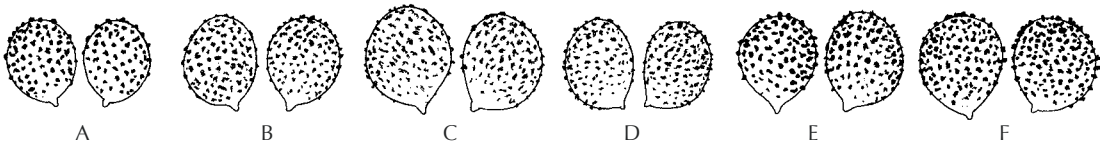
C. anomalellus Soop

- Sp \pm subglobose to broadly ellipsoid, $Q_{av} < 1.6$; not with *Pinus* 5
5. Sp 9.5-10.5 μm long; basidia usually 2-spored. Cap 30-100 mm, hemispherical, convex to expanded, sometimes with a low umbo, with incurved margin, sometimes wrinkled, when young often violet blue, then greyish ochraceous from centre and often persistently violet at margin, weakly hygrophanous or with fine streaks, somewhat sticky, micaceous when dry, often with remnants of veil at margin; gills crowded, deeply and long persistent violet to greyish brown; stem 40-120 x 6-10 mm, clavate to almost cylindrical, somewhat glossy, ochraceous white, often violet upwards, later greyish yellow from base; universal veil often abundant, dark yellow to ochraceous, in girdles and flocks; flesh greyish white, violet at top of stem, later yellowish; smell sometimes distinct, aromatic, like *Asarum*. Sp (9-)9.5-10.5 x (7-)7.5-8.5 μm , (broadly ellipsoid to) subglobose, moderately and coarsely verrucose (fig. 731E). In broadleaved and mixed coniferous forests on calcareous soil; very rare in hemib.;

SE (Gtl). – AC 2:38, CFP E06.

C. cingulatus (Velen.) Moëgne-Locc. & Reumaux (*C. luteoperonatus* Bidaud & Cheype)

- Sp 7-9.5 µm long; basidia 4-spored 6
- 6. Cap dry and mat, even in young and wet condition, with dull brownish-greyish tinges 7
- Cap viscid in wet condition, shiny when dry, without brownish-greyish tinges 9
- 7. Universal veil brownish, usually in one narrow distinct girdle. Cap 30-100 mm, hemispherical, convex to expanded, seldom with a low umbo, with incurved margin, sometimes wrinkled or rimose at centre, when young almost sticky, mat, somewhat felty in old, with fine hygrophanous streaks, ochraceous brown, later reddish brown; gills crowded, bluish to greyish brown; stem 40-110 x 5-15 mm, cylindrical to clavate, fibrous, white, bluish at top, later greyish yellow, sometimes with bluish mycelial felt, often flocculose below the girdle; flesh whitish, bluish upwards, yellowing by age, formalin slowly gives a rose reaction; smell faint, raphanoid. Sp (7.5-)8-9 x 6-7 µm, (broadly ellipsoid to) subglobose, moderately and coarsely verrucose (fig. 731F). In coniferous forests, usually with *Picea* on nutrient rich soil, often in young stands and plantations; autumn; common in western temp.-bore., occasional in eastern bore.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – AC 4:85, 86, B&K 5:254, CFP E07, FAD 93C, Mar 748.
C. caninus (Fr.: Fr.) Fr.
- Universal veil yellowish 8
- 8. Frb slender; stem 4-8 mm broad; young cap dark greyish brown; usually with *Betula* on acid, nutrient-poor soil, possibly also with other deciduous trees. Cap 30-80 mm, hemispherical-conical, then expanded, sometimes with a small umbo, greyish brown, seldom bluish at margin, later lighter brownish, sometimes with patches or a narrow zone of veil; gill crowded, light greyish to bluish, later greyish brown; stem 40-100 x 4-8 mm, cylindrical to narrowly clavate, fragile, white and somewhat glossy, sometimes bluish upwards, yellow with age; universal veil yellow usually in distinct girdles and patches; flesh whitish, upwards in stem bluish, later yellowish; smell distinct, raphanoid. Sp 7-8(-8.5) x 5.5-6.5(-7) µm, subglobose, strongly verrucose (fig. 733A). Late summer to autumn; very common in the north, especially suba., rare in temp.; DK (DD), FI, NO, SE (NA). – AC 4:80 (as *anomalus* var. *subcaligatus*), 81, CFP E08, Cke 773, 850.
C. lepidopus Cooke
- Frb fairly fleshy; stem 5-12 mm broad; young cap usually lighter greyish brown, soon whitish-greyish; mainly with different deciduous trees, often on rich soil. Cap 25-80 mm, hemispherical to convex, sometimes with a low umbo or depressed at centre, very seldom sticky, sometimes micaceous at margin, sometimes weakly hygrophanous in a zone or with diffuse streaks, greyish ochraceous to light brown, darker at centre, at margin often bluish, later more yellowing; gills crowded, greyish bluish violet to greyish, later greyish brown; stem 40-100 x 5-12 mm, cylindrical, usually with clavate base, glossy, white fibrous, usually bluish to violet upwards, later yellowing; universal veil usually thin, light yellowish, in bands or patches; flesh white, bluish violet upwards in stem, later yellowing; smell often distinct, raphanoid. Sp 7.5-8.5 x 6-7 µm, subglobose, moderately verrucose (fig. 733B). Mainly with *Quercus*, *Tilia*, *Betula*, *Fagus*, etc., possibly also with conifers; autumn; common in temp.-hemib., occasional in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – AC 4:82 (as var. *anomalus*), B&K 5:249, CFP E09, R&H 511.
C. anomalus (Fr.: Fr.) Fr.
- 9. Young cap yellow, yellowish, greyish ochre or tawny, seldom with a bluish tinge; sp moderately verrucose 10
- Ground colour of young cap whitish to light ochre, but often with a ± bluish cover; sp strongly verrucose 11
- 10. Cap 40-150 mm, fleshy, yellowish already when young; universal veil distinctly yellow; sp subglobose to broadly ellipsoid, $Q_{av} = 1.16-1.28$. Cap hemispherical to convex-expanded,



Spores: A: *Cortinarius lepidopus*, B: *C. anomalus*, C: *C. xanthocephalus*, D: *C. tabularis*, E: *C. albocyaneus*, F: *C. lebretonii*.

seldom with a low umbo, in wet conditions sticky to viscid or glutinous, as dry shiny and often wrinkled, with fine, dark hygrophanous streaks, ochraceous yellow to yellow, later more brownish, slightly lighter at margin; gills crowded, pale greyish brown, seldom with a greyish bluish tinge; stem 50-160 × 4-12 mm, cylindrical to clavate, glossy, white, seldom bluish at top, later turning pale yellow; universal veil yellow, usually forming distinct girdles and spots; flesh white, often with darker spots, seldom bluish upwards; smell faint, raphanoid. Sp 8-9(-9.5) × 6.5-7.5(-8) μm , subglobose, moderately verrucose (fig. 733C). In deciduous forests and cultivated areas with *Populus*, *Betula*, *Quercus*, *Tilia*, *Fagus* and other trees, especially on nutrient rich and clayey soil; late summer to autumn; common in temp.-bore.; DK (LC), FI, NO (LC), SE. – AC 4:84 (as *acerbiformis*), CFP E11, E12, Mar 749 (as *diabolicus*).

C. xanthocephalus P.D. Orton

- Cap 20-70(-100) mm, thin to somewhat fleshy, tawny or light greyish ochre as young; universal veil usually scanty, pale ochre to light yellowish; sp broadly ellipsoid to ellipsoid, $Q_{av} = 1.21-1.37$. Cap hemispherical, then convex, seldom with a low umbo, depressed at centre, faintly sticky-viscid when young, dry, somewhat glossy at margin, with fine darker hygrophanous streaks, later often with a reddish tint at centre and paler margin; gills crowded, pale greyish blue to greyish, later greyish brown; stem 40-120 × 4-15 mm, cylindrical to clavate at base, somewhat glossy, white, sometimes bluish at top, turning greyish yellow; universal veil thin, flocculose or \pm in girdles. Flesh brittle, light greyish blue to white with hygrophanous spots, later yellowing; smell faint, raphanoid. Sp 7.5-8.5 × 5.5-6.5 μm , broadly ellipsoid to subglobose, moderately and coarsely verrucose (fig. 733D). In deciduous forests, especially with *Betula*, but also *Corylus* and *Quercus*, often in young stands, also with *Salix* in alpine heathland; late summer to autumn; common in hemib.-suba., occasional in temp. and arc./alp.; FI (LC), NO (LC), SE (LC). – CFP E13, E14, M&J 102.

C. tabularis (Fr.: Fr.) Fr.

11. Universal veil sparse, whitish-ochraceous; frb slender; in deciduous forests, especially with *Betula*, but also *Fagus*. Cap 20-70 mm, hemispherical, then convex to expanded, seldom with a low umbo, viscid in wet condition, when dry weakly glossy to micaceous, with fine hygrophanous streaks, young usually pale bluish, then greyish ochraceous to yellow from centre; gills crowded, thin, lilaceous-bluish to clay or greyish brown; stem 40-120 × 4-8 mm, cylindrical with a clavate base, fragile, glossy, fibrous, white to pale ochraceous, upwards bluish, turning greyish ochraceous; universal veil thin, indistinct, bluish or white, becoming light yellowish, flocculose or fibrous; flesh white with greyish spots, upwards usually bluish, becoming yellowish by age; smell faint, raphanoid. Sp (7.5-)8-9 × (6-)6.5-7.5 μm , subglobose, strongly verrucose (fig. 733E). Mostly on damp and mesic to nutrient rich soil; late summer to autumn; common in temp.-bore.; SE. – CFP E15, E16, Mar 750 (as *azureus*).

C. albocyaneus Fr.

- Universal veil yellow, usually in girdles and patches; frb fairly robust; in broadleaved forests with *Tilia*, *Fagus*, *Quercus*, etc. Cap 30-60 mm, hemispherical to convex-expanded, with incurved margin, seldom with a low umbo, sometimes depressed at centre, with coarse hygrophanous streaks, viscid in wet condition, glossy when dry, often violaceous-bluish when young, later at margin, becoming ochraceous from centre; gills crowded, violaceous blue, later brown with a reddish tinge; stem 50-120 × 5-12 mm, cylindrical to clavate, white,

violaceous-bluish upwards, becoming a yellow to brownish yellow from the base; universal veil in \pm distinct bands or scattered patches; flesh white, violet bluish upwards, later yellowing; smell faint, raphanoid. Sp 8-9(-9.5) \times 6.5-7.5 mm, subglobose, strongly and densely verrucose (fig. 733F). Autumn; common in temp.-hemib.; DK (LC), NO, SE. – B&K 5:270 (as *viscidulus*), GCI C35 (as *C. azureus*), Rdm 41:23.

***C. lebretonii* Qué!**

Note: *C. azureus* Fr. is possibly the same, but has been interpreted in different ways.

Key D: Subgen. *Telamonia* sects *Pholidei* Melot and *Fuscoperonati* Liimat. & Niskanen in press

TUULA NISKANEN & ILKKA KYTÖVUORI

1. Cap distinctly brown scaly. Cap 30-70 mm, conical to hemispherical, later low convex to almost plane, fulvous to umber brown, not hygrophanous; gills crowded to medium spaced, pale and often bluish when young, later more brown; stem 50-110 \times 5-15 mm, cylindrical, firm, whitish silky-fibrillose and often with bluish tints at the top, lower part brownish; universal veil dark brown, forming distinct scales and girdles on stem; flesh white, darker at base, often with bluish tints at stem top; smell faint. Sp 7-8 \times 5-6 μ m, subglobose to broadly ellipsoid, moderately verrucose (fig. 735A), moderately to fairly strongly dextrinoid. Under *Betula* in forests, often on acid soil; late summer to autumn; common in hemib.-suba., less common in western parts, rare in temp.; DK (NT), FI (LC), NO (LC), SE (LC). – CFP B37, Phil 191d, R&H 510, Sieniop 212, Ves 361, ☉.

***C. pholideus* (Fr.: Fr.) Fr.**

- Cap smooth 2
- 2. Universal veil abundant, distinctly greyish brown to blackish brown; cap with hygrophanous streaks; sp 10.5-12 \times 6.5-7.5 μ m (fig. 735B). Cap 30-80 mm, hemispherical, then low convex with a broad umbo, reddish brown to blackish brown at centre, towards margin paler greyish brown; gills medium spaced, pale greyish brown when young, ochraceous brown with age; stem 30-100 \times 7-15 mm, clavate to slightly bulbous, up to 25 mm broad at the base, white to greyish white, with age brownish towards base, sometimes with a lilac tint at the top; universal veil forming girdles or scales on the stem; mycelium white; flesh brownish white, marbled hygrophanous; smell indistinct or faintly fruity; exsiccates with dark brown cap and greyish brown stem. Sp obovoid-ellipsoid, strongly verrucose. Mainly in mossy forests with *Pinus* and *Picea* on calcareous soil; autumn; very rare in temp.-bore.; FI (DD), NO (VU), SE (VU). – CFP A38.

***C. fuscoperonatus* Kühner**

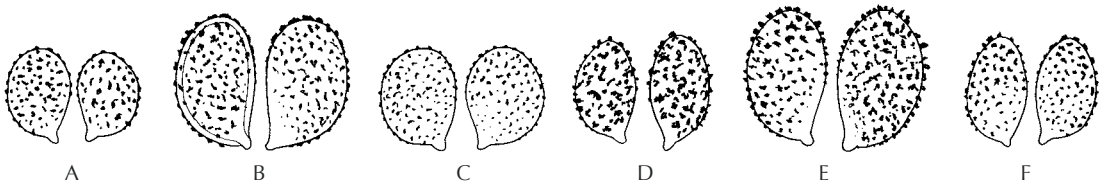
Note: type material has not been studied and the interpretation follows Brandrud et al. 1989.

- Universal veil sparse or fairly abundant, brownish or greyish; cap with or without hygrophanous streaks; sp on av < 10.5 μ m long 3
- 3. In coniferous forests; exsiccates with greyish black to brownish black cap and stem; sp subglobose to broadly ellipsoid see key E p. 734
- In coniferous forests on calcareous soil or in deciduous forests; exsiccates with pale to fairly dark brown cap, stem often paler, not blackish; sp amygdaloid to ellipsoid see key F p. 740

Key E: Subgen. *Telamonia* sects *Brunnei* Melot, *Cinnabarini* Melot, *Colymbadini* Melot, *Disjungendi* Kytöv., Liimat. & Niskanen in press and *Uracei* Melot

TUULA NISKANEN & ILKKA KYTÖVUORI

Cap dark brown, less often yellow brown to red brown or cinnabar red, sometimes with metallic tints, strongly hygrophanous or with hygrophanous streaks; exsiccates usually dark brown to blackish. 19 Nordic species are included, but the real number of the species might be much



Spores: A: *Cortinarius pholideus*, B: *C. fuscoperonatus*, C: *C. gentilis*, D: *C. colymbadinus*, E: *C. crassifolius*, F: *C. uraceus*.

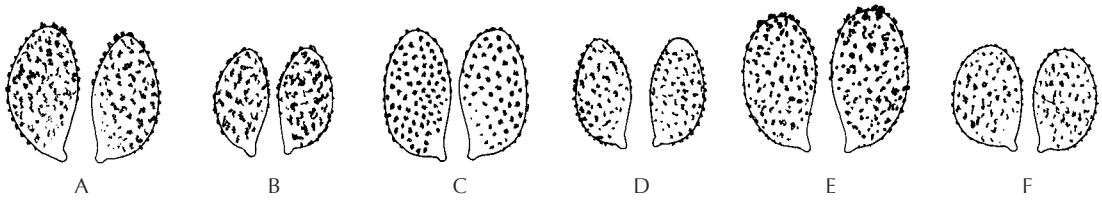
higher; the identity of the following names is unclear and they are not included in the key: *C. irregularis* (Fr.) Fr., *C. isabellinus* (Batsch) Fr. and *C. zinziberatus* (Scop.) Fr.

1. Universal veil yellow, forming distinct girdles on the stem; sp subglobose to somewhat elongate. Cap 30-60 mm, conical to hemispherical, later low convex to plane, often with a small umbo, saturated red brown to yellow brown, soon yellow due to drying; gills broad, distant, yellow brown to red brown; stem 50-110 x 3-8 mm, cylindrical, base sometimes somewhat rooting, yellow to yellow brown, darker towards the base; flesh red brown; smell recalling raw potatoes; exsiccates brownish yellow. Sp 7.5-9 x 6-7 μm , thin-walled, moderately verrucose (fig. 735C), weakly dextrinoid. In dry to mesic coniferous forests; late summer to late autumn; very common in hemib.-bore., occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP B31, M&J 3, Nyl 439, R&H 492, Sieniop 201.

C. gentilis (Fr.: Fr.) Fr

- Universal veil white, brownish, reddish or greenish, if yellow then very sparse; sp subglobose, amygdaloid or ellipsoid 2
2. Universal veil yellowish, reddish or greenish, usually sparse; sp amygdaloid to slightly amygdaloid, rarely ellipsoid 3
 - Universal veil white to brownish, sometimes sparse; sp subglobose, amygdaloid or ellipsoid 10
 3. Cap silky shiny fibrillose, with hygrophanous streaks or spots; sp broadly ovoid-ellipsoid, 8-9 x 5.5-6 μm see *C. valgus* key B 6
 - Cap not silky shiny fibrillose, strongly hygrophanous; sp amygdaloid or obovoid-ellipsoid 4
 4. Universal veil greyish to greenish yellow 5
 - Universal veil yellowish orange to red, sometimes brownish red 8
 5. Cap chocolate brown to olivaceous yellow brown; exsiccates dark yellowish brown with a characteristic, metallic, olivaceous yellow shine, also on drying. Cap 30-60 mm, hemispherical, then low convex to almost plane, with a low umbo, hygrophanous; gills medium spaced, cinnamon brown, with yellow edge; stem 40-100 x 4-10 mm, cylindrical, greyish yellow silky-fibrillose; universal veil greenish yellow, sparse; flesh pale brownish, darker towards the base of the stem; mycelium greenish yellow; smell indistinct or slightly raphanoid; fluorescence yellow. Sp (8-)-8.5-9 x (4.5-)-5-5.5 μm , amygdaloid, very strongly verrucose (fig. 735D), moderately dextrinoid. In mesic *Picea* forests, mostly on rich soil; summer to autumn, often precocious; occasional in hemib.- bore.; FI (LC), NO (NT), SE (LC). – CFP D55.
- C. colymbadinus* Fr.
- Note: exsiccates sometimes difficult to distinguish from *C. aurantiomarginatus*, but the latter has orange red base of the stem and does not fluoresce in UV-light.
- Cap dark brown, almost blackish brown; exsiccates blackish brown, sometimes with a purplish tint 6

6. Sp 11-12 x 7-7.5 μm . Cap 35-80 mm, hemispherical, then low convex to almost plane with an umbo, often very narrowly pellucid-striate, strongly hygrophanous; gills medium spaced to distant, chocolate brown; stem 60-130 x 6-13 mm, clavate, greyish white fibrillose, later and after handling brown; universal veil very sparse, greyish, sometimes with a greenish tint; flesh dark brown; mycelium white; smell indistinct or slightly raphanoid. Sp obovoid-ellipsoid to slightly amygdaloid, very strongly verrucose, especially at the apex (fig. 735E), strongly dextrinoid. In herb-rich, mesic to damp, forests with *Picea* on calcareous soil; late summer to autumn; rare in hemib.-bore.; FI, SE.
C. crassifolius (Velen.) Bon s. Lindström, Niskanen & Kytövuori
 - Sp < 10.5 μm long 7
7. In mesic *Picea* forests; sp (8-)8.5-9.5 x 5-5.5(-6) μm (fig. 735F). Cap 30-65 mm, conical to hemispherical, then low convex with an umbo, often narrowly to 1/3 pellucid-striate, strongly hygrophanous; gills medium spaced, chocolate brown; stem 60-100 x 4-9 mm, cylindrical, rarely clavate, greyish white fibrillose, often with a greenish tint, especially at the top; universal veil greyish, often with a greenish tint; flesh dark brown; mycelium white; smell indistinct. Sp amygdaloid, some of them thick-walled, moderately to fairly strongly verrucose, especially at the apex, strongly dextrinoid, dark. Mostly on rich to calcareous soil; late summer to autumn; occasional in hemib.- bore.; FI (LC), NO (NT), SE (LC).
C. uraceus Fr. (*C. viridipes* M.M. Moser)
 - In mixed forests of *Abies*, *Picea*, *Fagus*, *Quercus* and *Carpinus*; sp 9-10(-10.5) x 5.5-6.5 μm (fig. 737A). Cap 35-65 mm, conical to hemispherical, then low convex with an umbo, strongly hygrophanous; gills medium spaced, dark brown; stem 40-80 x 4-11 mm, cylindrical or slightly clavate, yellowish grey fibrillose with a greenish tint; universal veil greyish yellow, very sparse; flesh dark brown with yellowish tint; mycelium white; smell indistinct. Sp amygdaloid, some of them thick-walled, fairly strongly to strongly and acutely verrucose, especially at apex, strongly dextrinoid, dark. On calcareous soil; DE. – CFP C40 (as *uraceus*).
C. rigidipes M.M. Moser
 Note: difficult to distinguish from *C. uraceus*, and its variability needs further studies.
8. Whole frb cinnabar red to brownish red. Cap 30-60 mm, hemispherical, then low convex to almost plane, hygrophanous; gills medium spaced; stem 35-70 x 4-9 mm, cylindrical or slightly clavate; universal veil saturated red, sparse; flesh brownish red; mycelium bright red; smell slightly raphanoid; exsiccates cinnabar red to somewhat brownish. Sp 7.5-8.5 x 4.8-5.3 μm , amygdaloid, strongly verrucose, with low warts (fig. 737B), strongly dextrinoid, somewhat dark. In deciduous forests with *Fagus*, *Tilia*, *Corylus* or *Quercus*, on mull soil; late summer to autumn; occasional in temp., rare in hemib.; DK (VU), FI (CR), NO (VU), SE (NT). – CFP C14, GCI A23, Nyl 478, R&H 487, ☉.
C. cinnabarinus Fr.
 - At least cap brown 9
9. In deciduous forests; stem clavate, 7-14 mm broad, at base distinctly cinnabar red from universal veil. Cap 35-70 mm, hemispherical, soon low convex to almost plane, sometimes with an umbo, saturated red brown, strongly hygrophanous; gills crowded to medium spaced, bluish to greyish brown, later chocolate brown; stem 30-80 mm long, greyish white fibrillose, often with a bluish tint at the top when young; flesh greyish brown, sometimes with a bluish tint at stem top; mycelium bright red; smell indistinct; exsiccates with greyish brown to blackish brown cap, base of the stem cinnabar red. Sp (8.5-)9-10 x 5.5-6 μm , slightly amygdaloid, strongly verrucose (fig. 737C), strongly dextrinoid. With *Quercus*, *Fagus* and *Corylus*, on calcareous soil; late summer to autumn; very rare in temp.-hemib.; DK (CR), SE (VU). – CFP A37, GCI B35, Nyl 478, Svp 27:49, Ves 351.
C. bulliardii (Pers.: Fr.) Fr.
 - In herb-rich, mesic *Picea* forests; stem \pm cylindrical, 4-8 mm broad, base slightly orange red or not. Cap 25-60 mm, conical to hemispherical, then low convex to almost plane with an



Spores: A: *Cortinarius rigidipes*, B: *C. cinnabarinus*, C: *C. bulliardii*, D: *C. aurantiomarginatus*, E: *C. disjungendus*, F: *C. clarobrunneus*.

umbo, narrowly translucently striate, margin orange yellow from universal veil, vividly red brown, later darker, strongly hygrophanous; gills medium spaced, dark cinnamon brown, with yellowish edge; stem 40-100 mm long, greyish yellow fibrillose, often with a bluish tint at the top; universal veil golden or orange yellow to brown red, sparse; flesh brown, sometimes with a bluish tint at stem top, with age blackening at the base; mycelium orange; smell like cedar wood; exsiccates dark brown to blackish brown, mycelium often yellowish to red. Sp 7.5-8.5(-9) x 4.8-5.3 μm , amygdaloid, fairly strongly and often sharply verrucose (fig. 737D), strongly dextrinoid. Often on calcareous soil; late summer to autumn; occasional in hemib.- bore.; FI (LC), NO, SE (LC). – CFP C48.

C. aurantiomarginatus M.M. Moser s. Brandrud et al. 1994

10. Cap brown and silvery fibrillose, especially near the margin; stem cylindrical and firm; sp > 9.5 μm long. Cap 40-80 mm, hemispherical, then low convex to almost plane with a low and broad umbo, margin often long incurved, hygrophanous; gills medium spaced, pale greyish brown, later brown; stem 60-140 x 8-15 mm, whitish fibrillose, becoming brownish with age, especially at the base; universal veil white, fairly sparse, forming girdles on the stem; flesh pale greyish brown to brown, often darker at base of the stem, darkening with age; smell indistinct; exsiccates with dark greyish brown to blackish cap and somewhat paler stem. Sp 9.5-10.5 x 6-6.5(-7) μm , obovoid-ellipsoid, moderately verrucose (fig. 737E), weakly dextrinoid, somewhat dark. In deciduous and mixed forests with *Betula*; late summer to autumn; occasional, but locally common in hemib.-bore.; FI (LC), NO (LC), SE. – CFP D33.

C. disjungendus P. Karst.

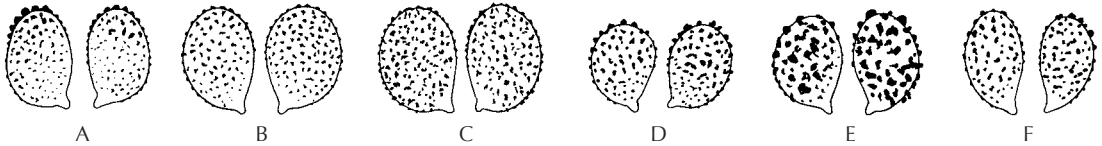
- Cap dark chestnut brown to amber or brown, rarely greyish brown; stem clavate or cylindrical and not conspicuously firm; sp < 9.5 μm long 11
- 11. Most sp > 5.5 μm wide 12
 - Most sp < 5.5 μm wide 16
- 12. Stem < 4 mm broad, cylindrical see *C. cicindela* 19
 - Stem > 4 mm broad, usually at least slightly clavate 13
- 13. Most sp < 6 μm wide 14
 - Most sp > 6 μm wide 15
- 14. Mainly with *Pinus*; cap pale greyish brown to brown; stem 8-15 mm broad; sp 7-8.5 x 5.5-6 μm (fig. 737F). Cap 35-80 mm, bell-shaped to conical, later low convex with a rounded umbo, often narrowly pellucid-striate, strongly hygrophanous; gills medium spaced, greyish brown, later brown; stem 60-130 mm long, cylindrical or clavate, greyish white fibrillose, later pale brown; universal veil white to brownish white, often sparse, not forming a girdle on the stem; flesh red brown, later darker; mycelium whitish; smell indistinct or slightly raphanoid, sometimes pleasant and aniseed-like; exsiccates brownish black. Sp subglobose to broadly ellipsoid, moderately verrucose, more strongly at apex, weakly dextrinoid to dextrinoid, somewhat dark; gill trama hyphae not or very finely zebra-striate incrustated,

seldom spot-like incrustated. In dry forests, often in sandy *Pinus* heathland, but also in mesic coniferous forests; autumn; common in hemib.-bore., less common in western parts; FI (LC), NO (LC), SE. – CFP B08.

C. clarobrunneus (H. Lindstr. & Melot) Niskanen, Kytöv. & Liimat. in press

Note: compare with *C. neofurvolaeus* key F 30, which has longer, ellipsoid sp and dark brown exsiccates.

- With *Picea*; cap greyish brown to reddish brown, sometimes with bluish tints; stem 4-8 mm broad; sp 7.5-9 × 5-6 μm (fig. 739A). Cap 30-60 mm, conical to hemispherical, later low convex with a small umbo, very faintly innately fibrillose, up to 1/2 pellucid-striate, strongly hygrophanous; gills medium spaced to distant, brown to dark brown, sometimes bluish when young; stem 60-100 mm long, cylindrical to clavate, greyish white fibrillose, soon pale brown; universal veil white, often very sparse, not forming a girdle on the stem; mycelium whitish; flesh dark reddish brown, darker towards the base of stem, sometimes bluish at stem top; smell indistinct or slightly raphanoid, sometimes rubber-like; exsiccates brownish black. Sp ellipsoid to weakly ovoid-ellipsoid, finely to moderately verrucose, strongly at the apex, dextrinoid to fairly strongly dextrinoid, somewhat dark; gill trama hyphae not or finely zebra-striate incrustated. In mesic forests; autumn; occasional in hemib.-bore.; FI, NO, SE. – CFP B35 (only part of the frbs), MycR.
- C. caesiobrunneus* Kytöv., Niskanen & Liimat. in press
- 15. With *Picea*; stem 8-15 mm broad; universal veil usually forming a distinct girdle on the stem; sp 8-9.5 × 6-7 μm (fig. 739B). Cap 35-80 mm, bell-shaped to conical, later low convex with a rounded or sometimes conical umbo, sometimes narrowly pellucid-striate, dark red brown to umber, sometimes with bluish tints, strongly hygrophanous; gills medium spaced, dark brown; stem 60-130 × 8-15 mm, cylindrical to clavate, greyish white fibrillose, later brown; universal veil white to brownish white; flesh dark red brown, sometimes with a bluish tint; with age blackish brown; mycelium white or bluish; smell indistinct or slightly raphanoid; exsiccates blackish. Sp broadly ellipsoid to subglobose, moderately verrucose, more strongly at apex, dextrinoid to fairly strongly dextrinoid; gill trama hyphae with dark spots, \pm zebra-striate incrustated, best seen in exsiccates. In mesic *Picea* forests; late summer to autumn; very common in hemib.-bore., occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP B07, GCI B31, R&H 522, Sieniop 192, Ves 356.
- C. brunneus* (Pers.: Fr.) Fr.
- Usually with *Pinus*; stem 4-11 mm broad; universal veil often sparse, rarely forming a distinct girdle on the stem; sp 8.5-10 × 6-6.5 μm (fig. 739C). Cap 25-70 mm, conical to hemispherical, later low convex to almost plane, with a small, but distinct umbo, up to 1/2 pellucid-striate, dark yellow brown to dark red brown, strongly hygrophanous; gills medium spaced, pale greyish brown, soon dark brown; stem 60-140 × 4-11 mm, cylindrical to slightly clavate, greyish white fibrillose, later brownish; universal veil white to brownish white; mycelium white, thick, attaching mosses at the base of the stem; flesh dark red brown, with age blackish brown; smell indistinct or slightly raphanoid; exsiccates blackish. Sp broadly ellipsoid, moderately verrucose, dextrinoid to fairly strongly dextrinoid; gill trama hyphae often not or very finely incrustated. In dry to damp coniferous forests, with *Pinus*, sometimes also with *Picea*; autumn; common in hemib.-bore., occasional in western parts and in temp.; FI (LC), NO, SE (LC). – CFP B35 (includes some frb of *C. caesiobrunneus*).
- C. glandicolor* (Fr.) Fr.
- 16. Cap strongly hygrophanous; stem 2-7 mm broad, cylindrical to tapering downwards or clavate 17
- Cap faintly hygrophanous or with hygrophanous streaks; stem 6-15 mm broad, clavate to cylindrical 20
- 17. Sp obovoid-subglobose, 6-7.5 × 5-5.7 μm (fig. 739D). Cap 20-55 mm, conical to hemispherical, later low convex with a small but distinct umbo, up to 1/3 pellucid-striate, dark red



Spores: A: *Cortinarius caesiobrunneus*, B: *C. brunneus*, C: *C. glandicolor*, D: *C. coleoptera*, E: *C. cincinnata*, F: *C. carabus*.

brown; gills medium spaced, dark red brown; stem 40-90 x 4-7 mm, tapering downwards, greyish white fibrillose, later reddish brown; universal veil white, very sparse; flesh dark red brown; mycelium white, sparse; smell indistinct; exsiccates with greyish black cap and greyish stem. Sp fairly strongly verrucose, weakly dextrinoid, dark. In dry *Pinus* heath forests on sandy soil; autumn; common in hemib.-bore.; FI (LC), NO (NE), SE. – Soop 04:89.

C. coleoptera H. Lindstr. & Soop

- Sp ovoid, ellipsoid to weakly dacryoid, > 7.5 μm long 18
 - 18. Stem 4-8 mm broad, cylindrical to clavate; gill trama hyphae not or finely zebra-striate incrustated see *C. caesiobrunneus* 14
 - Stem 2-4 mm broad, cylindrical; gill trama hyphae very strongly zebra- and spot-like incrustated 19
 - 19. Sp 7.5-9 x 5-6 μm , weakly ovoid (fig. 739E). Cap 10-30 mm, conical to hemispherical, very soon almost plane with an acute umbo, very faintly innately fibrillose, up to 1/2 pellucid-striate, dark brown; gills medium spaced, dark brown; stem 50-100 mm long, whitish fibrillose, soon brown to dark reddish brown; universal veil whitish, very sparse; flesh dark brown; mycelium white, sparse; smell indistinct; exsiccates with greyish black cap and stem. Sp very strongly and coarsely verrucose, weakly dextrinoid, dark; gill trama hyphae strongly zebra- and spot-like incrustated. In mesic to damp *Picea* forests, often in *Sphagnum*, but also in dry *Pinus* heath forests, often scanty; late summer to autumn; occasional in hemib.-bore.; FI, NO. – MycR.
- C. cincinnata* Kytöv., Niskanen & Liimat. in press
- Sp 7.5-9 x 4.5-5 μm , weakly dacryoid (fig. 739F). Cap 5-25 mm, conical to broadly conical, sometimes hemispherical, later low convex with a small umbo, dark brown to almost blackish brown; gills medium spaced, dark brown; stem 20-50 x 2-4 mm, cylindrical, greyish white fibrillose, later brown to dark brown; universal veil whitish, very sparse; flesh dark brown; mycelium white, sparse; smell indistinct; exsiccates with greyish black cap and stem. Sp moderately verrucose, strongly at apex, moderately dextrinoid, dark; gill trama hyphae strongly incrustated. In dry *Pinus* heath forests on sandy soil, but also in mesic coniferous forests with *Pinus*, often among low mosses or in paths; autumn; occasional in hemib., common in bore.; FI, SE. – MycR.
- C. carabus* Kytöv., Niskanen & Liimat. in press

- 20. Sp ellipsoid to obovoid-ellipsoid 21
- Sp subglobose 22
- 21. Cap greyish brown to brown; flesh greyish brown to brown, often darkening towards base; sp (7.5-)8-9 x 5-5.5 μm see *C. suberi* key H 1
- Cap brown to fairly dark brown; flesh dark brown; sp 6.5-7.5 x 4.5-5 μm (fig. 741A). Cap 45-80 mm, with a long down-curved margin, innately fibrillose, brown, faintly hygrophanous; gills medium spaced, greyish brown, sometimes with a bluish tint, soon dark chocolate brown; stem 60-110 x 8-13 mm, clavate, up to 25 mm broad at base, fairly firm, greyish white fibrillose, later brown; universal veil white, forming a sock-like sheath or thick girdles on the stem; flesh often with a bluish tint, strongest at the stem top; marbled hygrophanous;

mycelium white or sometimes bluish; smell indistinct or slightly raphanoid; exsiccates brownish black. Sp moderately and coarsely verrucose, weakly dextrinoid, somewhat dark. In mesic to dryish coniferous forests, with *Picea* or *Pinus*; rare in hemib.-bore.; FI, NO, SE. – AC 1:18.

C. pseudorubricosus Reumaux

22. Stem clavate; universal veil white, distinct, forming a girdle on the stem; sp 6-7 x 5-5.5(-6) μm , obovoid-subglobose, echinate-verrucose (fig. 741B). Cap 30-70 mm, hemispherical, later low convex with a low and broad umbo, innately fibrillose, yellow brown to greyish brown, with hygrophanous streaks; gills medium spaced, greyish brown, soon dark chocolate brown; stem 60-110 x 8-13 mm, up to 30 mm broad at base, greyish white fibrillose, later brown; flesh brown, with age and at stem base dark brown to blackish brown; mycelium white, smell indistinct; exsiccates blackish. Sp not very thin-walled, dark, weakly to moderately dextrinoid. In rich, mesic *Picea* forests on calcareous soil; late summer to autumn; very rare in bore.; FI. – MycR.

C. albogaudis Kytöv., Niskanen & Liimat. in press

Note: looks like *C. pinigaudis*, but with a white universal veil.

- Stem cylindrical; universal veil brownish, indistinct; sp 5.5-7 x 4.5-5.5 μm , ovoid to ovoid-subglobose, finely verrucose (fig. 741C). Cap 30-70 mm, conical to hemispherical, later low convex with a small umbo, coarsely innately fibrillose, greyish brown to dark brown, with hygrophanous streaks; gills medium spaced, pale greyish brown, later brown; stem 40-80 x 6-11 mm, greyish white fibrillose, later brownish; flesh brown, often with a bluish tint, especially at stem top; marbled hygrophanous; mycelium white or bluish; smell indistinct; exsiccates blackish. Sp very thin-walled, without iodine reactions. In mesic to damp *Picea* forests; late summer to autumn; very rare in bore.; FI (NT), NO (NE), SE (VU). – AC 1:8, CFP B28 (2nd and 3rd frb from right, cap on the lower right of the three caps, and half frb on the left are *C. paragaudis*).

C. ectypus J. Favre

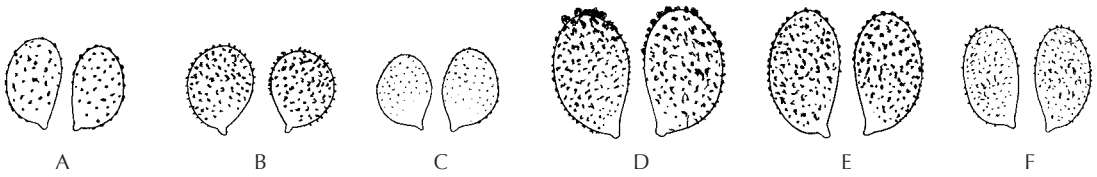
Key F: Subgen. *Telamonia* sects *Bovini* Liimat., Niskanen & Kytöv. in press, *Illumini* Liimat., Niskanen & Kytöv. in press, *Saturnini* Möenne-Locc. & Reumaux, *Sciophylli* (Möenne-Locc. & Reumaux) Liimat. & Niskanen in press, *Subbalaustini* Liimat., Niskanen & Kytöv. in press. and *Sordescentes* Melot

TUULA NISKANEN & ILKKA KYTÖVUORI

Cap \pm brown, mostly dark; universal veil white, greyish or brownish white; smell indistinct, raphanoid or pleasant; exsiccates often with dark brown cap. 19 species in the key, but the number of Nordic species is much higher, especially the species in temp.-hemib. deciduous forests are very poorly known.

Suppl. lit.: Bidaud et al. 2002.

- | | | |
|----|---|---|
| 1. | Frb with bluish tints | 2 |
| - | Frb without bluish tints | 5 |
| 2. | Sp > 9.5 μm long | 3 |
| - | Sp < 9.5 μm long | 4 |
| 3. | With <i>Quercus</i> , <i>Tilia</i> , <i>Fagus</i> and <i>Corylus</i> ; cap dark brown with a violet tint, without veil patches; universal veil white, very sparse. Cap 35-65 mm, conical to hemispherical, later low convex with an umbo, strongly hygrophanous; gills distant, bluish or greyish brown when young, later chocolate to purplish brown; stem 35-70 x 5-11 mm, cylindrical to slightly clavate, whitish silky-fibrillose, later brownish; flesh greyish white, distinctly bluish at stem top; smell indistinct; exsiccates dark greyish brown. Sp 10-11(-11.5) x 6-7 μm , obovoid-ellipsoid, moderately verrucose, strongly at the apex (fig. 741D), moderately dextrinoid. On | |



Spores: A: *Cortinarius pseudorubricosus*, B: *C. albogaudis*, C: *C. ectypus*, D: *C. serratissimus*, E: *C. lucorum*, F: *C. saturninus*.

mull soil, often in groups; late summer to autumn; very rare in temp.-hemib., occasional in western NO; DK (EN), NO (NT), SE. – GCI D183, M&J 38.

C. serratissimus M.M. Moser (*C. sciophyllus* Fr. s. auct. Nord.)

- With *Populus*; cap purplish brown, soon very pale due to the drying, often with white veil patches near the margin; universal veil white to somewhat greyish, forming a sheath in young frb, later in broad zones on the stem. Cap 50-110 mm, hemispherical, then convex to low convex, hygrophanous; gills distant and broad, greyish violet, later purple brown; stem 50-100 x 8-18 mm, cylindrical or slightly clavate, fibrillose, whitish grey, pale brownish yellow with age; flesh pale grey to pale violaceous, more brownish towards the base; exsiccates with pale greyish brown to brown cap, brown to dark brown gills and greyish stem. Sp 9.5-11 x 5.5-6.5 μm , obovoid-ellipsoid, moderately verrucose, strongest at apex (fig. 741E), moderately dextrinoid. In mixed forests, years and parks, on mull soil; late summer to autumn; occasional in temp.-southern bore., but locally abundant, rare in middle-northern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP C10, Sieniop 206, Ves 358.

C. lucorum (Fr.) J.E. Lange (non s. Lange)

4. In temp.-bore., rare in the northern parts, usually with *Salix caprea* or in sand dunes with *S. repens*, also on clay or mull soil. Cap 35-80 mm, hemispherical, later low convex to almost plane with a low and broad umbo, usually with white universal veil patches near the margin, chestnut brown, sometimes with a violet tint, whitish, silvery-micaceous fibrillose when young, distinctly hygrophanous; gills medium spaced, pale greyish brown, sometimes with a bluish tint, later chocolate brown; stem 50-100 x 6-13 mm, cylindrical or slightly clavate, whitish silky-fibrillose, often with a bluish tint at the top, later pale ochre brown; universal veil white, forming a thin sheath or zones on stem; flesh pale brownish, often with a bluish tint at stem top; smell indistinct; exsiccates with sordid to blackish brown cap and grey stem. Sp 8-9(-9.5) x 4.5-5 μm , narrowly ellipsoid, moderately, sharply verrucose (fig. 741F), weakly dextrinoid. Often in groups; summer to autumn; common, but locally very common in temp., occasional in hemib.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP C09, Sieniop 215, ☉.

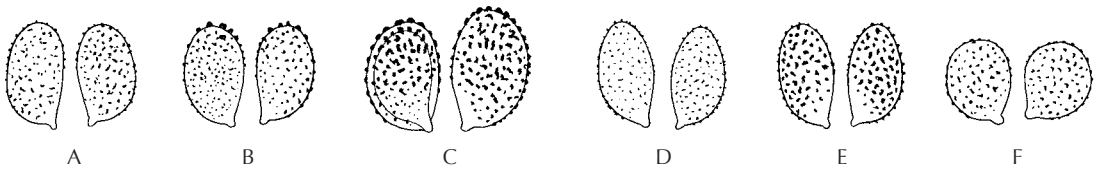
C. saturninus (Fr.: Fr.) Fr.

- In suba.-arc./alp. with dwarf *Salix* on rich soil. Cap 25-45 mm, hemispherical, later low convex to almost plane, sometimes with a low and broad umbo, often with white universal veil patches near the margin, chestnut brown, sometimes with a violet tint, distinctly hygrophanous; gills medium spaced, bluish when young, later chocolate brown; stem 25-50 x 5-10 mm, clavate, whitish silky-fibrillose, often with a bluish tint at the top, later pale ochre brown; universal veil white, often forming a sheath over the lower half of the stem; flesh greyish white, bluish at stem top; smell indistinct; exsiccates with sordid to blackish brown cap and greyish white stem. Sp 8-9 x (4.5-)5-5.5 μm , ellipsoid, faintly to moderately verrucose (fig. 743A), weakly dextrinoid. Late summer to autumn; common in suba.-arc./alp.; FI (DD), IS, NO (LC), SE (LC). – CFP A04, M&J 69.

C. subtorvus Lamoure

Note: type material has not been studied and the interpretation follows Brandrud et al. 1989.

5. With deciduous trees 6
 - With conifers 14
6. Usually with *Fagus*, *Quercus*, *Carpinus*, *Tilia* or *Corylus*, in temp.-hemib. 7
 - Usually with *Betula* or *Salix*, rarely *Corylus*, in temp.-bore. 9
7. Smell usually distinct, recalling parsley; cap distinctly hygrophanous, smooth. Cap 40-65 mm, hemispherical, then low convex, brown, hygrophanous; gills medium spaced, brown; stem 100 x 8-10 mm, clavate to bulbous, first whitish fibrillose, later brownish; universal veil white, sparse; flesh pale brownish to brownish; exsiccates fairly dark brown. Sp 8-9(-9.5) x 4.8-5.3 μm , narrowly obovoid to dacryoid, weakly to moderately verrucose, more strongly at apex (fig. 743B), faintly to moderately dextrinoid. In *Fagus* forests on mull or clayey soil; autumn; occasional in temp., rare in hemib., very poorly known; DK (LC), SE. – CFP B60 (only part of the frb, as *rheubarbarinus*), Nyl 452 (as *rheubarbarinus*).
C. phaeosmus Rob. Henry
 - Smell indistinct or pleasant, recalling flowers; cap weakly hygrophanous, innately fibrillose and/or silky shiny 8
8. Flesh whitish brownish to pale greyish brown; sp broadly ellipsoid to slightly ovoid, strongly verrucose (fig. 743C). Cap 50-100(-110) mm, hemispherical, then low convex, creamy greyish to pale reddish grey brown, innately fibrillose, weakly hygrophanous; gills crowded to medium spaced, pale brown, then fairly dark red brown; stem 50-90 x 9-20 mm, clavate to bulbous, sometimes with a pointed base, greyish white fibrillose, later more brownish; universal veil white, very sparse on the stem, more abundant on the cap, especially when young; flesh brownish white to pale greyish brown; smell indistinct or pleasant, recalling flowers; exsiccates with pale greyish brown cap and stem and dark gills. Sp (8.5-)9-10 x 6-6.5 μm , thick-walled, strongly dextrinoid; gill trama hyphae \pm smooth. With *Quercus*, *Corylus*, *Tilia*, *Fagus* and possibly *Carpinus* on calcareous mull soil, often in groups; late summer to autumn; rare in temp.-hemib., but poorly known; DK (DD), NO (VU), SE (LC). – CFP A23 (three big frb from the left).
C. aprinus Melot s. Brandrud et al. 1989
 Note: type material has not been studied, and the name has been used collectively in the Nordic countries.
 - Flesh whitish; sp slightly amygdaloid, moderately and densely verrucose (fig. 697C) *see C. cidus* key L 8
9. Cap 15-40 mm; stem 35-50 x 3-5 mm. Cap hemispherical, then low convex with an obtuse umbo, sometimes narrowly pellucid-striate, honey brown to red brown, hygrophanous; gills medium spaced, pale brownish, later brown, with a whitish edge; stem cylindrical to slightly clavate, whitish fibrillose, later more brownish; universal veil white, sparse; flesh pale brownish; smell faintly raphanoid; exsiccates with dark brown cap, greyish to brownish stem and brown to fairly dark brown gills. Sp 8-9 x 4.5-5 μm , narrowly amygdaloid, fairly finely verrucose (fig. 743D), weakly to moderately dextrinoid; gill trama hyphae very finely incrustated. In mesic, mixed forests with *Betula*; late summer to autumn; rare in hemib.-bore., but possibly overlooked; FI, SE. – MycP 2008, Soop 04:94 (as *erugatus*).
C. leiocastaneus Niskanen, Liimat. & Soop in press (*C. erugatus* (Weinm.) Fr. s. Soop)
 - Cap 35-80 mm; stem 40-100 x (5-)6-13 mm 10
10. Cap chestnut to purplish brown; mostly with *Salix*, but also with *Corylus* *see C. saturninus* 4
 - Cap warm yellow brown, vivid red brown to brown; with *Betula* 11
11. Sp subglobose *see C. balaustinus* key I 1
 - Sp ellipsoid to somewhat dacryoid 12
12. Cap vivid red brown; sp 8-9 x 4.5-5.5 μm (fig. 743E). Cap 30-80 mm, hemispherical, then low convex, sometimes narrowly pellucid-striate, hygrophanous; gills medium spaced, pale yellowish brown, later more brown; stem 30-90 x 6-13 mm, clavate to bulbous, sometimes cy-



Spores: A: *Cortinarius subtorvus*, B: *C. phaeosmus*, C: *C. aprinus*, D: *C. leiocastaneus*, E: *C. subbalaustinus*, F: *C. illuminus*.

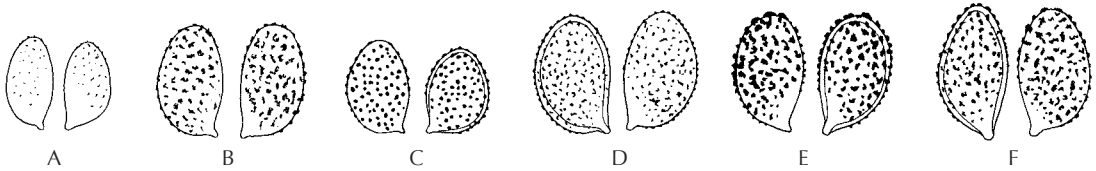
lindrical, whitish fibrillose when young, later red brown; universal veil white, fairly sparse, forming a sheath or incomplete girdles on stem; flesh pale red brown, somewhat darker towards base; smell indistinct; exsiccates with red-brown cap and pale greyish to brownish stem. Sp somewhat dacryoid to narrowly ellipsoid, strongly verrucose, moderately dextrinoid; gill trama hyphae smooth to finely incrustated. In mesic to dry, deciduous and mixed forests with *Betula*, often in lawns and yards or at roadsides; summer to autumn; occasional, but locally common in temp., rare but locally occasional in bore., rare in suba. in IS; DK (LC), FI (LC), IS, NO (LC), SE (LC). – CFP B03.

C. subbalaustinus Rob. Henry

Note: type material has not been studied.

- Cap warm yellow brown to brown; sp > 5.5 μm wide 13
- 13. Cap brown and silvery fibrillose; sp 9.5-10.5 x 6-6.5(-7) μm see *C. disjungendus* key E 10
- Cap warm yellow brown to orange brown, innately fibrillose; sp 8.5-9.5 x 5.5-6 μm see *C. bivelus* key I 4
- 14. Sp subglobose 15
- Sp amygdaloid, ellipsoid or fusiform 16
- 15. Cap vivid red brown to dark red brown; with *Picea*; sp 6-7(-7.5) x (5-)5.5-6 μm (fig. 743F). Cap 35-80 mm, hemispherical, later low convex to almost plane with an obtuse, often low umbo, hygrophanous, narrowly pellucid-striate; gills medium spaced, pale greyish to ochre brown, later fulvous brown; stem 60-140 x 6-15 mm, cylindrical or slightly clavate, whitish silky-fibrillose when young, later yellowish brown; universal veil white, pinkish or yellowish, fairly sparse, forming incomplete girdles on the stem; flesh pale brown to brown; smell faintly raphanoid; exsiccates with dark brown cap and pale greyish brown stem. Sp moderately verrucose, fairly weakly to moderately dextrinoid; gill trama usually distinctly zebra-striate incrustated. In mesic *Picea* forests; summer to autumn; common in hemib.-bore; FI (LC), NO (LC), SE. – CFP B15.
- C. illuminus*** Fr. s. lato
- Cap pale brown to brown; with *Pinus*; sp 7-8 x 5.5-6 μm see *C. clarobrunneus* key E 14
- 16. Sp 6.5-8 x 4-4.5 μm (fig. 745A). Cap 40-90 mm, hemispherical, then low convex to almost plane, with an obtuse umbo, dark, honey brown to greyish yellow brown, often with an olivaceous tinge, hygrophanous; gills medium spaced, olivaceous yellow brown, later dark brown; stem 60-140 x 8-17 mm, cylindrical, whitish fibrillose, later brownish; universal veil white, sparse; flesh yellowish brown; smell faint of cedar-wood; exsiccates with very dark, greyish brown to brown cap, very dark olivaceous gills and greyish stem. Sp fusiform, very finely verrucose, more strongly at apex, weakly dextrinoid; gill trama hyphae smooth to finely incrustated. In dry to mesic coniferous forests with *Picea*, also with planted *Picea sitchensis*; late summer to autumn; occasional in hemib.-bore., rarer in the western parts, rare in temp.; FI (LC), NO (NE), SE (LC). – CFP B12.
- C. melleopallens*** (Fr.) Britzelm.
- Sp > 4.5 μm broad 17

17. Smell aniseed-like or strong of *Viola odorata* 18
 - Smell indistinct or slightly raphanoid 20
18. Smell strong, sweetish of *Viola odorata*, at least when mature and on drying; sp 9-10 × 5-6 μm, narrowly ellipsoid (fig. 745B). Cap 35-75 mm, hemispherical, then low convex to almost plane, with an obtuse umbo, thin, narrowly pellucid-striate, with long incurved margin, fairly dark greyish brown to yellowish brown or reddish brown, hygrophanous; gills medium spaced, pale greyish brown, later fairly dark yellow brown; stem 50-110 × 4-10 mm, cylindrical, fairly stiff, whitish fibrillose, later brownish; universal veil white, forming incomplete girdles on the stem; flesh greyish brown; exsiccates with dark brown to sordid brown cap and greyish to brownish grey stem. Sp moderately verrucose, moderately to strongly dextrinoid; gill trama hyphae ± smooth. In mesic coniferous forests with *Picea*, on rich to calcareous soil; late summer to autumn; very rare, but locally rare in bore., with northern distribution; FI, NO (NE), SE (LC). – CFP A51.
C. ionosmus M.M. Moser, Nespiak & Schwöbel
- Smell aniseed-like; sp < 9 μm long, subglobose, ovoid or broadly ellipsoid 19
19. Sp 7.5-9 × 5-6 μm, ovoid (fig. 745C); with *Picea*. Cap 30-70 mm, hemispherical, soon low convex with a low umbo and narrowly down-curved margin, often narrowly pellucid-striate, saturated dull yellowish brown to somewhat reddish brown, sometimes with dark streaks or spots, hygrophanous; gills medium spaced, pale yellow brown, with age saturated brown; stem 50-120 × 4-10 mm, quite slender in the upper part, base clavate or bulbous, softening with age, top greyish white silky-fibrillose, downwards brown; universal veil white, forming a very thin, sock-like sheath, disappearing easily when bruised or with age, sometimes forming obscure zones; flesh reddish to yellow brown, darker towards the base; smell sometimes raphanoid; exsiccates dark, sordid brown. Sp weakly to clearly thick-walled, moderately to strongly dextrinoid, moderately verrucose; gill trama hyphae fairly finely scabrous. In mesic coniferous forests with *Picea*, often on calcareous soil, but also in ordinary *Vaccinium myrtillus* *Picea* forests; late summer to autumn; occasional in hemib.-bore., more common towards the north; FI (LC), NO, SE. – Kar 45:39.
C. anisatus H. Lindstr., Kytöv. & Niskanen
- Sp 7-8 × 5.5-6 μm subglose to broadly ellipsoid; with *Pinus* see *C. clarobrunneus* key G 14
20. Most sp > 9.5 μm long 21
 - Most sp < 9.5 μm long 24
21. Sp obovoid-ellipsoid, 9.5-11.5 × 6-7 μm; stem often firm, cylindrical to slightly clavate; exsiccates blackish see *C. disjungendus* key E 10
 - Sp ovoid, amygdaloid or ellipsoid, 9-11 × 5.5-6.5 μm; stem not conspicuously firm, clavate or cylindrical; exsiccates not blackish, but can be fairly dark 22
22. Cap innately fibrillose; exsiccates with pale brown to brown cap. Cap 50-100 mm, hemispherical, then low convex, sometimes with an umbo, greyish yellow brown to fairly dark brown, sometimes blackening in large spots, hygrophanous and with hygrophanous streaks; gills medium spaced, fairly broad, pale brown, soon chocolate brown; stem 50-100 × 9-15 mm, slightly clavate to clavate, greyish white fibrillose, soon brownish; universal veil greyish white, often forming a girdle and a thin sheath or incomplete girdles on stem; flesh brownish, darker towards the base; smell indistinct or weakly raphanoid; exsiccates with pale greyish or brownish stem. Sp 9-11 × 6-7 μm, ovoid to broadly amygdaloid, thick-walled, finely to moderately and often evenly verrucose (fig. 745D), moderately dextrinoid; gill trama hyphae ± smooth. In mesic coniferous forests with *Picea*, sometimes with *Pinus*, on calcareous soil; late summer to autumn; rare in hemib.-bore.; FI, SE.
C. fuscobovinus Kytöv, Niskanen & Liimat. in press
- Cap not innately fibrillose; cap in exsiccates dark, at least at centre 23



Spores: A: *Cortinarius melleopallens*, B: *C. ionosmus*, C: *C. anisatus*, D: *C. fuscobovinus*, E: *C. bovinus*, F: *C. oulankaensis*.

23. Sp (8.5-)9-10.5 x 5.5-6.5 μm , ellipsoid to ovoid-ellipsoid (fig. 745E); stem clavate to bulbous. Cap 40-80 mm, hemispherical, then low convex to almost plane, sometimes with a low and broad umbo, brown when young, later dark brown, hygrophanous; gills medium spaced to distant, pale greyish brown, later dark brown; stem 50-100 x 9-14 mm, greyish white fibrillose, soon brownish; universal veil greyish white to ochraceous white, darkening to greyish brown, forming a girdle and a thin sheath or incomplete girdles on stem; flesh greyish brown to brown; smell indistinct or weakly raphanoid; exsiccates with sordid brown to dark greyish brown cap and brownish greyish stem. Sp somewhat thick-walled, moderately verrucose, fairly strongly at apex, fairly strongly dextrinoid; gill trama hyphae \pm smooth. In mesic coniferous forests with *Picea*, on calcareous soil; late summer to autumn; rare in hemib.-bore.; FI (DD), NO (NE), SE (LC). – CFP E20, Soop 04:78.

C. bovinus Fr.

Note: the name has been used collectively in the Nordic countries.

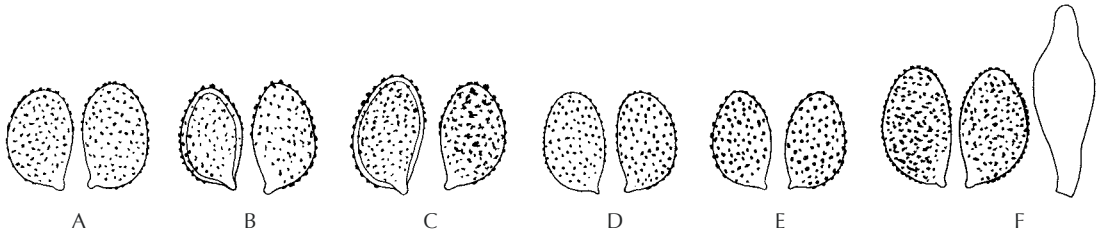
- Sp 9.5-11 x 6-7 μm , amygdaloid (fig. 745F); stem slightly clavate. Cap 45-80 mm, hemispherical, then low convex to almost plane with a low and broad umbo, brown with some greyish tints when young, later dark brown, hygrophanous; gills medium spaced to distant, pale greyish brown, later fairly dark brown; stem 55-80 x 9-13 mm, greyish white fibrillose, later brownish; universal veil greyish white to ochre white, often forming a thin sheath on lower half of stem; flesh pale greyish brown, darker towards base, marbled hygrophanous; smell indistinct or faintly raphanoid; exsiccates with dark brown, often minutely appressed scaly cap and pale greyish brown stem. Sp strongly and coarsely verrucose, dark, fairly weakly dextrinoid; gill trama hyphae mostly smooth. In mesic to damp coniferous forests with *Picea*, on calcareous soil; late summer to autumn; very rare in hemib.-bore.; FI, SE.

C. oulankaensis Kytöv., Niskanen, Liimat. & H. Lindstr. in press

24. Stem cylindrical, tapering downwards or slightly clavate; flesh brownish white to pale brownish; gill trama hyphae smooth to zebra-striate incrustated 25
 - Stem clavate to bulbous; flesh pale greyish brown to brown, often darkening with age; gill trama hyphae smooth to very finely incrustated 27
25. Cap greyish brown to dark greyish brown; sp broadly ellipsoid, weakly to moderately dextrinoid; epicutis hyphae with numerous, circular, hyaline, refracting granules. Cap 35-60 mm, hemispherical, then low convex with an obtuse umbo, slightly mat, later with darkening spots, hygrophanous; gills medium spaced, pale greyish brown, later fairly dark greyish brown, with white edge; stem 60-130 x 6-12 mm, clavate or cylindrical, sometimes tapering downwards, whitish silky-fibrillose; universal veil white, sparse; flesh whitish, but soon becoming pale brownish, e.g. after handling or cutting; smell faintly raphanoid; exsiccates with a fairly dark, red-brown cap, greyish white to brownish stem and often fairly dark brown gills. Sp 8-9(-9.5) x 5.5-6.5 μm moderately verrucose, more strongly at apex (fig. 747A); gill trama hyphae smooth to zebra-striate incrustated. In mesic to dryish coniferous forests, with *Picea*, often deep in mosses; late summer to autumn; occasional in hemib.-bore., more rare towards the north, possibly overlooked; FI, SE. – MycP 2008.

C. brunneifolius Kytöv., Niskanen & Liimat. in press

- Cap reddish brown to chocolate brown; sp fusiform, amygdaloid to slightly ellipsoid, weakly to strongly dextrinoid; epicutis hyphae without hyaline granules 26
- 26. Smell indistinct; cap fairly mat, without veil patches or fibrils; sp 8-9(-9.5) x 5.3-5.7 μm , amygdaloid to slightly ellipsoid (fig. 747B), fairly strongly to strongly dextrinoid. Cap 35-75 mm, hemispherical, then low convex to almost plane with an obtuse umbo, reddish brown, hygrophanous; gills medium spaced, pale brown, later vividly brick red to red brown; stem 70-150 x 6-15 mm, cylindrical or slightly clavate, often tapering downwards, whitish silky-fibrillose, later more brownish; universal veil white, sparse; flesh brownish white to pale brownish; exsiccates with a fairly dark red-brown cap, greyish white to brownish stem and often fairly dark brown gills. Sp sometimes thick-walled, moderately verrucose, more strongly at apex; gill trama hyphae distinctly zebra-striate and densely spot-like incrustated. In mesic to dry coniferous forests, usually with *Picea*, sometimes with *Pinus*, often deep in mosses; late summer to autumn; very common in bore., common in hemib.; FI (LC), NO (LC), SE (LC). – CFP D31, D36.
C. testaceofolius H. Lindstr. & Soop
- Smell faint, recalling cedar wood; cap waxy-glossy, but often with white universal veil fibrils or patches near the margin; sp 8.5-9.5 x 4.5-5.5 μm , fusiform to amygdaloid, with a suprahilar depression; weakly dextrinoid to sometimes more dextrinoid see *C. dolabratus* key I 4
- 27. Sp often > 5.5 wide 28
- Sp < 5.5 μm wide 30
- 28. Sp subglobose to broadly ellipsoid; exsiccates blackish see *C. clarobrunneus* key E 14
- Sp amygdaloid to ovoid; exsiccates not blackish but can be fairly dark 29
- 29. Cap often narrowly pellucid-striate; stem 4-10 mm broad, quite slender in upper part; exsiccates with dark, sordid-brown cap see *C. anisatus* key F 17
- Cap not pellucid-striate; stem 8-13 mm broad, stout; cap in exsiccates usually with dark centre and pale brown to brown margin. Cap 40-70 mm, hemispherical, then low convex to almost plane, with a low and broad umbo, fairly pale greyish brown when young, later brown to dark brown, hygrophanous; gills medium spaced, pale greyish brown, later dark brown; stem 50-90 mm long, clavate to bulbous, whitish fibrillose, later brownish; universal veil white, forming a fairly thin sheath or incomplete girdles on stem; flesh pale greyish brown, later brownish; smell indistinct; exsiccates with pale greyish to brownish stem. Sp 8.5-9.5 x 5.5-6(-6.5) μm , fusiform-ovoid, moderately and acutely verrucose, more strongly at apex (fig. 747C), moderately to fairly strongly dextrinoid; gill trama hyphae smooth to finely incrustated. In mesic to dryish coniferous forests with *Picea* or *Pinus*, on calcareous soil; late summer to autumn; rare in hemib.-middle bore.; FI, SE.
C. anisochrous Kytöv., Liimat., Niskanen & H. Lindstr. in press
- 30. In sandy *Pinus* heath forests; sp ellipsoid to very weakly amygdaloid (fig. 747D), moderately dextrinoid, fairly finely and evenly verrucose. Cap 30-70 mm, hemispherical, soon low convex with a broad umbo, deeply and dark saturated red brown, later with darkening to blackening spots, hygrophanous; gills medium spaced, pale yellowish brown when young, with age saturated brown; stem 50-120 x 5-12 mm, clavate or bulbous, finely whitish silky-fibrillose, later greyish yellow brown, with age dirty grey brown downwards; universal veil white, thin, sparse, often forming a distinct, but thin band in the middle of the stem; flesh brown to fairly dark brown; smell indistinct or slightly raphanoid; exsiccates variably brown, dark, not black. Sp (7.5-)-8-8.5(-9) x 5-5.5 μm ; gill trama hyphae smooth to very finely incrustated. In mesic to dry coniferous forests with *Pinus* and maybe also with *Picea*; autumn; common in hemib.-bore.; FI (LC), SE. – Kar 45:38.
C. neofurvolaeus Kytöv., Niskanen, Liimat. & H. Lindstr. (*C. furvolaeus* H. Lindstr. s. auct. p.p.)
Note: compare to *C. biformis* key L 14 which has bluish tints at stem top, whitish flesh and narrower sp.



Spores and cheilocystidia: A: *Cortinarius brunneifolius*, B: *C. testaceofolius*, C: *C. anisochrous*, D: *C. neofurvolaeus*, E: *C. sordidemaculatus*, F: *C. camphoratus*.

- In mesic *Picea* forests; sp ovoid to amygdaloid, weakly to strongly dextrinoid, moderately verrucose, sometimes slightly more verrucose at the apex 31
- 31. Cap greyish brown, umber to chestnut brown, not pellucid-striate; universal veil white to greyish white, fairly abundant, forming girdles on stem; sp amygdaloid, rather thin-walled. Cap 40-100 mm, hemispherical, soon low convex to almost plane with a low and very broad umbo, with age often ring-like depressed around the umbo, later blackening in large spots, hygrophanous; gills medium spaced, pale yellowish brown to greyish brown, brown to dark brown with age; stem 70-130 x 7-15 mm, clavate to somewhat bulbous, rather coarsely greyish white fibrillose, later brown, darkening downwards; flesh yellowish brown to greyish brown, darkening downwards in stem; smell indistinct; exsiccates dark sordid but not black. Sp 8-9 x 5-5.5 μ m, moderately verrucose, slightly more verrucose at apex (fig. 747E), weakly to moderately dextrinoid; gill trama hyphae finely incrustated. Especially on rich or calcareous soil, but also on acid soil; late summer to autumn; occasional in hemib.-bore., rare in the western parts; FI (LC), NO (NE), SE. – CFP D41 (as *furvolaeus*), Kar 45:38.
C. sordidemaculatus Rob. Henry (*C. furvolaeus* H. Lindstr.)
- Cap saturated dull yellowish brown to somewhat reddish brown, often narrowly pellucid-striate; universal veil white, fibrillose and thin; sp ovoid
see *C. anisatus* key F 17

Key G: Subgen. *Telamonia* sects *Telamonia* (Fr.) Gillot & Lucand and *Camphorati* Liimat. & Niskanen in press

TUULA NISKANEN & ILKKA KYTÖVUORI

Frb often fleshy, \pm with bluish tints; cap usually (40-)50-110 mm; universal veil often abundant, whitish, yellowish, greyish brown or bluish; many species with a fruity, *C. traganus*-like smell. Eight species presented here, but at least four more species, still not fully known, occur in the Nordic countries.

1. Universal veil at least partly lilac 2
- Universal veil whitish, yellowish to greyish brown 5
2. Smell very strong, unpleasant; flesh bluish, later pale yellowish brown; cheilocystidia distinct (fig. 747F). Cap 35-100 mm, hemispherical, then low convex to almost plane, somewhat silky shiny, smooth, blue to almost white when young, later pale yellowish brown; gills crowded to medium spaced, bluish lilac, later cinnamon brown; stem 50-130 x 9-20 mm, cylindrical or clavate, pale bluish, later pale yellowish brown, silky fibrillose; universal veil pale bluish, later yellowish; exsiccates whitish to pale yellowish brown. Sp (9-)9.5-10.5 x (5.5-)6-6.5 μ m, amygdaloid to somewhat ellipsoid, finely and densely verrucose, weakly dextrinoid; cheilocystidia 30-60 x 10-15 μ m, cylindrical, lageniform-fusiform to weakly

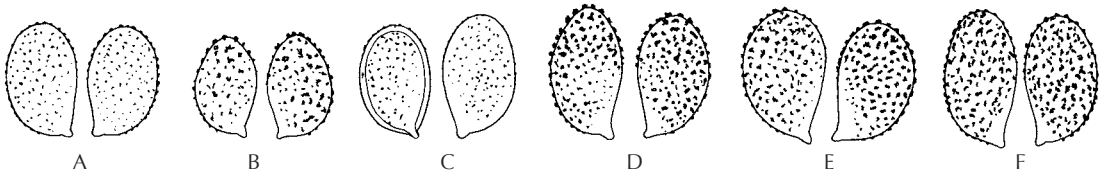
lageniform. In mesic *Picea* forests, in western NO also in mixed *Pinus-Betula* forests; late summer to autumn; very common in hemib.-bore., rare in temp.; DK (vU), FI (LC), NO (LC), SE (LC). – CFP A12, Nyl 456, R&H 508, Sieniop 194, Ves 353, ☉.

C. camphoratus (Fr.) Fr.

Note: blue colours disappear totally with age, but the species can be recognized in the field by its persistent, strong smell.

- Smell ± fruity or indistinct; flesh pale ochraceous reddish-brownish to saturated yellow brown; without true cheilocystidia 3

- 3. Stem slender, cylindrical or slightly clavate, 60-130 x 5-12 mm, distinctly longer than cap diam. Cap 30-70 mm, hemispherical, then low convex to almost plane, usually with lilac veil patches at margin, slightly fibrillose, ochraceous brown, paler when young, not hygrophanous; gills crowded to medium spaced, pale ochre brown when young, later darker brown; stem rather firm, lilac when young, especially at top, becoming brownish from the base; universal veil lilac on cap and upper part of stem, elsewhere whitish, abundant, forming rings and girdles on the stem; flesh pale ochraceous brownish, violaceous at stem top; smell persistently fruity, recalling *C. traganus*; exsiccates with greyish brown cap, brown to fairly dark brown gills and greyish to lilac stem. Sp (9-)-9.5-10.5 x 5.5-6.5 μm, ellipsoid, finely verrucose (fig. 749A), moderately dextrinoid. In mesic *Picea* forests and in suba. with *Betula*; late summer to autumn; occasional in middle bore.-suba., rare in hemib.-southern bore., very rare in temp.; DK (vU), FI (LC), NO (LC), SE (LC). – CFP A22 C50, M&J 36, Nyl 450, Sieniop 222, Svp 56:62.
- C. venustus* P. Karst. (*C. calopus* P. Karst.)
- Stem fleshy, clavate to bulbous, 50-110 x 9-20 mm, ± as long as the cap is wide 4
- 4. Cap pale lilac, later silvery grey; smell strong, fruity; sp mostly < 9.5 μm long. Cap 50-110 mm, hemispherical, then low convex, sometimes with a low and broad umbo, fleshy, slightly fibrillose, not hygrophanous; gills medium spaced, yellow brown, later vividly brown; stem 50-110 x 9-20 mm, distinctly fibrillose, pale lilac; universal veil abundant, forming woolly girdles; flesh saturated yellow brown, especially in the bulb; exsiccates whitish to whistish brownish, sometimes with lilac tints left in the universal veil. Sp 8-9(-9.5) x 5-6 μm, amygdaloid to slightly ellipsoid, moderately verrucose (fig. 749B), weakly dextrinoid. In dry to mesic coniferous forests, with *Pinus* and *Picea*; late summer to autumn; very common in hemib.-bore., very rare in temp.; DK (vU), FI (LC), NO (LC), SE (LC). – CFP C04, Phil 194a, R&H 508, Ves 353.
- C. traganus* (Fr.: Fr.) Fr. f. *traganus*
- f. *ochraceus* M.M. Moser, Ammirati & M.T. Seidl lacks lilac colours. – Soop 04:28.
- Cap brick-red to dark vividly red brown; smell slightly raphanoid; sp mostly > 9.5 μm long *C. solis-occasus* key I 3
- 5. Universal veil grey to greyish brown, abundant. Cap 50-120 mm, hemispherical, then low convex, margin with greyish brown veil patches, fleshy, fibrillose-tomentose, pale grey to greyish brown, sometimes with violet or olivaceous tints, not hygrophanous; gills medium spaced, broad, brown; stem 60-130 x 10-25 mm, clavate to bulbous, greyish white, sometimes bluish at the top; universal veil abundant, forming girdles on the stem; flesh whitish violet, brownish towards base; smell faint, slightly sour; exsiccates with a greyish to (olivaceous) brownish cap, brown gills and rather pale, olivaceous-brownish stem. Sp 9.5-10.5 x 6-6.5 μm, ellipsoid, very finely verrucose, thick-walled (fig. 749C), strongly dextrinoid. In mesic *Picea* forests; late summer to autumn; occasional in middle-northern bore., rare in southern bore., very rare in hemib.; FI (LC), NO (NT), SE (LC). – CFP A53, M&J 32, Nyl 455, R&H 518, Sieniop 221.
- C. rusticus* P. Karst. (*C. canabarba* M.M. Moser)
- Universal veil whitish to brownish-yellowish, sparse or abundant 6



Spores: A: *Cortinarius venustus*, B: *C. traganus*, C: *C. rusticus*, D: *C. niveotraganus*, E: *C. torvus*, F: *C. agathosmus*.

6. Hygrophanous; with *Populus tremula*; smell indistinct or slightly raphanoid see *C. lucorum* key F 3
 - Hygrophanous or not; with *Picea*, *Betula*, *Quercus* or *Fagus*; smell distinctly fruity, recalling *C. traganus* or pleasant and somewhat fruity 7
7. Smell strong, unpleasant; cheilocystidia present see *C. camphoratus* 2
 - Smell distinctly fruity, recalling *C. traganus* or pleasant and somewhat fruity; without true cheilocystidia 8
8. Frb first whitish, later brownish; most sp < 6 μm wide; with *Pinus*, *Picea* or *Betula* 9
 - Frb greyish brown to purplish brown; most sp > 6 μm wide; with *Picea*, *Quercus* or *Fagus* 10
9. With *Betula*, early in the season, sometimes already in June; flesh brownish whitish, often with a bluish tint at stem top; sp 9-11 x 5.5-6(-6.5) μm (fig. 749D). Cap 40-90 mm, hemispherical, then low convex, with a low and broad umbo, when young covered with white fibrils, first white to greyish white, then brown, with hygrophanous streaks; gills medium spaced, whitish grey when young, often with a bluish tint, later brown; stem 60-110 x 9-15 mm, clavate, up to 25 mm broad at the base, first whitish, later brownish; universal veil white, often forming a sock-like sheath; flesh marbled hygrophanous; smell strong, fruity, recalling *C. traganus*; exsiccates greyish white to brownish grey with brown gills. Sp narrowly amygdaloid to somewhat ellipsoid, strongly verrucose, stronger at apex, dark, moderately dextrinoid. In deciduous forests and in wooded yards, often in planted *Betula* forests, mostly on somewhat rich soil; summer; rare in hemib.-suba.; FI, SE.
C. niveotraganus Kytöv., Niskanen & Liimat. in press
 Note: compare with *C. niveoglobosus* key I 6, which has smaller sp and not hygrophanous cap, and to *C. alboviolaceus* key L 8, which lacks smell and has silky shiny fibrillose cap and shorter and broader sp.
 - With *Pinus* or *Picea*, in August to October; flesh saturated yellow brown; sp 8-9(-9.5) x 5-6 μm see *C. traganus* f. *ochraceus* 4
10. With *Fagus*, *Quercus*, *Tilia* and *Corylus*; frb usually stout and fleshy; stem clavate; universal veil forming a sock-like sheath and a collar or a ring. Cap 40-100 mm, hemispherical, then low convex, pinkish flesh brown to greyish brown, darker brown with age, when young covered with greyish white fibrils, slightly hygrophanous; gills distant, when young pale violaceous to greyish brown, later chocolate brown; stem 40-100 x 8-18 mm, robust, clavate and often tapering at the very base, greyish white, with a violaceous tint at the top; universal veil abundant, white to somewhat yellowish-brownish; flesh brownish white, violaceous at stem top; smell distinctly fruity, recalling *C. traganus*; exsiccates with greyish brown cap, dark gills and greyish stem, universal veil distinct, yellowish whitish. Sp 10-11.5 x 6-7(-7.5) μm , obovoid to broadly ellipsoid, moderately and densely verrucose, more strongly at apex (fig. 749E), moderately to fairly strongly dextrinoid. In forests on mull soil; autumn; very common in temp., occasional in hemib.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP B13, Phil 195d, Ves 354, ☉.
C. torvus (Fr.: Fr.) Fr.

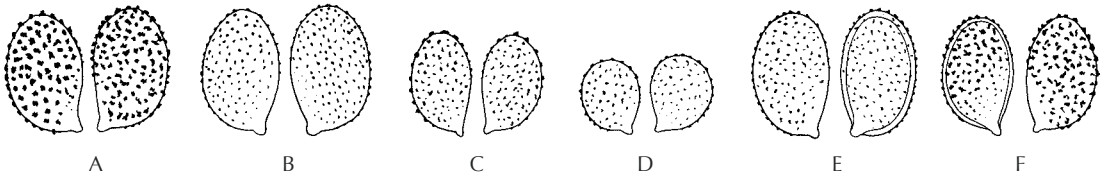
- With coniferous trees, very rarely *Betula*; frb more slender; stem long, mostly cylindrical; universal veil forming girdles on the stem 11
- 11. Smell strong, fruity, recalling *C. traganus*; cap smooth and often radially wrinkled, hygrophanous; most sp < 6.5 μm broad. Cap 40-80 mm, hemispherical, then low convex to plane, and with white veil remnants at margin, greyish violet to purplish brown; gills medium spaced, broad, pale greyish to violet, later more brownish; stem 60-130 x 6-15 mm, rather firm, whitish, violet at the top; universal veil white, abundant, forming often one complete ring and several incomplete girdles on the stem; flesh violet in stem top, yellowish brown towards base; exsiccates with brown cap, vivid brown gills and greyish stem. Sp 10-12 x 6-6.5 μm , dacryoid-ellipsoid, fairly narrow, with a suprahilar depression, moderately verrucose (fig. 749F), moderately dextrinoid. In mesic *Picea* forests, very rarely under *Betula*, often on somewhat rich soil; late summer to autumn; occasional in bore., more common towards the northern parts, very rare in hemib.; FI (LC), NO (LC), SE (NT). – CFP A05.
C. agathosmus Brandrud, H. Lindstr. & Melot
- Smell faint, pleasant, not like *C. traganus*; cap fibrillose to finely scaly, with hygrophanous streaks; most sp > 6.5 μm broad. Cap 30-80 mm, hemispherical, then low convex to plane, often with a low and broad umbo, greyish brown to purplish ochre brown; gills medium spaced to distant, dark violaceous, later more brownish; stem 60-130 x 5-11 mm, brownish-whitish with a violaceous tint; universal veil whitish to brownish-yellowish, rather abundant, forming distinct, incomplete girdles on the stem; flesh distinctly violaceous when young, later more brownish at stem base; exsiccates with fairly dark, greyish brown cap, dark gills and greyish brown stem. Sp 10-11.5 x 6.5-7 μm , broadly ellipsoid, moderately verrucose, more strongly at apex (fig. 751A), moderately dextrinoid. In mesic *Picea* forests, often on somewhat rich soil; summer to autumn, often precocious; occasional in western middle-northern bore., rare in southern bore.; NO (NT), SE (NT). – CFP B22.
C. ionophyllus M.M. Moser s. Brandrud et al. 1992
Note: the name has been used collectively in the Nordic countries and type material has not been studied. A possibly continental species differs by 9-10.5 x 5.5-6.5 μm sp; FI (LC), SE.

Key H: Subgen. *Telamonia* sect. *Malachii* Melot

TUULA NISKANEN & ILKKA KYTÖVUORI

Frb fleshy; cap 40-90 mm, innately fibrillose or finely scaly, fairly weakly hygrophanous; exsiccates often with a fairly dark, grey-brown cap. Two species in the key, but in addition at least one nameless species in the Nordic countries.

1. Cap finely scaly; flesh pale greyish white; sp (9.5-)10-11 x 6-7 μm (fig. 751B). Cap 40-90 mm, hemispherical, then low convex to almost plane with a low and broad umbo, greyish brown, sometimes with a bluish tint, somewhat hygrophanous; gills medium spaced, pale greyish brown, sometimes with a bluish tint, later brown; stem 50-120 x 8-15 mm, cylindrical with a clavate to bulbous, up to 35 mm broad base, whitish fibrillose, often with a bluish tint at the top; universal veil white, forming a sock-like sheath when young, later forming incomplete, woolly girdles on stem; flesh bluish in stem top; smell indistinct; exsiccates with greyish brown to dark greyish brown cap, pale greyish brown stem and brown to fairly dark brown gills. Sp ellipsoid to weakly amygdaloid, finely verrucose, weakly to moderately dextrinoid; gill trama hyphae finely incrustated. In mesic *Picea* forests; late summer to autumn; occasional in hemib.-bore., but more common in oceanic areas; DK (LC), FI (LC), NO (LC), SE (LC). – CFP D54, D42, GCI B91, Nyl 453, R&H 509.
C. malachius (Fr.) Fr.
- Cap smooth, but distinctly innately fibrillose; flesh greyish brown to brown; sp (7.5-)8-9 x 5-5.5 μm (fig. 751C). Cap 40-90 mm, hemispherical, then low convex to almost plane with a low and broad umbo, often whitish greyish when young, later greyish brown, with pale fibers and dark hygrophanous streaks, becoming considerably darker with age; gills me-



Spores: A: *Cortinarius ionophyllus*, B: *C. malachius*, C: *C. suberi*, D: *C. balaustinus*, E: *C. laniger*, F: *C. solis-occasus*.

dium spaced, pale greyish brown, rarely with a bluish tint, later brown; stem 50-140 x 8-15 mm, cylindrical with a clavate, up to 30 mm broad base, whitish fibrillose, sometimes with a bluish tint at the top; universal veil white, fairly abundant, forming a sock-like sheath when young, later incomplete girdles on the stem; flesh sometimes bluish in stem top; smell indistinct; exsiccates with brown, silvery-grey or blackish grey cap, greyish stem with a white girdle and brown to blackish brown gills. Sp ellipsoid to weakly amygdaloid, finely to moderately verrucose, weakly to moderately dextrinoid; gill trama hyphae fairly finely, but distinctly incrustated. In dry to mesic coniferous forests with *Pinus* and *Picea*; late summer to autumn; common in hemib.-bore.; FI (LC), NO (LC), SE (LC). – Soop 04:21 22, M&J 145.

C. suberi Soop (*C. brunneogriseus* Soop)

Note: compare to *C. quarciticus* L 4, which has smooth cap, greyish white flesh and paler exsiccates.

Key I: Subgen. *Telamonia* sects *Balaustini* Moëgne-Locc. & Reumaux, *Lanigeri* Melot and *Niveoglobosi* Kytöv., Liimat. & Niskanen in press

TUULA NISKANEN & ILKKA KYTÖVUORI

Frb often fleshy, usually without bluish tints; cap (30-)50-110(-130) mm, white, vividly yellow brown to dark brick red, not hygrophanous or hygrophanous; universal veil white or cream, rarely bluish; smell indistinct or slightly raphanoid.

- Sp subglobose (fig. 751D); stem 5-12 mm broad, cylindrical to very slightly clavate; cap slightly hygrophanous, soon drying and then with hygrophanous streaks and innate fibres. Cap 30-80 mm, hemispherical to low convex, for long with an incurved margin, smooth, vivid yellow brown to orange brown; gills medium spaced, yellow brown to red brownish; stem 50-110 x 5-12 mm, white fibrillose, later more brownish; universal veil white, sparse; flesh pale ochraceous yellow; smell slightly raphanoid; exsiccates with fairly pale, greyish flesh-coloured cap and often dark gills. Sp 5.5-6.5 x 4.7-5.2 μm , moderately verrucose, indextrinoid or very weakly dextrinoid; epicutis hyphae with dark brown granules or particles in Melzer. In deciduous and mixed forests with *Betula* and *Fagus*; late summer to autumn; common in bore, occasional in hemib. and suba.; FI (LC), NO (LC), SE (LC). – CFP B40.

C. balaustinus Fr.

Note: compare with *C. illuminis* key F 15, which grows with *Picea*, has vividly red-brown, strongly hygrophanous cap and does not have dark brown granules in epicutis hyphae.

- Sp fusiform, amygdaloid or ellipsoid; stem 8-22 mm broad, fleshy, slightly clavate to clavate; cap hygrophanous or not 2
- 2. Most sp > 9.5 μm long; cap brick red to dark vividly brown, not hygrophanous; with coniferous trees 3
- Most sp < 9.5 μm long; cap white, warm yellow brown or brick red, hygrophanous or not; usually with *Betula* or *Populus* 4
- 3. Frb without a lilac tint; universal veil white, usually abundant and woolly; cap fibrillose tomentose to finely scaly, pale brick red to deep red brown; stem usually long compared to the

cap diam.; sp ellipsoid (fig. 751E). Cap 40-90 mm, hemispherical to low convex, sometimes with a low and broad umbo, fleshy; gills medium spaced, vivid brick red; stem 60-150 x 8-16 mm, usually cylindrical with a clavate base, whitish fibrillose, later more red brownish; universal veil forming a ring and girdles on the stem; flesh pale reddish brown; smell slightly raphanoid; exsiccates with fairly dark, brown to somewhat greyish brown cap and greyish white stem. Sp 10-11.5(-12) x 6-6.5(-7) μm , fairly finely to moderately and densely verrucose, thick-walled, strongly dextrinoid; gill trama densely hyphae spot-like incrustated. In mesic *Picea* forests, also in *Pinus* heathland with solitary *Picea*; late summer to autumn; common in hemib.-bore., very rare in temp.; DK (NA, EJyl: Addit Næs), FI (LC), NO (LC), SE (LC). – CFP C53 (big cap on the left is *C. solis-occasus*), GCI D123 (lower photo), M&J 76, Nyl 457, R&H 518, Sieniop 204.

C. laniger Fr.

- Universal veil and stem top usually lilac when young, later whitish, lilac tints most constant on cap margin; cap smoother, finely fibrillose, brick red to dark vividly red brown, often with purplish tints; stem stout, short compared to the cap diam.; sp somewhat amygdaloid (fig. 751F). Cap 40-110 mm, hemispherical to low convex, margin with pale lilac universal veil when young; gills medium spaced, vivid ochre brown, later more red brown; stem 50-90 x 8-20 mm, clavate, fleshy, whitish fibrillose, later more reddish brown, often with a bluish tint at the top; universal veil usually forming one ring and a sparse sheath which disappears with age; flesh pale reddish brown, usually with a bluish tint at stem top; smell slightly raphanoid; exsiccates with fairly dark brown, sometimes greyish brown cap and greyish white stem. Sp 9.5-10.5(-11) x 6-6.5(-7) μm , moderately to rather strongly verrucose, more strongly at apex, somewhat thick-walled, strongly dextrinoid; gill trama hyphae somewhat spot-like incrustated. In mesic *Picea* forests, also in *Pinus* heathland with solitary *Picea*, on calcareous soil; late summer to autumn; rare in hemib.-bore.; FI, NO (LC), SE (NA). – CFP C20, Nyl 458.

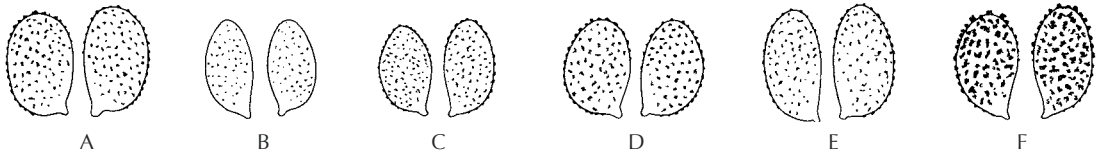
C. solis-occasus Melot

Note: type material has not been studied and the interpretation follows Brandrud et al. 1994.

4. Cap slightly hygrophanous; sp ellipsoid (fig. 753A). Cap 40-90 mm, hemispherical to low convex, smooth, fleshy, innately fibrillose, warm yellow brown to orange brown, often with tiny holes made by insects; gills medium spaced, pale greyish apricot brown when young, later vividly red brown; stem 60-130 x 9-18 mm, clavate, whitish fibrillose, later more apricot brown; universal veil white, forming often one ring and a sparse sheath or zones which disappear with age; flesh pale brownish; smell slightly raphanoid; exsiccates with brown to dark brown cap and greyish white stem. Sp 8.5-9.5 x 5.5-6 μm , moderately verrucose, moderately to strongly dextrinoid; gill trama hyphae somewhat spot-like incrustated. In deciduous and mixed forests, but also in parks and forested yards with *Betula*; late summer to autumn; common in hemib.-suba., rare in temp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – CFP B30, R&H 519, Sieniop 191.

C. bivelus (Fr.: Fr.) Fr.

- Cap not hygrophanous; sp fusiform to amygdaloid (figs 751B-D) 5
- 5. Cap at first pale brownish to almost cream, later brick red; exsiccates with a fairly dark, greyish brown cap; sp Q > 1.7 (fig. 753B). Cap 50-110 mm, hemispherical to low convex, with a long incurved margin, often with big, cream-coloured veil patches near the margin, fleshy, not hygrophanous; gills medium spaced, greyish red brown when young, later brick red; stem 60-150 x 9-16 mm, clavate, whitish fibrillose, later more reddish brown, often with bluish tints at the top, at least when young; universal veil cream, forming girdles and zones on the stem; flesh pale brownish, with bluish tints at stem top; smell slightly raphanoid. Sp 7-8 x 4-4.5 μm , fusiform, finely verrucose, weakly dextrinoid. In deciduous and mixed forests and in road sides with *Betula*; late summer to autumn; occasional in hemib.-suba., more common in northern part, rare in temp.; DK (VU), FI (LC), NO (NE), SE (LC). – CFP E21,



Spores: A: *Cortinarius bivelus*, B: *C. alborufescens*, C: *C. niveoglobosus*, D: *C. alboglobosus*, E: *C. duracinus* s. Kytövuori & Niskanen, F: *C. duracinus* s. lato.

Nyl 467, Sieniop 187, Soop 04:13, Svp 56:59, 60.

C. alborufescens Imler s. Brandrud et al. 2008 (incl. *C. cremeolaniger* P.D. Orton, *C. pearsonii* P.D. Orton)

- Cap first white, later brownish; exsiccates whitish grey to brownish, usually with dark gills; sp Q < 1.7 (fig. 691D-E) 6
6. Sp 7-8.5 × 4.3-5 μm (fig. 753C). Cap 50-100 mm, hemispherical to low convex, smooth, first whitish, later brownish, not hygrophanous; gills crowded to medium spaced, pale greyish brown later darker; stem 40-90 × 10-22 mm, clavate, fleshy, whitish fibrillose, later brownish; universal veil white, rather sparse, forming often a sock-like sheath or broad zones on the stem; flesh pale greyish brown; smell not known. Sp narrowly amygdaloid to slightly fusiform, fairly finely verrucose, fairly weakly dextrinoid. In mixed forests, presumably associated with *Populus*, often on calcareous soil; late summer to autumn; poorly known, presumably very rare in bore.; FI, SE. – CFP B54.
- C. niveoglobosus* H. Lindstr. (*C. pseudorusticus* Bidaud)
- Note: the IUCN classification of the species in SE refers to another species. The true *C. niveoglobosus* has only been confirmed from two localities in the Nordic countries
- Sp 7.5-9 × 5-6 μm (fig. 753D). Cap 50-100 mm, hemispherical to low convex, smooth, first whitish, later brownish, not hygrophanous; gills crowded to medium spaced, pale greyish brown, later darker; stem 40-90 × 10-20 mm, slightly clavate, fleshy, whitish fibrillose, later brownish; universal veil white, fairly abundant, forming floccose girdles and zones; flesh pale greyish brown; smell fruity. Sp amygdaloid, finely to moderately verrucose, fairly weakly to moderately dextrinoid. In mixed forests, presumably associated with *Betula*; late summer to autumn; poorly known, presumably rare in bore.-suba.; FI, SE.
- C. alboglobosus* Kytöv., Liimat. & Niskanen in press
- Note: compare with *C. argillaceosericeus* key L 5, which has an innately fibrillose cap with hygrophanous streaks, narrower sp and grows with *Picea* or *Pinus*.

Key J: Subgen. *Telamonia* sects *Bicolores* (M.M. Moser) Melot and *Duracini* Melot
TUULA NISKANEN & ILKKA KYTÖVUORI

Frb often with violet tints; cap 25-90 mm, in most species 40-80 mm, strongly hygrophanous, yellowish brown to chocolate brown; stem radicating or cylindrical; universal veil white; smell indistinct, like cedar-wood, raphanoid or cellar-like, sp often somewhat fusiform. Seven species in the key. The real number of the species might double that and especially sect. *Duracini* is poorly studied. The identity of the names *C. candelaris* Fr., *C. licinipes* Fr., *C. scutulatus* (Fr.) Fr. and *C. imbutus* Fr. var. *vilior* P. Karst. is unclear, and they are not included in the key.

1. Stem radicating and cartilaginous, whitish 2
 - Stem not radicating or flesh with distinct violet tints 3
2. Sp narrowly ellipsoid to somewhat fusiform, moderately verrucose (fig. 753E); in coniferous forests. Cap 45-70 mm, conical, later low conical, sometimes with an umbo, caramel to brown, strongly hygrophanous; gills medium spaced, pale greyish brown, later brown;

stem 80-170 x 8-15 mm, whitish silky-fibrillose, later pale brown; universal veil white, very sparse; flesh pale whitish brown; smell slightly raphanoid; exsiccates with brown, often black-centred cap and brownish white stem. Sp 8.5-9.5 x 5-5.5 μm , moderately to fairly strongly dextrinoid. In mesic *Picea* forests, on rich to calcareous soil, often solitary; late summer to autumn; occasional in hemib.-bore.; FI (LC), NO, SE.

C. duracinus Fr. s. Kytövuori & Niskanen

Note: the name has been used collectively in the Nordic countries, the most common taxon in coniferous forests is presented above.

- Sp dacryoid to narrowly obovoid-ellipsoid, often strongly verrucose (fig. 753F); in coniferous and deciduous forests. Cap 30-70 mm, hemispherical to conical, later low conical, sometimes with an umbo, brownish, strongly hygrophanous; gills medium spaced, pale greyish brown, later brown; stem 50-160 x 6-14 mm, whitish silky-fibrillose, sometimes with a bluish tint at top, later pale brown; universal veil white, very sparse; flesh pale whitish brown; smell indistinct or raphanoid; exsiccates with brown to dark brown cap and brownish white stem. Sp 7.5-10 x 4.5-6 μm , moderately to fairly strongly dextrinoid. Solitary or fasciculate; autumn; occasional in temp.-bore.; FI, NO (LC), SE. – CFP C28.

C. duracinus Fr. s. lato (non s. Kytövuori & Niskanen)

Note: the species in deciduous forests remind of *C. acetosus* key K 2, which has a smell of iodoform.

- 3. Smell faint of cedar wood 4
- Smell indistinct, radish-like or cellar-like as in *Russula adusta* 5

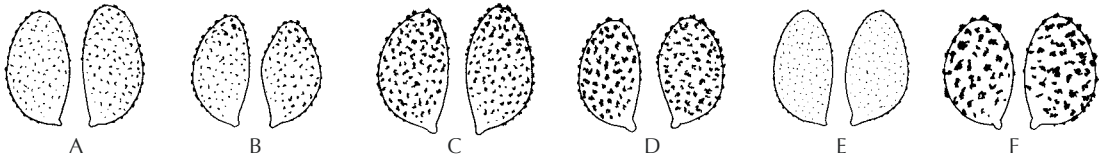
- 4. Flesh whitish, distinctly violet in stem top; in coniferous forests, in damp depressions, often in *Sphagnum*; sp 9-10.5 x 5-6 μm , amygdaloid to ellipsoid (fig. 755A). Cap 25-70 mm, hemispherical, then low convex with down-curved margin, chocolate brown to dark purplish brown, strongly hygrophanous; gills medium spaced, saturated red brown, darkening with age; stem 70-120 x 5-10 mm, cylindrical, violet at the top; universal veil white; exsiccates with rather dark brown cap, brown gills, greyish white stem and white mycelium. Sp fairly faintly to moderately verrucose, fairly weakly to moderately dextrinoid; gill trama hyphae strongly incrustated. In mesic to damp *Picea* forests, usually in *Sphagnum*; late summer to autumn; common in hemib.-bore.; FI (LC), NO (LC), SE (LC). – CFP A06, Jordst 10(1).

C. tortuosus (Fr.: Fr.) Fr.

- Flesh whitish brown, rarely faintly violet in stem top; in mesic to dry coniferous forests; sp 8-9(-9.5) x 4.5-5.5 μm , fusiform with a suprahilar depression (fig. 755B). Cap 30-80 mm, hemispherical, then low convex with a low and broad umbo, margin usually with white universal veil patches, dark red brown, often with a lighter ring around the umbo due to the drying, strongly hygrophanous; gills medium spaced, saturated red brown; stem 50-110 x 5-13 mm, cylindrical; universal veil white, mycelium white; exsiccates with rather dark brown cap, (dark) brown gills, greyish white stem and cream-coloured mycelium. Sp moderately verrucose, more strongly at apex, weakly dextrinoid. In dry to mesic coniferous forests with *Pinus* and *Picea*, most typically in dry *Pinus* heath forests on sandy soil; late summer to late autumn; common in hemib.-bore., very rare in temp.; DK (NA, EJyl: Skagen Klitpl), FI (DD), NO (NE), SE (LC). – CFP D52.

C. dolabratus Fr.

- 5. Sp obovoid-ellipsoid, 10-11(-11.5) x 6-7 μm ; with *Quercus*, *Tilia* or *Corylus*
see *C. serratissimus* key F 3
- Sp fusiform, amygdaloid or ellipsoid, < 6.5 μm wide; with coniferous or deciduous trees 6
- 6. At least base of the stem violet; most sp > 5.5 μm wide 7
- Only top of the stem violet; most sp < 5.5 μm wide 8
- 7. In coniferous forests, often in *Sphagnum*, also in subalpine *Betula* forests; smell indistinct; sp 9.5-11 x 5.5-6.5 μm , amygdaloid to somewhat fusiform, moderately verrucose (fig. 755C), fairly weakly dextrinoid. Cap 30-90 mm, convex, later low convex to broadly conical with



Spores: A: *Cortinarius tortuosus*, B: *C. dolabratus*, C: *C. evernius*, D: *C. cagei*, E: *C. imbutus*, F: *C. acetosus*.

an umbo, somewhat finely scaly with age, dark red brown to purplish brown, strongly hygrophanous and fairly soon drying very pale; gills often broad, medium spaced to distant, purplish brown, with distinctly paler edge; stem 70-150 × 5-15 mm, tapering downwards, usually stiff, violet over entire length, at least when young; universal veil white, forming distinct zones and girdles; mycelium white; flesh brownish in cap, violet in stem; exsiccates with pale brown cap, dark gills and greyish white stem with distinct cream-white universal veil zones. In damp to mesic *Picea* forests; summer to autumn; very common in hemib.-bore., rare in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A11, Nyl 469, R&H 520, Sieniop 200.

C. evernius (Fr.: Fr.) Fr.

- In hemib.-temp. deciduous forests; smell cellar- or radish-like; sp 8.5-9.5(-10) × 5.5-6 μm, amygdaloid to slightly ellipsoid, strongly verrucose (fig. 755D), moderately to strongly dextrinoid. Cap 15-60 mm, conical then low convex with an umbo, red brown, strongly hygrophanous and soon drying very pale; gills medium spaced, pale chocolate brown to purplish brown; stem 40-100 × 5-9 mm, cylindrical or tapering downwards, violet when young, later ± violet at the base; universal veil white, sparse; mycelium white; flesh red brown in the cap, ± violet in the stem; exsiccates with greyish to yellowish brown cap, brown gills, darker in young frb, stem yellowish to greyish white. In deciduous forests with *Fagus*, *Tilia* and *Corylus*, on rich soil; late summer to autumn; rare in temp.; DK (vU), NO (vU), SE (vU). – CFP D48, GCI A15, Nyl 469, RdM 41:12.

C. cagei Melot (*C. bicolor* Cooke nom. illeg.)

Note: there might be several closely related species in the Nordic countries. Type material has not been studied, and the interpretation follows Brandrud et al. 1998

8. Smell strong, cellar-like; with coniferous trees; exsiccates with a yellow to red-brown cap. Cap 30-90 mm, convex, then low convex to almost plane with undulate margin, dark red brown, strongly hygrophanous, soon drying very pale; gills often broad, distant, dark brown to purplish brown; stem 50-120 × 7-15 mm, cylindrical or slightly clavate, sometimes tapering; universal veil white, sparse; mycelium white; exsiccates with brown gills, yellowish or greyish white stem and white mycelium. Sp 9.5-10.5 × 5-5.5 μm, fusiform, fairly faintly verrucose, stronger at apex (fig. 755E), weakly dextrinoid. In mesic *Picea* forests, often on somewhat rich soil; late summer to autumn; occasional in hemib.-bore., presumably less common towards the eastern parts; FI (LC), NO (NE), SE (LC). – CFP D60.

C. imbutus Fr.

Note: the name has been used collectively in the Nordic countries.

- Smell indistinct; with deciduous trees; exsiccates with dark greyish brown, sordid brown or blackish brown cap see key H p. 750

Key K: Subgen. *Telamonia* sects *Obtusi* Melot and *Acetosi* (Moëne-Loec. & Reumaux) Niskanen, Liimat. & Kytöv. in press TUULA NISKANEN & ILKKA KYTÖVUORI

Frb without bluish tints; cap warm yellow brown, red brown to dark brown, strongly hygrophanous; stem cylindrical or rooting, whitish, at least when young; universal veil white, sometimes very indistinct; smell at the base of stem iodoform-like, best observed when slightly dried. Five

species in the key, but the real number of the Nordic species is much higher. *Obtusi* species growing in deciduous forests are not in the key.

Suppl. lit.: Bidaud et al. 2003.

1. Flesh white to yellowish white, yellowing with age or handling; stem 4-14 mm broad; usually under deciduous trees, rarely under conifers, mainly in temp.-hemib.; most sp > 5.5 μm broad 2
 - Flesh yellow brown; stem 1.5-6 mm broad; in coniferous and sometimes in deciduous forests, in temp.-bore.; most sp < 5.5 μm broad 3
2. Cap red brown; smell iodoform-like or pleasant cellar-like; sp (8.5-)9-10(-10.5) x 5.5-6.5 μm , ovoid to amygdaloid (fig. 755F). Cap 35-70 mm, conical, later low convex with an obtuse umbo, often somewhat rimy at the centre, sometimes narrowly pellucid-striate, strongly hygrophanous and fairly soon drying very pale; gills distant, waxy, brown, with white edge; stem 60-110 x 7-14 mm, rooting, often hard, whitish; universal veil white, very sparse; flesh yellowish white, yellowing with age or handling; exsiccates with pale brown to brown cap and brownish white stem. Sp very strongly verrucose, moderately to strongly dextrinoid; gill trama hyphae distinctly incrustated. With *Quercus*, *Tilia*, *Fagus* and *Corylus* on mull soil, often in groups or fasciculate; summer to autumn, often precocious; rare, but locally occasional in temp.-hemib., very rare in southern and middle bore.; DK (VU), FI (LC), NO (LC), SE – GCI C3, Soop 04:71.

C. acetosus (Velen.) Melot (*C. rigens* (Pers.) Fr. s. J.E. Lange)

Note: compare with species in sect. *Duracini* p. 753, which lack the smell of iodoform. Taxonomy in the Nordic countries needs further studies.

- Cap brown to dark brown; smell in gills distinct, like cedar-wood, at the base of stem like iodoform; sp 7-8 x 5.5-6 μm , ovoid-subglobose (fig. 757A). Cap 15-50(-60) mm, hemispherical, later low convex with an obtuse umbo, often somewhat rimy at the centre, narrowly pellucid-striate, hygrophanous; gills distant, pale brown, later brown, with white edge; stem 30-100 x 4-7 mm, cylindrical to somewhat rooting, white; universal veil white, very sparse; flesh whitish; exsiccates with dark brown cap and brownish white stem. Sp moderately verrucose, weakly dextrinoid; gill trama hyphae finely incrustated. In mixed forests of *Corylus*, *Pinus*, *Quercus*, *Abies alba* and *Betula* or mixed *Fagus* forests, mycorrhizal associate unknown, on calcareous soil; summer to autumn; very rare in temp.-hemib.; DK (EN, EJyl: Pamhule), NO (VU, Oslo, Hord: Kvam), SE. – AC 14:473, Svp 56:61.

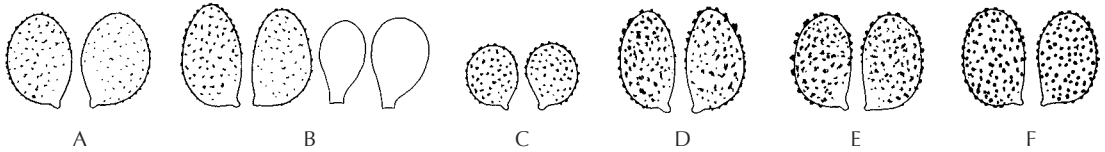
C. fragrantior Gaugué s. auct.

Note: type material has not been studied.

3. Frb *Galerina*-like; cap distinctly conical, with an acute umbo; sp 8-9(-9.5) x 4.5-5.5 μm , ovoid to broadly amygdaloid, weakly to moderately verrucose (fig. 757B), weakly dextrinoid. Cap up to 2/3 pellucid-striate, yellow brown to pale red brown, strongly hygrophanous and fairly soon drying very pale; gills medium spaced, yellowish brown, with white edge; stem 25-60 x 1.5-3 mm, cylindrical, whitish fibrillose, soon yellowish brown; universal veil white, fairly sparse; flesh yellow brown; smell at the base of stem iodoform-like, best observed when slightly dried; exsiccates with yellow-brown to dark brown cap and pale greyish brown to yellow-brown stem. Gill trama hyphae distinctly incrustated; gill edge often with numerous, balloon-shaped, sterile cells. In mesic to damp, often somewhat eutrophic coniferous forests with *Picea*, often in low depressions, on needle litter or between low mosses, often in groups; summer to autumn; common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP C46, GCI C7, M&J 43, Nyl 475.

C. acutus (Pers.) Fr.

- Frb not so *Galerina*-like; cap conical, bell-shaped to low convex; sp subglobose, amygdaloid or ellipsoid, moderately to strongly verrucose, moderately to strongly dextrinoid 4



Spores and cheilocystidia: A: *Cortinarius fragrantior*, B: *C. acutus*, C: *C. trossingenensis*, D: *C. obtusus* s. lato, E: *C. albovariegatus*, F: *C. rubroviroleipes*.

4. Sp (4.5-)5-5.5 x 4-4.5 μm , subglobose (fig. 757C); cap 5-25 mm, usually without an umbo. Cap hemispherical, later low convex to almost plane, up to 1/3 pellucid-striate, red brown to dark red brown, strongly hygrophanous; gills medium spaced, yellowish brown, with white edge; stem 20-45 x 2-4 mm, cylindrical, white, soon yellowish brown to red brown; universal veil white, fairly sparse; flesh yellowish brown; smell at the base of stem weak, iodoform-like, best observed when slightly dried; exsiccates with brown to dark red-brown cap and pale greyish brown to yellow-brown stem. Sp moderately verrucose, moderately dextrinoid; gill trama hyphae very strongly zebra-striate and spot-like incrustated. In mesic coniferous forests with *Picea*, in needle litter or mosses, often in groups; summer, rarely later in the season; rare in hemib.-bore., but possibly overlooked; FI (LC), SE (LC). – CFP C39.

C. trossingenensis Melot s. lato

Note: type material has not been studied, and the interpretation follows Brandrud et al. 1994.

- Sp > 7 μm long, amygdaloid or ellipsoid; cap 10-50 mm, often with an umbo 5
5. Sp (7.5-)8-9 x 4.5-5 μm , amygdaloid (fig. 757D). Cap 20-50 mm, conical, often with an umbo, bell-shaped to hemispherical, up to 1/2 pellucid-striate, vividly red brown to dark red brown or yellow brown, strongly hygrophanous and fairly soon drying very pale; gills medium spaced, yellowish brown, often with white edge; stem 40-100 x 3-6 mm, cylindrical or rooting, white, soon yellowish brown; universal veil white, fairly sparse; smell at the base of stem often first raphanoid then iodoform-like, best observed when slightly dried; exsiccates with brown to dark red-brown cap and pale greyish brown stem. Sp strongly verrucose, moderately to strongly dextrinoid; gill trama hyphae distinctly incrustated. In mesic to damp coniferous forests with *Picea*, sometimes with *Pinus*, *Betula* and *Salix* dwarf shrubs, in needle litter or mosses; summer to late autumn, often precocious; very common in temp.-bore., occasional in suba.-arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – CFP C57.

C. obtusus (Fr.: Fr.) Fr. s. lato

Note: the name has been used very collectively in the Nordic countries. Some photos of *C. obtusus*, e.g. Sieniop 209 and Ves 357 may represent other species.

- Sp 7.5-8.5 x 5-5.5 μm , ellipsoid (fig. 757E). Cap 10-40 mm, conical, later low conical with an acute umbo, up to 1/2 pellucid-striate, red brown to dark red brown, strongly hygrophanous; gills medium spaced, yellowish brown, with white edge; stem 40-90 x 4-8 mm, cylindrical, first whitish, soon yellowish brown to reddish brown; universal veil white, forming complete and incomplete girdles on stem; flesh yellowish brown; smell at base of stem weak, iodoform-like, best observed when slightly dried; exsiccates with brown to dark reddish brown cap and pale greyish brown to yellow-brown stem. Sp fairly strongly verrucose, moderately to fairly strongly dextrinoid; gill trama hyphae strongly zebra-striate and spot-like incrustated. In mesic to damp coniferous forests with *Picea*, often in groups; summer, less frequent later in the season; presumably occasional in hemib.-bore., poorly known; DK (LC), FI (LC), SE. – CFP A27.

C. albovariegatus (Velen.) Melot

Note: the taxonomy is unclear. Type material has not been studied, and the interpretation follows Brandrud et al. 1989.

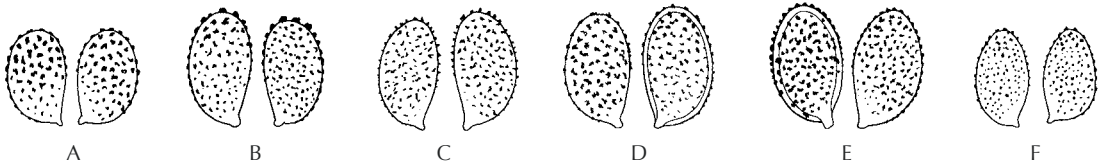
Key L: Subgen. *Telamonia* sects *Firmiores* (Fr.) Henn. (*Armeniaci* (M.M. Moser) Melot), *Urbici* Liimat., Niskanen & Kytöv. in press and *Boulderenses* Liimat., Niskanen & Kytöv.

TUULA NISKANEN & ILKKA KYTÖVUORI

Cap 40-90 mm, often slightly viscid-sticky when moist, strongly hygrophanous or with hygrophanous streaks, smooth; flesh in the stem often very pale, greyish white, brownish white to pale greyish brown; universal veil white or vividly red; smell often indistinct, in some species slightly fruity or raphanoid; exsiccates with pale brownish to brownish cap; sp amygdaloid to ellipsoid. 11 species in the key, but more species occur in the Nordic countries.

Note: If a species does not match here see also key F.

1. Universal veil yellow, pinkish or vividly red 2
- Universal veil white 3
2. Universal veil vivid red; stem ± blue; sp ellipsoid (fig. 757F). Cap 20-60 mm, convex, soon low convex with a low and broad umbo, silky whitish fibrillose at margin, especially when young, red brown to dark red brown, strongly hygrophanous; gills medium spaced, pale greyish to yellowish brown, with age cinnamon brown; stem 45-90 × 7-13 mm, cylindrical or slightly clavate, fibrillose; universal veil fairly abundant, in a continuous coating on basal part of the stem or forming belts or zones; flesh pale yellowish to greyish brown, bluish in the cortex; smell indistinct; exsiccates with a yellow-brown to light red-brown cap, red universal veil still visible on the stem. Sp (7.5-)8-9 × 5-5.5(-6) μm, fairly finely verrucose, dextrinoid to strongly dextrinoid. In mesic *Picea* forests; late summer to autumn; very rare in bore.; FI, NO (EN, Oppl: Nordre Land). – Kar 46:2, Sienil 58:101.
C. rubrovioleipes Bendiksen & K. Bendiksen
- Universal veil pale pinkish or yellow; stem whitish, later brownish; sp subglobose 15
see *C. illuminus* key F
3. Cap whitish, greyish or bluish, with hygrophanous streaks 4
- Cap yellow brown, red brown to fairly dark brown, strongly hygrophanous 9
4. With *Pinus*; cap with distinct, broad and narrow, hygrophanous streaks and spots; sp 7.5-8.5 × 4.8-5.3 μm (fig. 759A). Cap 40-90 mm, hemispherical, then low convex to almost plane with a low and broad, often flattened umbo, silky shiny fibrillose, sometimes viscid-sticky when moist, pale greyish, later yellowish grey, at least at the centre; gills crowded to medium spaced, pale yellowish brown, sometimes with a bluish tint, later fairly vividly brown; stem 50-120 × 8-15 mm, cylindrical with a bulbous to clavate, up to 35 mm broad base, often somewhat widening towards the top and with a bluish tint, silky whitish fibrillose, with hygrophanous streaks; universal veil white, fairly sparse, sometimes forming girdles on stem; flesh pale greyish white; smell indistinct; exsiccates greyish to pale greyish brown, with brown gills. Sp slightly obovoid to ellipsoid, fairly strongly verrucose, fairly thin-walled, moderately dextrinoid. In dry *Pinus* heath forests, especially on sandy soil; late summer to late autumn; common in hemib.-bore., less common in western parts, rare in temp.; DK (VU), FI (LC), NO (LC), SE (LC). – CFP C59 (1st, 2nd, 3rd and 5th frb from the left are *C. suberi*), M&J 145, Jordst 14(1) (as *pseudomalachius*), Sieniop 213.
C. quarciticus H. Lindstr.
Note: compare with *C. suberi* key H 1, which has distinctly innately fibrillose cap, greyish brown flesh and brown to greyish black exsiccates.
- Usually with *Picea* or deciduous trees; cap with very fine pattern of silky, pale, superficial threads and hygrophanous streaks; sp > 8.5 μm long 5
5. With coniferous trees, on calcareous soil. Cap 40-90 mm, convex, soon low convex to almost plane with a low umbo, silky shiny, innately fibrillose, white to pale brownish grey, with hygrophanous streaks; gills medium spaced, pale greyish to yellowish brown, later more



Spores: A: *Cortinarius quarciticus*, B: *C. argillaceosericeus*, C: *C. urbicus*, D: *C. alboviolaceus*, E: *C. turgidus*, F: *C. carneinatus*.

brownish; stem 45-90 x 6-15 mm, clavate or cylindrical, whitish silky-fibrillose; universal veil white, fairly sparse, in young frb often forming a thin sheath over the lower half of stem, disappearing very easily when thumbed; flesh pale greyish brown; smell faint, slightly fruity in gills, raphanoid in flesh; exsiccates with fairly dark, greyish cap, greyish white stem and brown to dark brown gills. Sp (8-)8.5-9.5 x 5-5.5(-6) μm , obovoid-ellipsoid, finely to moderately verrucose, more strongly at apex (fig. 759B), weakly to moderately dextrinoid; gill trama hyphae smooth to very finely incrustated. In mesic to dry forests; late summer to autumn; rare in eastern hemib.-bore.; FI (NT), SE (LC). – Soop 04:23 (as *diosmus*).
C. argillaceosericeus Kytöv., Niskanen & Liimat. in press (*C. diosmus* Kühner s. Soop)
 Note: compare with *C. niveoglobosus* and *C. alboboglobosus* key I 6 which have smooth, not hygrophanous cap and grow with deciduous trees.

- With deciduous trees, on acid to calcareous soil 6
- 6. Sp 8.5-9.5 x 5-5.5 μm (fig. 759C), weakly to moderately dextrinoid. Cap 35-80 mm, convex, soon low convex to almost plane with a low umbo, silky shiny, innately fibrillose, white to pale brownish grey, with hygrophanous streaks; gills medium spaced, pale greyish to yellowish brown, later more brownish; stem 45-90 x 6-13 mm, clavate or cylindrical, whitish silky-fibrillose; universal veil white, fairly sparse, in young frb often forming a thin sheath over the lower half of stem; flesh pale greyish; smell faint, slightly fruity in gills, raphanoid in flesh; exsiccates with greyish cap, greyish white stem and brown to dark brown gills. Sp ellipsoid to obovoid-ellipsoid, finely to moderately and somewhat sharply verrucose, weakly to moderately dextrinoid; gill trama hyphae smooth to very finely incrustated. In deciduous and mixed forests, with *Betula*, *Corylus* and *Tilia*, often on rich to calcareous mull soil; late summer to autumn; rare in temp.-hemib.; DK (EN), FI (DD), NO (NT), SE (LC). – CFP C07.
C. urbicus (Fr.) Fr.
 Note: *C. chevassutii* Rob. Henry with a marginate bulb is reported as very rare from the Nordic countries, but the taxonomy and nomenclature need further studies. Compare with *C. niveotraganus* key G 9, which has bigger sp and *C. traganus*-like smell, and *C. alboviolaceus* key L 8, which has a indistinct smell, often bluish tints in frb and strongly dextrinoid sp.
- Sp > 5.5 μm wide, fairly strongly to strongly dextrinoid 7
- 7. Smell indistinct or pleasant, recalling flowers; flesh whitish brownish to pale greyish brown; exsiccates with pale greyish brown cap and stem, and dark gills see *C. aprinus* key F 8
- Smell indistinct; flesh whitish to whitish blue; exsiccates greyish white to pale greyish brown, with brown gills 8
- 8. With *Betula* and *Fagus*, possibly also *Tilia* and *Quercus*; at least young frb \pm with bluish colours; stem 50-120 x 5-10 mm, clavate. Cap 35-85 mm, hemispherical, then low convex to almost plane with a low and broad umbo, silky shiny, finely innately fibrillose, sometimes viscid-sticky when moist, pale silvery bluish grey to almost white, later ochraceous to greyish white; gills medium spaced, pale greyish brown with a bluish tint, later fairly vivid brown; stem silky whitish fibrillose, pale bluish white, later yellowish; universal veil whit-

ish, fairly thin, forming incomplete girdles on the stem; flesh whitish blue, later and towards base of the stem yellowish; smell indistinct; exsiccates very pale, greyish brown, often with vividly brown gills. Sp 8.5-10 x (5.5-)6-6.5 μm , ellipsoid, thick-walled, moderately verrucose (fig. 759D). In deciduous and mixed forests; summer to autumn; very common in hemib.-suba., common in temp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – CFP A59, Phil 189f, R&H 510, Sieniop 187, Ves 352, ⊙.

C. alboviolaceus (Pers.: Fr.) Fr.

- With *Fagus*; frb usually without bluish colours, but may have bluish tints at stem top; stem 40-90 x 10-20 mm, fleshy, clavate to bulbous, up to 35 mm broad at the base, often with pointed base. Cap 40-100 mm, hemispherical, then low convex to almost plane with a low and broad umbo, silvery silky shiny, finely innately fibrillose, sometimes viscid-sticky when moist, slightly hygrophanous, pale brownish grey, later with a more yellow centre; gills medium spaced, pale brownish white, later fairly vivid brown; stem silky whitish fibrillose; universal veil white, sparse; flesh whitish; smell indistinct or somewhat fruity in flesh; exsiccates greyish white to pale brownish grey, with brown gills. Sp (9-)9.5-10.5 x (5.5-)6-6.5 μm , slightly amygdaloid, thick-walled, moderately and densely verrucose (fig. 759E). In deciduous forests, also with *Quercus* and *Carpinus*, on bare soil or in leaf litter, often on calcareous soil; autumn; occasional in temp.; DK (LC), NO (VU), SE (VU). – CFP B58, GCI A179, M&J 84, Phil 193d, Ves 359.

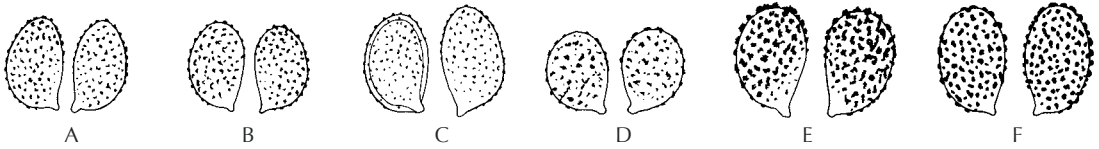
C. turgidus Fr.

- 9. With *Betula*; flesh light brown, without bluish tints, often darker at stem base 10
- Under coniferous trees; flesh whitish, greyish to brownish white, often with a bluish tint at stem top 11
- 10. Cap 15-40 mm, honey brown to red brown; stem 35-50 x 3-5 mm; sp 8-9 x 4.5-5 μm , narrowly amygdaloid, fairly finely verrucose see *C. leiocastaneus* key F 9
- Cap 30-80 mm vivid red brown; stem 30-100 x 6-13 mm; sp 8-9 x 4.7-5.3 μm , somewhat dacryoid to narrowly ellipsoid, strongly verrucose see *C. subbalaustinus* key F 12
- 11. Sp < 5 μm wide 12
- Sp > 5 μm wide 15
- 12. Sp mostly > 8.5 μm long see *C. dolabratus* key J 4
- Sp mostly < 8.5 μm long 13
- 13. Stem 50-120 x 7-13 mm, usually fleshy, at base up to 25 mm broad, only slightly longer than cap diam.; cap 35-80 mm; sp amygdaloid to ovoid, with a suprahilar depression; in mesic *Picea* forests, rarely with *Pinus*, often in younger plantations and even in wooded yards and at roadsides. Cap convex, soon low convex to almost plane, with a low umbo, somewhat shiny, sometimes viscid-sticky when moist, yellow brown to red brown, often with a purplish tint, strongly hygrophanous; gills crowded to medium spaced, pale greyish white, often with a bluish tint, later more vivid brown; stem clavate, silky whitish fibrillose, often with a bluish tint at the top; universal veil white, fairly sparse; flesh greyish white, usually bluish at stem top; smell indistinct; exsiccates with brownish cap and whitish stem. Sp 7.5-8.5 x 4.5-5 μm , fairly finely to moderately verrucose, more strongly at apex (fig. 759F), moderately to fairly strongly dextrinoid. Often on slightly rich soil; late summer to autumn; poorly known, but considered occasional in hemib.-bore., more frequent in the western parts; FI, NO, SE. – Soop 04:75.

C. carneinatus Soop (*C. privignoides* Rob. Henry s. Brandrud in Nord. Macr.)

Note: can macroscopically recall *C. armeniacus* (pt. 15) with bluish tints.

- Stem 50-140 x 5-12 mm, at base up to 15 mm broad, usually distinctly longer than cap diam.; cap 35-65 mm; sp ellipsoid to slightly ovoid; in dry, sandy *Pinus* heathland to mesic *Picea* forests 14



Spores: A: *Cortinarius biformis*, B: *C. melitosarx*, C: *C. armeniacus*, D: *C. renidens*, E: *C. minutalis*, F: *C. hinnuleoarmillatus*.

14. Cap fairly dark grey brown to yellow brown; top of stem often with bluish tints. Cap 35-65 mm, convex, soon low convex to plane, with a low umbo, \pm silky-silvery shiny fibrillose, with some white universal veil remnants in the margin, sometimes viscid-sticky when moist, strongly hygrophanous; gills crowded to medium spaced, pale greyish, then yellowish brown, sometimes initially with a bluish tint, later more brownish; stem cylindrical to slightly clavate, silky whitish fibrillose, often turning somewhat ochraceous brown with age; universal veil white, forming incomplete girdles on the stem; flesh greyish white, usually bluish at stem top; smell indistinct; exsiccates with fairly light, yellow-brown to greyish brown cap and whitish stem. Sp (7-)7.5-8 \times 4.5-5 μ m, fairly strongly verrucose (fig. 761A), moderately to fairly strongly dextrinoid. In dry to damp coniferous forests and plantations with *Pinus* and *Picea*; late summer to late autumn; very common in temp.-bore.; DK (LC), FI (LC), IS (Su: Fingvellir), NO, SE (LC). – CFP C05, C22, Svp 22:4, Ves 356.

C. biformis Fr.

- Cap yellow brown to red brown; top of stem without bluish tints. Cap 35-65 mm, convex, soon low convex to plane, somewhat shiny, strongly hygrophanous; gills crowded to medium spaced, pale yellowish, later more vivid brown; stem 50-140 \times 5-12 mm, cylindrical to clavate, silky whitish fibrillose, often turning somewhat ochraceous brown with age, sometimes stiff; universal veil white, forming incomplete girdles on the stem; flesh greyish to brownish white; smell indistinct; exsiccates with fairly light, yellow-brown to somewhat red-brown cap and whitish stem. Sp 7-7.5(-8) \times 4.3-4.8 μ m, moderately verrucose (fig. 761B), weakly to moderately, sometimes fairly strongly dextrinoid. In dry to mesic coniferous forests with *Pinus*, typically in sandy heath forests; late summer to autumn; poorly known, considered common in hemib.-bore., very rare in temp.; DK (NA), FI (LC), SE. – Soop 04:73.

C. melitosarx Soop

Note: *C. biformis* with yellow brown cap is difficult to distinguish from *C. melitosarx*.

15. Cap saturated apricot yellow to yellowish red brown; stem 50-120 \times 7-15 mm, clavate; flesh whitish, very rarely with a faint bluish tint at top of stem; sp often thick-walled, strongly dextrinoid. Cap 35-85 mm, convex, soon low convex to almost plane, with a low umbo, somewhat shiny, sometimes viscid-sticky, strongly hygrophanous; gills crowded to medium spaced, pale apricot yellow brown, later more brownish; stem silky whitish fibrillose; universal veil white, sparse; flesh marbled hygrophanous; smell indistinct; exsiccates with fairly light, yellow-brown to brown cap and whitish stem. Sp 8-9 \times 5-5.5 μ m, ellipsoid, fairly finely to moderately verrucose (fig. 761C). In coniferous forests with *Pinus* and *Picea*, typically in sandy *Pinus* heath forests; late summer to autumn; common in hemib.-bore., but very common in sandy heathland, rare in temp.; DK (vu), FI (LC), IS (Su: Fingvellir), NO (LC), SE (LC). – CFP A46, GCI C31, Nyl 465, R&H 519, Sieniop 189.

C. armeniacus (Schaeff.: Fr.) Fr.

- Cap red brown, grey brown to chocolate brown; stem 60-150 \times 5-15 mm, cylindrical or slightly clavate, sometimes tapering downwards; flesh with some brownish tints or distinctly bluish at top of stem; sp rarely thick-walled, weakly to strongly dextrinoid

16

16. Flesh whitish, distinctly violet in top of the stem; often in *Sphagnum*; sp 9-10.5 \times

- 5.2-5.7 μm see *C. tortuosus* key J 4
- Flesh brownish white, rarely faintly violet in top of the stem; usually not in *Sphagnum*; sp < 9.5 μm wide 17
17. Cap greyish brown to dark greyish brown; sp broadly ellipsoid, weakly to moderately dextrinoid; epicutis hyphae with numerous, circular, hyaline, refracting granules see *C. brunneifolius* key F 25
- Cap reddish brown to chocolate brown; sp fusiform, amygdaloid to slightly ellipsoid, weakly to strongly dextrinoid; epicutis hyphae without hyaline granules 18
18. Cap waxy-glossy, but often with white universal veil fibrils or patches near the margin; sp 8.5-9.5 x 4.5-5.5 μm , fusiform to amygdaloid, with a suprahilar depression; weakly to sometimes moderately dextrinoid see *C. dolabratus* key J 4
- Cap fairly mat, without veil patches or fibrils; sp 8-9(-9.5) x 5.3-5.7 μm , amygdaloid to slightly ellipsoid, fairly strongly to strongly dextrinoid see *C. testaceofolius* key F 24

Key M: Subgen. *Telamonia* sect. *Renidentes* Liimat. & Niskanen in press

TUULA NISKANEN & ILKKA KYTÖVUORI

Cap 20-50 mm, hemispherical, then low convex to almost plane, sometimes with a low umbo, orange brown to vivid red brown, strongly hygrophanous and fairly soon drying pale ochraceous brownish; gills medium spaced, pale yellowish brown; stem 25-70 x 3-7 mm, cylindrical, yellowish to ochre brown fibrillose; universal veil and cortina absent; flesh yellow brown to red brown; smell indistinct or slightly raphanoid; exsiccates with pale reddish brown cap and pale brown stem. Sp 6-7 x 5-5.5 μm , obovoid-subglobose, fairly coarsely verrucose, with wide and low warts (fig. 761D), moderately dextrinoid; gill trama hyphae very finely incrustated. In mesic *Picea* forests, sometimes also in *Pinus*-dominated forests or *Tilia-Corylus* forests, on rich soil; late summer to autumn; occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – CFP D53, GCI B131, M&J 123.

C. renidens Fr.

Note: compare with *C. gentilis* key E 1 which has distinct, yellow veil and larger sp.

Key N: Subgen. *Telamonia* sects *Hinnulei* Melot and *Safranopedes* Liimat., Kytöv. & Niskanen in press

TUULA NISKANEN & ILKKA KYTÖVUORI

Frb yellowish brown to ochre brown; cap smooth, often with blackening spots, strongly hygrophanous; universal veil white, rarely yellow or orange; smell usually strong, earthy or raphanoid; sp subglobose to ellipsoid, usually strongly verrucose; with deciduous trees. Five species in the key, but the real number of the species in the Nordic countries is much higher.

Suppl. lit.: Bidaud et al. 1997.

1. In suba.-arc./alp. with smaller and dwarfish *Salix* species; cap 10-25 mm. Cap hemispherical to conical, later low convex with a small and fairly acute umbo, saturated red brown to yellowish brown, often with blackening spots, hygrophanous; gills medium spaced to distant, pale yellowish brown, later cinnamon brown; stem 20-40 x 3-6 mm, cylindrical, often first silky whitish fibrillose, later yellowish brown, darker towards the base; universal veil white, often forming a sock-like sheath and a ring; flesh brown, darker towards stem base; smell indistinct or slightly earthy; exsiccates yellow brown to slightly greyish brown. Sp 8-9 x 5.5-6 μm , obovoid, fairly strongly verrucose (fig. 761E), moderately dextrinoid. Summer to early autumn; occasional in suba.-Arct; FI, NO (LC). – CFP D46.

C. minutalis Lamoure

Note: type material has not been studied, and the interpretation follows Brandrud et al. 1998.

- In temp.-bore. with *Betula*, *Corylus*, *Fagus*, *Carpinus* and *Quercus*; cap (25-)30-60 mm 2



Spores: A: *Cortinarius hinnuleus* s. lato, B: *C. roseonudipes*, C: *C. safranopes*, D: *C. helvelloides*, E: *C. sani-osus*, F: *C. aureovelatus*.

2. Universal veil orange red; gills \pm with violet tints. Cap 30-50(-60) mm, conical, later low convex with an umbo, with some orange-red universal veil remnants at the margin, orange to ochre brown, hygrophanous; gills distant, broad, ochre brown, later cinnamon brown, often retaining a violet tint; stem 60-100 \times 5-12 mm, cylindrical or slightly clavate, fibrillose, base somewhat rooting; universal veil fairly abundant, often forming rings on the stem; flesh ochre, darker towards the base; smell raphanoid or slightly earthy; exsiccates vividly yellow brown to brown, orange veil still visible on the stem, in some frb violet tints visible in the gills. Sp 9-10(-10.5) \times 5.5-6.5 μm , obovoid to weakly oblong-ellipsoid, somewhat thick-walled, moderately to strongly verrucose (fig. 761F), fairly strongly dextrinoid. In deciduous forests and parks with *Quercus*, on rich to calcareous soil, often on damp, mull soil; summer to late autumn; very rare in temp.-hemib.; FI (DD), SE. – AC Hors-serie 1:110, Jordst 25(3):12, Kar 46(1):2, Sienil 57(1):5.

C. hinnuleoarmillatus Reumaux

- Universal veil white or yellowish; gills without violet tints 3
3. Sp 7-8.5 \times 5-6.5 μm , subglobose to obovoid-subglobose, $Q < 1.5$ (fig. 763A). Cap 25-70 mm, hemispherical to conical, later low convex with an umbo, pale reddish to ochraceous brown, hygrophanous; gills distant, pale yellow to red brown, later cinnamon brown; stem 30-120 \times 5-12 mm, cylindrical, first whitish fibrillose, later yellowish brown, darker towards the base; universal veil white, forming a ring and incomplete girdles on the stem; flesh pale yellow brown, with age darker towards stem base; smell strong, earthy; exsiccates red brown. Sp strongly verrucose, fairly weakly to moderately dextrinoid. In mixed and deciduous forests and parks with *Quercus*, *Betula*, *Populus*, *Fagus*, *Corylus*, *Tilia* and *Carpinus*, on rich to calcareous soil, often on mull or clayey soil; late summer to late autumn; common in temp.-hemib., occasional in bore., less common in the north; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A19, GCI D107, Sieniop 203, Ves 354.

C. hinnuleus Fr. s. lato

- Sp $> 8.5 \mu\text{m}$ long, dacryoid to obovoid-ellipsoid, $Q > 1.5$ 4
4. Exsiccates yellow brown; sp narrowly obovoid to \pm dacryoid, fairly strongly and slightly spiny-verruucose (fig. 763B), weakly to moderately dextrinoid. Cap 25-60 mm, hemispherical to conical, later low convex with an umbo, yellowish brown, often with blackening spots, hygrophanous; gills distant, pale yellowish brown, later yellow brown; stem 40-120 \times 5-13 mm, cylindrical; universal veil white to possibly slightly yellowish, forming incomplete girdles on the stem; flesh pale yellowish brown, darker towards stem base; smell raphanoid. Sp 8.5-10 \times 5.5-6 μm . In deciduous and mixed forests and parks, at least with *Corylus*, on mull soil; late summer to autumn; poorly known, but considered occasional in temp.-hemib.; FI. – AC Hors-serie 1:110.

C. roseonudipes Rob. Henry & Moëne-Locc.

- Exsiccates greyish; sp obovoid-ellipsoid to \pm dacryoid, very strongly and coarsely verrucose (fig. 763C), moderately to strongly dextrinoid. Cap 25-60 mm, hemispherical to conical, later low convex with an umbo, yellowish brown, sometimes with an olivaceous or grey ochre brown tinge, often with blackening spots, hygrophanous, soon drying pale greyish ochre;

gills medium spaced to distant, pale yellowish brown, later yellow brown, with whitish edge; stem 40-110 x 5-13 mm, cylindrical, often with an up to 20 mm broad, bulbous or pointed base, first whitish fibrillose, later yellowish brown, darker towards the base; universal veil white, forming incomplete girdles on the stem; flesh honey yellow, darker towards the base of the stem; smell raphanoid. Sp (8.5-)9-10 x 5.5-6.5 μm , somewhat thick-walled. In deciduous forests and parks, under *Corylus*, *Fagus*, *Tilia* and *Quercus*, on rich to calcareous soil, often on bare mull soil; late summer to autumn; presumably rare in temp.-hemib., but often abundant; NO (vu), SE. – CFP C38 (as *conicus*).

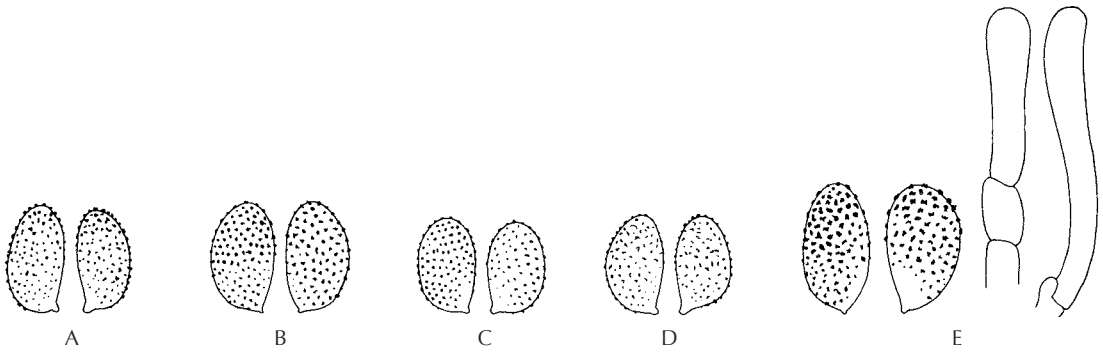
C. safranopes Rob. Henry (*C. conicus* (Velen.) Rob. Henry s. Brandrud et al. 1994)

Note: the name has been used very collectively in the Nordic countries.

Key O: Subgen. *Telamonia* sects *Incrustati* Melot, *Helvelloides* M.M. Moser, *Paleacei* Nespiak and *Saniosi* Moënné-Locc. & Reumaux

HÅKAN LINDSTRÖM

1. Veil distinctly golden yellow 2
- Veil not golden yellow 4
2. Cap finely scaly to fibrous from veil; gills remarkably distant, for a long time dark violet. Cap 5-30 mm, hemispherical to bell-shaped, then convex-expanded, often with a marked umbo, irregular, hygrophanous, dark brown with an olivaceous tinge, drying yellowish brown; gills somewhat decurrent, thick, later umber; stem 20-80 x 2-4 mm, cylindrical, often twisted and tapering downwards, yellow brown, dark brown downwards, often violet at top; universal veil abundant, sheathing the stem; flesh yellow brown, darker at base, often dark violet at top; smell indistinct. Sp 8-10 x 5-6.5 μm , broadly ellipsoid to somewhat obovoid, faintly to moderately verrucose (fig. 763D); veil hyphae incrustated, 5-15 μm wide. With *Alnus incana* and *A. glutinosa*, in moist, rich places; summer to autumn; locally common in temp.-bore.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K5 328, Bol Bres 39:95, CFP A17, Sieniop 202, Ves 363, ☉.
C. helvelloides (Fr.: Fr.) Fr.
- Cap almost smooth, somewhat glossy; gills not remarkably distant, seldom with a violet tinge 3
3. Cap 5-30 mm, yellowish brown; stem 1-5 mm broad; sp 8.5-10 x 5-6.5 μm , $Q < 1.8$, broadly ellipsoid, coarsely verrucose (fig. 763E). Cap bell-shaped to convex with a distinct umbo, somewhat glossy, often dark brown at centre, hygrophanous, sometimes blackening in spots, sometimes more chestnut, often darker at centre, drying light yellowish brown; gills medium spaced to distant, brownish yellow, seldom with a violet tinge; stem 10-50 mm long, cylindrical, rather stiff, glossy at top, light ochraceous, yellowish brown at base; universal veil usually distinct, forming bands; flesh yellow to yellowish brown, light in top of stem, seldom with a violet tinge, dark brown at base; smell indistinct. With deciduous trees and bushes such as *Betula*, *Tilia*, *Quercus*, *Populus* and *Salix*. In forests, thickets and alpine/arctic heathland; summer to autumn; common in temp.-arc./alp., in IS very rare or overlooked; DK (LC), FI (LC), IS, NO (LC), SE (LC). – CFP E01, E02, FAD 103C, R&H 492, Soop 05:87.
C. saniosus (Fr.: Fr.) Fr.
- Cap 40-70 mm, reddish brown; stem 4-9 mm; sp 7-9 x 3.5-4.5 μm , $Q > 1.8$, narrowly ellipsoid to cylindrical, finely verrucose (fig. 763F). Cap bell-shaped, expanded, sometimes with a low umbo, somewhat glossy, hygrophanous, sometimes blackening in spots, darker towards centre, drying orange to yellow brown; gills medium spaced to distant, yellowish brown; stem 20-70 mm long, cylindrical, rigid, pale greyish ochraceous at top, yellowish brown, darker at base; universal veil usually distinct, forming bands on the stem; flesh pale ochraceous to yellow brown, darker downwards in stem; smell indistinct. With *Pinus* and *Picea*, often on sandy soil, in suba. also with *Betula*, once recorded with *Fagus*; often early in



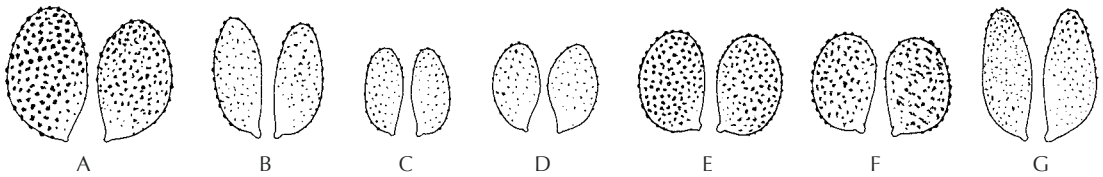
Spores and cheilocystidia: A: *Cortinarius helobius*, B: *C. comatus*, C: *C. angelesianus*, D: *C. psammocephalus*, E: *C. oreobius*.

season, summer to autumn; occasional in hemib.-suba.; FI (LC), NO (LC), SE. – CFP E03.

C. aureovelatus E. Bendiksen, K. Bendiksen & H. Lindstr.

4. Veil brownish or yellowish brown 5
- Veil white, ochraceous to yellowish 8
5. Cap not scaly. Cap 4-15 mm, bell-shaped, later expanded, often with small umbo, finely fibrillose, sometimes striate, hygrophanous, dark brown, blackening in spots, drying paler yellow brown; gills medium spaced to distant, pale yellowish brown; stem 20-50 x 1-4 mm, cylindrical, fibrillose, light yellowish brown, darker downwards; universal veil ochraceous-brownish; flesh dark yellow, brownish downwards in stem; smell indistinct. Sp 8-9.5 x 4-5 μm , ellipsoid, rather finely to moderately verrucose (fig. 765A); sterile cells clavate to globose. With *Picea* and *Pinus*, maybe also with deciduous trees, mostly on bare mineral soil at roadsides, often on rich soil; usually in early summer, sometimes later in the season; rare in temp.-bore., but occasional in DK; DK (LC), FI (DD), NO (LC), SE (LC). – CFP C43.
C. helobius Romagn.
- Cap finely scaly 6
6. Cap 5-15 mm; with *Salix*. Cap conical, convex with a \pm acute umbo, finely brownish scaly, later more smooth, hygrophanous, dark brown, drying yellow brown; gills medium spaced to distant, dark brown; stem 10-40 x 1-3 mm, cylindrical, yellowish brown, pale at top, darker downwards; universal veil in a brownish ring zone and finely scaly-floccose below; flesh dark brown, blackish at stem base; smell indistinct. Sp 9-11 x 5.5-6.5 μm , broadly ellipsoid, finely verrucose (fig. 765B). In shrubs in lowlands and dwarf shrubs in alpine areas; summer to early autumn; rare in bore.-arc./alp.; FI, FO, NO (LC), SE. – Fav 55:9.10, FND 32:39, M&J 48.
C. comatus J. Favre
- Cap 10-60 mm; not with *Salix* 7
7. With *Pinus* in sandy heathland or dry moraine and with *Picea* in moss rich *Vaccinium* forests. Cap 20-50 mm, bell-shaped, then convex to expanded, usually with a small, acute umbo, covered with yellow-brown scales, hygrophanous, dark brown to umber, drying yellow brown; gills medium spaced, dark brown; stem 40-90 x 2-6 mm, cylindrical to tapering downwards, fibrillose, ochraceous to pale yellowish brown, darker at base; universal veil abundant, yellowish brown to ochraceous; flesh yellowish brown to dull yellow, dark brown in stem base; smell faint. Sp 7-8.5 x 4.5-5.5 μm , broadly ellipsoid, moderately verrucose (fig. 765C). Autumn; common in hemib.-bore.; FI (LC), NO (LC), SE (LC). – B&K 5:292, CFP C33, Däh 801, GCI C23, M&J 42.
C. angelesianus A.H. Sm. (*C. strobilaceus* M.M. Moser)

- With deciduous trees, preferably *Quercus* on rich soil. Cap 10-30 mm, bell-shaped, then convex to expanded, usually with a small, \pm acute umbo, hygrophanous, covered with dark brown scales on a concolourous background, drying pale yellow brown; gills fairly distant, dark yellow brown; stem 30-60 x 2-7 mm, cylindrical, fibrillose, yellow brown, dark amber towards base; universal veil abundant, forming a ring zone and flocculose below, dark yellow brown; flesh dark yellow brown, blackish in base of stem; smell faint. Sp 7.5-8.5 x 4.5-5 μ m, moderately and fairly coarsely verrucose (fig. 765D). Late summer to autumn; occasional in temp., rare in hemib.; DK (LC), FI (DD), NO (EN), SE (LC). – CFP D57, FAD 99F, Sieniop 213.
C. psammocephalus (Bull.) Fr.
- 8. Cap 5-20 mm, light brown or vivid red or yellow brown; with dwarf *Salix* in arc./alp. heathland 9
 - Cap bigger or with dark brown colours; rarely with dwarf *Salix* in arc./alp. heathland 11
- 9. Gill edge sterile with abundant cheilocystidia (fig. 765E). Cap 8-20 mm, bell-shaped to convex, usually with a distinct umbo, fibrous at margin, hygrophanous, saturated reddish brown, darker at centre, drying more yellowish brown; gills distant, light reddish brown, edge often whitish; stem 10-30 x 1-3 mm, cylindrical, fibrillose, dark brown, paler upwards; universal veil sparse, whitish, flocculose to fibrillose; flesh dark reddish brown, paler at centre of stem; smell indistinct. Sp 9.5-11 x 5.5-6.5(-7) μ m, ellipsoid to broadly ellipsoid, finely verrucose. In alpine heathland; summer to early autumn; very rare but probably overlooked in arc./alp., known from NO (LC, Hord). – B&K 5:348, Fav 55:9.3, M&J 100.
C. oreobius J. Favre
 - Gill edge not sterile, sterile cells not abundant 10
- 10. Sp 8-9 x 5.5-6.5 μ m, ellipsoid, strongly verrucose; smell earthy or indistinct
see *C. minutalis* key N 1
 - Sp 10-11 x (5-)6-7 μ m, moderately verrucose (fig. 767A); smell sometimes like cedar wood. Cap 6-22 mm, bell-shaped to convex, sometimes with an indistinct umbo, smooth, glossy, hygrophanous, saturated reddish brown, drying pale brownish; gills medium spaced, dark ochraceous brown; stem 8-15 x 2-3 mm, cylindrical, reddish brown, downwards darkening; veil abundant, yellowish white, sock-like, loose, later fibrillose; flesh brown and blackening in stem base. In alpine heathland; summer to early autumn; rare but poorly known in sub-arc./alp.; NO (LC), SE (LC).
C. lamoureae Bon
- 11. Veil light ochraceous to yellowish white; frb relatively robust; stem on av > 5 mm broad, with deeply saturated colours in cap, gills and stem; pileipellis strongly incrustated; smell \pm like cedar wood 12
 - Veil whitish; frb relatively slender; stem on av < 5 mm broad; not with strong (yellow) brown pigments all over; pileipellis moderately incrustated; smell indistinct, *Pelargonium*-like or earthy 14
- 12. Sp 9-11 x 4-4.5 μ m (fig. 767B); cap dark reddish brown. Cap 20-40 mm, bell-shaped, convex, usually with a small acute umbo, somewhat floccose from yellowish veil, hygrophanous, drying ochraceous brown; gills medium spaced, dark yellowish brown, seldom with a violet tinge; stem 20-50 x 3-7 mm, cylindrical, downwards sometimes tapering, firm, yellowish brown, dark brown at base; veil ochraceous forming a ring zone; flesh yellowish brown; smell faint or weakly of cedar wood. Sp narrowly fusiform, finely verrucose. With *Pinus*, usually on dry, sandy soil; autumn; occasional in temp.-bore.; DK (LC), FI (DD), SE (LC). – Arnold 25, Ves 357.
C. fusisporus Kühner (*C. semivestitus* M.M. Moser)
 - Sp < 8 μ m long; cap yellowish brown 13



Spores: A: *Cortinarius lamoureae*, B: *C. fusisporus*, C: *C. lux-nymphae*, D: *C. andreae*, E: *C. flexipes* var. *flexipes*, F: *C. flexipes* var. *flabellus*, G: *C. violilamellatus*.

13. Cap yellowish scaly at margin; sp 6.5-8 x 3-3.5(-4) μm , $Q > 1.8$, narrowly fusiform, moderately verrucose (fig. 767C); usually in sandy *Pinus* forests, sometimes with *Picea*. Cap 20-50 mm conical, soon expanded, with inflected margin, often with a small umbo, hygrophanous, yellow brown to rust brown, drying more yellowish; gills medium spaced, yellowish brown, rarely violet tinged; stem 20-50 x 3-6 mm, cylindrical, firm, golden yellow to yellow brown, darker at base; veil whitish-ochraceous, forming a ring zone; flesh ochraceous to yellowish brown; smell none or weakly of cedar wood. Often on tracks or bare spots; summer to autumn; common in hemib.-bore.; FI (LC), NO (LC), SE (LC). – CFP C45, Sieniop 206.
C. lux-nymphae Melot
- Cap not scaly at margin; sp 6.5-7.5 x 4-4.5 μm , $Q < 1.8$, fusiform, finely verrucose (fig. 767D); usually with *Picea*. Cap 15-55 mm, bell-shaped, expanded, usually with a small umbo, faintly fibrous, hygrophanous, yellowish brown, drying golden yellow, sometimes with black spots; gills medium spaced, yellowish brown; stem 40-70 x 3-9 mm, cylindrical, rather stiff, light yellowish brown, downwards darker; flesh ochraceous to yellow brown; veil yellowish white, floccose; smell often distinct of cedar wood. On dry, rich soil; summer to autumn; occasional in hemib.-bore.; FI (LC), NO (LC), SE. – CFP E17.
C. andreae H. Lindstr.
14. Smell of *Pelargonium* 15
 - Smell indistinct or weakly of cedar wood 19
15. Cap 10-60 mm; stem 3-10 mm thick; sp broadly ellipsoid, $Q < 1.5$, \pm rounded at apex; smell strong and with an acid component 16
 - Cap 5-25 mm; stem 2-5 mm thick; sp ellipsoid to cylindrical, $Q > 1.5$, \pm pointed at apex; smell usually weak or with a rose-like component 17
16. Cap \pm acute, white scaly all over; stem top, gills and mycelial felt violet. Cap 10-40 mm, conical, then convex, usually with an acute umbo, dark greyish or violet brown; drying yellowish grey; gills crowded, dark violet; stem 40-100 x 3-7 mm, cylindrical, often tapering downwards, rigid, violet to greyish brown downwards; veil abundant, white, often forming a ring and floccose below; flesh dark violet brown to yellow brown. Sp 8-9(9.5) x 5-6 μm , coarsely verrucose (fig. 767E). With deciduous trees, e.g. *Fagus*, *Betula* and *Quercus*, and with conifers, preferably in moist and acid habitats, often fasciculate; late summer to autumn; very common in temp.-arc./alp., especially in oceanic areas, less common in northern continental areas; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – Arnold 22, B&K 5:323, CFP D43, Däh 820 (as *paleiferus*), Mar 793 (*C. paleifer*).
C. flexipes (Pers.: Fr.) Fr. var. *flexipes* (*C. paleiferus* Svrček)
- Cap variable, acute to expanded, white scaly at margin only; violet colours not striking. Cap 10-60 mm, bell-shaped to hemispherical, often with a low umbo; gills crowded, dark brownish, sometimes with a violet tinge; stem 40-100 x 3-10 mm, brown, upwards sometimes violet. Sp 7.5-8.5 x 5-6 μm (fig. 767F). In other characters like the main variety. With conifers and sometimes with deciduous trees, *Fagus* and *Betula*, often on moist and acid habitats, often fasciculate; late summer to autumn; very common in temp.-bore.; DK, FI (LC), IS, NO,

SE. – B&K 5:322, CFP D35, D45, Mar 794 (as *rigidus*), 792 (as *paleaceus*).

C. flexipes (Pers.: Fr.) Fr. var. *flabellus* (Fr.: Fr.) H. Lindstr. & Melot

17. Cap finely scaly all over; with *Pinus* in sandy habitats. Cap 7-25 mm, conical, bell-shaped to convex usually with an acute umbo, hygrophanous, dark brown, drying pale yellow brown; gills medium spaced, often violet, sometimes greyish; stem 15-50 x 2-5 mm, cylindrical, yellow brown, seldom with violet top; veil abundant, yellowish white, forming a ring or floccose; flesh greyish brown, darker at base. Sp 9.5-11(-12) x 4.5-5.5 μm , narrowly fusiform, with a suprahilar depression, finely verrucose (fig. 767G). Often fasciculate on bare spots; autumn; rare in hemib.-bore.; FI (LC), SE. – CFP D39.

C. violilamellatus P.D. Orton

- Cap usually fibrous (to finely scaly) at margin; in deciduous forests 18
18. Sp ellipsoid-fusiform, $Q < 1.7$ (fig. 769A); with *Betula*, *Quercus*, *Fagus*, *Salix*, etc. Cap 5-25 mm, bell-shaped, conical, convex, often with a \pm acute umbo, often striate at margin, hygrophanous, dark greyish brown to buff, drying greyish ochre; gills crowded, usually deep violet, then greyish brown; stem 30-60 x 2-4 mm, cylindrical, whitish fibrous, often violet at top, brownish from base; veil white, floccose to fibrous; flesh yellow brown to greyish brown, darker at stem base; smell often with a rose-like component. Sp 8-9(-9.5) x 4.5-5.5(-6) μm , finely to moderately verrucose. Usually on nutrient rich soil; summer to autumn; common in temp.-arc./alp.; DK (LC), FI, NO (LC), SE. – AC 43 (as *pelargoniobtusus*), B&K 5:316, CFP D47.

C. diasemospermus Lamoure var. *diasemospermus*

Note: a nomenclatural revision is needed,

- Sp narrowly fusiform, $Q > 1.7$ (fig. 769B); with *Salix* and *Tilia*. Smell often weak. Sp 8.5-10 x 4.5-5.5 μm , often with a suprahilar depression, finely verrucose. In other characters like the main variety. Under deciduous trees in forests, parks and with shrubs, usually on nutrient rich or moist soil; summer to autumn; occasional, but often locally abundant in temp.-arc./alp.; DK, NO, FI (LC), NO, SE. – Arnold 35 (*C. tiliaceus*), CFP D27, GCI D75.

C. diasemospermus Lamoure var. *leptospermus* H. Lindstr.

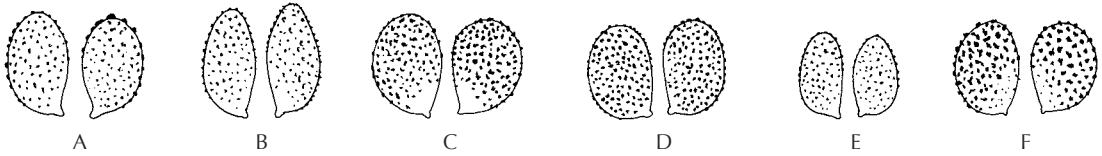
19. Cap \pm fibrous, not scaly 20
 - Cap finely scaly, at least at margin, best visible when dry 22
20. Gills saturated brown when young. Cap 10-35 mm, bell-shaped, expanded with a \pm acute papilla, smooth, striate at margin, hygrophanous, dark reddish brown, drying greyish ochre; gills medium spaced, cinnamon to yellowish brown; stem 40-80 x 2-5 mm, cylindrical, somewhat stiff, white fibrillose, reddish brown, darker downwards; veil white, forming bands and flocculose; flesh pale reddish brown; smell indistinct. Sp 8-9.5 x 5.5-6.5 μm , broadly ellipsoid, moderately verrucose (fig. 769C). With *Pinus* and *Picea*, often in *Sphagnum*; autumn; occasional in hemib.-bore.; FI, SE. – CFP E19, Fav 48:4.2-5.

C. striaepilus J. Favre

- Gills pale ochraceous when young 21
21. Sp 7.5-8.5 x 5-6 μm , broadly ellipsoid (fig. 769D); frb not remarkably stiff; cap fibrillose, dull. Cap 10-50 mm, bell-shaped, expanded, with a \pm acute umbo, finely fibrillose, hygrophanous, dull reddish brown to greyish yellow brown, drying pale greyish yellow, often blackening in spots; gills medium spaced, light ochraceous to yellowish brown; stem 50-100 x 2-6 mm, cylindrical, often tapering at base, greyish brown, often with a reddish tinge, darker at base; veil white, floccose or in bands; flesh reddish brown to yellow brown, downwards dark in stem; smell indistinct. Sp finely to moderately verrucose. With *Picea* and *Pinus*, often in *Sphagnum*; autumn; occasional in hemib.-bore.; FI (DD), NO (LC), SE (LC). – CFP D38.

C. flos-paludis Melot

- Sp 6.5-7.5 x 3.5-4 μm , narrowly ellipsoid (fig. 769E); frb stiff; cap not fibrillose, somewhat glossy. Cap 15-60 mm, globose to bell-shaped, expanded, sometimes with a small umbo,



Spores: A: *Cortinarius diasemospermus* var. *diasemospermus*, B: *C. diasemospermus* var. *leptospermus*, C: *C. striaepilus*, D: *C. flos-paludis*, E: *C. depressus*, F: *C. flexipes* var. *inolens*.

somewhat glossy, hygrophanous, dark reddish brown, sometimes almost black at centre, drying pale yellow brown; gills crowded to medium spaced, ochraceous to light yellowish; stem 20-90 x 3-8 mm, cylindrical to tapering at base, white fibrous, light reddish brown, often darker at base; veil white, floccose; flesh ochraceous to pale brownish yellow, darker downwards in stem; smell indistinct. Sp finely verrucose. With *Pinus* and *Picea* on nutrient poor soil, in dry to moist habitats; late summer to autumn; occasional, but locally common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP B18, GCI C11.

C. depressus Fr.

- 22. Sp broadly ellipsoid to subglobose, $Q < 1.6$, moderately to coarsely verrucose; stem stiff; gills rather dark when young 23
- Sp ellipsoid to narrowly ellipsoid, $Q > 1.6$; finely to moderately verrucose, stem not remarkably stiff; gills rather pale when young 24

- 23. Frb yellowish brown; sp broadly ellipsoid (fig. 769F); often with a marked band of veil on the stem contrasting the cortex. Cap 10-50 mm, yellow brown, drying pale yellow brownish; gills yellow brown; stem brownish yellow, rarely with violet tinge at top, darker at base; flesh yellow brown, darker downwards in stem; smell indistinct. Sp 8-9 x 5-6 μm , moderately verrucose. In other characters like the main variety. With *Picea* and *Pinus* in nutrient poor forests and with *Betula* in suba.; late summer to autumn; occasional, in some years common in hemib.-suba.; DK, FI (LC), NO, SE. – CFP D29.

C. flexipes (Pers.: Fr.) Fr. var. *inolens* H. Lindstr.

- Frb reddish brown; sp subglobose (fig. 770A); usually without a marked white band of veil on stem. Cap 15-50 mm, bell-shaped to convex with an acute umbo, finely white scaly, at least at margin, hygrophanous, dark red brown, drying pale greyish brown; gills medium spaced, ochraceous to greyish brown; stem 40-90 x 3-6 mm, cylindrical, at base often tapering, stiff, white fibrillose, from below light greyish brown to reddish brown; veil abundant, white forming a protruding ring or floccose; flesh pale greyish to ochraceous brown, darker downwards in stem; smell indistinct. Sp 6.5-7.5 x 5-6 μm , coarsely verrucose. With *Pinus* and *Picea*; autumn; occasional in temp.-bore.; FI (DD), NO (NE), SE (LC). – Arnold 17, CFP D58, GCI C75, M&J 51.

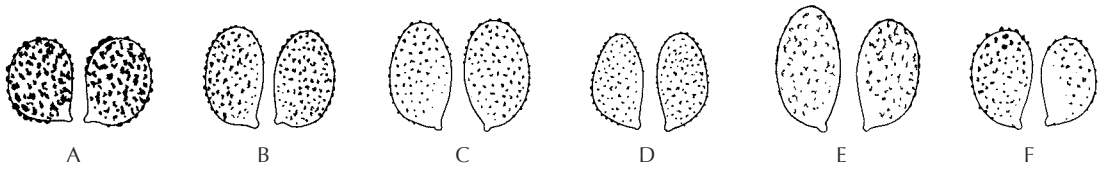
C. comptulus M.M. Moser

- 24. With conifers. Cap 15-30 mm, bell-shaped, convex to expanded, often with a small papilla, finely white scaly to fibrillose, hygrophanous, pale red brown, drying greyish ochre, often with blackish spots; gills crowded to medium spaced, ochraceous to greyish brown; stem 40-80 x 2-5 mm, cylindrical, fragile, white fibrillose, pale reddish to greyish brown, darker downwards; veil abundant, white, forming a ring and floccose below; flesh ochraceous to greyish brown; smell indistinct. Sp 7.5-9 x 4.5-5.5 μm , ellipsoid, finely verrucose (fig. 770B). Usually with *Picea*, in nutrient poor forests; autumn; locally common in hemib.-bore.; FI (LC), NO (NE), SE (LC). – CFP D40.

C. pilatii Svrček

- With deciduous trees and shrubs

25



Spores: A: *Cortinarius comptulus*, B: *C. pilatii*, C: *C. gossypinus*, D: *C. hemitrichus*, E: *C. lilacinopusillus*, F: *C. americanus*.

25. In *Salix* scrubs. Cap 4-20 mm, bell-shaped, expanded with a ± acute umbo, hygrophanous, densely covered with white scales or fibrils, light reddish to greyish brown, drying pale greyish ochre; gills medium spaced, dull yellow to yellow brown; stem 20-45 × 2-4 mm, cylindrical, white fibrous, light greyish brown, darker at base; veil abundant, woolly, white, forming a ring and floccose; flesh yellow brown, darker at stem base; smell indistinct. Sp (8-)8.5-9.5 × 5-5.5 μm, narrowly ellipsoid to somewhat amygdaloid, finely verrucose (fig. 770C). At shores and along streams in lowlands, often fasciculate; summer to autumn; rare in hemib.-bore.; FI, SE. – CFP E18.

C. gossypinus H. Lindstr.

- With *Betula*. Cap 10-40 mm, bell-shaped, expanded with a marked umbo, hygrophanous, with white scales and fibrils, greyish to blackish brown, drying ochraceous grey; gills medium spaced, ochraceous to pale greyish brown; stem 30-70 × 2-6 mm, cylindrical, white fibrous, pale greyish brown, darker downwards, rarely with a bluish tinge at the top; veil white, forming a ring zone and floccose; flesh ochraceous brown; smell indistinct. Sp 7-8.5 × 4-5 μm, narrowly amygdaloid to fusoid, moderately verrucose (fig. 770D). Usually in dry habitats, often fasciculate; autumn; common in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Arnold 11, C&D 1140, CFP A31, Däh 821, ☉.

C. hemitrichus (Pers.: Fr.) Fr.

Key P: Subgen. *Telamonia* sect. *Hydrocybe* (Fr.) Nezdobjm.

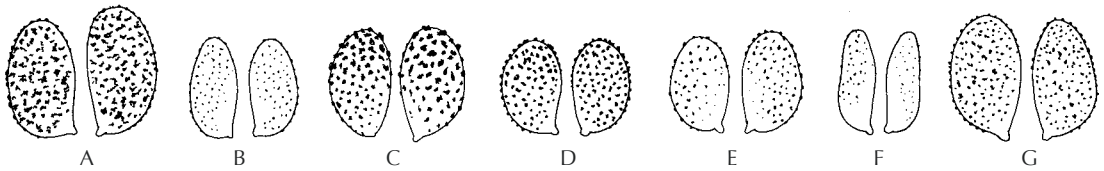
HÅKAN LINDSTRÖM

- | | | |
|----|--|---|
| 1. | Cap lilac, yellowish, buff, orange brown or brown, but not dark brown | 2 |
| - | Cap dark brown to almost black | 8 |
| 2. | Young frb lilac to deeply violet; cap on av < 10 mm; with <i>Alnus</i> | 3 |
| - | Young frb not lilac or deeply violet; cap on av > 10 mm; mostly with other symbionts | 4 |
| 3. | Sp 9-10(-10.5) × 5-6.5 μm (fig. 770E); cap persistently pale lilac or violet; gill trama hyaline. Cap 3-15 mm, bell-shaped to convex, with a small umbo, slightly fibrillose, hygrophanous, drying pale greyish; gills thick, medium spaced to distant, for a long time violet; stem 15-40 × 1-3 mm, with a weakly bulbous base, sometimes turning red; universal veil flocculose, whitish; flesh violet; smell faint. Sp finely to rather coarsely verrucose; ellipsoid. With <i>Alnus incana</i> or <i>A. glutinosa</i> , usually in swamp forests; summer to early autumn; occasional, but locally common in temp.-bore.; DK (LC), FI (LC), NO, SE (LC). – CFP B25 (as <i>bibulus</i>), OPN 6B, Ves 363 (as <i>pulchellus</i>). | |

C. lilacinopusillus P.D. Orton (*C. bibulus* Quél. s. auct.)

Note: *C. pulchellus* J.E. Lange is possibly the same, but the original description is ambiguous with sp described as 9 × 5 μm.

- Sp 7.5-8.5 × 4.5-5.5 μm (fig. 770F); cap dark violet, later blackish from centre, soon light brownish; gill trama incrustated. Cap 4-17 mm, bell-shaped to convex, with a small umbo, slightly fibrillose as young, hygrophanous, drying greyish; gills not especially thick, medium spaced to distant, soon ochraceous brown; stem 15-40 × 2-5 mm, weakly bulbous at



Spores: A: *Cortinarius casimiri*, B: *C. odhinnii*, C: *C. roseipes*, D: *C. parvannulatus*, E: *C. croceocingulatus*, F: *C. heterosporus*, G: *C. alnetorum*.

base, fibrous; universal veil flocculose, whitish; flesh dark brownish; smell faint. Sp ellipsoid, finely verrucose. With *Alnus incana* and *A. glutinosa*, in wet habitats in swamp forests; summer to early autumn; rare in temp.-bore.; DK (LC), FI, SE. – B&K 5:297.

C. americanus A.H. Sm.

4. Sp on av > 10 μm long (fig. 771A); smell faint or raphanoid. Cap 10-40 mm, bell-shaped to convex with a distinct umbo, often rugose, when young woolly-fibrous, often striate, hygrophanous, red brown to somewhat greyish brown, darker at centre, sometimes with blackish spots, drying more ochraceous; gills distant, light reddish brown; stem 30-70 x 2-5 mm, with a harder bulb at base, white fibrous, light brown, sometimes violet at top, turning red; universal veil woolly, white; flesh reddish brown to whitish; smell none or raphanoid. Sp 10-11.5 x 6-7 μm , broadly ellipsoid, coarsely verrucose; sterile cells clavate. Both with deciduous trees and conifers, on both acid and rich soil; autumn; very common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – Arnold 41, CFP D28, D32, M&H 4:124.

C. casimiri (Velen.) Huijsman (*C. subsertipes* Romagn.)

- Sp on av < 10 μm long; smell distinctly chemical-pungent, like *Lepiota aspera* or intensively cedar-like 5
 - 5. Frb stout; stem > 4 mm broad; universal veil not forming a collar; with *Pinus* in sandy habitats. Cap 30-60 mm, bell-shaped to convex, often with a small acute umbo, smooth and glossy, hygrophanous, vividly orange brown, drying light orange brown, with darker spots when old; gills broad, medium spaced, yellowish brown; stem 40-60 x 4-9 mm, sometimes tapering at base, rigid, yellowish white, later brass yellow; universal veil white to light yellowish, at first sock-like, later fibrous; flesh light yellowish; smell strong, pungent. Sp 7-9.5 (-10) x 4-4.5 μm , narrowly ellipsoid to amygdaloid, very finely verrucose (fig. 771B); sterile cells frequent. In dry, sandy heathland; autumn; occasional in hemib.-bore., more common to the north and east; FI (LC), NO (LC), SE (LC). – CFP B06.
- C. odhinnii* Melot
- Frb slender; stem < 4 mm broad; universal veil often forming a collar; usually with deciduous trees, bushes or herbs 6
 - 6. Flesh in stem reddening when cut; cap greyish brown; universal veil usually without a protruding collar. Cap 10-35 mm, bell-shaped to expanded with an acute umbo, hygrophanous, lighter yellow brown towards margin, drying ochraceous grey; gills medium spaced, yellowish brown. Stem 20-40 x 2-4 mm, grey or violet grey, fibrillose, often reddening at base; universal veil greyish-whitish; flesh greyish, after reddening becoming reddish brown; smell \pm distinct. Sp 8-10(-11) x 5.5-6.5(-7) μm , broadly ellipsoid, coarsely verrucose (fig. 771C); sterile cells clavate. Known with deciduous trees or *Helianthemum* on calcareous soil; autumn; very rare in hemib., but perhaps overlooked; SE (Öl). – AC 311, Soop 05:93.

C. roseipes (Velen.) G. Garnier

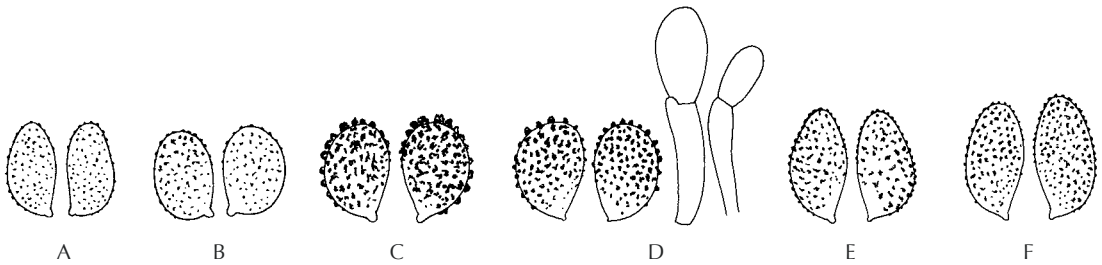
- Flesh in stem not reddening when cut; cap yellowish or orange brown; universal veil often forming a protruding collar on the stem 7

7. Universal veil white; cap smooth; sp rather strongly verrucose. Cap 8-30 mm, bell-shaped to convex with a ± acute umbo, sometimes striate, hygrophanous, vivid yellow to orange brown, sometimes with a greyish shade; gills distant, yellowish brown, seldom with violet tinge, drying pale yellow; stem 30-60 × 1-4 mm, light orange brown, often with a distinct universal veil forming a protruding collar, below flocculose; flesh pale orange brown; smell strong, pungent. Sp (7-)8-9 × 4.5-5.5 μm, ellipsoid to obovoid (fig. 771D), moderately to fairly strongly dextrinoid. With deciduous trees, *Salix* shrubs or dwarf *Salix*, seldom conifers; summer to autumn; common in temp.-arc. / alp.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A60.

C. parvannulatus Kühner (*C. cedriolens* M.M. Moser nom. inval.)

Note: a variable species.

- Universal veil ochre; cap fibrous; sp fairly finely verrucose. Cap 5-15 mm, bell-shaped to convex, often with a ± acute umbo, sometimes striate, hygrophanous, dull reddish brown to buff, drying ochre; gills distant, ochraceous brown; stem 20-60 × 1-3 mm, pale ochraceous brown, upwards often violet, with a distinct universal veil forming a protruding collar, below floccose; flesh ochraceous brown; smell strong, pungent. Sp 8-9.5 × 5-5.5 μm, ellipsoid (fig. 771E), fairly weakly dextrinoid. With *Salix* shrubs or dwarf *Salix*; summer to early autumn; rare in suba.-arc. / alp.; FI, NO, SE. – Arnold 18, Sieniop 211 (as *parvannulatus*).
C. croceocingulatus N. Arnold & E. Ludwig
8. Sp boletoid, $Q > 2$ (fig. 771F); cap innately fibrillose, especially at margin (*Inocybe*-like). Cap 10-40 mm, bell-shaped, soon expanded to depressed, with decurved margin and low umbo, mat, weakly hygrophanous, dark reddish brown to umber, blackish at centre, drying somewhat paler brown; gills crowded, ochraceous to yellow brown; stem 20-60 × 3-6 mm, sometimes with a small bulb, fibrous, pale greyish, seldom faintly violaceous at the top; universal veil greyish, sometimes reddening; flesh white-greyish with a rose tinge; smell indistinct. Sp 8.5-10(-10.5) × 2.5-3.5 μm, very finely verrucose. With *Pinus* in sandy heathland; autumn; occasional in hemib.-bore., rare in temp.; DK (NA), FI (LC), SE. – Arnold 27, Soop 05:96.
C. heterosporus Bres.
- Sp not fusiform, $Q < 2$; cap not innately fibrillose 9
9. With *Alnus*; universal veil abundant; flesh in stem almost black. Cap 10-40 mm, bell-shaped, convex, with long incurved margin, with an umbo, often very fibrous to felty, often floccose from universal veil at margin, hygrophanous, dark greyish brown, drying paler greyish; gills medium spaced to distant, greyish brown, seldom violet tinged; stem 25-70 × 2-5 mm, whitish fibrous, becoming dark grey; universal veil greyish white, forming thick girdles; flesh sometimes with a violet tinge; smell faint or like cedar wood. Sp 9-10.5 × 5-5.5 μm, narrowly ellipsoid, moderately verrucose (fig. 771G); sterile cells clavate. With *Alnus incana* and *A. glutinosa*, both in swamp forests and on dry soil; summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Arnold 2, B&K 5:291, CFP A32.
C. alnetorum (Velen.) M.M. Moser
- Not with *Alnus*; universal veil not remarkably abundant; flesh in stem usually pale 10
10. Gills whitish or greyish brown when young, often with a bluish tinge; smell indistinct; stem base or universal veil distinctly red or turning red when thumbed 11
- Gills yellowish brown; smell distinct or indistinct; stem base only sometimes turning faintly red 14
11. Young gills crowded and whitish, often with a bluish tinge; sp finely to moderately verrucose 12
- Young gills not remarkably crowded or pale, seldom bluish; sp strongly verrucose 13
12. Frb stout; stem 4-8 mm broad; universal veil usually white or slowly turning red; sp narrowly ellipsoid to cylindrical (to slightly fusiform), av $Q > 1.7$. Cap 20-50 mm, bell-shaped, soon expanded, sometimes with an umbo, glossy, hygrophanous, blackish to dark reddish



Spores and cheilocystidia: A: *Cortinarius erubescens*, B: *C. praestigiosus*, C: *C. vernus*, D: *C. inops*, E: *C. umbrinolens*, F: *C. carbunculus*.

brown, drying paler greyish brown; gills becoming greyish; stem 25-60 x 4-8 mm, firm, whitish fibrous, later greyish; reddening at base; universal veil thin, white, sometimes turning red; flesh in cap dark brown, in stem greyish white, slightly reddening when cut. Sp (7-)7.5-8.5 x 4-5 μm , almost smooth (fig. 773A); sterile cells scattered, clavate. With deciduous trees, e.g. *Betula*, *Fagus* and *Quercus*, and conifers, usually in dry habitats; autumn; occasional in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP D51.

C. erubescens M.M. Moser

- Frb slender; stem 2-4 mm broad; universal veil red or soon turning red; sp broadly ellipsoid, av Q < 1.7. Cap 8-40 mm, bell-shaped to convex, often with a small umbo, glossy, hygrophanous, dark reddish brown, at centre blackish, drying ochraceous grey; stem 30-60 mm long, whitish fibrous, later greyish, often bluish at the top; universal veil red or turning red; flesh dark brown in the cap, greyish white, with a purple tinge in the stem. Sp (7-)7.5-8.5 x 4.5-5.5 μm , finely to moderately verrucose (fig. 773B); sterile cells scattered, clavate to lageniform. With deciduous trees, e.g. *Salix caprea*, *Betula* and *Fagus*, often in moderately wet habitats; autumn; occasional in temp.-bore.; FI (LC), NO (LC), SE (LC). – CFP E04.

C. praestigiosus (Fr.) M.M. Moser

13. With deciduous trees or shrubs in lowland habitats; cap 10-40 mm; stem 2-5 mm broad. Cap bell-shaped to convex, later expanded, hygrophanous, dark brown to blackish brown, drying greyish brown; gills medium spaced, beige; stem 20-70 x 2-5 mm, light greyish, reddening from base; universal veil whitish, sometimes reddening; flesh greyish white; smell faint. Sp 7.5-8.5 x 5-6 μm , obovoid to subglobose, strongly verrucose (fig. 773C); sterile cells clavate to subglobose, abundant. With *Betula*, *Tilia*, *Quercus* and *Fagus*; spring and summer, but also in autumn; common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – ACI 2 (as *castaneus*), Arnold 20, CFP C51, M&J 74, Ves 363.

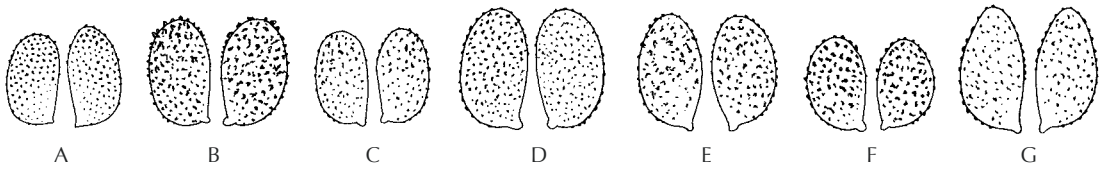
C. vernus H. Lindstr. & Melot (*C. erythrinus* Fr. s. auct.)

- With *Salix*, mainly in alpine habitats; cap 4-18 mm, stem 1-2(-3) mm broad. Cap bell-shaped to convex, sometimes with a small umbo; finely fibrillose, hygrophanous, blackish brown, drying dark brown; gills medium spaced, cinnamon; stem 10-30 x 1-2(3) mm, pale fibrillose, dark brown; universal veil scanty, whitish, fibrillose; flesh dark greyish, sometimes with a pink flush; smell faint. Sp 7.5-8.5 x (5-)5.5-6 μm , obovoid to subglobose, strongly verrucose (fig. 773D); sterile cells clavate, abundant. With dwarf *Salix* and in *Salix* shrubs; summer to early autumn; rare, but probably overlooked, in suba.-arc. / alp.; NO, SE. – B&K 5:337, Fav 55:10.1, M&J 82.

C. inops J. Favre

Note: near is also *C. pusillus* F.H. Møller, but sp less strongly verrucose and probably not a synonym.

14. Smell earthy like *C. himmuleus* or beet rot 15
 - Smell of cedar wood (*Juniperus virginianus*) or faint 16
15. With deciduous trees; cap dark brown; stem paler; smell strongly earthy; sp 8.5-9.5 x (4.5)-5.5 μm (fig. 773E). Cap 15-40 mm, bell-shaped to expanded, usually with low umbo, often rimose at margin, hygrophanous, drying more greyish; gills crowded to medium spaced, yellowish brown; stem 30-70 x 3-7 mm, white fibrous, then greyish brown, sometimes reddening at base; universal veil whitish; flesh greyish brown, turning faintly reddish at base. Sp ellipsoid to amygdaloid, moderately verrucose; sterile cells clavate. Usually with *Betula*, but also *Fagus*; autumn; common in temp.-southern bore., occasional in middle-northern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – CFP A08, Sieniop 220, Ves 362.
C. umbrinolens P.D. Orton
 - With *Picea*; cap and stem almost black; smell moderately strong, usually earthy; sp 9.5-10.5 x 5-6 μm (fig. 773F). Cap 8-40 mm, bell-shaped to convex-expanded, with a small umbo, hygrophanous, drying greyish brown; gills crowded (to medium spaced), dark brown; stem 25-40 x 3-5 mm, almost black; universal veil greyish-brownish; flesh blackish brown. Sp ellipsoid to amygdaloid, moderately verrucose; sterile cells clavate (to lageniform). In wet forests, often with tall herbs; late summer to autumn; rare in hemib.-bore.; FI, SE. – CFP E05.
C. carbunculus H. Lindstr. & H. Markl.
16. With conifers; smell faint see *C depressus* key P 21
 - With deciduous trees or shrubs; smell of cedar wood or faint 17
17. In alpine habitats; universal veil often forming a protruding ring; sp av Q > 1.8, narrowly ellipsoid to cylindrical, finely verrucose (fig. 775A). Cap 10-20 mm, bell-shaped to convex, with a small umbo, hygrophanous, at first fibrous to almost scaly from a whitish veil, blackish brown, paler at margin, drying dark reddish brown; gills medium spaced, yellowish brown; stem 10-25 x 1-3 mm, brown; universal veil white, universal veil at first sock-like, later flocculose below the ring; flesh blackish brown in cap, reddish brown in stem; smell faint. Sp 8-9(-10) x 4-5 μm . With *Salix* bushes and shrubs; summer; very rare but probably overlooked in suba.-arc./alp.; SE. – Fav 55:9.6.
C. albonigrellus J. Favre
 - Mainly in lowland habitats; universal veil not forming a protruding ring; sp ellipsoid to broadly ellipsoid, av Q < 1.8, moderately to coarsely verrucose 18
18. Cap 10-35 mm, bell-shaped to convex, universal veil remnants scanty, smell usually faint; sp (8-)8.5-10 x 5-6 μm (fig. 775B). Cap with a small umbo, hygrophanous, dark greyish brown, drying paler yellowish brown; gills medium spaced, dull yellow brown; stem 30-60 x 2-5 mm, white fibrous, yellowish grey to brown, sometimes violet upwards; universal veil greyish white, forming faint girdles; flesh greyish brown. Sp broadly ellipsoid to obovoid, fairly finely to moderately verrucose, strongest at apex. With deciduous trees and bushes, e.g. *Salix* and *Betula*, often on somewhat moist soil; late summer to autumn; occasional in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – AC 29, C&D 1142, CFP C02, FAD 103D, Ves 362.
C. decipiens (Pers.: Fr.) Fr. var. *decipiens*
 - Cap 20-60 mm, bell-shaped to expanded, universal veil remnants abundant, smell usually strong of cedar wood; sp 7-8.5 x 5-5.5 μm (fig. 775C). Cap sometimes with a small umbo, dark greyish to blackish brown; stem 40-90 x 2-6 mm; universal veil rendering the stem flocculose. Sp narrowly ellipsoid to ellipsoid, moderately verrucose. In other characters like the main variety. With *Betula*, *Populus*, *Quercus* and *Salix* bushes, often in young forests and in dry habitats; occasional, but locally common in temp.-suba.; DK (LC), FI (LC), NO, SE (LC). – B&K 5:314, CFP D44, FND 15:11a.
C. decipiens (Pers.: Fr.) Fr. var. *atrocoeruleus* (M.M. Moser) H. Lindstr.



Spores: A: *Cortinarius albonigrellus*, B: *C. decipiens* var. *decipiens*, C: *C. decipiens* var. *atrocoeruleus*, D: *C. colus*, E: *C. anthracinus*, F: *C. danicus*, G: *C. bayeri*.

Key Q: Subgen. *Telamonia* sect. *Anthracini* Melot

TUULA NISKANEN & ILKKA KYTÖVUORI

Cap 10-40 mm, red brown to dark purplish brown, hygrophanous; universal veil orange or red; with anthrachinonic pigments. Three species in the key, but in addition at least one nameless species occurs in the Nordic countries.

1. Universal veil very distinct, vividly orange red, often as a continuous coating on the basal part of the stem. Cap 10-30 mm, conical to hemispherical, later low convex, sometimes with a low umbo, red brown, hygrophanous; gills medium spaced, yellowish brown, later cinnamon brown; stem 40-70 × 2-5 mm, cylindrical to slightly clavate, whitish silky-fibrillose, later pale yellowish brown; flesh pale ochraceous brown; smell indistinct; exsiccates with brown cap, usually lower half of the stem orange red. Sp 9-10(-10.5) × 5.5-6.5 μm, ellipsoid, weakly to moderately verrucose, more strongly at apex (fig. 775D), moderately dextrinoid; gill trama hyphae distinctly zebra-striate incrustated. In mesic *Picea* forests, but also in dry *Pinus* forests; late summer to autumn; rare in hemib.-coniferous suba.; DK (RE), FI (LC), NO (LC), SE (LC). – CFP A55.

C. colus Fr.

Note: the name has been used collectively in the Nordic countries.

- Universal veil fairly sparse, fibrillose, orange or blood red 2
 - 2. Universal veil orange; cap purplish brown to black; sp 8-10 × 5-6 μm (fig. 775E). Cap 10-30 mm, conical when young, soon almost plane with an often acute umbo, hygrophanous; gills medium spaced, yellowish brown, later cinnamon brown; stem 30-55 × 3-5 mm, cylindrical, silky-fibrillose, pale purplish; flesh pale purplish, often with a lilac tint; smell indistinct; exsiccates with greyish-blackish cap, purplish-blackish stem and cinnamon-brown gills. Sp ellipsoid to slightly amygdaloid, finely to moderately verrucose, weakly to moderately dextrinoid; gill trama hyphae finely to distinctly zebra-striate incrustated; basidia and sp sometimes with turquoise crystals; pileipellis with strongly purple subpellis. In mesic coniferous or deciduous forests with *Picea*, *Corylus*, *Fagus*, *Betula*, *Quercus* or *Tilia*, often on rich soil; late summer to autumn; occasional in hemib., rare in temp. and bore., more rare towards the north; DK (LC), FI (LC), NO (LC), SE (LC). – CFP C03, GCI D15, R&H 487, Nyl 477, Ves 363.
- #### *C. anthracinus* (Fr.: Fr.) Fr.
- Universal veil blood red; cap dull red brown; sp 7.5-8.5 × 5-5.5 μm (fig. 775F). Cap 20-45 mm, conical, later low convex, often with an umbo, hygrophanous; gills medium spaced, brownish with a purplish tint; stem 30-55 × 3-5 mm, cylindrical, silky-fibrillose, rose to greyish rose, sometimes with a lilac tint at the top; flesh pale red brown; smell slightly raphanoid; exsiccates with a fairly dark brownish cap, vinaceous-blackish stem and cinnamon-brown gills. Sp ellipsoid to slightly amygdaloid, fairly strongly verrucose, weakly dextrinoid; gill trama hyphae finely zebra-striate incrustated. In deciduous forests with *Fagus* or *Quercus*; late summer to autumn; rare in temp.; DK (NT), SE.

C. danicus Høil.

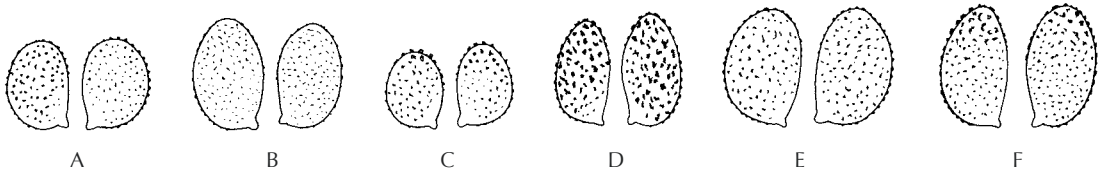
Note: type material has not been studied.

Key R: Subgen. *Telamonia* sects *Fulvescentes* Melot and *Laeti* Melot

TUULA NISKANEN & ILKKA KYTÖVUORI

Cap 10-65 mm, mat, often thin, hygrophanous, with warm red brown, vinaceous red to ochraceous brown, rarely olive-brown colours; stem silky-shiny fibrillose; universal veil yellowish, ochraceous, pinkish or vinaceous, sometimes very indistinct; flesh ± yellowish brown, not dark, nor darkening towards stem base. Seven species in the key, but the real number of the Nordic species is much higher.

1. Universal veil ochraceous or yellow 2
- Universal veil pinkish to vinaceous 4
2. In dry *Pinus* heath forests on sandy soil; cap 10-25 mm, with small, ochraceous scales. Cap conical to hemispherical, later low convex with an umbo, mat, yellow brown to dark red brown, hygrophanous; gills medium spaced, pale yellowish brown, with age yellow brown; stem 30-55 × 2-5 mm, cylindrical, whitish silky-fibrillose; universal veil yellow ochraceous, forming complete and incomplete girdles on stem; flesh yellowish brown; smell indistinct; exsiccates with a red-brown to dark brown cap and pale greyish yellow stem. Sp 9.5-11 × 5-6 μm, narrowly amygdaloid, with a suprahilar depression, moderately verrucose (fig. 775G), weakly dextrinoid. Late summer to late autumn; occasional in hemib.-bore.; FI (LC), SE. – Soop 04:91.
C. bayeri (Velen.) Moëgne-Loec. & Reumaux s. lato
Note: type material has not been studied, and the interpretation follows Lindström & Soop.
- In mesic *Picea* forests; cap 20-65 mm, ± smooth 3
3. Cap pale greyish yellow brown, sometimes with olivaceous brown tints; universal veil ochraceous yellow; sp subglobose (fig. 777A). Cap 35-65 mm, conical to hemispherical, later low convex with an umbo, mat, hygrophanous; gills medium spaced, pale yellowish brown, with age yellow brown; stem 50-130 × 5-11 mm, cylindrical to somewhat clavate, whitish silky-fibrillose; universal veil forming complete and incomplete girdles on stem; flesh yellowish brown to yellowish grey; smell indistinct; exsiccates with a pale greyish yellow-brown cap and pale greyish brown stem. Sp 7.5-8 × 5.5-6 μm, subglobose to broadly ovoid, moderately verrucose, weakly to moderately dextrinoid. In coniferous forests with *Picea*; late summer to autumn; common in bore., occasional in hemib., less common in western parts; FI (LC), NO (LC), SE (LC). – CFP C49, R&H 511.
C. ochrophyllus Fr.
- Cap vivid yellowish brown; universal veil yellow to ochraceous yellow; sp ellipsoid to slightly amygdaloid (fig. 777B). Cap 20-50 mm, conical to hemispherical, later low convex with an umbo, mat, narrowly pellucid-striate, hygrophanous; gills medium spaced, pale yellowish brown, later cinnamon brown; stem 40-110 × 3-9 mm, cylindrical, whitish silky-fibrillose; universal veil fairly distinct, forming complete and incomplete girdles on stem; flesh yellowish brown; smell indistinct; exsiccates with a pale brown cap and pale yellowish brown stem. Sp 9-10 × 5.5-6(-6.5) μm, low verrucose to almost smooth, moderately to strongly dextrinoid. In mesic coniferous forests with *Picea*; late summer to autumn; rare in hemib.-bore.; FI (DD), NO (LC), SE (NE). – CFP C12.
C. detonsus (Fr.: Fr.) Fr.
4. Universal veil vinaceous red to red brown, often distinct; stem 6-11 mm broad; sp 6.5-7.5 × 5-5.5 μm, ovoid-subglobose (fig. 777C). Cap 35-60 mm, conical to hemispherical, later low convex with an umbo, mat, vinaceous red brown, darkest at the centre, hygrophanous; gills medium spaced, pale yellowish brown, with age vividly yellowish brown; stem 50-110 mm long, cylindrical, whitish silky-fibrillose; universal veil forming many thin patches or incomplete girdles on stem, sometimes sparse; flesh yellow brown; smell indistinct; exsiccates with a fairly dark brown cap and pale greyish stem. Sp moderately verrucose, moderately dextrinoid. In mesic coniferous forests with *Picea*, in western NO also in mixed *Pinus-Betula*



Spores: A: *Cortinarius ochrophyllus*, B: *C. detonsus*, C: *C. badiovinaceus*, D: *C. fulvescens*, E: *C. bulliardoides*, F: *C. subfloccopus*.

forests, often solitary; late summer to autumn; occasional in hemib.-bore.; FI (LC), NO (LC), SE (NT). – AC 7:154, M&J 44.

C. badiovinaceus M.M. Moser

- Universal veil vinaceous red to pale pinkish, distinct or indistinct; stem 3-9 mm broad; sp > 7.5 μm long 5
- 5. With *Betula*; sp 7.5-8.5 \times 5-5.7 μm , obovoid see *C. heterocyclus* key C 2
- With coniferous trees; sp > 8 μm long, ovoid, amygdaloid or ellipsoid 6
- 6. Sp < 5.5 μm broad. Cap 25-50 mm, conical to hemispherical, later low convex with an umbo, mat, narrowly pellucid-striate, red brown to vinaceous red brown, hygrophanous; gills medium spaced, pale yellowish brown, later cinnamon brown; stem 50-120 \times 3-9 mm, cylindrical, whitish silky-fibrillose; universal veil pale pinkish, hazy, forming incomplete girdles on stem; flesh yellowish brown; smell indistinct; exsiccates with a brown to fairly dark brown cap and pale greyish stem. Sp 8.5-9.5 \times 4.8-5.2 μm , narrowly amygdaloid, moderately verrucose (fig. 777D), weakly to moderately dextrinoid. In mesic coniferous forests with *Picea*; late summer to late autumn; common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Nyl 476.

C. fulvescens Fr.

Note: the name has been used collectively in the Nordic countries, including most of the pinkish to vinaceous red veiled species. The name is here used for the common species with fairly big and amygdaloid sp.

- Sp > 5.5 μm broad 7
- 7. Sp 8.5-10.5 \times 6-7 μm , broadly ovoid (fig. 777E). Cap 35-60 mm, conical to hemispherical, later low convex with an umbo, mat, red brown to vinaceous red brown, hygrophanous; gills medium spaced, pale yellowish brown, later yellowish to cinnamon brown; stem 60-120 \times 4-9 mm, cylindrical, whitish silky-fibrillose; universal veil pale pinkish, forming incomplete girdles on stem; flesh honey brown; smell indistinct; exsiccates with brown cap and pale greyish stem. Sp finely, evenly verrucose, strongly dextrinoid; gill trama hyphae strongly incrustated. In mesic coniferous forests with *Picea*; late summer to autumn; occasional in hemib.-bore.; FI, NO, SE. – AC 7:149.

C. bulliardoides Rob. Henry

- Sp 9-10.5 \times 5.5-6.5 μm , slightly amygdaloid to ellipsoid (fig. 777F). Universal veil fairly distinct, vinaceous red; often in *Sphagnum*. Cap 15-40 mm, conical to hemispherical, later low convex with an umbo, mat, translucently striate up to halfway, red brown to vinaceous red brown, hygrophanous; gills medium spaced, pale yellowish brown, later cinnamon brown; stem 50-110 \times 3-7 mm, cylindrical, whitish silky-fibrillose; universal veil forming many thin patches and incomplete girdles on stem; flesh yellowish brown; smell indistinct; exsiccates with a brown to fairly dark brown cap and pale greyish stem. Sp fairly finely verrucose, more strongly at apex, moderately dextrinoid. In mesic to damp coniferous forests with *Picea*; late summer to autumn; occasional in hemib.-bore., but overlooked; FI (LC), NO, SE. – AC 7:148 (as *floccopus* var. *gracilis*), Kar 48, M&J 79 (as *fasciatus*).

C. subfloccopus Kytöv., Niskanen & Liimat. in press (*C. floccopus* Bidaud var. *gracilis* Bidaud & Fillion, *C. fasciatus* s. Kytövuori et al. 2005)

Cotylidia P. Karst.

JAN VESTERHOLT

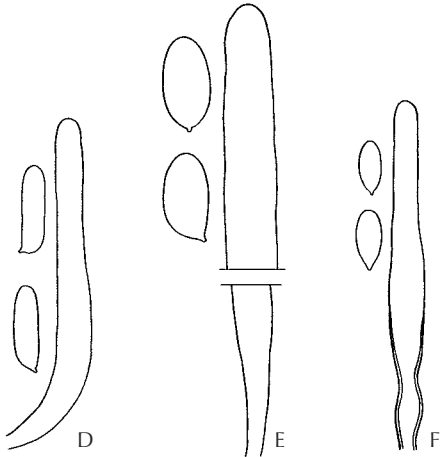
Frb omphalinoid, stereoid or corticioid, membranous, with ± smooth hymenophore. Hymenophore smooth or slightly veined, minutely pubescent. Stem central, eccentric or absent.

Sp ellipsoid to cylindrical, smooth, thin-walled, without iodine reactions. Basidia 4-spored. Pseudocystidia strongly projecting, cylindrical, smooth, thin-walled. Hyphae thin-walled, cylindrical. Pileipellis a cutis. Clamps absent.

On mosses or seemingly on soil, possibly always associated with mosses.

Three species in the Nordic countries.

Lit.: Eriksson & Ryvarden 1975, Reid 1965.



Spores and pseudocystidia. D: *Cotylidia muscigena*, E: *C. pannosa*, F: *C. undulata*

1. On mosses; sp cylindrical, $Q > 2.5$ (fig. 67D). Frb up to 20 mm high and 10 mm broad, half funnel-shaped, at base contracted into a short, lateral stem; upper side pruinose-hairy, slightly zonate, whitish to pale ochraceous, ± translucent; hymenium whitish, pruinose from the pseudocystidia; stem short, c. 1 mm, whitish, hairy. Sp 6-8.5 × 2-2.5 μm, sometimes agglutinating in pairs or tetrads; pseudocystidia up to 120 × 5-9 μm, projecting, almost cylindrical. On *Bryum* or other mosses; very rare and only known from a few records in DK (EJyll: Grenå Plantage), FI (PP), NO (NE, Troms) and SE (Upl). – ⊙.
C. muscigena L. Remy (*Cotylidia* sp. in *Cortic. of N. Europe* vol. 3:305)
- On soil, often among mosses; sp narrowly ellipsoid to ellipsoid, $Q < 2.5$ 2
2. Frb 30-50 mm, ± rosette-like, ± leathery-tough, without a distinct stem. Upper side radially fibrose, whitish to yellowish or yellowish brown; hymenium irregularly veined, coloured like upper surface, pruinose from the pseudocystidia; base whitish tomentose. Sp 7-9 × 3.5-4 μm, ellipsoid (fig. 67E); pseudocystidia up to 150 × 10-12 μm, projecting, cylindrical with rounded apex. On soil in deciduous forests; very rare in hemib.; in DK not recorded since 1863; DK (RE), FI, SE (DD). – B&K 2:184, GBW 1:186, ⊙.
C. pannosa (Sowerby: Fr.) D.A. Reid (*Thelephora* p. Sowerby: Fr.)
- Cap 5-15 mm, funnel-shaped, very thin and soft; frb mostly with a distinct stem. Cap often with dentate margin; upper side radially fibrillose, pale buff to brownish; hymenium smooth or slightly veined, coloured like upper side; stem up to 10 × 1-2 mm, cylindrical, pruinose, buff to brownish. Sp 4-5 × 2-2.5 μm, narrowly ellipsoid (fig. 67F); pseudocystidia up to 70 × 5-10 μm, ± cylindrical, slightly thick-walled downwards, projecting. On dry soil among mosses (*Polytrichum*, *Dicranum*, *Mniacea*), also on burnt ground; autumn to winter; very rare in temp.-bore.; a few records from DK (DD), NO (NE) and SE (LC), in FI north to Ks. – B&K 2:185, R&H 137, Svp 27:14, ⊙.
C. undulata (Fr.: Fr.) P. Karst. (*Thelephora* u. Fr.: Fr.)

Crepidotus (Fr.) P. Kumm.

BEATRICE SENN-IRLET

Frb with reduced, lateral stem, pleurotoid. Cap 2-80 mm, ± kidney-shaped seen from above, often hoof-shaped when young, fibrillose, tomentose, scaly or ± glabrous, dry, white or coloured, in some species hygrophanous. Gills radiating from a lateral to strongly eccentric point of attachment, with a fimbriate edge, whitish, becoming light buff, light ochraceous buff, tawny to cinnamon, more rarely yellow or pink. Stem only visible in young frb, short, tomentose, whitish. Veil absent. Flesh pale, in some species with a distinct gelatinous layer. Smell and taste indistinct. Sp deposit brown, clay-coloured, snuff brown or cinnamon.

Sp globose, ovoid, ellipsoid, cylindrical to fusiform, sometimes slightly amygdaloid, smooth to rugose or verrucose or finely spiny, pale brown, buff to almost hyaline, with or without loosening perispore, without iodine reactions. Cheilocystidia present. Pleurocystidia absent. Trama subregular. Pileipellis a cutis or a trichodermal cutis. Clamps present or absent.

Saprotrophic on wood, mostly deciduous wood, on plant remnants or on soil.

12 species in Nordic countries, 15 species in the key. Microscopical examination, especially of the spores and cheilocystidia is necessary for identification of most species.

Lit.: Delivorias & Gounou-Zagou 2006, Orton 1960, Pilát 1948, Pouzar 2005, Senn-Irlet 1995a.

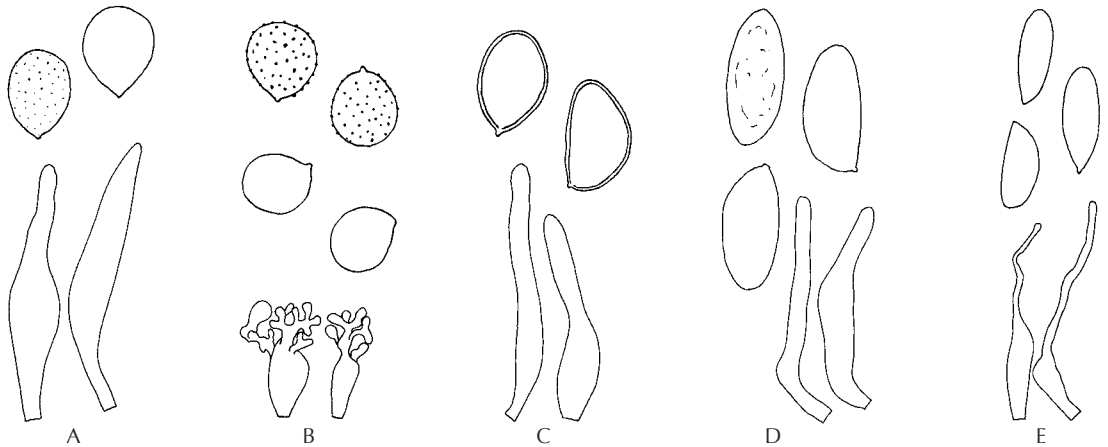


Fig. 865. Spores and cheilocystidia: A: *Crepidotus cinnabarinus*, B: *C. roseoornatus*, C: *C. mollis* var. *calolepis*, D: *C. versutus*, E: *C. epibryus*.

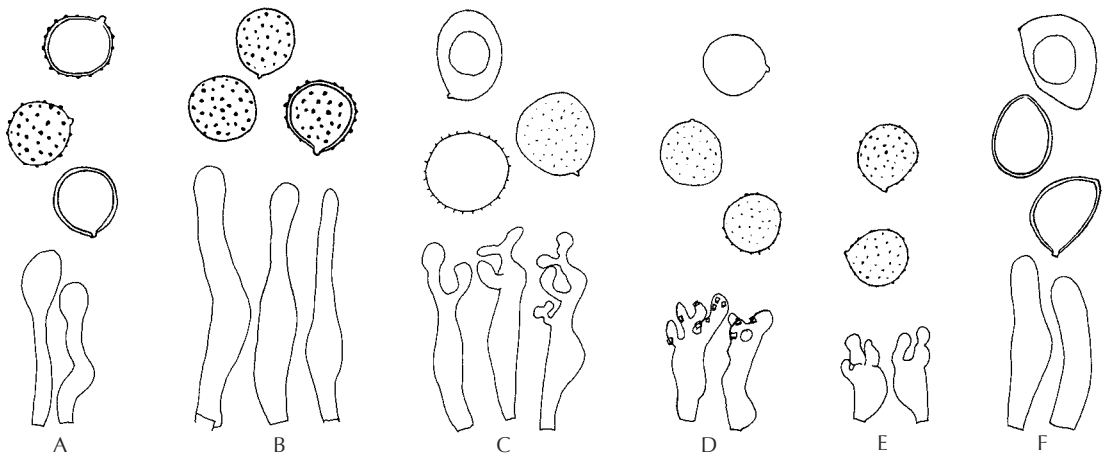


Fig. 866. Spores and cheilocystidia: A: *Crepidotus applanatus*, B: *C. stenocystis*, C: *C. cesatii*, D: *C. cristatus*, E: *C. carpaticus*, F: *C. autochthonus*.

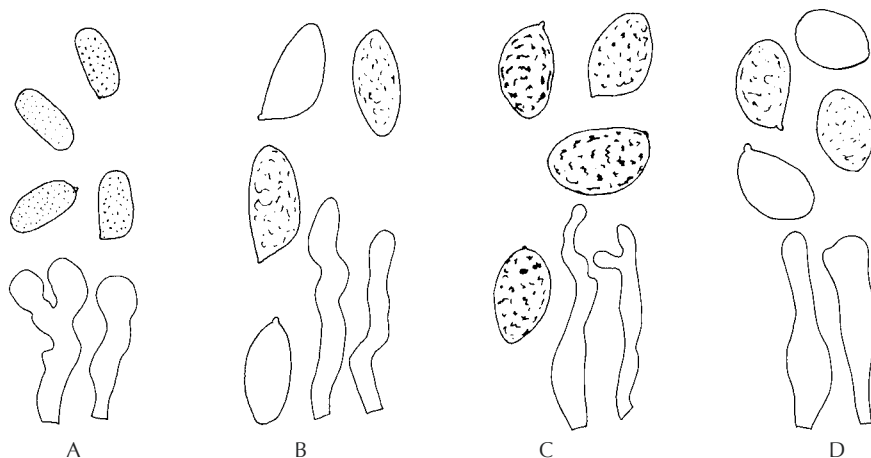


Fig. 867. Spores and cheilocystidia: A: *Crepidotus variabilis*, B: *C. luteolus*, C: *C. subverrucisporus*, D: *C. lundelli*.

1. Cap red or pink 2
 - Cap white, yellow or brown 3
2. Without clamps; cheilocystidia conical to narrowly utriform (fig. 865A). Cap 10-25 mm, felty-tomentose, cinnabar to scarlet; gills pale brown to tawny, with a distinctly fimbriate, scarlet edge. Sp 6-8 x 5-6.5 μm , globose to broadly ellipsoid, Q = 1-1.3, verruculose; cheilocystidia 60-75 x 8-11 μm , with reddish pigment soluble in KOH. On wood of deciduous trees, i.e. *Tilia*, *Fraxinus*, *Malus* and *Fagus*; autumn; very rare in temp.-hemib.; DK (EN), NO (EN, Hord: Kvam), SE (VU). – Lud 16.4, Svp 11:30, .

C. cinnabarinus Peck

 - With clamps; cheilocystidia cylindrical, branched, with finger-like protuberances (fig. 865B). Cap 4-8 mm, tomentose, pale red, pastel red; gills pink. Sp 6-8 x 4.5-6 μm , ellipsoid, Q = 1.2-1.5, verruculose; cheilocystidia 20-38 x 6-12 μm . On wood of deciduous trees; autumn. LV. – Lud 16.8, M&J 4.

C. roseornatus Pöder & Ferrari
3. Cap with a gelatinous layer in the upper part of the flesh, making the frb elastic, whitish, ochraceous or brownish. Cap 3-80 mm, glabrous or with scattered innate fibrils; gills pale, then dirty brown. Sp 7-10 x 5-6.5 μm , ellipsoid, Q = 1.3-1.7, smooth, thick-walled, strongly coloured; cheilocystidia 22-55 x 4-10 μm , narrowly utriform, lageniform or cylindrical; trama short-celled and multi-branched, in the gelatinous layer with filiform hyphae; clamps absent. On coarse, standing or lying wood of deciduous trees, sometimes in cracks of living trees; all year; common in temp.-hemib., occasional in southern-middle bore.; DK (LC), FI, NO (LC), SE (LC). – B&K 5:390, Lud 16.1, Phil 269g, R&H 467, Ves 385, .

C. mollis (Schaeff.: Fr.) Staude var. *mollis*
 var. *calolepis* (Fr.) Pilát (*C. calolepis* (Fr.) P. Karst.) differs in having a cap with dense, minute rusty-brown scales; sp (fig. 865C); mainly on *Populus*; common in hemib.-bore., occasional in temp.; DK, FI (LC), NO, SE. – Lud 16.2, R&H 468, Sieniop 284.

 - Cap without a gelatinous layer, white, cream, yellow, ochraceous; frb often brittle 4
4. Clamps absent; sp almost smooth 5
 - Clamps present; sp smooth or faintly to distinctly ornamented 6
5. Sp ellipsoid, Q = 1.6-2.1 (fig. 865D); cheilocystidia not branched. Cap 5-25 mm, felty-tomentose, white; gills clay white, becoming cinnamon buff. Sp 8.5-12 x 5-6.5 μm , almost smooth,

faintly coloured; cheilocystidia 25-75 x 5-9 μm , cylindrical, flexuous. On wood of deciduous trees, mainly *Betula* and *Alnus*, also spreading to plant debris and naked soil; autumn; common in hemib.-bore., rare in temp. and suba.; DK (DD), FI (LC), IS, NO (LC), SE (LC). – GBW 4:438, Sieniop 285.

C. versutus (Peck) Sacc. (*C. pubescens* Bres.)

- Sp fusiform, pip-shaped, $Q = 2.1-3.2$ (fig. 865E); cheilocystidia in part branched. Cap 2-20 mm, felty-tomentose, white, gills white to pale ochraceous. Sp 6.5-9.5 x 2.5-3.5 μm , thin-walled, weakly coloured, often only seen in sp deposits; cheilocystidia 30-55 x 4-7 μm , narrowly lageniform, whip-like. On plant debris, twigs and decaying deciduous wood; summer to winter; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:387, Lud 16.10, M&J 5.

C. epibryus (Fr.: Fr.) Quél. (*C. hypnophilus* (Pers.) Norstein, *C. herbarum* (Peck) Sacc.)

- | | | |
|----|--|----|
| 6. | Sp globose to broadly ellipsoid, $Q < 1.35$, ornamented | 7 |
| - | Sp ellipsoid to amygdaliform, $Q > 1.40$, ornamented or smooth | 12 |
| 7. | Cheilocystidia simple, not branched (figs 866A-B); cap hygrophaneous | 8 |
| - | Cheilocystidia branched, with finger-like protuberances (figs 866C-E); cap not hygrophaneous | 9 |
| 8. | Cheilocystidia clavate, capitate, broadest in the upper part, rarely with slightly depressed apex (fig. 866A); on hardwood. Cap 5-50 mm, often petaloid, almost smooth, hygrophaneous, becoming translucently striate, dingy cream to ochraceous; gills cinnamon to snuff brown. Sp 4.5-7 x 4.5-6.5 μm , globose, $Q = 1-1.1$, distinctly warty; cheilocystidia 23-65 x 11-16 μm . On coarse, often very rotten wood of deciduous and coniferous trees; autumn; rare in hemib.-middle bore., in FI north to EH, very rare in temp.; DK (NA, EJyl: Addit Næs, Bolderslev Skov), FI (NT), NO (LC), SE (LC). – B&K 5:384, Lud 16.6, M&J 1. | |

C. applanatus (Pers.) P. Kumm.

- Cheilocystidia narrowly lageniform, cylindrical, broadest in lowest part (fig. 866B); on coniferous wood. Cap 10-40 mm, petaloid to spathulate, almost smooth, becoming translucently striate, ochraceous; gills cinnamon to snuff brown. Sp 5-7.5 x 5-7 μm , globose, $Q = 1-1.1$, distinctly warty; cheilocystidia 35-70 x 7-12 μm . Autumn; rare in temp.-bore.; SE.

C. stenocystis Pouzar

- | | | |
|-----|---|----|
| 9. | Cheilocystidia mostly $> 30 \mu\text{m}$ long | 10 |
| - | Cheilocystidia $\leq 30 \mu\text{m}$ long | 11 |
| 10. | Sp 6-9 x 5.5-7.5 μm (fig. 866C). Cap 5-25 mm, kidney-shaped, hoof-shaped, white, felty-tomentose; gills medium spaced to distant, whitish, later cream to salmon or pinkish cinnamon. Sp subglobose to broadly ellipsoid, $Q = 1-1.3$, very finely spiny; cheilocystidia 24-50 x 5-10 μm , narrowly utriform, clavate, flexuous or angled, upper part antler-like; pileipellis often with coiled hyphae. On deciduous wood, in the northern part mainly on conifer twigs; all year; very common in southwestern temp., common elsewhere in temp., occasional in hemib.; DK (LC), NO (LC), SE (LC). – Lud 16.13B-C, M&J 3 (as <i>sphaerosporus</i>), Pers 16:77, Ves 384, ☉. | |

C. cesatii (Rabenh.) Sacc. var. *cesatii*

- Sp 6-9 x 4.5-7 μm . Sp broadly ellipsoid to ovoid, $Q = 1.2-1.45$. In other characters like the main variety. On coniferous twigs and branches; common in hemib.-bore., rare but locally occasional in temp.; DK, FI, NO, SE.– Lud 16.13A, Sieniop 285.

C. cesatii (Rabenh.) Sacc. var. *subsphaerosporus* (J. E. Lange) Senn-Irlet (*C. subsphaerosporus* (J.E. Lange) Hesler & A.H. Sm.)

- | | | |
|-----|--|--|
| 11. | Cheilocystidia with crystals (fig. 866D). Cap 2-10 mm, pale sulphur to lemon yellow; gills pale yellowish, later cinnamon. Sp 5-6.5 x 4.5-6.5 μm , $Q = 1-1.25$, globose to subglobose, verruculose; cheilocystidia 20-30 x 6-15 μm clavate, narrowly utriform, with short, finger-like | |
|-----|--|--|

protuberances; pileocystidia cylindrical to broadly clavate with simple or very short outgrowths. On wood of deciduous trees; autumn; very rare in temp.; DK (DD). – Pers 18:233, Svp 33:61 (as *carpaticus*), ☉.

C. cristatus Senn-Irlet & Immerzeel

- Cheilocystidia without crystals (fig. 866E). Cap 2-8 mm, cream buff to pale yellowish, later ochraceous buff; gills rusty brown, chestnut, cinnamon. Sp 5-6.5 x 4.5-6 μm , Q = 1-1.2, globose, verruculose, distinctly punctate; cheilocystidia 17-26 x 6-10 μm , clavate, narrowly utriform, with polymorphic short outgrowths; pileipellis with crooked to coiled hyphae. On wood of deciduous trees; summer to winter; DE. – Lud 16.9.

C. carpaticus Pilát

12. Sp smooth, strongly coloured; cap fan-shaped. Cap 20-40 mm, felty, cream-buff; gills snuff brown. Sp 7-9 x 5-6 μm , ovoid, amygdaloid with acute apex (fig. 866F), Q = 1.3-1.7, thick-walled; cheilocystidia 20-30 x 5.5-11 μm , narrowly utriform, rather undifferentiated. On rich soil in connection with litter or woody debris; summer to autumn; rare in temp.; DK (LC). – FAD 132E, GBW 4:429, Lud 16.3, M&J 5, Ves 384, ☉.

C. autochthonus J.E. Lange

- Sp rugulose to verruculose, thin-walled; cap not fan-shaped 13
13. Sp 5.5-7.5 x 2.5-4 μm , cylindrical (fig. 867A). Cap 5-10 mm, often becoming lobed, white; gills ochraceous tawny to cinnamon brown. Sp punctate, Q = 1.6-2.3; cheilocystidia 20-25 x 5-12 μm , clavate, branched, angular. On twigs of deciduous trees, litter, herbaceous stems, rarely on conifer twigs; all year, but mainly in autumn; common in temp., occasional in hemib.-middle bore., rare in northern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:392, Lud 16.12, Phil 269e, Ves 385.

C. variabilis (Pers.: Fr.) P. Kumm.

- Sp > 4 μm broad, fusiform to amygdaloid or ellipsoid 14
14. Sp fusiform-elongate to amygdaloid (fig. 867B). Cap 2-25 mm, cream, yellowish, rarely distinctly yellow; gills yellowish to sulphur yellow, later cinnamon buff. Sp 7.5-10 x 4-5.5 μm , Q = 1.6-2.2, minutely punctate to rugulose; cheilocystidia 35-65 x 5-10 μm , cylindrical, flexuous, sometimes branched. On twigs of deciduous trees and herbaceous stems, often *Urtica*; autumn to early winter; occasional in temp.; DK (LC), SE (LC). – B&K 5:389, Lud 16.7, M&J 4, ☉.

C. luteolus (Lamotte) Sacc.

- Sp oblong to ovoid or ellipsoid to amygdaloid 15
15. Sp ellipsoid to amygdaloid, distinctly rugulose (fig. 867C). Cap 5-10 mm, often hoof-shaped, white to cream, often drying yellowish to light orange; gills white, later light ochraceous buff to cinnamon or reddish brown. Sp 7.5-10 x 5-6.5 μm , Q = 1.4-1.7, distinctly coloured; cheilocystidia 21-65 x 5-12 μm , narrowly lageniform, cylindrical, at times angled; pileipellis with crooked terminal cells. On twigs of deciduous trees, especially on calcareous localities; summer to autumn; rare in temp.-bore.; DK (LC), FI (NT), NO (LC), SE (NE). – B&K 5:391, Lud 16.11, ☉.

C. subverrucisporus Pilát (*C. epibryus* (Fr.: Fr.) Qué. s. auct. p.p.)

- Sp oblong to ovoid, marbled to faintly rugulose (fig. 867D). Cap 4-30 mm, white to cream buff or chamois; gills whitish clay, later brown to snuff brown, without pinkish tints. Sp 6.5-9.5 x 4.5-6 μm , Q = 1.4-1.7, faintly coloured; cheilocystidia 28-65 x 6-12 μm , clavate, narrowly utriform, rarely subcapitate; pileipellis with crooked terminal cells. On wood of deciduous trees, very rarely on conifers, on twigs and branches, occasionally on logs or herbaceous stems, mosses, soil or litter; summer to autumn; occasional in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – GBW 4:433, Lud 16.14, M&J 3.

C. lundellii Pilát (*C. inhoneustus* P. Karst. s. Norstein 1990)

Crinipellis Pat.

MACHIEL NOORDELOOS

One species in the Nordic countries, see description below.

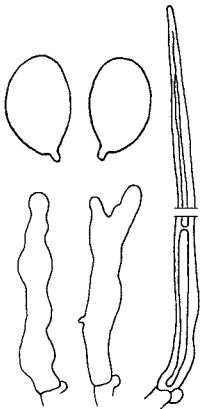
Lit.: Antonín & Noordeloos 1997, Noordeloos in Bas et al. 1995.

Frb marasmioid with long brown hairs. Cap 3-15 mm, hemispherical, then convex, finally plane, usually with small papilla, pale creamy white, densely covered with stiff, ± radially arranged, orange to red brown hairs. Gills free or narrowly adnate, medium spaced to crowded, L = 15-30, white. Stem 6-30(-50) × 0.3-1(-2) mm, filiform, pale cream, densely covered with stiff, orange to red-brown hairs like cap. Smell indistinct. Taste mild. Sp deposit white.

Sp (6.5-)7.5-9.5(-10.5) × (4-)4.5-6(-8) μm, broadly ellipsoid to oblong (fig. 287F), hyaline, without iodine reactions. Basidia 4-spored. Cheilocystidia (17-)28-55(-72) × 3.5-8.5 μm, narrowly clavate, fusiform, clavate or strangulate, often bifurcate or with one or more apical projections. Pileipellis a cutis with transitions to a trichoderm of 200-600 μm long, up to 9 μm wide setiform hairs, ending in a point, with thick, dextrinoid walls. Stipitipellis with similar cystidia. Clamps present.

Saprotrophic or parasitic on basal parts of dead and living grasses, herbaceous plants, e.g. *Artemisia campestris*, more rarely on wood and lianas such as *Clematis*; common in temp. and south-eastern hemib. (Öl, Gtl), otherwise rare in hemib.-bore., in FI with southwestern distribution; DK (LC), FI (DD), NO (NT), SE (LC). – GBW 3:230, Lud 17.1, R&H 336, Svp 32:5, Ves 223, ⊙.

C. scabella (Alb. & Schwein.: Fr.) Murrill (*C. stipitaria* (Fr.) Pat.)



Spores and cheilocystidia.

Cyphella Fr.: Fr.

HENNING KNUDSEN

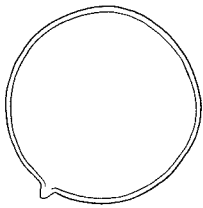
One species in the area; see description below.

Frb cyphelloid, > 5 x 5 mm. Frb hanging from a short contracted base; gills absent, stem strongly reduced. Frb 5-20 x 4-15 mm, very thin-fleshed; outside yellowish brown, greyish brown to dark brown, smooth or finely fibrillose, margin whitish, hairy-pubescent; inside smooth, cream or beige with a glaucous, waxy tinge. Taste and smell insignificant. Sp deposit white.

Sp 16-21 μm in diam., globose to subglobose, with distinct apiculus, smooth, relatively thick-walled (fig. 275D), hyaline, non-amyloid. Basidia 4-spored. Clamps present. Cystidia absent. Marginal hairs thick-walled, brown, 3-10 μm broad, capitate. Hyphae incrustated near margin.

Saprotrophic on the bark of trunks and branches of still standing or fallen *Abies* from late in the season and through the winter. Rare; *DE, PL.* – B&K 2:227, GBW 3:590, Svp 49:47, 📍.

C. digitalis (Alb. & Schwein.: Fr.) Fr.



Spore.

Cyphellostereum D.A. Reid

KLAUS HØILAND

One species in the Nordic countries, see description below.

Lit.: Reid 1965.

Frb corticioid, membranous, with smooth hymenophore. Frb up to 10 mm in diam., ± round, spatulate or of irregular shape, margin even or lobed. Upper side of interwoven hyphae in a soft texture, white to cream. Stem absent or as a short, contracted base. Hymenophore smooth, cream. Smell and taste insignificant. Sp deposit white.

Sp 4-5 x 2.5-3 μm, ellipsoid to ovoid, smooth, thin-walled (fig. 67G), hyaline, non-amyloid. Cystidia 35-55 x 4-6 μm, subulate, with a rounded apex, thin-walled. Clamps absent. Hyphae smooth, 2-3 μm broad, with parallel walls.

On mosses, usually *Polytrichum*; autumn; rare in hemib.-bore., in NO only in Akh, Hord and STr, in FI only in U, EH and OP; FI, NO (LC), SE (LC). – B&K 2:233, GBW 1:192, ⊙.

C. laeve (Fr.: Fr.) D.A. Reid (*Cantharellus l.* Fr.: Fr., *Cyphella l.* (Fr.: Fr.) S. Lundell)



Spores and hymenial cystidia

Cystoderma Fayod

IRJA SAAR

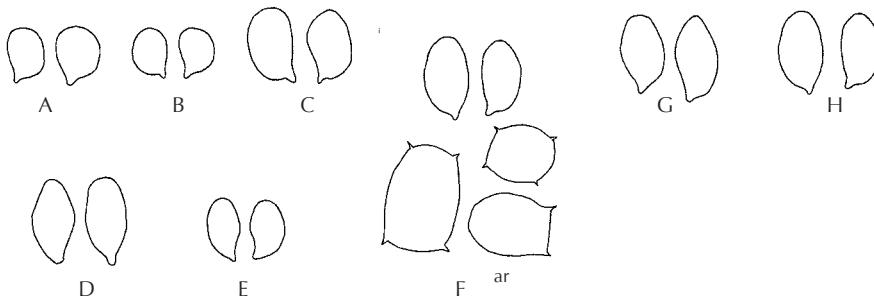
Frb collybioid, granulose. Cap 10-60 mm, often umbonate, sometimes radially wrinkled, granulose to finely scaly, mat, dry, margin at first denticulate from veil remnants, pinkish, rusty brown, ochre, yellowish, orange brown or white. Gills adnexed to adnate, emarginate or with a decurrent tooth, white to pale cream or yellowish buff. Stem silky striate at top, with a persistent membranous ring with granulose underside and filamentous upper surface or with an evanescent floccose-scaly ring zone, below minutely to coarsely granulose-floccose, concolorous with cap or top with a violet or purple shade. Smell unpleasantly musty-earthly or indistinct. Taste mild, indistinct to unpleasant. Sp deposit white to pale cream.

Sp ellipsoid, oblong or fusiform, smooth, without germ pore, hyaline, amyloid. Cystidia absent. Pileipellis a paraderm or a conioderm. Outer velar layer on cap and stem formed by chains of inflated globose to ellipsoid spherocysts. Arthroconidia formed in the upper part of cap flesh in a few species. Clamps present.

Saprotrophic; on soil, sometimes on rotten wood, among moss and litter, mostly in forests, but also in open areas. Summer and autumn.

Four species in the Nordic countries.

Lit.: Harmaja 1979, 1984, 1985, Heinemann & Thoen 1973, Saar 2003, Saar et al. in press, Smith & Singer 1945.



Spores and arthroconidia: A: *Cystoderma carcharias* var. *carcharias*, B: *C. carcharias* var. *fallax*, C: *C. tumikoskii*, D: *C. jasonis* var. *niveum*, E: *C. amianthinum*, F: *C. jasonis* var. *jasonis*, G: *C. jasonis* var. *lilacipes*, H: *C. jasonis* var. *saarenoksae*.

1. Ring persistent, membranous, ascending 2
 - Ring evanescent, floccose-scaly 4
2. Cap and stem greyish pink or vinaceous to almost white; smell unpleasant; spherocysts in pileipellis hardly discolouring in KOH. Cap 15-60 mm, convex to low convex; gills white; stem 30-70 x 3-8 mm. Sp 4-5.5 x 3-4 μm, broadly ellipsoid to ellipsoid (fig. 513A). On soil among moss and litter, both on rich and poor soil, in mixed and coniferous forests, grassland and gardens; summer to late autumn; widespread and common in temp.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 4:203, Däh 535, R&H 420, Sienil 43:53, Ves 215, ☉.
C. carcharias (Pers.: Fr.) Fayod var. *carcharias*
 - Cap and stem rusty brown, ochre, yellowish or orange brown; smell indistinct; spherocysts in pileipellis discolouring to dark rusty brown in KOH 3
3. Sp (3.5-)4-5.5 x 3-4 μm (fig. 513B); cap and stem rusty brown, rarely medium brown or ochre. Cap and stem rusty brown, rarely medium brown or ochre; gills white to pale buff; smell indistinct. In other characters like the main variety. On soil among moss and litter on rich soil, in deciduous and mixed forests, also in subalpine *Betula* forests; autumn; rare in temp.-arc./alp.; DK (DD, Sj), FI (LC), IS, NO (LC), SE (NE). – Bol Bres 46:29, Däh 538, Lud 18.12, Sienil 43:53, 57, SZP 64(1):7.

C. carcharias (Pers.: Fr.) Fayod var. *fallax* (A.H. Sm. & Singer) I. Saar in press (*C. fallax* A.H. Sm. & Singer, *C. intermedium* Harmaja)

- Sp 5.5-8(-10) x 4-5(-6) μm (fig. 513C); cap yellowish to orange brown. Cap 15-50 mm, convex to low convex, finely granulose; gills white to cream; stem 18-70 x 3-11 mm, often widened downwards; smell indistinct. Sp broadly ellipsoid to ellipsoid, amyloid; spherocysts in pileipellis darkening cinnamon to rusty in KOH. On soil among moss and litter, in arctic tundra and in boreal rich *Picea* forests, often caespitose; summer; very rare in arc./alp.; FI (DD, Ks: Kuusamo), NO (LC, incl. SvB). – AAF 1:27, FND 32:44, Lud 18.10.

C. tuomikoskii Harmaja (*C. arcticum* Harmaja)

4. Frb snow white, hygrophanous. Spherocysts in pileipellis hyaline in KOH. (Fig. 513D). In other characters like the main variety. Mostly on acid rock outcrops, among mosses (*Polytrichum*, *Dicranum*); autumn; very rare in temp.-hemib.; DK (NE, WJyl: Stensbæk Plt.), FI (DD, U: Espoo, Helsinki), NO (Østf: Fredrikstad). – Sienil 43:57.

C. jasonis (Cooke & Massee) Harmaja var. *niveum* (Harmaja) I. Saar in press (*C. niveum* Harmaja)

- Frb coloured 5
- 5. Cap yellowish buff, cinnamon buff to honey yellow 6
- Cap pale to dark brown or yellowish brown to yellowish cinnamon 7
- 6. Gills white; arthroconidia absent or rare in context under the pileipellis. Cap 15-50 mm, convex to low convex, buff, yellowish buff, cinnamon buff, saffron buff; stem 25-60 x 2-7 mm. Sp 5-6(-7) x (2.5-) 3-3.5 μm , ellipsoid to oblong (fig. 513E), amyloid; spherocysts in pileipellis darkening to cinnamon or rusty in KOH. On soil among mosses and litter, in heathland and deciduous forests, parks, grasslands and alpine heaths; summer to autumn; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:202, Phil 138a, R&H 420, Sienil 43:48, Ves 215, ☉.

C. amianthinum (Scop.: Fr.) Fayod (*C. rugosoreticulata* (F. Lorinser) Wasser)

- Gills yellowish buff; arthroconidia abundant in context under the pileipellis, 4.5-12 x 3-5 μm (fig. 513F). Cap 10-35 mm, convex to low convex, more rarely bell-shaped or obtusely conical, cinnamon buff, honey yellow to yellowish cinnamon; stem 25-70 x 2-5 mm; flesh in cap yellow near the surface, pale ochre below, brownish in stem. Sp (5.5-)6-7.5(-9) x 3-4.5 μm , oblong to fusiform, amyloid; spherocysts in pileipellis darkening to cinnamon or rusty in KOH. On soil among mosses and litter, especially in *Vaccinium-Picea* forests; summer to late autumn; very common in hemib.-bore., common in temp., rare in suba.-arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:205, Lud 18.5, R&H 421, Sienil 43:48, Ves 214, ☉.

C. jasonis (Cooke & Massee) Harmaja var. *jasonis* (*C. longisporum* (Kühner) Arnolds)

7. Stem top with a violet or purple shade. Cap very finely granulose, hygrophanous, pale to dark brown, without a yellowish tinge; gills pale brown or yellowish ochre; stem reddish brown to almost blackish below, with dark brown flocks; flesh in cap pale brownish. (Fig. 513G); arthroconidia rare in the upper part of cap flesh. In other characters like the main variety. On acid rock outcrops, among mosses (*Polytrichum*, *Dicranum*); autumn to late autumn; occasional in hemib.-bore., rare in temp.; DK (NA, Sj: Rude Skov), FI (LC), NO (NE, Oppl: Lunner), SE (NE). – BSMF 89 pl. 1, Lud 18.9, Sienil 43(2) cover, Sieniop 99.

C. jasonis (Cooke & Massee) Harmaja var. *lilacipes* (Harmaja) I. Saar in press (*C. lilacipes* Harmaja, *C. longisporum* (Kühner) Arnolds var. *purpurascens* Arnolds)

- Stem top yellowish. Cap very finely granulose, yellowish brown, fulvous; gills yellowish to yellowish buff; flesh in cap very pale brown. (Fig. 513H). In other characters like the main variety. On acid rock outcrops, among mosses (*Polytrichum*, *Dicranum*), also in bogs; autumn to late autumn; rare but locally occasional in hemib.-bore.; FI (LC). – Sienil 43:49.

C. jasonis (Cooke & Massee) Harmaja var. *saarenoksae* (Harmaja) I. Saar in press (*C. saarenoksae* Harmaja)

Cystodermella Harmaja

IRJA SAAR

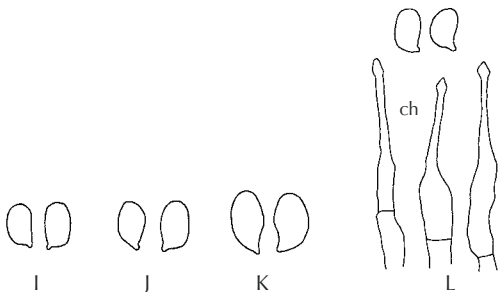
Frb collybioid. granulose. Cap 15-80(-100) mm, often umbonate, sometimes radially wrinkled, granulose to finely scaly, mat, dry, margin at first denticulate from veil remnants, in shades of brown, orange, red or white. Gills adnexed to adnate, emarginate or with a decurrent tooth, white to pale cream or yellowish buff. Stem silky striate at top, with an evanescent floccose-scaly ring zone, below minutely to coarsely granulose-floccose, concolorous with cap. Smell unpleasantly musty-earthly or indistinct. Taste mild, indistinct to unpleasant. Sp deposit white to pale cream.

Sp ellipsoid or oblong, smooth, without germ pore, hyaline, non-amyloid. Cystidia mostly absent, but one species with urticoid cheilo-, pleuro- and caulocystidia. Pileipellis a paraderm or a conioderm. Outer velar layer on cap and stem formed by chains of inflated globose to ellipsoid spherocysts. Arthroconidia absent. Clamps present.

Saprotrophic; on soil, among moss and litter, mostly in forests, but also in open areas. Summer and autumn.


Three species in the Nordic countries.

Lit.: Harmaja 1974a, 2002, Heinemann & Thoen 1973, Saar 2003, Saar et al. in press, Smith & Singer 1945.



Spores and cheilocystidia: I: *Cystodermella granulosa* var. *ambrosii*, J: *C. granulosa* var. *granulosa*, K: *C. adnatifolia*, L: *C. cinnabarina*.

1. Frb snow white when young, later tinged cinnamon buff. Sp (fig. 513I); pileipellis of spherocysts and filamentous hyphae, spherocysts hyaline to very slightly yellowish in KOH. In other characters like the main variety. On soil among mosses and litter, in heath forests, grazed mixed forests and damp *Alnus* forests; summer to autumn; rare in temp.-suba.; DK (EN, Sj), FI (VU), IS (Au), SE (NE). – BCat 814, Bres 50, Jordst 21(2), Sienil 43:57.
C. granulosa (Batsch: Fr.) Harmaja var. *ambrosii* (Bres.) I. Saar in press (*Cystoderma a.* (Bres.) Singer)
- Frb coloured 2
2. Cap and stem rusty tawny, brick, cinnamon, greyish brown, fulvous to umber, 15-50 mm, convex to low convex; gills white; stem 25-60(-100) x 3-6 mm; flesh whitish in cap, brownish in stem; smell absent or slightly unpleasant. Sp 3.5-5 x 2-3 μ m, oblong (fig. 513J), non-amyloid; spherocysts in pileipellis darkening to rusty in KOH. On soil among moss and litter, in forests, grassland, gardens and along paths and roads; summer to autumn; widespread and common in hemib.-bore., occasional in temp. and suba.-arc. / alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:204, Lud 18.11, R&H 421, Sienil 43:49, Sieniop 98, ⊙.
C. granulosa (Batsch: Fr.) Harmaja var. *granulosa* (*Cystoderma g.* (Batsch: Fr.) Fayod)
- Cap in shades of orange or red 3

3. Cystidia absent. Cap up to 25-50(-80) mm, convex to low convex, then expanded, brownish apricot, brownish orange, orange buff; gills white; stem 25-70(-100) x 5-10 mm; flesh white to whitish; smell absent or slightly unpleasant. Sp (3.5-)4-4.5(-5) x (2-)2.5-3 μ m, ellipsoid to oblong (fig. 513K), non-amyloid; spherocysts in pileipellis darkening to cinnamon in KOH. On soil among moss and litter, in forests, parks and grassland, often on rich soil; summer to autumn; common in hemib.-bore., rare but locally occasional in temp., rare in suba.-arc./alp.; DK (LC), FI (LC), NO (LC, incl. Svb), SE (LC). – Sienil 43:52, .
- C. adnatifolia* (Peck) Harmaja (*Cystoderma granulosum* (Batsch: Fr.) Fayod var. *adnatifolium* (Peck) A.H. Sm. & Singer, *Cystoderma a.* (Peck) Harmaja)
- Cheilo-, pleuro- and caulocystidia 30-50 x 4-10 x 3-4 μ m, slightly lageniform below, tapering to a long, narrow neck with a spear-shaped apex often covered with crystals (fig. 513L). Cap 20-80(-100) mm, convex, low convex, brownish red, brownish orange, orange cinnamon, coral; gills white; stem 30-80 x 5-12(-15) mm; flesh white to whitish; smell absent. Sp (3.5-)4-5 x 2-2.5 μ m, ellipsoid to oblong, non-amyloid; spherocysts in pileipellis darkening to rusty in KOH. On soil among moss and litter; summer to autumn; common in hemib.-bore., occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:208, Däh 539, GBW 3:237, R&H 422, Sienil 43:52.
- C. cinnabarina* (Alb. & Schwein.: Fr.) Harmaja (*Cystoderma c.* (Alb. & Schwein.: Fr.) Fayod, *Cystoderma terreji* (Berk. & Broome) Harmaja)

Cystolepiota Singer

CHRISTIAN LANGE

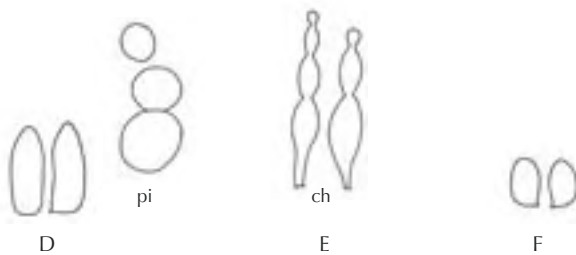
Frb lepiotoid, with pulverulent surface. Cap 5-50 mm, hemispherical, convex to plane, ± pulverulent when young, with age ± smooth, dry, white, pink, yellow, brown or lilac. Gills free, white to cream. Stem pruinose to slightly pulverulent, rarely strongly so, often with a thin ring zone, concolorous with cap, often darkening towards the base. Smell in some species distinct, unpleasant gas-like, otherwise indistinct. Taste indistinct to unpleasant. Sp deposit white to slightly yellowish to purplish.

Sp ellipsoid, smooth or slighty ornamented, without germ pore, hyaline, non-amyloid, in a few species slightly dextrinoid, in most species metachromatic. Cystidia absent or present. Pileipellis an epithelium, with 10-70 μm , globose to oblong, elongate, loosely arranged elements mixed with thin hyphae. Clamps present in Nordic species.

Saprotrophic, terrestrial on ± calcareous soils, mostly under deciduous trees and shrubs, in forest edges, roadsides, parks and gardens. Autumn to early winter. Most species are relatively rare with few records from the Nordic countries, mainly in the southern parts of the region.

Seven species in the Nordic countries.

Lit.: Kelderman 1994, Knudsen 1978, Vellinga & Huijser 1998, Vellinga in Noordeloos et al. 2001, Zecchin 2000.



Spores, cheilocystidia and pileipellis elements: D: *Cystolepiota bucknallii*, E: *C. cystidiosa*, F: *C. seminuda*.





1. Cap with yellow, lilac, rose or brownish pulverulent covering 2
 - Cap with white or whitish cap covering, but often turning reddish, brownish or greyish on handling 5
2. Cap pale sulphur yellow. Cap 15-35 mm, convex with a low umbo, finely granulose-farinose; stem 30-50 x 2-3 mm, cylindrical, farinose to glabrous, concolorous with cap or with brownish base; flesh pale yellow; smell indistinct or slightly unpleasant. Sp 3.5-5.5 x 2.5-3 μm , oblong to ovoid, dextrinoid; cheilocystidia 30-45 x 5-8 μm , irregular to clavate or fusi-form. In deciduous woods on rich soil; autumn; very rare in temp., mainly in southernmost SE and southeastern DK; DK (CR), SE (DD). – FE 4:6a, R&H 412, ⊙.

C. icterina Knudsen

 - Cap pale lilac, rose to brownish 3
3. Cap pale lilac. Cap 10-30 mm, ovoid to bell-shaped, expanding to convex, pulverulent, when old smooth and more pale, cream to whitish-greyish; stem 20-60 x 2-4 mm, concolorous with cap, but often turning darker towards base, slightly tapering towards base; flesh white to purplish; with a strong smell like gas, naphthalene; taste unpleasant. Sp 7-9 x 2.5-3.5 μm , ellipsoid or with ± truncate base (fig. 533D), ± dextrinoid; cheilocystidia absent. In deciduous woods on rich soil, often at roadsides on ditch banks; autumn; rare in temp.; DK (LC), SE (NT). – B&K 4:209, C&D 667, FAD 13E, Svp 26:3, Ves 281, ⊙.

C. bucknallii (Berk. & Broome) Singer & Cléménçon

 - Cap rose or brownish 4

4. Cap with pale rose, pulverulent covering, looking like small, echinate-granulate spines, not discolouring on handling; cheilocystidia hyaline. Cap 10-40 mm, hemispherical to plane; stem 15-50 x 2-4 mm, with granules or bands of scales concolorous with cap on a pale base, often with a faint ring zone; flesh cream; smell faint, gas-like; taste neutral. Sp 4-6 x 2.5-3 μm , cylindrical to oblong; cheilocystidia 15-30 x 7-12 μm , clavate, with a \pm moniliform outgrowth on top; pleurocystidia not present. In deciduous woods on rich soil; autumn; very rare in temp.-hemib.; DK (EN), FI (DD, V: Lohja, Torhola), SE (DD, Sk: Falsterbo). – FE4:5a, Nit 317, Phil 137g, RdM 43:155, ZM 55:96 (as *Lepiota pseudoasperula*), .
C. moelleri Knudsen (*Lepiota rosea* Rea, *C. rosea* (Rea) Bon non Singer)
- Cap with pinkish, grey-brown, pyramid-like warts, discolouring pinkish to brownish on handling; cheilocystidia with yellow \pm granular contents. Cap 20-50 mm, hemispherical to plane with an umbo; stem 15-50 x 2.5-5 mm, cylindrical, above whitish, pubescent, below granular to floccose, concolorous with cap; flesh white to cream; smell unpleasant; taste unpleasant. Sp 3.5-5.5 x 2-3 μm , ellipsoid, without iodine reactions; cheilo- and pleurocystidia 17-50 x 6-12 μm , irregular, moniliform (fig. 533E). In deciduous woods on rich soil; autumn; very rare in temp.; DK (NA, Sj: Suserup, Lol: Maribo Søndersø). – C&D 665, FE 4:5c, RdM 32:103, 43:159.
C. cystidiosa (A.H. Sm.) Bon (*C. luteocystidiata* (D.A. Reid) Bon)
5. Cap 5-25 mm, white, not discolouring on handling, only slightly pulverulent; stem dark purplish towards base; without cheilocystidia. Cap hemispherical to conical; stem 10-50 x 1-3 mm, cylindrical or tapering towards base; flesh white; smell indistinct; taste neutral. Sp 3.5-4.5 x 2-2.5 μm , ellipsoid (fig. 533F), without iodine reactions. In deciduous woods, at roadsides and in parks on rich soil; autumn; common in temp., occasional in hemib.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:211, C&D 666, FAD 14A,B, R&H 412, Ves 280, .
C. seminuda (Lasch) Bon (*C. sistrata* (Fr.) Singer)
- Cap 20-45 mm, white, strongly pulverulent when young, discolouring reddish or greyish when handled and with age; stem concolorous with cap or brownish towards base; cheilocystidia clavate with \pm moniliform outgrowth 6
6. Cheilocystidia with yellow, \pm granular content see *C. cystidiosa* 4
- Cheilocystidia without coloured content 7
7. Cap white, but discolouring reddish to orange on handling, strongly and persistently pulverulent. Cap 20-40 mm, hemispherical to convex; stem 20-50 x 2-4 mm, cylindrical, below woolly ring zone pruinose-flocculose, concolorous with cap; flesh white; smell unpleasant; taste neutral. Sp 4.5-6 x 2-3 μm , ellipsoid, without iodine reactions; cheilocystidia and occasional pleurocystidia 15-35 x 6-12 μm . In deciduous woods on rich soil; autumn; rare in temp.; DK (VU), SE (NE, Sk). – C&D 664, FAD 14I, FE 4:2b (as *adulterina*), RdM 43:156, Svp 26:34, .
C. hetieri (Boud.) Singer (*Lepiota rufescens* (Berk. & Broome) J.E. Lange)
- Cap white to slight greyish, discolouring, first to cream, but soon greyish, giving a dull impression, pulverulent layer quickly dissolving, exposing a \pm smooth cap. Cap 20-50 mm, convex to plane; stem 15-50 x 2-4 mm, cylindrical, flocculose, concolorous with cap; flesh white; smell neutral; taste neutral. Sp 5-6.5 x 2-3 μm , ellipsoid, without iodine reactions; cheilocystidia and pleurocystidia 15-35 x 6-12 μm . In deciduous woods on rich soil; autumn; occasional in temp., rare in hemib.-bore., with very few records from FI; DK (NT), FI (DD), NO (Oppl: Gran), SE (VU). – B&K 4:210, FAD 14J (both as *C. hetieri*), Nit 317, RdM 43:150, R&H 411, .
C. adulterina (F.H. Møller) Bon

Delicatula Fayod

THOMAS LÆSSØE & STEEN A. ELBORNE

One species in the Nordic countries; see description below.

Lit.: Antonín & Noordeloos 2004.

Frb mycenoid to omphalinoid, uniformly whitish, discolouring yellowish, with veined hymenophore. Cap 3-15 mm, flat-topped ovoid with inrolled margin, bell-shaped to convex, plane or umbilicate, striate to the opaque spot at centre, translucent when moist, irregularly radially fibrillose from veil, margin thin, dentate or more or less appendiculate from overhanging veil. Gills emarginate-decurrent, not or barely reaching the margin, very narrow and rather thick, irregularly wavy, often forked and interconnected, distant. Stem 5-25 × 0.5-1.5 mm, cylindrical with a bulbous base, pubescent to almost smooth, translucent to opaque, with discoid whorl of somewhat agglutinated to strigose hairs at base. Smell and taste indistinct. Sp deposit white.

Sp 6.5-9 × 4-5 μ m, ovoid, ellipsoid, amygdaloid to citriform, smooth, without germ pore (fig. 275F), amyloid. Basidia (2-)4 spored. Gill trama non-amyloid. Cheilo- and pleurocystidia \pm cylindrical, but normally absent; caulocystidia (probably of veil origin) cylindrical to clavate. Pileipellis a cutis with some ascending elements of velar origin. Veil of filamentous elements, some erect and cystidia-like. Clamps present.

Saprotrophic, on or around dead wood, often *Alnus*, or on plant debris, in mostly boggy, moss rich areas, typically with *Mnium*, more rarely in more open grassy habitats; summer to autumn; common in hemib.-bore., occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – A&N 04:126, 127, B&K 3:205, C&D 536, Lud 20.1, Ves 239, 📍.

D. integrella (Pers.: Fr.) Pat.



Spores.

Dendrocollybia R.H. Petersen & Redhead

MACHIEL NOORDELOOS

Collybia (Fr.) Staude s. lato p.p., *Microcollybia* Lennox p.p.

Monotypic genus, see description below.

Lit.: Antonín & Noordeloos 1997, Hughes et al. 2001, Komorowska 2000.

Frb small, collybioid with branched stem. Cap 2-10(-15) mm, convex, often with small papilla, slightly wrinkled, hardly hygrophanous, pale greyish white or greyish brown. Gills adnate, narrow, crowded, grey to grey brown or chocolate brown, darker than cap. Stem 20-60 x 0.1-0.5 mm, cylindrical, dark brown or reddish brown with numerous, up to 5 mm long side branches, bearing a very small, globose, sterile cap. Smell none. Taste mild. Sp deposit white. Sclerotium up to 5 mm in diam., subglobose to globose, dull, black.

Sp 4.5-6.5 x 2-2.5 μm , ellipsoid (fig. 403B), thin-walled, hyaline, without iodine reactions. Cystidia absent. Pileipellis a cutis. Clamps present.

Saprotrophic?, in groups on mummified remnants of fleshy agarics, incl. *Lactarius* species; summer to autumn; rare in temp.-bore.; DK (VU), FI (NT), NO (NT), SE (LC). – A&N 97:21, R&H 317, Svp 30:21, ☉.

D. racemosa (Pers.: Fr.) R.H. Petersen & Redhead (*Collybia r.* (Pers.: Fr.) Quél.)



Spores.

Dermoloma (J.E. Lange) Singer

JAN VESTERHOLT

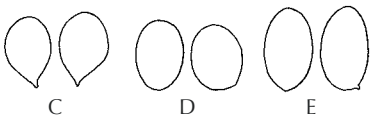
Frb collybioid to tricholomatoid. Cap 7-40(-60) mm, smooth, sometimes cracking irregularly, dry, pale to dark grey or brown, ± hygrophanous. Gills adnate to emarginate, mostly rather broad, distant to medium spaced, whitish to pale grey or brownish. Stem cylindrical or tapering downwards, often with pruinose top. Smell slightly to strongly farinaceous. Taste mild or bitter. Sp deposit white to cream.

Sp subglobose to broadly ellipsoid or slightly dacryoid, smooth, hyaline, amyloid, ± dextrinoid or without iodine reactions. Basidia 4-spored, less often 2-spored. Cystidia absent. Pileipellis a hymeniderm or a paraderm. Clamps present or absent.

Saprotrophic in dry and unfertilized grassland, often with *Hygrocybe* species, less often on rich soil in deciduous forests.

Three species in the Nordic countries. Delimitation of species with amyloid sp uncertain.

Lit.: Arnolds 1993, Arnolds in Bas et al. 1995, Jeppson 1997, Ludwig 2001.



Spores: C: *Dermoloma cuneifolium*, D: *D. josserandii* var. *josserandii*, E: *D. pseudocuneifolium*.

- Sp non-amyloid, rarely ± dextrinoid. Cap 10-40(-60) mm, convex to expanded, sometimes umbonate, smooth, dry, hygrophanous, mostly not translucently striate, buff to greyish brown, darkest at centre, paler to whitish at margin; gills deeply emarginate, broad, medium spaced, whitish to pale grey; stem 20-60 x 3-10 mm, cylindrical or with tapering base, fibrillose, with pruinose top, white to pale greyish; smell farinaceous. Sp 5-6.5 x 4-5 μm, subglobose to broadly ellipsoid or slightly dacryoid (fig. 403C). In dry, unfertilized grassland, rarely on rich soil in deciduous forests; late summer to autumn; occasional in temp.-bore., much rarer in the eastern parts; DK (LC), FI (VU), NO (VU), SE (LC). – GBW 3:240, Lud 22.5, Jordst 18(2), Ves 207, ⊙.

D. cuneifolium (Fr.: Fr.) Bon (*D. atrocinereum* (Pers.) Herink)

- Sp amyloid 2
 - 2. Sp broadly ellipsoid (fig. 403D), $Q_{av} = 1.2-1.4$. Cap 14-33 mm, convex to expanded or slightly depressed, smooth, dry, pale greyish ochre to beige, occasionally with pale greyish brown centre; gills emarginate, rather broad, medium spaced to distant, whitish to very pale buff; stem 20-40 x 2-5 mm, cylindrical or with tapering base, white to pale brownish grey; smell strongly farinaceous. Sp 4.5-7 x 3.5-5 μm, amyloid. In dry unfertilized grassland, in parks and forests on basic soils; autumn; rare in temp.-southern bore.; SE (DD). – Lud 22.3. *D. josserandii* Dennis & P.D. Orton var. *josserandii*
var. *phaeopodium* (P.D. Orton) Arnolds differs in having a greyish brown to sepia cap and greyish or brownish tinged gills and stem. FI (PH: Konnevesi), NO (EN, M&R: Herøy).
 - Sp ellipsoid (fig. 403E), $Q_{av} = 1.5-1.7$. Cap 7-30 mm, convex to expanded or slightly depressed, smooth, dry, slightly hygrophanous, slightly translucently striate in outer part, buff to greyish brown; gills emarginate, rather broad, pale greyish brown; stem 20-40 x 1-3 mm, cylindrical or slightly tapering at base, buff to greyish brown; smell farinaceous, at least when crushed. Sp 6-8 x 3.5-5 μm, amyloid. In dry, unfertilized grassland, rarely on rich soil in deciduous forests; summer to autumn; rare in temp.-bore.; DK (VU), FI (VU, V: Lohja), FO, NO (VU), SE (NT). – Lud 22.4, M&J 2, Ves 207, ⊙.
- D. pseudocuneifolium* Bon

Descolea Singer

JAN VESTERHOLT

Setchelliogaster Pouzar, *Descomyces* Bougher & Castellano

One species in the Nordic countries; see description below.

The genus is widely distributed in the southern hemisphere, including also sequestrate forms earlier referred to *Setchelliogaster*, and hypogeous forms earlier referred to *Descomyces*. In southern Europe two species occur with *Eucalyptus*.

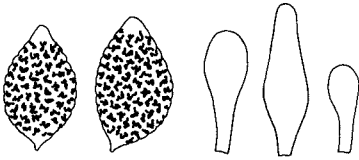
Lit.: Esteve-Raventós et al. 1997, Horak 1971, Petersen 1992, Singer 1951, Vesterholt & Petersen 1992.

Frb uniformly brown with a membranous ring, under *Nothofagus*. Cap 10-45 mm, convex to bell-shaped, later expanded with or without a broad umbo, smooth, dry, but shiny when wet, weakly hygrophanous, yellowish brown to orange brown, translucently striate at margin or not. Gills narrowly adnate, buff to umber. Stem 30-70 × 3-7 mm, cylindrical to subclavate, fibrillose, cream to buff. Partial veil membranous, forming a cream to pale buff, hanging ring with a striate upper side. Smell indistinct. Taste not recorded. Sp deposit ochraceous.

Sp 11-13.5 × 6-7.5 μm, citriform (fig. 646A), verrucose, strongly dextrinoid. Basidia 4-spored. Cheilocystidia 15-35 × 6-11 μm, clavate to spheropedunculate or utriform. Pleurocystidia absent. Pileipellis a hymeniderm. Clamps present.

On soil, in mycorrhizal association with *Nothofagus*, introduced from Tierra del Fuego, Argentina; autumn; only few records from arboreta and plantations in temp. and bore.-suba.; DK (NA, Sj: Hørsholm), FO (Tórshavn), NO (NE, Hord: Bergen). – P,R&V 139, Svp 25:33, ⊙.

D. antarctica Singer



Spores and cheilocystidia.

Echinoderma (Bon) Bon

CHRISTIAN LANGE

Lepiota (Pers.: Fr.) Gray sect. *Echinacea* Fayod

Frb lepiotoid, brown scaly. Cap 10-180 mm, with pyramidal warts, dry, greyish brown to orange brown or dark brown. Gills free, crowded to very crowded, white or cream to pinkish, edge concolorous or dark brown. Stem cylindrical or with a clavate base, with a ring zone, with or without a ring, in lower part woolly or with scales of cap colour. Smell indistinct, fruity or unpleasant. Taste mild or unpleasant. Sp deposit white to cream.

Sp ellipsoid, cylindrical to subfusiform, smooth, hyaline, ± dextrinoid, rarely without iodine reactions, pinkish metachromatic or not. Cheilocystidia present, in a few species absent, cylindrical, clavate or lanceolate. Pleurocystidia absent. Pileipellis of short chains of subglobose to pyriform cells, at most 3 times as long as broad. Clamps present.

Saprotrophic on soil, typically in rich, deciduous or coniferous woodlands, parks and shrubs, sometimes on decaying wood.

Nine species in the Nordic countries. Preliminary phylogenetic studies point towards a close relationship between *Echinoderma* and the genera *Cystolepiota* and *Melanophyllum* (Vellinga 2003a).

Lit.: Enderle & Kriegelsteiner 1989, Kelderman 1994, Knudsen 1980, Vellinga 2003a, Vellinga in Noordeloos et al. 2001.

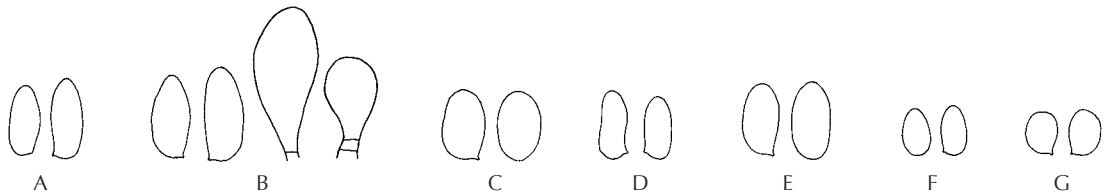


Fig. 357. Spores and cheilocystidia: A: *Echinoderma hystrix*, B: *E. aspera*, C: *E. calcicola*, D: *E. perplexa*, E: *E. echinacea*, F: *E. pseudoasperula*, G: *E. carinii*.

- Gill edge dark; with yellowish-brownish drops at stem top; smell distinct, like cat urine or elder flowers. Cap 30-80 mm, first conical, later convex with a broad umbo, greyish-brownish to olivaceous, covered with pointed, radial fibrillose scales; gills crowded, whitish; stem 40-80 x 4-8 mm, cylindrical, with a distinct ring, below ring and on underside of ring with scales of cap colour and often with brown guttules, above whitish; taste neutral to unpleasant. Sp 5.5-7 x 2.5-3 μ m, cylindrical (fig. 537A); cheilocystidia 15-40 x 6-10 μ m, narrowly clavate, with age with brownish walls and contents; pileipellis of chains of irregular, brownish cells with intracellular pigment soluble in ammonia, up to 100 x 30 μ m. In deciduous forests on rich, often disturbed soil; summer to autumn; rare in temp.-bore., only two records from NO (Tel: Porsgrund, Nordl: Saltdal; DK (EN), NO (VU), SE (EN). – B&K 4:227, FAD 10E, GBW 4:61, Nit 316, Phil 131g. ☉.

E. hystrix (F.H. Møller & J.E. Lange) Bon (*Lepiota* h. F.H. Møller & J.E. Lange, *Cystolepiota* h. (F.H. Møller & J.E. Lange) Knudsen)

- Gill edge concolorous with the face; stem without brownish drops; smell different or absent

2. Cap 60-180 mm; with many forked gills; stem with a thin-fleshed, but distinct ring, though it is often left as patches along the cap margin. Cap conical, expanding to plane with a low umbo, orange brown to brown, at centre covered with loosely attached, 2-4 mm high pyramidal warts, towards margin with radial fibrillose spines; gills very crowded, white to cream; stem 50-120 x 8-16 mm, cylindrical, above the ring whitish, below with a woolly, floccose tomentum of cap colour; smell unpleasant, like *Lepiota cristata*; taste neutral or slightly unpleasant. Sp 6-10 x 2.5-3.5 μm , cylindrical to subfusiform (fig. 537B); cheilocystidia 15-45 x 7-25 μm , broadly clavate; pileipellis of chains of globose to irregular ellipsoid cells, up to 20-60 x 10-50 μm , with brown walls. On rich soil in forests and gardens, also found in greenhouses; summer to autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:214, C&D 660, GBW 4:58, R&H 413, Ves 276, ☉.
E. aspera (Pers.: Fr.) Bon (*Lepiota a.* (Pers.: Fr.) Quél., *L. acutesquamosa* (Weinm.) P. Kumm.)
- Cap rarely exceeding 100 mm; stem with a ring zone, but without well developed ring; gills not notably forked 3
3. Cheilocystidia numerous, different from basidioles, lanceolate, cylindrical or clavate 4
- Cheilocystidia absent or in scattered tufts, not distinct from basidioles 6
4. Sp without iodine reactions. Cap 20-30 mm, plane with a low umbo, covered with 1-3 mm high, grey brown to brown, pointed scales on a cream background; gills crowded to medium spaced, white to cream; stem 30-40 x 3-4 mm, cylindrical, with a sparse ring zone, above whitish cream, below with girdles of scales of cap colour; flesh white; smell indistinct or slightly unpleasant; taste unknown. Sp 4-6 x 2.5-3 μm , cylindrical, non-amyloid; cheilocystidia 15-30 x 5-10 μm , cylindrical to clavate; pileipellis of chains of globose to ellipsoid cells, up to 10-40 μm , with brown walls. On rich soil in deciduous forests; autumn; very rare in temp.; DK (CR), SE. – Svp 26:35 (not typical and perhaps another taxon).
E. boertmannii (Knudsen) Bon (*Lepiota b.* Knudsen)
Note: several morphologically different collections with sp without iodine reactions are known and further studies are needed.
- Sp \pm dextrinoid 5
5. Both cap and stem densely covered with 1-5 mm long, pointed, persistent tomentose scales. Cap 30-70 mm, hemispherical to plane with a low umbo, dark grey brown, with age with appressed, silky patches; gills crowded, white to cream; stem 30-80 x 4-10 mm, cylindrical with a slightly bulbous base, above the ring-zone whitish, below densely covered with woolly, pointed scales of cap colour; flesh whitish; smell unpleasant or fruity; taste neutral. Sp 4-6 x 2.5-3.5 μm , ellipsoid to cylindrical (fig. 537C), dextrinoid, not metachromatic; cheilocystidia 20-30 x 4-7 μm , in fascicles, narrowly clavate; pileipellis of chains of cells up to 30-70 x 15-40 μm , oblong, with thick, brown walls. On calcareous soil in deciduous woods; autumn; very rare in temp.-hemib.; DK (EN), SE (EN). – B&K 4:217, GBW 4:60, Svp 34:33.
E. calcicola (Knudsen) Bon (*Lepiota c.* Knudsen)
- Cap and stem with 1-2 mm long, tomentose, soon loosening scales, leaving the cap silky shiny. Cap 30-60 mm, conical to plane with a low umbo, grey brown to brown, uniformly coloured, rarely exposing the whitish flesh, towards the margin radially fibrillose; gills crowded, white to cream; stem 30-60 x 3-10 mm, with slightly bulbous base, above ring zone whitish, below of cap colour; flesh white; smell unpleasant, like *L. cristata*; taste unpleasant. Sp 4.5-6.5 x 2.5-3 μm , oblong to ellipsoid (fig. 537D), dextrinoid, metachromatic; cheilocystidia 20-40 x 5-10 μm , clavate to fusiform, often irregular; pileipellis of chains of subglobose to oblong cells up to 15-60 μm wide and long, brown, thick-walled. On rich soil in deciduous woods and parks; autumn, rare in temp.-hemib.; DK (EN), NO (NT, Tel: Bamble, Porsgrunn), SE (DD). – B&K 4:233, ☉.
E. perplexa (Knudsen) Bon (*Lepiota p.* Knudsen)

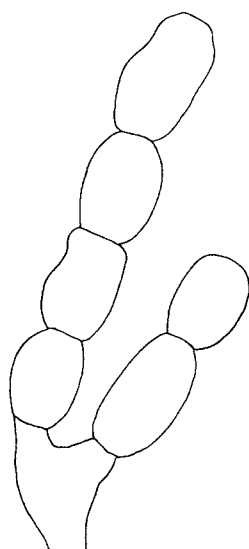


Fig. 359. Pileipellis elements: *Echinoderma echinacea*.

6. Cap and stem with up to 1 mm high, dark chocolate brown, woolly scales on a pale background. Cap 20-50 mm, hemispherical to plane, towards margin exposing a whitish pink flesh; gills white, crowded to medium spaced; stem 20-60 x 3-6 mm, cylindrical or with slightly enlarged base, above a woolly ring zone pinkish-brownish, below densely covered with a scaly-woolly tomentum of cap colour; flesh white; smell unpleasant; taste unpleasant. Sp 3.5-5.5 x 2.5-3 μm , ellipsoid, dextrinoid; cheilocystidia absent; pileipellis of chains of up to 20-60 x 15-50 μm , globose to ellipsoid cells with brown, thick walls. On rich soil in deciduous woods and parks; autumn; rare in temp.-hemib., very rare in bore.; DK (LC), NO (VU), SE (EN). – B&K 4:231, FAD 12H (as *Lepiota echinella* var. *eriophora*), GBW 4:62, Svp 26:35, Ves 276, ☉.

E. jacobi (Vellinga & Knudsen) Gminder (*Lepiota j.* Vellinga & Knudsen, *L. langei* Knudsen non Locq.)

- Cap and stem grey brown, reddish brown, pinkish to yellowish, not distinctly woolly 7
7. Cap and stem with 1-2 mm high, reddish brown, pointed scales, often loosening and leaving bare patches. Cap 20-50 mm, convex with a low umbo, towards the margin radially fibrillose, exposing the white flesh; gills crowded, white to cream; stem 30-60 x 2-8 mm, cylindrical or with slightly clavate base, above the woolly ring-zone pinkish white, below with girdles of pointed, erect scales of cap colour; flesh white; smell unpleasant; taste unpleasant. Sp 4-5.5 x 2.5-3 μm , oblong to ellipsoid (fig. 537E), dextrinoid; cheilocystidia 8-30 x 4-10 μm , absent or sparse, in tufts; pileipellis of chains of subglobose cells up to 20-40 μm (fig. 539A), with brown walls. In deciduous and coniferous woods, not exclusively on rich soil; autumn, occasional in temp.-southern bore., rare in middle bore.; DK (LC), FI (LC), NO (VU), SE (NT). – FAD 10D, Sieniop 102, Ves 277, ZM 55:64bis, ☉.
- E. echinacea* (J.E. Lange) Bon (*Lepiota e.* J.E. Lange)
- Cap and stem with up to 1 mm high, more granular scales, dull grey-brown to pinkish-yellowish brown 8

8. Cap 10-25 mm, with 1 mm high, woolly-granulose, easily detachable scales; stem 2-3 mm broad. Cap hemispherical to convex, light brown to pinkish brown, radial fibrillose towards the margin; gills whitish, medium spaced to crowded; stem 20-50 mm long, cylindrical, typically twice as long as cap diam., above the woolly ring zone cream yellowish, below with a woolly-scaly tomentum of cap colour; flesh white; smell and taste unpleasant. Sp 3.5-5 x 2-3 μm , oblong to ellipsoid-cylindrical (fig. 537F), dextrinoid, weakly metachromatic; cheilocystidia absent; pileipellis of chains of elongate to ellipsoid cells, up to 30-50 x 20-45 μm , with light brown walls. In deciduous woods and parks on rich soil; late summer to autumn; rare in temp.-hemib., in SE also in bore. (Mpd); DK (vu), NO (vu), SE (vu). – C&D 659, Nit 317, Svp 26:35, Ves 277.
- E. pseudoasperula* (Knudsen) Bon (*Cystolepiota p.* Knudsen, *Lepiota p.* (Knudsen) Knudsen)
- Cap normally 25-50 mm, with up to 0.5 mm high, easily detachable, pointed scales; stem 3-7 mm broad. Cap hemispherical to low convex with a low umbo, pale brown to yellow brown; gills crowded, white to cream; stem 20-50 mm long, typically less than twice as long as cap diam., cylindrical, above the woolly ring zone pale ochre brown, silky, below with girdles of pointed scales of cap colour; flesh white; smell unpleasant; taste neutral. Sp 3.5-4.5 x 2-3 μm , ellipsoid (fig. 537G), dextrinoid, eventually weakly metachromatic; cheilocystidia 15-30 x 5-9 μm , in scattered groups or absent; pileipellis of chains of globose cells up to 10-30 μm , with yellow-brown walls. In deciduous forests and hedges on rich soil; autumn; rare in temp.; DK (DD), SE (Sk). – FAD 10C (as *Lepiota echinella* var. *asperula*), ÖZP 14:51.
- E. carinii* (Bres.) Bon (*Lepiota c.* Bres.)

Entoloma (Fr.) P. Kumm.

MACHIEL NOORDELOOS

Frb with central, rarely eccentric or lateral stem, crepidotoid, omphalinoid, collybioid, mycenoid or tricholomatoid. Cap conical, bell-shaped, hemispherical, convex, plane, with umbonate or depressed to funnel-shaped centre, glabrous, pruinose, fibrillose, tomentose, finely to distinctly scaly, smooth, rugulose or veined, hygrophanous or not, translucently striate or not, white, cream, ochre, yellow, brown, grey, red, green, blue, violaceous or pink. Gills free, narrowly adnexed, adnate, emarginate or decurrent, distant to crowded, usually medium spaced, white, yellow, grey, brown, blue or violaceous, usually with a pink tinge when mature, edge even or uneven to strongly fimbriate, with same colour as sides or with contrasting colour due to the presence of pigmented cystidia. Stem usually well-developed, glabrous and polished, or covered with longitudinal fibrils, tomentose or with scattered to crowded scales, white, cream, ochre, yellow, brown, grey, red, green, blue, violaceous or pink, at base usually with a tomentum, sometimes with strigose hairs. Smell none or distinct, farinaceous, rancid, like cucumber, fish, garlic or rotten cabbage, or aromatical, in some species reminiscent of the smell of *Hebeloma sacchariolens*. Taste mild or farinaceous-rancid, often unpleasant, rarely bitter. Sp deposit pink with a brownish shade.

Sp 5-22 µm long, angled, usually thick-walled with pronounced angles, more rarely thin-walled and weakly angled or nodulose-angled, iso- to heterodiametrical. Basidia mostly 4-spored, rarely exclusively 2-spored. Cheilocystidia present or absent, cylindrical to clavate, lageniform, fusiform, lecythiform or tibiiform. Pleurocystidia usually absent, rarely present, fusiform to lageniform. Hymenophoral trama regular to subregular. Pileipellis a cutis of narrow cylindrical hyphae, sometimes bi-layered with distinct subpellis, or a trichoderm of inflated elements, or a hymeniderm of clavate to rounded elements; pigment intracellular, homogenous or in granules, or incrusting the outer walls of the hyphae, or a combination of pigment types. Clamps present or absent.

Saprotrophic or ectomycorrhizal, rarely parasitic, in a wide range of habitats from lowland into the alpine and arctic zone.

210 species in the Nordic countries, 232 species in the key.

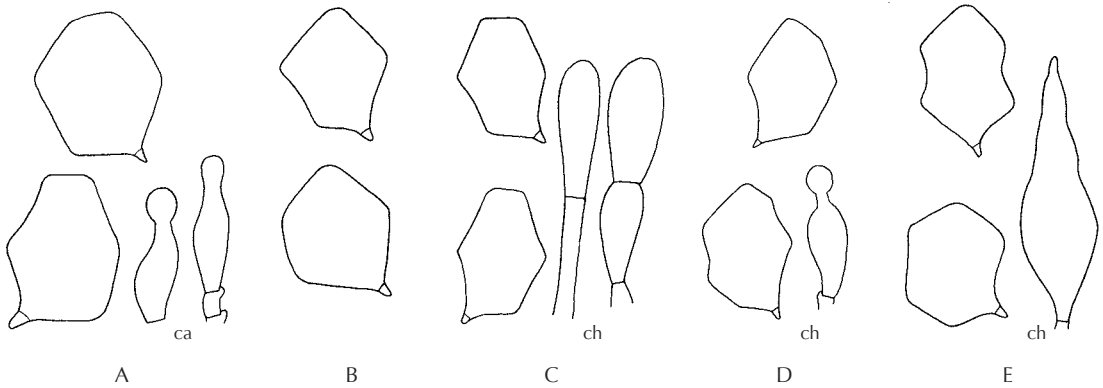
Lit.: Gröger 2006, Ludwig 2007, Noordeloos, 1992, 2004, Vesterholt & Brandt-Pedersen 1990, Vesterholt 2002.

- | | | |
|----|--|---------------------|
| 1. | Frb crepidotoid, with reduced, eccentric or lateral stem, or stem entirely lacking | Key A p. 434 |
| - | Frb omphalinoid, collybioid, mycenoid or tricholomatoid, with well developed, usually central stem | 2 |
| 2. | Gill edge distinctly coloured | Key B p. 435 |
| - | Gill edge concolorous with sides | 3 |
| 3. | Cap with blue or violaceous tinge | Key C p. 441 |
| - | Cap without blue or violaceous tinge | 4 |
| 4. | Stem with blue or violaceous tinge | Key D p. 447 |
| - | Stem without blue or violaceous tinges | 5 |
| 5. | Cap pink or with a pink tinge | Key E p. 453 |
| - | Cap without a pink tinge | 6 |
| 6. | Cap convex to flattened, slightly to distinctly depressed at centre; frb collybioid, clitocyboid or omphalinoid with adnate to decurrent gills | 7 |
| - | Cap conical to convex, with or without an umbo; frb mycenoid or tricholomatoid with free, adnexed to adnate-emarginate gills | 9 |
| 7. | Cap glabrous, often hygrophanous | Key F p. 454 |
| - | Cap fibrillose, tomentose or finely scaly, hygrophanous or not | 8 |

8. Pigment parietal-incrusting **Key G p. 459**
 - Pigment intracellular or lacking **Key H p. 461**
9. Sp cuboid or cruciform (figs 467A-B) **Key I p. 466**
 - Sp not cuboid or cruciform 10
10. Cap glabrous, often distinctly hygrophanous 11
 - Cap fibrillose, tomentose, finely scaly or venose, at least at centre, often not or indistinctly hygrophanous 13
11. Habit tricholomatoid with convex to plane cap with or without an umbo; gills adnate-emarginate to adnate, sometimes with a decurrent tooth; stem fibrous **Key J p. 467**
 - Habit mycenoid with conical to convex cap, usually with an umbo, gills adnexed, free or rarely adnate with a decurrent tooth; stem slender, often rigid 12
12. Cheilocystidia absent **Key K p. 476**
 - Cheilocystidia present **Key L p. 483**
13. Frb mycenoid with a thin, slender stem; cap strongly radially fibrillose to minutely scaly, often with micaceous sheen, reminiscent of a small *Inocybe*; gills dark grey to chocolate brown; stem with long hairs; pigment incrusting, rarely with additional intracellular pigment; basidia often with dark pigment (necropigment) **Key M p. 486**
 - Frb mycenoid or tricholomatoid; cap pruinose, rimulose, rugulose, venose, fibrillose, finely scaly or tomentose; gills white or with brown or grey tinge, not dark grey brown to chocolate brown; stem glabrous or pruinose, without long hairs; pigment intracellular, rarely incrusting; basidia without dark pigment 14
14. Cheilocystidia distinctly capitate, at least a considerable number per gill edge **Key N p. 488**
 - Cheilocystidia, if present, not capitate **Key O p. 489**

Key A: Frb crepidotoid with reduced, eccentric or lateral stem, or stem lacking

1. Pileo- and caulocystidia capitate (fig. 435A); sp 9.5-13(-15) × 7.5-10(-11.5) μm, 5-6-angled in side-view, subisodiametrical to heterodiametrical. Cap 1-15 mm, hemispherical to convex, expanding with age, white; gills narrowly adnate to almost free, distant, pink; stem well developed in young frb only, soon lateral and reduced to almost lacking. Clamps present. On rotten wood of deciduous trees; late summer to autumn; very rare or overlooked in temp.-hemib.; DK (DD), FI (U: Helsinki). – FE 5A:1358, FM 9:49, Lud 94.4, Svp 57:35, Win 93:59, ©. *E. jahni* Wölfel & Winterh.
 - Frb without capitate pileo- and caulocystidia; sp different 2
2. Frb purely white 3
 - Frb pigmented 4
3. On debris of grasses and sedges in marshy places; stem in young stages central, then eccentric, 2-6 × 0.2-1 mm; gills distant, often anastomosing or forked
see *E. albotomentosum* key H 2
 - Parasitic on mushrooms, also found on dead wood; stem lateral or absent, at most 5 × 1 mm; gills distant, well-developed. Cap 3-9 mm, convex to plane, appressed fibrillose. Sp 9.5-12.5 × 8-11 μm, 5-6-angled in side-view (fig. 435B); clamps present. Summer to autumn; very rare in temp.; SE (LC, Sk: Osby). – FE 5A:1356, Lud 94.7.
E. parasiticum (Quél.) Kreisel
4. Clamps present; cheilocystidia absent. Cap 5-35(-60) mm, low convex, often irregularly shaped with undulating margin, pale grey to grey brown, densely covered with silvery fibrils; gills crowded, L = 10-25, greyish to brownish pink; stem 1-15 × 0.5-3 mm, eccentric to lateral, reduced, densely silvery fibrillose, grey to grey brown; smell and taste farinaceous.



Spores, caulocystidia and cheilocystidia: A: *Entoloma jahnii*, B: *E. parasiticum*, C: *E. serrulatum*, D: *E. fuscomarginatum*, E: *E. indutoides* var. *griseorubidum*.

Sp 9.5-12 x 6.5-8 μ m, heterodiametrical, irregularly many-angled. Terricolous or on dead plant remains; autumn; occasional in hemib.-middle bore., rare in temp.; DK (NT), FI (DD, V: Nauvo), NO (NE), SE (LC). – B&K 4:13, FAD 80C, FE 5:71B, FE 5A:1355, R&H 386, \odot .

E. byssisedum (Pers.: Fr.) Donk

- Clamps absent; cheilocystidia present or absent 5

5. Parasitic on *Cantharellus* or *Craterellus*. Cap 2-10 mm, plane, subtomentose, pale brown; gills adnate, distant; pale pink; stem 1-4 x 1 mm, eccentric or lateral, finely tomentose, pale brown; smell none. Sp 7.5-10 x 6-7.5 μ m. Summer to autumn; rare in temp.-bore.; FI (VU, V and ES), SE (NE). – FE 5A:323, Jordst 22(3), Lud 94.6.

E. pseudoparasiticum Noordel.

- On rotten wood. Cap 6-20 mm, convex to plane, grey, strongly aeriferous-fibrillose; gills adnate, crowded, pinkish brown; stem strongly reduced, usually absent. Sp 8.5-11 x 7-7.5 μ m; cheilocystidia 30-70 x 3-10 μ m, cylindrical-flexuose. Autumn; rare in temp.-suba.; DK (EN), FI (DD), NO (NE), SE (NE, SK). – \odot .

E. depluens (Batsch: Fr.) Hesler


Key B: Gill edge coloured

1. Cap with blue or violaceous tinges 2
 - Cap yellowish, brown, grey brown or pink 7
2. Cap and stem soon getting an olivaceous tinge. Cap 10-50 mm, conical-convex or hemispherical, expanding to convex, umbilicate, tomentose to finely scaly, not translucently striate or at margin only, dark brown with an olivaceous tinge; gills adnate-emarginate, with a decurrent tooth, medium spaced, sordid white to grey pink with blue-black, serrulate edge; stem 20-70 x 2-6 mm, blue grey, then olivaceous blue or glaucous, polished; smell and taste indistinct. Sp 8.5-10.5(-11) x 6-8(-9) μ m, 5-7-angled in side-view; clamps absent. Solitary or in small groups in moss and grass, also in humus in mixed forests on moist soil, preferably on base-rich soil; autumn; rare in hemib.-bore.; NO (LC), SE (NA). – Däh 423, FE 5A:1288, GBW 4:168, Lud 94.93.

E. querquedula (Romagn.) Noordel.

 - Cap and stem without olivaceous tinges 3
3. Cap and stem blue; stem polished 4
 - Cap and stem blue or violaceous; stem covered with fibrils 5


4. Gills edge blue-black, fimbriate. Cap 5-40 mm hemispherical or conical-convex expanding to low convex, depressed to umbilicate, tomentose, then finely scaly, not translucently striate, dark blackish blue, blue grey or violaceous blue; gills adnate to decurrent, medium spaced to crowded, white or with a blue tinge, then pinkish grey; stem 15-60 x 1-4 mm, dark blue or violaceous blue, polished or with a blue fibrillose covering; smell faint or distinctly aromatic; taste mild to rancid. Sp 9-12 x 6.5-8 μm , 5-7-angled in side-view (fig. 435C); basidia 4-spored; cheilocystidia 25-110 x 3-20 μm , cylindrical to clavate with blue intracellular pigment; clamps absent. In groups in pastures, meadows, natural grassy vegetations, heathland, in humus of deciduous forests, on acid to neutral or base-rich soil; summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – FAD 77G,G1, FE 5:52a, FE 5A:1286, FND 21:34,35, R&H 382, ☉.
- E. serrulatum* (Fr.: Fr.) Hesler
- Gills edge brown, entire. Cap 10-50 mm, convex, umbilicate, tomentose to minutely scaly, not hygrophanous, not translucently striate; gills adnate-emarginate or with a decurrent tooth, medium spaced, blue, then blue pink; stem 20-50 x 2-4 mm, blue, polished; smell and taste indistinct. Sp 8.5-12.5 x 6-8.5 μm , heterodiametrical, 5-9-angled in side-view; cheilocystidia 35-75 x 5-25 μm , cylindrical to clavate; pileipellis a cutis to a trichoderm of inflated elements, 6-22 μm wide with intracellular pigment; clamps absent. In groups in grassland, along roads, and in damp, rich coniferous forests among grasses; summer to autumn; occasional in temp.-suba.; DK (NT), FI (LC), FO, NO (LC), SE (LC). – FE 5:53ab, FE 5A:1294-1295, FND 21:10,11, Ves 255.
- E. chalybaeum* (Fr.: Fr.) Noordel. var. *chalybaeum*
var. *lazulinum* (Fr.) Noordel. differs in having a translucently striate cap. Occasional in temp.-bore.; DK, FI (DD), FO, NO, SE. – Däh 424, FE 5A:1295.
5. Gill edge blue-violaceous, serrulate. Cap 13-30 mm, convex, then flattened, umbilicate, minutely scaly, not translucently striate, blackish brown with a violaceous tinge; gills medium spaced, yellowish blue, then sordid pink; stem 20-45 x 2-5 mm, strongly fibrillose-striate, brown with a violaceous tinge; smell and taste indistinct. Sp 8.5-11 x 6-7.5 μm , 5-6-angled in side-view; gill edge sterile, of the serrulatum-type with blue pigmented cheilocystidia, 20-50 x 2.5-7 μm ; clamps absent. Found in a pasture near a mixed forest; late summer; found in a pasture near a mixed forest; late summer; very rare hemib.; FI (V). – FE 5A:1293.
- E. violaceoserrulatum* Noordel.
- Gill edge brown 6
6. On deciduous wood, mainly on *Alnus*, less often *Corylus*. Cap 5-40(-50) mm, conical or hemispherical, then convex, depressed or umbilicate, minutely scaly, not translucently striate, violet blue, then brown with a violaceous tinge; gills adnate to adnexed, medium spaced, violaceous, then violaceous pink; stem 20-70 x 1-6 mm, fibrillose striate, pale to dark violaceous blue; smell aromatic; taste soapy-nasty. Sp (8-)9-11.5 x 6-8 μm , 5-7-angled in side-view; cheilocystidia 20-60 x 5-15 μm , cylindrical, clavate or lageniform with brown-violaceous intracellular pigment; clamps abundant. Single or in small groups on living and dead wood in moist forests; summer to autumn; rare, but locally occasional in temp.-bore.; DK (NT), FI (VU), NO (NT), SE (LC). – FAD 76A, FE 5:46e, FE 5A:1275, Phil 162b, Ves 254, ☉.
- E. euchroum* (Pers. Fr.) Donk
- On soil in grassland, rarely in deciduous forests. Gill edge brown. In other characters like the main variety. In groups, preferably on calcareous soil; summer to autumn; rare in temp.-suba.; DK, FI (VU), NO, SE. – FAD 80H, FE 5:56a,87h, FE 5A:1299, GBW 4:164, Svp 21:24, ☉.
- E. mougeotii* (Fr.) Hesler var. *fuscmarginatum* Noordel.
7. Stem blue, violaceous or steel grey when young and fresh 8
- Stem white, pink, pale cream, yellow or brown 15

8. Gill edge of the serrulatum-type, with blue-black or reddish-lilaceous pigment 9
 - Gill edge smooth, not of the serrulatum-type, with brown pigment 11
9. Cap pink to pinkish red. Cap 5-45 mm, conical or hemispherical expanding to convex, depressed to umbilicate, fibrillose or tomentose, then finely scaly, not translucently striate, often with a blue tinge near margin; gills adnate-emarginate, medium spaced, white, then pink, sometimes with slight grey tinge, with fimbriate or flocculose, concolorous or blackish blue edge; stem 20-60 x 1-5 mm, glabrous or with scattered bluish fibrils, pink, lower half grey blue or bright blue; smell weak or sweetish; taste mild. Sp 9-10.5(-11) x 6.5-8 μ m, 6-9-angled in side-view; cheilocystidia 25-75(-100) x 7-20 μ m, cylindrical or fusiform, with or without blue intracellular pigment; clamps absent. In alpine and arctic habitats, often with dwarf shrubs, also found in alvar vegetation at sea level and in *Picea* forests on calcareous ground in bore.; summer to autumn; very rare in temp.-arc./alp.; DK (NA, EJyl: Høstemark). FI (DD, Ks: Kuusamo), NO (DD), SE (NT). – BCat 314, FE 5:58b, FE 5A:1310-1311, FND 21:9, RdM 43:213.
E. catalaunicum (Singer) Noordel.
 - Cap flesh-coloured or brown 10
10. Cap pale flesh-coloured to beige. Cap 10-25 mm convex, deeply umbilicate, glabrous or minutely radially fibrillose, with a granulose to minutely scaly centre, deeply translucently striate; gills adnate-decurrent, medium spaced, white, then sordid pink, with blue-black, serrulate edge; stem 20-50 x 1-2 mm, glabrous, polished, pale grey-yellow with faint blue tinge; smell and taste indistinct. Sp 9-11.5(-12.5) x 6-8.5 μ m, 5-7-angled in side-view; gills edge of the serrulatum-type; cheilocystidia 30-60 x 5-20 μ m, cylindrical to clavate with abundant blue, intracellular pigment; clamps absent. In poorly manured grasslands and hay-fields; summer to autumn; very rare in temp.-suba.; DK (NE), FI (DD, PS: Kuopio), NO (NE), SE (DD). – FE 5:52b, FE 5A:1289 (too red).
E. carneogriseum (Berk. & Broome) Noordel.
 - Cap brown, yellow brown or red brown. Cap 5-40 mm, hemispherical or conical-convex, then convex or low convex, with depressed to umbilicate centre, fibrillose with a granulose or \pm finely scaly centre, deeply translucently striate; gills adnate-emarginate, medium spaced, white, then grey pink, with blue-black, serrulate edge; stem 20-50 x 1-5 mm, glabrous or with scattered fibrils, grey brown or yellow brown with distinct blue tinge when fresh; smell and taste indistinct. Sp 8.5-11.5(-12.5) x 6.5-7(-8) μ m, 5-7-angled in side-view; gill edge sterile of the serrulatum-type; cheilocystidia 20-120 x 7-20 μ m, cylindrical to clavate with blue, intracellular pigment; pileipellis a cutis to a trichoderm of inflated, 10-45 μ m wide elements with blue intracellular pigment; clamps absent. In groups in grassland and meadows, often on acid, peaty soil, or in *Sphagnum* bogs, also in xerophytic grasslands on calcareous soil; summer to autumn; occasional, but locally common in hemib.-suba., rare in temp.; DK (EN), FI (LC), FO, IS (Au, Na), NO (LC), SE (LC). – B&K 4:14, FE 5:52c, FE 5A:1287-1288, FND21 8, GBW 4:154, .
E. caesiocinctum (Kühner) Noordel.
11. Stem intensely blue with a fine blue flocculose covering. Cap (5-)10-20 mm, convex, then plane with depressed to umbilicate centre, tomentose to finely scaly, not translucently striate, dark grey brown to almost black; gills adnate-emarginate, medium spaced, sordid white, then pinkish brown, with entire, concolorous or brown edge; stem 20-45 x 1-4 mm; smell and taste indistinct. Sp 9-13.5 x 6.5-9 μ m, 5-7-angled in side-view; gill edge sterile; cheilocystidia 20-50 x 5-15 μ m, cylindrical to narrowly clavate, with brown, intracellular pigment; pileipellis a trichoderm of inflated elements, 20-70 x 10-30 μ m, with intracellular pigment; clamps absent. In seminatural grassland and open grassy places in boreal or sub-alpine moist *Betula* or *Alnus* forests; summer to autumn; very rare in temp.-suba.; DK (NA, EJyl: Bygholm Å), NO (VU). – Bol Bres 39:28, BSMF 115:174, FE 5A:1317, Lud 94.114.
E. coeruleoflocculosum Noordel.

- Stem polished 12
- 12. Cap pale brown, yellowish brown or reddish brown, deeply translucently striate 13
- Cap dark brown, sepia or blackish brown, not translucently striate 14
- 13. Cap pale glaucous grey to sordid yellow brown with a darker central spot; stem pale blue or with glaucous green tinges; cheilocystidia 20-100(-120) × 5-20 μm, septate. Cap 5-20 mm, conical, expanding to low convex, often with a small papilla, innately fibrillose with minutely scaly centre, translucently striate; gills adnate-decurrent, medium spaced, white, then pink with a brown edge; stem 20-60 × 1-3 mm, polished; smell and taste indistinct. Sp 9-12(-12.5) × 6-8(-9) μm, 5-7-angled in side-view; gill edge sterile; cheilocystidia often with brown intracellular pigment; pileipellis a cutis or a trichoderm of inflated hyphae, 10-25 μm wide, with intracellular pigment; clamps absent. In groups in mossy grassland and pastures; summer to autumn; locally common in hemib.-suba., occasional in temp.; DK (NT), FI (DD), FO, NO (LC), SE (LC). – Däh 417, FE 5:66b, FE 5A:1329, FND 21:16, GBW 4:230, ☉.
E. exile (Fr.: Fr.) Hesler (*E. pyrospilum* (P.D. Orton) M.M. Moser)
- Cap pale to moderately dark reddish brown with darker centre; stem pale blue to steel grey, soon turning brown; cheilocystidia 35-80 × 4-12 μm, not septate. Cap 10-25 mm, hemispherical to convex, depressed, innately fibrillose with a very minutely scaly centre, deeply translucently striate; gills ascending-adnate, medium spaced, pale to dark brown pink with brown edge; stem 20-40 × 1-2.5 mm, becoming brown, polished; smell and taste indistinct. Sp (10-)11-13 × (6-)7-8 μm, (5-)6-9-angled in side-view; gill edge sterile; cheilocystidia with brown, intracellular pigment; pileipellis a cutis to a trichoderm of cylindrical to inflated elements, 10-20 μm broad, with intracellular pigment; clamps absent. In peat-bogs and mesotrophic, scrubby lake shore bogs; late summer; in bore., poorly known; FI (DD, EH, Ks). – FE 5A:1333.
E. caliginosum (Romagn. & J. Favre) Bon & Courtec.
- 14. Sp 9-11.5(-14) × 6-9 μm, Q = 1.2-1.9, heterodiametrical, 5-7(-8)-angled in side-view; gills without blue tinges. Cap 15-55 mm, conical or hemispherical, then convex, depressed to umbilicate, radially fibrillose or tomentose, then with finely scaly centre, not striate or translucently striate at margin only, very dark sepia or grey brown with almost black centre; gills emarginate or with a decurrent tooth, broadly adnate, pale grey, then sordid pink, with entire or slightly irregular, brown edge; stem 20-70 × 2-4(-5) mm, blue or blue grey, then steel grey, polished; smell and taste none or farinaceous. Gill edge sterile; cheilocystidia 30-80(-110) × 5-20 μm, fusiform, cylindrical to broadly clavate, with brown, intracellular pigment; pileipellis a cutis to a trichoderm of inflated terminal elements, 30-90 × 10-25 μm, with brown, intracellular pigment; clamps absent. In groups in grassland, in forests and among *Sphagnum* in peat-bogs up to suba.; summer to autumn; locally common in hemib.-suba., occasional in temp.; DK (NT), FI (DD), FO, NO (LC), SE (LC). – B&K 4:62 (as var. *parvisporigerum*), FE 5:62B, FE 5A:1323-1324, FND 21:29, Lud 94.109, Ves 257, ☉.
E. poliopus (Romagn.) Noordel. var. *poliopus*
- Sp 7.5-11 × 7-8 μm, Q = 1.05-1.4, subisodiametrical to short heterodiametrical, 4-6-angled in side-view; gills often with a blue tinge. Cap 15-40 mm, convex, depressed, minutely scaly, not translucently striate, blackish at first, then dark umber brown; gills adnate, white with distinct pale blue tinge when young, then greyish pink with a brown edge; stem 40-50 × 2-2.5 mm, dark blue, then grey blue, finally with glaucous or olivaceous tinge, polished; smell and taste indistinct. Gill edge sterile of the serrulatum-type; cheilocystidia, 20-65 × 6-16 μm, clavate with brown intracellular pigment; pileipellis a cutis to a trichoderm, of inflated terminal elements, 20-70 × 9-15 μm, with brown, intracellular pigment; clamps absent. In groups in meadows grazed with cattle on calcareous soil; summer; very rare in temp.-bore.; NO (NE, Nordl: Herøy), SE (Sk: Brösarp). – FE 5A:1321, Lud 94.103.
E. broesarpensis E. Ludw. & Noordel.

15. Stem pink to dull red with fine darker fibrils and scales; gill edge reddish lilaceous. Cap 15-30 mm, convex to low convex, umbilicate, fibrillose with finely scaly centre, slightly translucently striate, dull red with greyish red centre; gills broadly adnate, medium spaced to crowded, pink; stem 30-55 x 2-3 mm; smell and taste indistinct. Sp 8.5-11 x 6-8 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 22-60 x 3-10 μm , cylindrical to clavate, with intracellular pigment; clamps absent. In mossy meadows and in raw humus of deciduous forests of *Corylus* and *Carpinus* on calcareous soil; late summer to autumn; very rare in temp.-bore.; DK (CR), NO (EN). – FE 5A:1290, SN 2005(1):20, ☉.
E. callirhodon Hauskn. & Noordel.
- Stem white, pale ochre, ochre, yellow or brown; gill edge blackish blue or brown 16
16. Gill edge blackish blue, of the serrulatum-type 17
- Gill edge brown, cheilocystidia in a hymeniform layer 18
17. Terrestrial; cap and stem yellow. Cap 10-25 mm, convex to low convex with slightly depressed centre, minutely scaly, slightly translucently striate; gills adnate-emarginate, medium spaced, pink with blue, fimbriate edge; stem 20-40 x 1-3 mm, polished; smell and taste indistinct. Sp 8.5-10.5 x 6-8 μm , 5-6-angled in side-view; gill edge sterile, of the serrulatum-type; cheilocystidia 20-45 x 2.5-9 μm , cylindrical to clavate, with bluish intracellular pigment; pileipellis a trichoderm of swollen elements, 40-90 x 10-25 μm , with brown, intracellular pigment; clamps absent. In small groups in rich deciduous forests; autumn; very rare in hemib.; FI (A: Finström). – FE 5A:1293, Sieniop 263.
E. xanthoserrulatum Noordel. & Vauras
- On wood; cap and stem dark brown. Cap 10-20 mm, convex, umbilicate, minutely scaly, not hygrophanous, not translucently striate; gills adnate-emarginate, medium spaced, pink with a blue tinge, with a blue, serrulate edge; stem 20-40 x 1-2 mm, polished; smell and taste indistinct. Sp (8-)8.5-10(-10.5) x 6-7(-7.5) μm , 5-7-angled in side-view; gills edge sterile, of the serrulatum-type; cheilocystidia 40-65 x 6-20 μm , with blue intracellular pigment; pileipellis a trichoderm of inflated elements, 20-65 x 8-20 μm , with brown, intracellular pigment; clamps absent. In small groups on rotten wood in deciduous forests; autumn; very rare in temp.; DK (NE). – FE 5A:1289.
E. linkii (Fr.: Fr.) Noordel.
18. Cheilocystidia clavate, lageniform or lecythiform with weakly delimited 2-8 μm wide capitulum (fig. 435D). Cap 15-60 mm, conical, expanding with age to conico-convex or convex with an umbo, not hygrophanous, brown to red brown, innately radially fibrillose breaking up in small scales; gills adnate or emarginate, medium spaced, white, then pink, finally reddish brown, with a brown edge; stem 20-60 x 2-7 mm, pale brown, silvery striate; smell and taste farinaceous to rancid. Sp (8-)9-12(-12.5) x (6-)7-8.5(-9) μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia 20-60 x 5-16 μm ; pileipellis a cutis to a trichoderm of inflated elements, 15-20 μm wide, with intracellular pigment; clamps present. In groups in boggy areas, heathland and grassy places, roadsides, etc.; late summer to autumn; rare in temp. and suba.; DK (EN), NO (NE, Troms: Kåfjord), SE (LC, Sk). – FE 5A:1270.
E. fuscomarginatum P.D. Orton
- Cheilocystidia not capitate 19
19. Cheilocystidia lageniform to fusiform with acute apex (figs 435E, 467C); clamps present 20
- Cheilocystidia cylindrical to clavate; clamps absent 21
20. Cap glabrous, pale creamy ochre to pale brown see *E. excentricum* key J 9
- Cap minutely scaly, brown, sometimes tinged olivaceous. Except for cap colour like the main variety (fig. 435E). In groups in grassland; late summer to autumn; very rare in temp.-arc./alp.; DK (CR), NO (NE), SE (DD). – Bol Bres 39:35, BSMF 120:348, 349, FE 5:49a, FE 5A:1344, Svp 21:20.
E. indutoides (P.D. Orton) Noordel. var. *griseorubidum* (Noordel.) Noordel. (*E. griseorubidum* Noordel.)

21. Cap pale beige-ochre. Cap 10-35 mm, convex, umbilicate, minutely scaly at centre only; gills medium spaced, white, then pink; stem 35-65 x 1-3 mm, very pale, polished; smell and taste indistinct. Sp 9-11.5 x 7-8.5 μm , heterodiametrical, 5-6-angled in side-view; gill edge sterile; cheilocystidia 20-50 x 7-20 μm , clavate to vesiculose with brown, intracellular pigment; pileipellis a cutis to a trichoderm of inflated elements, 8-22 μm wide, with intracellular pigment; clamps absent. In groups in grassland; summer to autumn; very rare in temp.-suba.; DK (NA), FI (DD), FO. – B&K 4:58, BSMF 122:bis, 124, FE 5:59a, FE 5A:1334-1335, FND 21:26, ☉.
E. ochromicaceum Noordel. & Liiv
 - Cap darker, brown, red brown or yellow brown 22
22. Cap yellow to reddish yellow (fulvous) 23
 - Cap red brown to grey brown 24
23. Gills yellow ochre, then yellow pink; sp (9-)10-15 x 6.5-9.5 μm . Cap 5-50 mm, convex, umbilicate, minutely scaly, weakly hygrophanous, translucently striate, yellow to reddish yellow; gills adnate-decurrent, medium spaced to distant, with brown, entire edge; stem 30-70 x 2-4 mm, polished, yellow; smell fruity or indistinct; taste unpleasant. Sp heterodiametrical, 5-9-angled in side-view; gill edge sterile; cheilocystidia 25-90 x 5-30 μm , cylindrical to clavate with brown intracellular pigment; pileipellis a cutis to a trichoderm of inflated elements, 15-30 μm wide, with intracellular pigment; clamps absent. In small groups in grassland and at roadsides; summer to autumn; occasional in hemib.-suba., but very common in FO, very rare in temp.; DK (EN), FO, NO (NE), SE (NE). – B&K 4:96, FE 5A:1337-1338, FND 21:40, Svp 21:29, ☉.
E. xanthochroum (P.D. Orton) Noordel.
 - Gills white, then pink; sp 10-13 x 7-9 μm . Cap 10-22 mm, hemispherical to convex, umbilicate, minutely scaly, not hygrophanous, not or slightly translucently striate, warm brown to yellow red; gills adnate with a decurrent tooth, medium spaced, with fimbriate, brown edge; stem 20-90 x 1-4 mm, polished, yellowish white or with grey tinge; smell none; taste slightly bitter to rancid. Sp heterodiametrical, 6-9-angled in side-view; gill edge sterile; cheilocystidia 30-90 x 5-15 μm , cylindrical to clavate, with brown, intracellular pigment; pileipellis a cutis to a trichoderm of inflated elements, 10-25 μm wide, with brown, intracellular pigment; clamps absent. In groups in *Sphagnum* of peat bogs; summer to autumn; very rare in bore., one locality in NO (NE, Oppl: Lunner). – B&K 4:85, FE 5A:1338.
E. sphagnorum (Romagn. & J. Favre) Noordel.
24. Cap dark grey brown, with or without a reddish tinge, not translucently striate; gills and base of stem turning reddish when bruised. Cap 10-50 mm, convex, umbilicate, not hygrophanous; gills adnate-emarginate or decurrent, medium spaced, brown with a pink tinge, with brown edge; stem 20-70 x 1-7 mm, polished or with scattered fibrils, brown; smell and taste indistinct to farinaceous. Sp 9-12.5(-14.5) x 6-9 μm , heterodiametrical, 5-7-angled in side-view; gill edge sterile; cheilocystidia 20-80 x 5-20 μm with brown, intracellular pigment; pileipellis a cutis to a trichoderm of inflated elements, 10-25 μm wide, with brown, intracellular pigment; clamps absent. In groups in grassland, preferably on calcareous soil; summer to autumn; locally occasional in hemib.-arc./alp., rare in temp.; DK (EN), FO, NO (NT), SE (LC). – Cet 2325, FE 5:70a, FE 5A:1341, FND 21:37, 38, Svp 21:29.
E. turci (Bres.) M.M. Moser
 - Cap yellow brown to grey brown, translucently striate; gills and stem not staining red when bruised 25
25. Cap pale cream yellow to pale yellow brown with well-delimited, distinctly darker centre; often with glaucous tinges, particularly in basal part of stem; sp 6-7-angled in side-view see *E. exile* 13
 - Cap dull yellow to yellow brown, sometimes with grey tinge, without well-delimited

darker centre; sp 5-9-angled in side-view. Cap 15-50 mm, convex, umbilicate, not or slightly hygrophanous, minutely scaly in central part, slightly to distinctly translucently striate; gills adnate-decurrent, medium spaced, white, then pink, then brownish pink with a brown edge; stem 20-80 x 1-3 mm, polished, pale brown; smell and taste none to farinaceous. Sp (9-)10-14.5(-15) x 6-9(-10) μm ; gill edge sterile; cheilocystidia 20-55 x 6-20 μm , cylindrical to clavate, often with brown intracellular pigment; pileipellis a cutis to a trichoderm of inflated elements, 10-30 μm wide, with brown, intracellular pigment; clamps absent. In groups in grassland and in open forests, peat-bogs and arctic and alpine tundra; summer to autumn; locally common in hemib.-arc./alp., rare in temp.; DK (EN), FI (DD), FO, NO (LC), SE (LC). – B&K 4:50, FE 5:69a,85c, FE 5A:1331, FND 21:26, Ves 258, .

E. longistriatum (Peck) Noordel. var. *longistriatum* (*E. sarcitulum* (P.D. Orton) Noordel.) var. *microsporium* Noordel. differs in sp 6.5-10 x 5.5-9 μm . NO.

Key C: Cap with blue or violet colours

1. Cap smooth or at most slightly wrinkled at centre; pileipellis two-layered, of a thin suprapellis of narrow, 2-7(-10) μm wide hyphae, laying on a subpellis of strongly inflated elements; clamps abundant 2
 - Cap fibrillose, tomentose, finely scaly or rugulose; pileipellis a trichoderm, a cutis with transitions to a trichoderm, or a hymeniderm, of inflated elements, at least 10 μm wide; clamps present, or more frequently absent 4
2. Frb collybioid, thin-fleshed; cap slightly depressed, translucently striate; stem polished. Cap 5-30 mm, hygrophanous, translucently striate, first blue, soon dark brown tinged purple or violaceous; gills adnate-emarginate, medium spaced, dark grey, then grey pink, veined on the sides; stem 15-60 x 2-5 mm, sky blue fading to brown blue; smell and taste indistinct. Sp 8-10(-11) x 6.5-8 μm , subsodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 3-8(-11) μm wide hyphae with intracellular pigment; clamps present. In small groups in moss in coniferous forests; late summer to autumn; rare in hemib.-bore., very rare in temp.; DK (EN), NO (NT). – FE 5:21b, Lud 94.72, Svp 21:41. *E. caeruleopolitum* Noordel. & Brandt-Ped.
 - Frb mycenoid or tricholomatoid, thin- or thick-fleshed; cap conical to convex or umbonate, not striate; stem fibrillose 3
3. Habit tricholomatoid; gills crowded, L = 30-40; often in grassland, but also in fertile deciduous woods. Cap 30-80 mm, conical, then convex, umbonate, glabrous, not hygrophanous, not translucently striate, deep blue, grey blue or indigo, then violaceous brown; gills adnate-emarginate, white, then salmon pink; stem 35-70 x 10-35 mm, tapering towards base, fibrillose, steel blue, grey blue, grey violaceous, with yellow tinged base; smell and taste weakly farinaceous. Sp (7-)7.5-9 x 6.5-8 μm , subsodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2.5-7 μm wide hyphae with intracellular pigment; clamps present. In grassland, often in \pm natural vegetation, poorly manured meadows, etc., mostly on calcareous soil; autumn; very rare in temp.-suba.; DK (CR), FO (Velbastadur), NO (VU), SE (VU). – B&K 4:12, FE 5:1-2, FE 5A:1168, GBW 4:152, Jordst 13(2). *E. bloxamii* (Berk. & Broome) Sacc. (*E. madidum* (Fr.) Gillet, nom. inval.)
 - Habit mycenoid or slenderly tricholomatoid; gills medium spaced, L \leq 25; in deciduous and coniferous forests. Cap 20-40(-50) mm, conical to convex, umbonate, glabrous or radially fibrillose, not hygrophanous, not translucently striate, grey blue; gills adnate-emarginate, white, then pink; stem 30-100 x 2-5 mm, fusiform, blue to blue grey with distinct yellow tinge near base, fibrillose striate; smell and taste weak to slightly farinaceous. Sp (6.5-)7-8.5 (-9) x (5.5-)6-7.5(-8) μm , 5-8-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2-6 μm wide hyphae with blue, intracellular pigment; clamps abundant. In deciduous and coniferous forests, often in \pm acidulous habitats, frequently also on calcareous soil where the upper layer is acidified; summer to autumn; occasional, but locally common in

hemib.-bore., rare in temp. and suba.; DK (NT), FI (LC), NO (LC), SE (LC). – FAD 74A, FE 5:4, FE 5A:1169, R&H 376, Ves 254, ☉.

E. nitidum Quél.

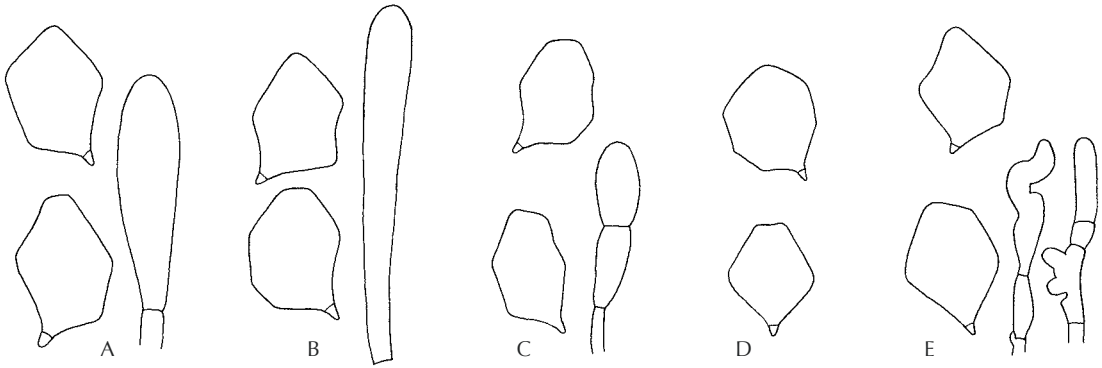
4. Gills blue or violaceous, at least when young 5
 - Gills without blue or violaceous tinge, also when young 9
5. Clamps present. Cap 5-30 mm, bell-shaped, then convex, umbonate, fibrillose with finely scaly centre, not hygrophanous, not translucently striate, blackish blue; gills adnate to deeply emarginate, medium spaced, pale blue grey, then pink; stem 25-60 x 1-3 mm, dark blue, polished or with scattered fibrils; smell and taste indistinct. Sp 7.5-11(-12) x 6-8 μm , heterodiametrical, 6-8-angled in side-view; gill edge heterogeneous; cheilocystidia 20-60 x 5-20 μm , cylindrical, scattered to abundant; pileipellis a trichoderm of inflated, 5-20 μm wide hyphae with blue intracellular pigment. Single or in groups in humus and on fallen sticks and on rotten stumps in deciduous and coniferous forests; late summer to autumn; very rare in temp.-suba.; DK (EN), FO (Søldarfjørður), NO (NE). – Däh 425, FE 5:46F, FE 5A:1284, Lud 94.102, Svp 21:20.
E. lepidissimum (Svrček) Noordel.
- Clamps absent 6
6. Beside blue tinges, also green tinges present, at least in stem. Cap 8-20 mm, convex to plane, not hygrophanous, not translucently striate; dark ultramarine blue with sulphur-yellow tinges at centre, silky tomentose; gills adnate-emarginate, distant, ultramarine blue, then glaucous with a sulphur-yellow tinge; stem 20-40 x 1-2 mm, polished, ultramarine blue fading to greenish blue or glaucous green; smell and taste indistinct. Sp 8.5-11 x 7-8 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of inflated, 5-18 μm wide hyphae with intracellular pigment; clamps absent. In groups in grassland; summer to autumn; very rare in temp.-suba.; SE.
E. cyaneoviridescens (P.D. Orton) Noordel.
- No green tinges present 7
7. Blue tinges ephemeral, quickly disappearing, then frb pale to moderately dark brown; stem rather pale yellow or grey. Cap 10-20 mm, convex to low convex, umbilicate, fibrillose with minutely scaly centre, hygrophanous, translucently striate, pale brown with darker centre; gills almost free, medium spaced, white with a faint blue tinge when young, then pink; stem 30-45 x 11-20 mm, polished; smell and taste indistinct. Sp 9-12 x 7.5-9.5 μm , heterodiametrical, 5-7-angled in side-view (fig. 445A); cheilocystidia 25-70 x 6-15 μm , cylindrical to clavate; pileipellis a cutis to a trichoderm of inflated, 12-22 μm wide hyphae with pale intracellular pigment; clamps absent. In groups in grassland and in grass in deciduous forests; summer to autumn; very rare in temp.-bore.; DK (NA), FI (DD, A: Jomala). – B&K 4:53, FE 5:61, FE 5A:1322, FND 21:26, Lud 94.119.
E. mutabilipes Noordel. & Liiv
- Blue or violaceous tinges persistent 8
8. Cheilocystidia present; stem without orange-yellow tinges, also when bruised
 see *E. chalybaeum* key B 4
- Cheilocystidia absent; stem with a bright yellow-red or orange splotch, particularly when bruised. Cap 5-30 mm, convex, umbilicate, with minutely scaly centre, not hygrophanous, translucently striate, dark blackish blue to ultramarine; gills adnate-emarginate, medium spaced, blue, then bluish pink; stem 15-50 x 1-3 mm, blue, fading to greenish blue; smell and taste indistinct. Sp 8-11(-11.5) x 6.5-8 μm , heterodiametrical, 5-7-angled in side-view; pileipellis a cutis to a trichoderm of inflated hyphae, 12-40 μm wide, with blue intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; very rare in temp.-suba.; DK (CR), NO (VU). – FE 5A:1296, FND 21:15, Svp 21:24.
E. cruentatum (Quél.) Noordel.

9. Clamps present 10
 - Clamps absent 13
10. Sp 6.5-8.5 x 5.5-6 μm ; cap with about the same colour as the stem; stem polished. Cap 5-10 mm, conical to conical-convex with a small umbo, fibrillose with finely scaly centre, not hygrophanous, not translucently striate, blackish blue; gills adnate-emarginate, medium spaced, white, then pink; stem 20-40 x 0.5-1 mm, polished, blue; smell and taste indistinct. Sp subsodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis a trichoderm of cylindrical to slightly inflated hyphae, 10-19 μm wide, with blue intracellular pigment; clamps present. In small groups in mixed forests; autumn; very rare in bore.; NO (NE, Nordl: Rana). – FE 5A:1284.
E. coelestinum (Fr.) Hesler
 - Sp larger; cap and stem differently coloured; stem covered with fibrils or small scales 11
11. Sp many-angled, relatively thin-walled see *E. tjallingiorum* key D 9
 - Sp with 5-8 angles, with walls of normal thickness 12
12. Stem lilac blue or steel blue, appressed fibrillose; pigment intracellular in pileipellis. Cap 5-40 mm, conical, then convex, blunt or umbonate, fibrillose, tomentose, becoming minutely scaly, not hygrophanous, not translucently striate, deep blue, then violaceous blue or brown blue; gills adnate-emarginate, medium spaced, white, then brownish pink; stem 20-65 x 2-6 mm; smell and taste spermatic to farinaceous. Sp (9-)9.5-12 x 7-9.5(-10) μm , heterodiametrical, 6-8-angled in side-view; gill edge heterogeneous; cheilocystidia 20-45 x 5-20 μm , cylindrical, clavate to lageniform; pileipellis a trichoderm of septate hyphae, 20-45 μm wide, with intracellular pigment; clamps present. In small groups on humus and dead wood in deciduous forests on rich clay or calcareous soil and in dry grassland; summer to autumn; very rare in temp.-bore.; DK (VU), FI (DD), NO (VU), SE (NT). – FE 5:47b, FE 5A:1276, Jordst 13(2), Svp 21:20.
E. dichroum (Pers.: Fr.) P. Kumm.
 - Stem pale violaceous with darker violaceous, fibrillose covering; pigment intracellular in suprapellis, incrusting in subpellis. Cap 25-40 mm, conical, then convex, umbonate, tomentose to minutely scaly, not hygrophanous, not translucently striate, violaceous to violaceous grey; gills adnate-emarginate, medium spaced, sordid cream, then with pink tinge; stem 40-70 x 3-6 mm; smell and taste indistinct. Sp 9-12.5 x 7-9.5 μm , heterodiametrical, 6-9-angled in side-view; gill edge heterogeneous; cheilocystidia 30-55 x 5-10 μm , cylindrical to flexuous or lageniform; pileipellis a trichoderm of septate hyphae, up to 40 μm wide, with intracellular pigment; clamps present. In small groups in raw humus in deciduous forests; summer to autumn; very rare in temp.-bore.; DK (NA), NO (DD, M&R: Norddal & Tingvoll). – FE 5A:1279, FND 14:7, SN 2006(1):27.
E. allochroum Noordel.
13. Cap translucently striate when moist and fresh. Cap 13-26 mm, convex, umbilicate, with minutely scaly centre, slightly hygrophanous, violaceous brown to grey brown with violaceous tinge; gill adnate-emarginate, medium spaced, white, then pink; stem 20-40 x 1.5-2.5 mm, polished, pale grey-blue; smell and taste indistinct. Sp 8-11 x 5.5-8.5 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent. Pileipellis a cutis to a trichoderm of inflated, 15-25 μm wide hyphae, with intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; rare in temp.-suba.; DK (NA), NO (NT), SE (NE). – B&K 4:65, FE 5:54a, FE 5A:1297-1298, FND 21:30, Lud 94.122.
E. pseudocoelestinum Arnolds
 - Cap not translucently striate, opaque 14
14. Cheilocystidia 60-125 x 5-14 μm (fig. 445B); gills beige brown to grey brown when young; cap violaceous to brown violaceous, zonate. Cap 20-55 mm, truncate-conical, umbilicate, not hygrophanous, not translucently striate; gills adnate-decurrent, medium spaced; stem 40-95

x 4-8 mm, innately fibrillose, violaceous grey; smell and taste indistinct to subfarinaceous. Sp 10-11.5 x (7-)7.5-8.5 μm , heterodiametrical, 5-6-angled in side-view; cheilocystidia cylindrical; pileipellis a trichoderm of inflated elements, 8-20 μm wide, with blue intracellular pigment; clamps absent. In groups in unfertilized grassland on calcareous soil (alvar); late summer to autumn; DE, EE. – FE 5:48, FE 5A:1280, Lud 94.99.

E. violaceozonatum Noordel. & Liiv

- Cheilocystidia absent or ≤ 70 μm long; gills white or very pale coloured when young; cap differently colored, usually not zonate 15
- 15. Sp 11.5-15 μm long 16
- Sp ≤ 12.5 μm long 17
- 16. Cap 4-10 mm, deeply translucently striate; gill edge sterile with abundant cheilocystidia. Cap conical, then convex, umbonate or not, minutely scaly at centre only, grey blue, violaceous blue or blackish blue; gills adnate to free, medium spaced to distant, white, then pink; stem 15-65 x 0.5-1 mm, deep blue to grey blue, polished; smell and taste indistinct. Sp (10-)11-15.5(-16) x 6.5-11 μm , heterodiametrical, 6-9-angled in side-view; cheilocystidia 20-70 x 5-20 μm , cylindrical to clavate; pileipellis a cutis to a trichoderm of inflated elements, 10-35 μm wide, with intracellular pigment; clamps absent. In groups in unfertilized grass and among *Sphagnum* in moist places; summer to autumn; very rare in temp.-bore.; DK (DD), FI (DD, PS: Kuopio), NO (NE), SE (NE). – FE 5:54b, FE 5A:1297, Lud 94.107, Svp 21:24.
E. cyanulum (Lasch: Fr.) Noordel. var. *cyanulum*
- Cap 15-40 mm, not translucently striate; gill edge heterogeneous with scattered cheilocystidia. Cap convex, umbilicate, rugulose to minutely scaly, not hygrophanous, black with a faint blue tinge, blackish brown with age; gills adnate, medium spaced, pale grey, then salmon pink; stem 30-50 x 1.5-4.5 mm, blackish blue like cap, polished; smell and taste indistinct. Sp 11.5-14.5 x 8-11 μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia 20-50 x 4-10 μm , cylindrical to clavate; pileipellis a cutis to a trichoderm of up to 45 μm wide, inflated terminal elements, with intracellular pigment; clamps absent. In small groups in deciduous forests and unfertilized grassland; summer to autumn; very rare in bore.; NO (VU). – B&K 4:6, BSMF 122:opp. 126, FE 5:56C, FE 5A:1303.
E. aethiops (Scop.) G. Stev.
- 17. Stem glabrous, polished 18
- Stem fibrillose or covered with small flocks or scales 21
- 18. Gill edge sterile; cheilocystidia abundant. Cap 10-50 mm, convex, umbilicate, fibrillose to minutely scaly, not hygrophanous, not translucently striate, blackish blue, fading to brown with a bluish-violaceous tinge; gills adnate-emarginate, medium spaced, white or yellow, then pink; stem 15-50 x 1-5 mm, polished, ultramarine or deep blue black with a licaceous tinge, fading with age; smell none or sweetish; taste indistinctive. Sp (8-)9-11.5(-12.5) x 6-7.5 μm , heterodiametrical, 5-7-angled in side-view (fig. 445C); cheilocystidia 20-45 x 4-16 μm , cylindrical to clavate; pileipellis a cutis to a trichoderm of inflated terminal elements, 6-20 μm wide, with intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; very rare in temp.-suba.; DK (NA, EJyl: Vingum), IS (Na: Gil Öxnadal), NO (DD), SE (NE). – Bol Bres 39:25, FE 5A:1301, FND 21:7.
E. caeruleum (P.D. Orton) Noordel.
- Gill edge fertile without cheilocystidia, or cheilocystidia rare and scattered among basidia 19
- 19. Cap very dark blue, almost black, not distinctly changing colour when old. Cap 10-45 mm, convex, umbilicate, minutely scaly at centre; gills adnate to adnexed, medium spaced, sordid grey with a pink tinge; stem 25-50 x 1-3 mm, polished, grey blue to steel grey; smell and taste indistinct. Sp 9-11 x 6-7 μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia 25-50 x 7-15 μm , cylindrical to clavate; pileipellis a cutis to a trichoderm of inflated ele-



Spores and cheilocystidia: A: *Entoloma mutabilipes*, B: *E. violaceozonatum*, C: *E. caeruleum*, D: *E. juniperinum*, E: *E. lidbergii*.

ments, 10-20 μm wide, with intracellular pigment; clamps absent. In groups in unfertilized grassland on calcareous soil; summer to autumn; very rare in temp.-suba.; DK (NA), NO (DD). – FE 5A:1303.

E. melanochroum Noordel.

- Cap blue or blue-violaceous, gradually loosening its blue or violaceous tinges with age towards sordid brown 20
20. Smell strong, unpleasant, reminiscent of *Lepiota cristata*; taste rancid-farinaceous; cap 10-30 mm, conical to bell-shaped, with a small papilla, occasionally umbilicate. Cap entirely tomentose or fibrillose with a finely scaly centre, not hygrophanous, translucently striate when old, dark blackish brown, tinged blue, blue black, blackish-violaceous, grey blue, finally brown or sepia; gills adnate, emarginate or with a short decurrent tooth, distant to medium spaced, cream, then pinkish brown; stem 38-66 x 1-3 mm, cylindrical, polished, indigo blue when young, then blue grey, steel grey, rarely with a green tinge. Sp 9-11 x 6-8 μm , heterodiametrical, 6-8-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated elements, 10-25 μm wide, with intracellular pigment; clamps absent. In groups in deciduous forests, often on bare, black soil; summer to autumn; very rare in hemib.-bore.; NO (NE, Tel: Bamble, Oppl: Jevnaker). – FE 5:85d, FE 5A:1320, Tin 34:48.

E. lepiotosme (Romagn.) Noordel.

- Smell and taste indistinct; cap 20-70 mm, convex-umbilicate. Cap strongly fibrillose, then finely scaly, not hygrophanous, not translucently striate, blue grey to violaceous grey; gills adnate or with a small decurrent tooth, medium spaced, sordid pink; stem 40-130 x 5-12 mm, cylindrical to compressed, polished, blue, then violaceous blue or violaceous brown. Sp 9.5-12.5 x 7-9.5 μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated elements, 15-25 μm wide, with intracellular pigment; clamps absent. In groups in mixed forests on calcareous soil; summer to autumn; very rare in hemib.; FI (DD, A: Lemland), SE. – FE 5:57, FE 5A:1300.

E. viiduense Noordel. & Liiv

21. Stem pale grey, then yellowish ochre; cap dark greyish-violaceous with carmine centre when young. Cap 15-40 mm, convex, umbilicate, fibrillose; gills adnate-emarginate, medium spaced, sordid white, then pinkish brown; stem 45-65 x 2.5-4 mm, polished; smell and taste indistinct. Sp (8-)8.5-11.5(-12) x (6-)6.5-8.5(-9.5) μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated elements, 8-20 μm wide, with intracellular pigment; clamps absent. In unfertilized grassland on calcareous soil; late summer; very rare in temp.; SE. – FE 5A:1306.

E. prunicolor Örstadius & A. Ryberg

- Stem blue, violaceous or violaceous black; cap without carmine tinges 22
- 22. Cap blue to bluish black when young 23
 - Cap violaceous to violaceous black 25
- 23. Gill edge fertile; cheilocystidia absent. Cap 10-40 mm, convex, umbilicate, tomentose, then minutely scaly, not hygrophanous, not translucently striate, bluish black, then grey brown with a purple to bluish-violaceous tinge; gills adnate-emarginate, medium spaced, white, then sordid pink; stem 25-70 x 2-6 mm, innately fibrillose to flocculose, blue, grey blue or violaceous blue; smell and taste indistinct to farinaceous-rancid. Sp 8-12 x 6-8 μm , heterodiametrical, 4-7-angled in side-view; pileipellis a cutis to a trichoderm or hymeniderm at centre, of inflated 10-25 μm wide hyphae with intracellular pigment; clamps absent. In unfertilized grassland, hay-fields and open woodland; summer to autumn; occasional in temp.-suba.; DK (NT), FI (DD), FO, NO (NT), SE (NT). – FE 5:56b, FE 5A:1304, FND 21:6, GBW 4:152, Ves 254, ☉.
E. atrocoeruleum Noordel.
- Gill edge sterile with abundant cheilocystidia 24
- 24. Cap and stem deep blue to almost black, not changing colour with age; gills purely white when young. Cap 15-55 mm, convex, umbilicate, tomentose, then minutely scaly, not hygrophanous, not translucently striate; gills adnate-emarginate or with a decurrent tooth, medium spaced; stem 30-70 x 1.5-4 mm, fibrillose; smell and taste indistinctive. Sp 8-11(-11.5) x 6-7.5(-8) μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 20-60 x 5-15 μm , cylindrical to clavate; pileipellis a cutis to a trichoderm, of inflated, 15-30 μm wide elements with intracellular pigment; clamps absent. In unfertilized grassland; summer to autumn; rare in temp.-arc./alp.; DK (EN), FI (NT), FO, NO (NT), SE (NT). – B&K 4:25, FE 5:55, FE 5A:1299, GBW 4:156, FND 21:14, ☉.
E. corvinum (Kühner) Noordel.
- Cap and stem initially blackish blue, soon fading to greyish brown with a blue tinge; gills often yellowish when young, later pink with yellowish spots see *E. caeruleum* 18
- 25. Cheilocystidia absent 26
 - Cheilocystidia present 27
- 26. Sp 6.5-8(-8.5) x 5.5-7(-7.5) μm ; cap 14-18 mm. Cap conical, then conical-convex, not hygrophanous, not translucently striate, with small, violaceous scales on a paler flesh-colored background; gills adnexed to almost free, crowded, greyish white, then pinkish grey; stem 17-22 x 3-3.5 mm, fibrillose, dark violaceous brown; smell and taste indistinct. Sp iso- to heterodiametrical, (4-)5-6(-7)-angled in side-view; cheilocystidia absent; pileipellis a trichoderm of long, fusiform elements, 52-110 x 3.5-9 μm , with intracellular pigment; clamps absent. In small group among *Urtica dioica* in damp forests of *Alnus glutinosa* on peaty soil; autumn; NL. – FE 5A:1255.
E. pachydermum Arnolds & Noordel.
- Sp 9.5-14 x 7-10 μm ; cap 10-50(-75) mm. Cap conical to convex, umbonate or umbilicate, strongly radially fibrillose to finely scaly, not hygrophanous, not translucently striate, violaceous black, then violaceous brown; gills broadly adnate, deeply emarginate, medium spaced, white, then sordid pink; stem 30-120 x 1.5-8 mm, fibrillose, bluish violaceous or violaceous brown; smell and taste indistinct or rancid. Sp heterodiametrical, 6-9-angled in side-view; cheilocystidia absent; pileipellis a trichoderm of inflated elements, 15-30 μm wide, with intracellular pigment; clamps absent. In mossy, unfertilized grassland and among *Sphagnum*; summer to autumn; very rare in hemib.; SE (Vg). – FE 5A:1302, Lud 94.95.
E. nigroviolaceum (P.D. Orton) Hesler
- 27. Sp 8.5-9.5(-10) x 6-7.5 μm . Cap 10-25 mm, convex to low convex, umbilicate, not hygrophanous, not translucently striate, blackish-violaceous with small, darker scales; gills adnate-

emarginate, medium spaced, white, then pink; stem 25-50 x 1-3 mm, cylindrical, violaceous, fibrillose-finely scaly; smell and taste indistinct. Sp heterodiametrical, 5-6-angled in side-view; gill edge sterile; cheilocystidia in dense clusters, 30-70 x 7-15 μm , cylindrical to clavate; pileipellis a trichoderm to a hymeniderm of inflated elements, 30-90 x 10-25 μm , with intracellular pigment; clamps absent. In small groups in open unfertilized *Juniperus* alvar on calcareous soil; autumn; *EE*. – FE 5A:1305.

E. alvarens Noordel. & Vauras

- Sp 9-11.5(-12.5) x 6-8(-9) μm . Cap 10-50 mm, convex, umbilicate, entirely minutely tomentose-finely scaly, not hygrophanous, not translucently striate, dark violaceous black or violaceous grey; gills adnate-emarginate or with a decurrent tooth, medium spaced, white or cream, then pink; stem 30-80 x 2-4.5 mm, fibrillose, violaceous grey; smell none or slightly aromatic; taste mild to rancid. Sp heterodiametrical, 5-9-angled in side-view; cheilocystidia 15-70 x 8-20 μm , cylindrical to clavate; pileipellis a trichoderm of inflated terminal elements, 12-25 μm wide, with intracellular pigment in pileipellis; clamps absent. In groups in grassland, preferably on calcareous soil; summer to autumn; occasional in hemib.-suba., very rare in temp.; DK (EN), IS, NO (LC), SE (LC). – BSMF 119:291, FE 5:56a,87h, FE 5A:1299, Lud 94.98, RdM 40:13.

E. mougeotii (Fr.) Hesler var. *mougeotii*

Key D: Stem with blue or violaceous colours; cap without blue or violaceous tinges

1. Cap glabrous; pileipellis an ixocutis of 2.5-8 μm wide, cylindrical hyphae 2
 - Cap fibrillose, rugulose, tomentose or finely scaly, at least at centre; pileipellis a trichoderm or hymeniderm, at least at centre, of at least 10 μm wide elements 3
2. Sp 6-8 x 5.5-7 μm , very thin-walled, almost isodiametrical. Stem violaceous blue. In other characters like the main variety. In grassland and heathland, on acidulous, sandy or peaty soil; late summer to early winter; *NL*.

E. vinaceum (Scop.) Arnolds & Noordel. var. *violeipes* Arnolds & Noordel.

 - Sp 8-10(-11) x 6.5-8 μm , subisodiametrical, 5-6-angled in side-view
see *E. caeruleopolitum* key C 2
3. Clamps present, at least at base of basidia; pileipellis a trichoderm or a transition between a cutis and trichoderm, of long, septate hyphae with intracellular and often also incrusting pigment 4
 - Clamps absent; pileipellis a cutis or transition between a cutis and trichoderm, sometimes a true trichoderm or hymeniderm of inflated elements 12
4. Stem glabrous, polished 5
 - Stem fibrillose to minutely scaly 6
5. Sp 8-10 x 6-8 μm , isodiametrical (fig. 445D), Q = 1-1.2. Cap 5-20 mm, convex, then plane, slightly umbilicate or umbonate, glabrous to fibrillose, at centre sometimes minutely scaly, weakly hygrophanous, translucently striate, dark grey brown, rarely with blue tinges near margin; gills adnate-emarginate, medium spaced, white or grey brown, then pink; stem 20-45 x 1-2 mm, polished, blue or steel grey; smell and taste (sub)farinaceous. Sp 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm, of cylindrical, 5-20 μm wide hyphae with brown intracellular pigment; clamps present. Between mosses, needles and grass, preferably in *Juniperus* heathland on sandy or loamy soil; late summer to autumn; very rare in temp.-bore.; DK (VU), NO (NE), SE (NE).

E. juniperinum Barkman & Noordel.

 - Sp 8-11.5 x 6.5-8 μm , heterodiametrical, Q = 1.2-1.5. Cap 5-15 mm, convex, then low convex, slightly umbilicate, minutely granulate to \pm finely scaly, not hygrophanous, not translucently striate, very dark brown to almost black; gills adnate-emarginate, medium spaced, white or pale brown, then sordid; stem 25-50 x 1-3 mm, polished, blue grey to violaceous;

smell none or farinaceous; taste slightly to distinctly farinaceous. Sp 5-6-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated, 10-20 μm wide hyphae with brown intracellular pigment; clamps abundant. In poorly manured grasslands, hayfields, open deciduous forests, at roadsides; late summer to autumn; very rare in hemib.-suba.; NO (NE).

E. insidiosum Noordel.

6. Cap pale pinkish brown or pinkish lilac 7
 - Cap yellow brown, brown, grey brown or almost black 8

7. Cap pinkish lilac; sp 10-12.5 x 7-9 μm , 5-9-angled in side-view, thin-walled, almost nodulose. Cap 10-25 mm, convex, umbonate, radially fibrillose, not hygrophanous, not translucently striate; gills adnate-emarginate, medium spaced, whitish with lilac tinge; stem 20-40 x 1-2 mm, longitudinally fibrillose-striate, steel blue; smell and taste indistinct. Sp heterodiametrical; cheilocystidia absent; pileipellis a cutis to a trichoderm of cylindrical to slightly inflated, 10-18 μm wide hyphae with intracellular pigment; clamps present. Terrestrial, in small groups in deciduous scrub or forests of *Alnus incana*; late summer to autumn; very rare in temp.-hemib.; DK (NA, EJyl: Buderupholm), NO (DD, Nordl: Herøy). – FE 5A:1281.
E. callichroum E. Horak & Noordel.

- Cap pale pinkish brown; sp 9-11 x 7-8 μm , 5-7-angled in side-view, with pronounced angles (fig. 445E). Cap 4-10 mm, convex, then plane, finely punctate to tomentose, hygrophanous, translucently striate; gill free, distant, pink; stem 12-30 x 0.5-1 mm, finely striate with blue fibrils, violaceous pink; smell and taste indistinct. Sp heterodiametrical; gill edge heterogeneous; cheilocystidia 30-90 x 5-10 μm , often septate, irregularly coralloid; pileipellis a cutis to a trichoderm of clavate terminal elements, 40-70 x 8-17 μm with intracellular pigment; clamps present. Found singly, terrestrial, on gravelly soil at roadside in a boreal *Picea* forest with scattered *Salix caprea*, on slightly calcareous soil; autumn; very rare in bore.; SE (Mpd: Borgsjö).

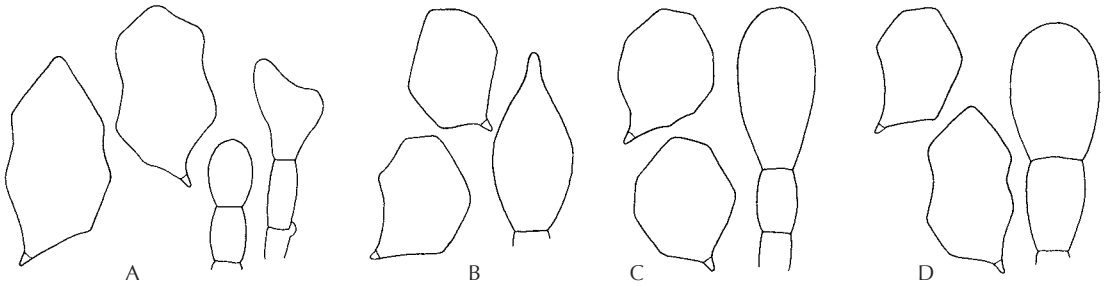
E. lidbergii Noordel.

8. Stem finely scaly with darker fibrillose scales 9
 - Stem silvery fibrillose-striate 10

9. Stem violaceous, with darker scales; sp thick-walled, 5-9-angled in side-view, with rather acute angles see *E. allochroum* key C 12
 - Stem blue, dark blue, or violaceous grey with darker scales; sp thin-walled, many-angled in side-view, with weak angles. Cap 20-80 mm, conical, then convex or plane, umbonate, rarely depressed, radially fibrillose, tomentose, then finely scaly, not hygrophanous, not translucently striate, dark grey brown, sometimes with a blue violaceous tinge; gills adnate-emarginate, medium spaced, white, then sordid pink; stem 25-110 x 2-12 mm; smell none; taste mild to bitter. Sp 9-11(-11.5) x 6-7 μm , heterodiametrical; gill edge heterogeneous; cheilocystidia 20-60 x 6-15 μm , cylindrical-flexuose to lageniform; pileipellis a cutis to a trichoderm, of septate, cylindrical to inflated, 7-20 μm wide hyphae, with inflated terminal elements 20-90 x 5-30 μm with brown intracellular and blue incrusting pigment; clamps abundant. Single or in groups on rotten wood or in raw humus of *Quercus* and *Betula* in deciduous forests, also in coniferous forests; late summer to autumn; rare in temp.-bore.; DK (NT), FI (DD, V: Dragsfjärd, EH: Tampere), NO (NT), SE (VU). – FE 5:47a, FE 5A:1277, R&H 381, Sieniop 262, Svp 21:20.

E. tjallingiorum Noordel.

10. Terrestrial, in grassy and mossy vegetation; smell none. Cap 10-40 mm, conical or hemispherical, then convex, radially fibrillose-finely scaly, not hygrophanous, not translucently striate, very dark brown to almost black; gills adnate-emarginate, medium spaced, white, then pale grey or brown with a pink tinge; stem 40-80 x 1-5 mm, striate with dark blue fibrils on a steel-blue background; taste indistinct. Sp 8.5-11.5 x 6-8.5 μm , heterodiametrical,



Spores and cheilocystidia: A: *Entoloma wynnei*, B: *E. rhynchocystidium*, C: *E. glaucobasis*, D: *E. sodale*.

6-9-angled in side-view (fig. 449A); cheilocystidia absent; pileipellis a cutis to a trichoderm, of inflated, 5-20 μm wide hyphae with brown, intracellular pigment; clamps present. Terrestrial, solitary or in groups in grassy places, natural grasslands, roadsides in coniferous and deciduous forests, open places, etc., also in needle litter, preferably on \pm calcareous soil; late summer to autumn; rare in temp.-bore.; DK (EN), FI (DD), NO (DD), SE (NE). – Lud 94.111, Svp 21:20.

E. lampropus (Fr.: Fr.) Hesler

- On wood, wood chips or sawdust 11
- 11. On rotten wood of *Fagus*, including sawdust; smell farinaceous; sp 8-11(-11.5) x 6-7(-7.5) μm . Cap 20-40 mm, conical, then convex, umbilicate, minutely scaly, not hygrophanous, not translucently striate, dark grey to grey brown; gills broadly adnate-emarginate, medium spaced, white, then pink; stem 30-60 x 2-4 mm, silvery striate, dark indigo or blue grey; taste farinaceous. Sp heterodiametrical, 6-8-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm, of 6-24 μm wide, cylindrical, septate hyphae with brown, intracellular pigment; clamps present. Late summer to autumn; occasional in temp., very rare in hemib.-bore.; DK (VU), NO (LC), SE (DD). – FE 5:88b, FE 5A:1282-1283, Lud 94.108, Svp 21:20.

E. placidum (Fr.: Fr.) Zerova

- In groups on wood and sawdust in coniferous forests; smell strong, like bugs; sp 10-18 x 7-10 μm (fig. 449A). Cap 20-40 mm, convex, then plane, umbonate, velvety, then finely scaly, slightly hygrophanous, translucently striate at margin only, dark brown; gills adnexed to almost free, medium spaced; stem 25-50 x 3-6 mm, cylindrical, fibrillose striate, blue-brown; taste unknown. Sp heterodiametrical, 5-9-angled in side-view; gill edge heterogeneous; cheilocystidia cylindrical to irregularly inflated, 20-60 x 8-20 μm ; pileipellis a trichoderm of 5-20 μm wide, inflated hyphae with brown, intracellular pigment; clamps present. Autumn; UK. – FE 5:83, FE 5A:1280.

E. wynnei (Berk. & Broome) Sacc.

- 12. Gill edge sterile or heterogeneous; cheilocystidia present 13
- Gill edge fertile; cheilocystidia absent 22
- 13. Gills with a distinct blue tinge when young, then grey with a pink tinge; sp very irregularly shaped, from almost iso- to distinctly heterodiametrical
see *E. broesarpensis* key B 14
- Gills without blue tinge; sp regularly shaped 14
- 14. Cheilocystidia rostrate or almost tibiiform with a small, rounded capitulum on a long neck, much longer than basidia (fig. 449B). Cap 30-60 mm, convex to plane, slightly umbilicate, fibrillose, not hygrophanous, not translucently striate, grey brown with an ochraceous tinge, with a distinct violaceous tinge at margin; gills adnate-emarginate, medium spaced, sordid pink; stem 30-75 x 3-6 mm, grey with a distinct violaceous tinge, polished; smell and taste

indistinct. Sp (8-)8.5-11(-11.5) x 7-8.5 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia, 25-45(-70) x 7-15(-20) μm ; pileipellis a trichoderm of inflated terminal elements, 30-80(-110) x 10-25 μm with brown, intracellular pigment; clamps absent. In groups in open *Juniperus* heath (alvar); *EE*. – FE 5:51a.

E. rhynchocystidiatum Noordel. & Liiv

- Cheilocystidia clavate or cylindrical, with about the same length as basidia 15
- 15. Sp on av < 10 μm long 16
- Sp on av > 10 μm long 17
- 16. Cap sordid grey brown or dark sepia, not translucently striate or at margin only; stem usually intensely blue or bluish-violaceous. Sp 8-11(-11.5) x 6-8 μm , heterodiametrical, 5-8-angled in side-view. In other characters like the main variety. In groups in unfertilized grassland; summer to autumn; rare in temp.-suba.; DK, NO, SE. – FE 5A:1325.
E. poliopus (Romagn.) Noordel. var. *parvisporigerum* Noordel.
- Cap porphyry brown, deeply translucently striate; stem steel grey with a faint blue tinge. Cap 15-30 mm, conical-convex, then convex, umbilicate, minutely scaly at centre; gills adnate-emarginate, medium spaced, grey, then grey pink; stem 5-60 x 1-4 mm, polished; smell and taste indistinct or slightly aromatic. Sp 7.5-10 x 6-8 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 30-60 x 6-15 μm , cylindrical to clavate; pileipellis a cutis to a trichoderm of inflated hyphae, 5-25 μm wide, with brown intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; very rare in temp.; DK (CR, EJyl: Grønnestrand, Lien). – Bol Bres 39:45, FE 5A:1326, Svp 21:25.
E. porphyrogriseum Noordel.
- 17. Cap pale beige with dark brown, minutely scaly centre see *E. mutabilipes* key C 7
- Cap yellow brown, brown or grey brown 18
- 18. Stem bicoloured, brown above, blue below; sp 9-13.5 x 7-10 μm , many-angled in side-view, almost nodulose (fig. 449C). Cap 10-30 mm, convex, umbilicate, entirely minutely scaly, not hygrophanous, deeply translucently striate, sordid brown; gills adnate-decurrent, medium spaced, sordid pink; stem 20-60 x 1-3 mm, white fibrillose; smell and taste indistinct. Sp heterodiametrical; cheilocystidia 20-95 x 10-35 μm , broadly clavate; pileipellis a cutis to a trichoderm of inflated hyphae, 15-35 μm wide, with brown intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; very rare in temp.-suba.; DK (CR), SE (NE). – FE 5:5a, FE 5A:1326, FND 21:18, GBW 4:159, Lud 94.117, ☉.
E. glaucobasis Noordel.
- Stem uniformly coloured; sp regularly angled in side-view, 6-9 μm broad 19
- 19. Stem intensely blue with fine blue flocculose covering see *E. coeruleoflocculosum* key B 11
- Stem glabrous, polished 20
- 20. Cap fulvous, contrasting the delicate violaceous brown stem. Cap 10-25 mm, convex, umbilicate, tomentose, not hygrophanous, not or indistinctly translucently striate, then minutely scaly; gills adnate-emarginate, medium spaced, cream, then pink; stem 20-50 x 1-3 mm, polished; smell and taste indistinct. Sp 8.5-11(-11.5) x 6-8(-8.5) μm , heterodiametrical, 5-7-angled in side-view; gill edge heterogeneous; cheilocystidia 20-40 x 6-12 μm , cylindrical to clavate; pileipellis a trichoderm of inflated elements, 20-40 x 10-35 μm , with intracellular pigment; clamps absent. Terrestrial, in groups in mixed deciduous forests on calcareous soil; summer; FI (EH: Urjala). – FE 5A:1328, Sieniop 260.
E. fulvoviolaceum Noordel. & Vauras
- Cap yellow brown to dull brown, sepia or blackish brown; stem blue to blue grey 21
- 21. Cap moderately dark yellow brown, deeply translucently striate; cheilocystidia broadly clavate (fig. 449D). Cap 10-40 mm, bell-shaped to conical, then convex, umbilicate, minutely

scaly at centre, weakly hygrophanous; gills adnate-emarginate, medium spaced, white, then pink; stem 10-60 x 1-4 mm, polished, pale blue grey; smell and taste indistinct. Sp 9.5-14 x 7-9 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 20-80 x 10-30 μm , broadly clavate; pileipellis a cutis to a trichoderm of inflated, 10-25 μm wide hyphae with intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; occasional in hemib.-bore., rare in temp.-suba.; DK (VU), NO (NT), SE (LC). – B&K 4:84, FE 5:62a, FE 5A:1323, FND 21:36, Ves 257.

E. sodale Noordel.

- Cap dark brown, sepia or greyish brown, not or only short translucently striate; cheilocystidia fusiform to cylindrical-clavate. Cap 15-55 mm, conical, then convex, umbilicate, with minutely scaly centre, not hygrophanous, slightly translucently striate; gills adnate-emarginate, medium spaced, pale grey, then sordid pink; stem 20-70 x 2-4(-5) mm, polished, blue or blue grey, then steel grey; smell and taste none. Sp 9-11.5 x 6.5-9 μm , 6-8-angled in side-view; cheilocystidia 20-40 x 6-20 μm , fusiform, cylindrical to broadly clavate, with brown, intracellular pigment; pileipellis a cutis to a trichoderm of inflated terminal elements, 20-75 x 10-20 μm , with brown, intracellular pigment; clamps absent. In groups in unfertilized grassland, in forests and among *Sphagnum* in peat-bogs; summer to autumn; very rare in temp.-suba.; DK, NO (Tel: Bamble). – FE 5A:1325.

E. poliopus (Romagn.) Noordel. var. *discolor* Noordel.

- | | | |
|-----|---|----|
| 22. | Stem pruinose, fibrillose, fibrillose-striate or finely scaly | 23 |
| - | Stem glabrous, polished | 25 |

23. Cap pale to medium brown; stem pale blue grey, densely silvery striate. Cap 15-50 mm, conical, then conical-convex, indistinctly umbilicate, minutely scaly, not hygrophanous, not translucently striate; gills adnate-emarginate, medium spaced, white, then pink; stem 40-120 x 2-8 mm, cylindrical; smell and taste indistinct. Sp 9-13.5(-14) x 6.5-8(-9) μm , heterodiametrical, 5-9-angled in side-view, with blunt angles; cheilocystidia absent; pileipellis a trichoderm of inflated hyphae, 15-40 μm wide, with intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; occasional in hemib.-suba., rare in temp.; DK (VU), FI (LC), NO (NT), SE (NT). – FAD 73C, FE 5:63b, FE 5A:1316, FND 21:19, R&H 382.

E. griseocyaneum (Fr.: Fr.) P. Kumm.

- | | | |
|---|--|----|
| - | Cap dark brown; stem either pruinose or with appressed, dark fibrils | 24 |
|---|--|----|
24. Stem finely pruinose all over; cap up to 30 mm, convex to low convex. Cap minutely scaly, not hygrophanous, not translucently striate, very dark brown almost black; gills adnate-emarginate, medium spaced, sordid grey pink; stem 20-70 x 1-5 mm, dark blue grey; smell and taste indistinct. Sp 9-12(-12.5) x 6.5-8 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a trichoderm of inflated hyphae, 8-25 μm wide, with intracellular pigment; clamps absent. In groups in grassland; summer to autumn; very rare in hemib.-suba.; FI (DD), NO (EN). – BSMF 115:175, FE 5:64b, FE 5A:1317.

E. viaregale Noordel.

- Stem with innate, dark fibrils; cap 20-70 mm, conical to conical-convex. Cap finely to recurved scaly, not hygrophanous, not translucently striate, dark sepia to blackish brown; gills adnate to adnexed, medium spaced, sordid pink; stem 20-90 x 1-6 mm, ultramarine to indigo, with a fibrillose covering; smell and taste indistinct. Sp 9-14 x 6.5-8 μm , heterodiametrical, 5-9-angled in side-view; cheilocystidia absent; pileipellis a trichoderm of inflated hyphae, 6-20 μm wide, with intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; rare in temp., very rare in hemib.-suba.; DK (EN), NO (NE), SE. – FE 5:63a, FE 5A:1315, FND 21:3, Lud 94.116, Svp 53:36, ☉.

E. anatinum (Lasch: Fr.) Donk

- | | | |
|-----|------------------------|---------------------------------|
| 25. | Cap pinkish | see <i>E. ianthinum</i> key E 4 |
| - | Cap pale to dark brown | 26 |

26. Cap dark brown, not translucently striate or at margin only 27
 - Cap moderately dark or pale brown, distinctly translucently striate 28
27. Cap minutely scaly all over; stem grey with a slight blue tinge; sp 10-12.5 x 6.5-9 μm . Cap 20-60 mm, convex, umbilicate, indistinctly hygrophanous, not or indistinctly translucently striate, dark grey brown; gills adnate-emarginate, medium spaced, brown, then pinkish brown; stem 40-90 x 3-6 mm, polished; smell and taste indistinct or aromatical. Sp heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a trichoderm of inflated hyphae, 15-30 μm wide, with intracellular pigment; clamps absent. In groups in grassland; summer to autumn; very rare in temp.-bore.; DK (EN), FI (DD), NO (NE), SE (NE). – B&K 4:76, FE 5:64a, FE 5A:1315, FND 21:32, ☉.
E. scabrosum (Fr.) Noordel.
- Cap scaly at centre only; stem blue; sp 9-11 x 6-8 μm see *E. lepiotosme* key C 20
28. Sp isodiametrical. Cap 5-20 mm, convex, then plane, umbilicate, minutely scaly, not hygrophanous, not or distinctly translucently striate, pale to dark grey brown; gills adnate-decurrent, medium spaced, brown, then brownish pink; stem 25-50 x 1-2 mm, scattered fibrillose, almost polished, grey blue; smell and taste indistinct. Sp 7-10 x 7-9 μm , 4-6-angled in side-view; cheilocystidia absent; pileipellis a trichoderm of inflated elements, 5-25 μm wide, with intracellular pigment; clamps absent. Terrestrial in unfertilized grassland and open *Betula* forests; summer to autumn; UK.
E. allospermum Noordel.
- Sp heterodiametrical 29
29. Sp < 10 μm long 30
 - Sp > 10 μm long 31
30. Cap pale yellow brown with dark brown centre; gills adnate-emarginate; stem deep blue, violaceous blue or sky blue. Cap 10-35 mm, convex, umbilicate, minutely scaly at centre only, slightly hygrophanous, deeply translucently striate; gills medium spaced, white, then pink; stem 25-60 x 1-3 mm, polished; smell and taste indistinct. Sp 7-10 x 6.5-7.5 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated, 10-20 μm wide hyphae with intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; occasional in hemib.-bore., rare in temp. and suba.; DK (EN), FI (DD, PS: Kuopio), NO (LC), SE (NT). – Däh 419, FE 5:60b, FE 5A:1318, FND 21:24, GBW 4:162, ☉.
E. lividocyanulum Noordel.
- Cap pinkish to pinkish brown with darker centre; gills deeply decurrent; stem blue. Cap 5-40 mm, bell-shaped to convex, depressed to umbilicate, hygrophanous, deeply translucently striate, minutely scaly at centre only; gills medium spaced, pink, often with a brown tinge; stem 15-70 x 1-3 mm, polished; smell and taste mild to farinaceous. Sp 8-10.5(-11) x 6-8 (-9) μm , Q = 1.1-1.6, subiso- to heterodiametrical, 5-7-angled in side-view; gill edge fertile, cystidia absent; pileipellis a cutis to a trichoderm of inflated elements, 20-70 x 4-22 μm , with intracellular and minutely incrusting pigment; clamps absent. In groups in humus on fertile soil in deciduous woods, parks and gardens. Summer to autumn; rare in temp.-hemib.; DK (LC), NO (NE). – FE 5:85, FE 5A:1350, Lud 94.121, Ves 247, ☉.
E. incarnatofuscens (Britzelm.) Noordel. (*E. leptonipes* (Romagn.) M.M. Moser)
31. Cap minutely scaly all over; stem deep blue; basidia 4-spored. Cap 10-30 mm, conical to convex, slightly umbilicate, weakly hygrophanous, deeply translucently striate, red brown to grey brown; gills adnate-emarginate, medium spaced, sordid grey, then grey pink; stem 20-60 x 1-4 mm, cylindrical, polished; smell and taste slightly to distinctly farinaceous. Sp 9-14 x 6-10 μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated, 10-25 μm wide hyphae with intracellular pigment; clamps absent. In unfertilized grassland and pastures; summer to autumn; occasional in

temp.-arc./alp.; DK (NT), FI (LC), FO, NO (LC), SE (LC). – B&K 4:11, FE 5:60a, FE 5A:1318, FND 21:4,5, Ves 256.

E. asprellum (Fr.: Fr.) Fayod

- Cap finely scaly at centre only; stem violaceous grey; basidia 2- and 4-spored. Cap 15-60 mm, convex, umbilicate, not hygrophanous, deeply translucently striate, dark grey brown or sepia; gills adnate-emarginate, medium spaced, pale grey, then pink; stem 25-90 x 1-3 mm, cylindrical, polished; smell and taste indistinct. Sp 9.5-14 x 6-9 μm , heterodiametrical, 5-9-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated, 15-30 μm wide hyphae with intracellular pigment; clamps absent. In unfertilized grassland; summer to autumn; very rare in temp.-suba.; DK (CR), FI (DD, EH: Tampere), NO (NE), SE. – FE 5:87f, FE 5A:1319, Svp 21:28.

E. huijzmanii Noordel.

Key E: Cap pink or with pink tinges

1. Habit mycenoid; cap convex, often with an umbo 2
 - Habit collybioid or omphalinoid; cap convex with a slightly to distinctly depressed centre 4
2. Stem white, fibrillose striate; cheilocystidia lageniform to lecythiform. Cap 10-30(-50) mm, conical to low convex, umbonate, rarely umbilicate, not hygrophanous, not translucently striate, violaceous grey to pinkish lilaceous; gills almost free, medium spaced, white, then pinkish grey; stem 10-50(-60) x 1-4 mm; smell and taste farinaceous or indistinct. Sp 6.5-10 x 5-7 μm , heterodiametrical, 6-7-angled in side-view; cheilocystidia 15-50 x 10-19 x 5-10 μm ; pileipellis a cutis to a trichoderm, of cylindrical or inflated, 5-20 μm wide hyphae with intracellular pigment; clamps absent. Terrestrial among mosses and in humus in very damp places with *Salix* or other deciduous trees; autumn; NL. – Bol Bres 27:91, FE 5A:1255.

E. lilacinoroseum Bon & Guinberteau

 - Stem pink or yellow, polished; cheilocystidia cylindrical-clavate or absent 3
3. Frb entirely pink; sp 11.5-13(-15) x 8-9.5 μm . Except for the pink frb like the main variety. Among *Sphagnum* in peat bog; autumn; NL.

E. cyanulum (Lasch: Fr.) Noordel. var. *roseolum* Noordel. & Sullock-Enzlin

 - Cap pink to pinkish brown, fading to ochraceous pink; stem yellow; sp 9-11(-11.5) x 7-8 μm . Cap 15-25 mm, conical, then convex, smooth, hygrophanous, deeply translucently striate; gills almost free, medium spaced, pink; stem 25-30 x 1-2 mm, polished; smell and taste indistinct. Sp heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2.5-11 μm wide hyphae with intracellular pigment; clamps present. In seminatural, nutrient poor grasslands; late summer to autumn; NL. – FE 5:85a.

E. verecundum (Fr.: Fr.) Noordel.
4. Stem lilac at top, downwards pink, polished; cheilocystidia absent. Cap 10-30 mm, hemispherical, then bell-shaped to conical, umbilicate, slightly rugulose, minutely scaly at centre, hygrophanous, deeply translucently striate, pink with a faint lilac tinge when fresh, more brownish at centre; gills adnate-emarginate with a decurrent tooth, medium spaced, pink; stem 40-55 x 1-3 mm; smell none; taste slightly raphanoid. Sp 9.5-11.5 x 6-7 μm , heterodiametrical, 6-8-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm, of 10-12 μm wide hyphae with intracellular pigment; clamps absent. In marshy places, on peaty soil, among *Sphagnum*; summer to autumn; very rare in bore.; SE (NE, Jmt). – FE 5:80b, FE 5A:1311, FND 21:21.

E. ianthinum (Romagn. & J. Favre) Noordel.

 - Stem without lilac tinges; cheilocystidia present 5
5. Cap when fresh with distinct pink-lilaceous tinges, turning uniformly ochraceous under influence of daylight, entirely tomentose, not translucently striate; stem yellow to yellow

ochre, densely white-fibrillose striate. Cap 10-50 mm, bell-shaped, then convex, not hygrophanous; gills adnate-emarginate or with a decurrent tooth, medium spaced, white, then pink; stem 10-75 x 1-4 mm, cylindrical; smell and taste indistinct. Sp 10-13 x 6.5-9(-9.5) μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 20-80 x 10-15 μm , cylindrical to subclavate; pileipellis a trichoderm of inflated terminal elements, 25-95 x 10-30 μm , with intracellular pigment; clamps absent. Terrestrial and on mossy trunks of trees in swampy deciduous forests (*Alnus*, *Fraxinus*, *Populus*), less often in *Sphagnum* or unfertilized grassland, preferably on rich soil; summer to autumn; rare in temp.-bore.; DK (EN), FI (VU), NO (VU), SE (VU). – B&K 4:68, Bol Bres 27:90, FE 5:68, FE 5A:1339-1340, Svp 21:29, ☉.

E. queletii (Boud.) Noordel.

- Cap without lilaceous tinges, fibrillose, translucently striate or not; stem grey or pink, polished or with scattered fibrils in upper part 6
- 6. Cap light grey with a distinct pink tinge, not translucently striate, radially fibrillose; stem grey. Cap 15-35 mm, convex, umbilicate, not hygrophanous; gills free, white, then pink; stem 25-50 x 2-3 mm, polished; smell and taste indistinct. Sp 9-11 x 6-7.5 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 25-60 x 8-13 μm , clavate to lageniform; pileipellis a trichoderm to a hymeniderm of broadly clavate terminal elements, 30-70 x 12-20 μm , with intracellular pigment; clamps absent. In groups in forests; *EE*. – FE 5:59b, FE 5A:1312.
E. roseotinctum Noordel. & Liiv
- Cap more purely pink, usually translucently striate, glabrous or minutely granulose to finely scaly, particularly at centre, fibrillose or glabrous towards margin; stem pink 7
- 7. Gill edge of the serrulatum-type, lilac-pink; stem minutely scaly-fibrillose in upper part, downwards polished or with scattered fibrils see *E. callirhodon* key B 15
- Gill edge a hymeniform layer, concolorous with sides or pink; stem polished. Cap 10-30 mm, conical to bell-shaped or conical-convex, then low convex, umbilicate, entirely tomentose to almost scaly, not hygrophanous, not translucently striate, pink to pinkish red; gills adnate-emarginate, medium spaced, white, then pink; stem 20-60 x 1-6 mm, pink; smell and taste indistinct. Sp 8.5-10.5(-11) x 7-8 μm , heterodiametrical, 6-9-angled in side-view; cheilocystidia 20-60 x 5-20 μm , cylindrical to clavate or lageniform; pileipellis a cutis to a trichoderm, of strongly inflated, 20-40 μm wide terminal elements with intracellular pigment; clamps absent. In groups in seminatural grassland and in black soil of deciduous forests; summer to autumn; very rare in temp.-bore.; DK (CR), FI, FO (Sandvik), NO (EN), SE (EN). – BCat 819, B&K 4:71, BSMF 120:344, 346, FE 5:58c, FE 5A:1308-1309, ☉.
E. roseum (Longyear) Hesler



Key F: Frb collybioid, clitocyboid or omphalinoid with glabrous, convex to flattened, depressed, umbilicate or funnel-shaped, hygrophanous cap and adnate to deeply decurrent gills

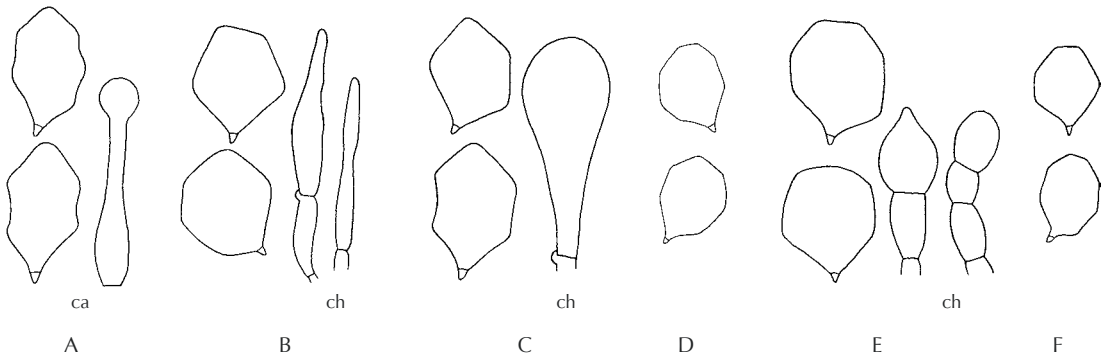
- 1. Cap white or at most with yellow tinge at centre 2
- Cap distinctly pigmented 4
- 2. Cap and stem with capitate cystidia (fig. 457A); clamps absent. Cap 2-15 mm, convex, slightly depressed, glabrous or slightly fibrillose, not hygrophanous, not translucently striate, white; gills adnate-emarginate, distant, white, then pink; stem 10-30 x 0.5-2 mm, polished, white or tinged yellow, hyaline; smell strongly farinaceous; taste rancid. Sp 8-12.5 x 6-7(-7.5) μm , heterodiametrical, 5-7-angled; cheilocystidia absent; pileipellis a cutis of cylindrical, non-pigmented hyphae, 10-30 μm wide. In small groups on bare soil in damp forests; summer to autumn; rare in temp.-bore.; DK (LC), FI (LC), NO (NE, Troms), SE (LC, Sk). – BCat 709, FE 5:46d, FE 5A:1274, GBW 4:172, Lud 94.52, ☉.
E. cephalotrichum (P.D. Orton) Noordel. (*Rhodophyllus molliusculus* (Quél.) Romagn. nom. illeg.)

- Cap and stem without capitate cystidia; clamps present 3
- 3. Sp 8-11.5 x 6-8 μm ; cap 15-30 mm. Cap conical-convex to convex, not depressed, glabrous, hygrophanous, translucently striate, white, tinged yellow at centre; gills adnate-emarginate with a decurrent tooth, medium spaced, white, then pink; stem 20-60 x 1-3 mm, with a fibrillose covering; smell and taste indistinct. Sp heterodiametrical, 6-10-angled in side-view; cheilocystidia absent; pileipellis a cutis of entangled, cylindrical, 10-25 μm wide, pigmentless hyphae. Terrestrial, single or in small groups in grassland and in *Sphagnum* bogs; summer to autumn; DE, NL. – FE 5:46d, FE 5A:1273.
E. olorinum (Romagn. & J. Favre) Noordel.
- Sp 7-10 x 5.5-7 μm ; cap 4-10 mm. Cap convex, not depressed, glabrous, hygrophanous, deeply translucently striate, brilliantly white with a slight yellow tinge with age; gills adnate-emarginate or slightly decurrent, distant, white; stem (13-)24-45 x 0.5-2 mm, glabrous, white, hyaline; smell and taste indistinct. Sp heterodiametrical; cheilocystidia absent; pileipellis a cutis of cylindrical, 4-12 μm wide, unpigmented hyphae; clamps present. Terrestrial in shady, moist places in or near deciduous forests and in grasslands; summer to autumn; rare in temp.-bore.; DK (DD), NO (NE, Akh: Nannestad), SE (LC). – FE 5:46C, FE 5A:1274.
E. percandidum Noordel. (*Rhodophyllus omphaliiformis* Romagn. non *Entoloma o.* (Velen.) Noordel.)
- 4. Stem slightly to distinctly fibrillose-striate or fibrillose-flocculose 5
- Stem smooth, polished or slightly ribbed, not covered with fibrils 9
- 5. Smell strong, like ripe apples; stem substriate see *E. melenosmum* 14
- Smell none or nitrous; stem fibrillose striate or fibrillose-finely scaly 6
- 6. Frb omphalinoid with deeply decurrent gills; cap 5-20 mm see *E. rusticoides* key G 7
- Frb clitocyboid, gills adnate with a decurrent tooth; cap mostly > 20 mm 7
- 7. Smell nitrous; stem white, strongly silvery striate. Cap 20-40 mm, low convex, slightly umbilicate, glabrous, hygrophanous, deeply translucently striate, medium dark grey brown or yellow brown; smell strong, nitrous; taste farinaceous-rancid. In other characters like the main variety. Often in large groups on black humus in damp alluvial forests (*Alnus*, *Fraxinus*, *Salix*); SE. – FE 5A:1180.
E. rhodopolium (Fr.: Fr.) P. Kumm. var. *pseudopolitum* Noordel.
- Smell none or farinaceous; stem coloured underneath striation 8
- 8. Smell and taste indistinct; stem grey brown to red brown, fibrillose-costate; pigment intracellular. Cap (10-)20-65 mm, convex, umbilicate, glabrous, hygrophanous, not translucently striate, dark grey brown, sepia, red brown or blackish brown; gills broadly adnate with a decurrent tooth, crowded, pale brown, then brown pink; stem 25-90 x 3-9 mm. Sp (7-)7.5-9.5-(10.5) x (6-)7-8(-9) μm , subsidiametrical, (4-)5-6-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2.5-8 μm wide, cylindrical hyphae with brown pigment; clamps absent. In groups in poorly manured grasslands, roadsides or clearings in deciduous forests; late summer to late autumn; very rare in temp.-southern bore.; DK (DD, not observed since 1937), FI (DD), SE (NE). – FAD 76F, FE 5:88f.
E. costatum (Fr.: Fr.) P. Kumm.
- Smell and taste farinaceous-rancid; stem dark brown, fibrillose-striate; pigment incrusting. Cap 15-60 mm broad; gills crowded, adnate with only a short decurrent tooth; stem strongly silvery striate. Cap convex to low convex, umbilicate, glabrous, hygrophanous, not translucently striate, sepia or red brown; gills sordid brownish pink; stem 20-40 x 2-6 mm, dark brown. Sp 7-9 x 6-8 μm , (sub-)isodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-7 μm wide, cylindrical hyphae with incrusting pigment; clamps absent. In groups on dry, sunny spots, preferably on calcareous soil; spring to autumn; very rare in temp.; DK (DD, Fyn, not observed since 1938). – Däh 439, FAD 198E, FE 5:28B, FE

5A:1214, Lud 94.77.

E. sericeoides (J.E. Lange) Noordel.

9. Pigment incrusting, sometimes in addition with intracellular pigment 10
 - Pigment intracellular only 13
10. Cap pale brown to pale yellow brown 11
 - Cap medium dark brown to blackish brown 12
11. Cheilocystidia 20-70 x 2-8 μm , cylindrical or lageniform (fig. 457B). Cap 3-10 mm, convex, umbilicate, hygrophanous, translucently striate, pinkish brown or yellow brown; gills decurrent, distant, white, then pink; stem 15-40 x 0.5-1(-2) mm, yellowish, hyaline, polished; smell and taste indistinct. Sp 8-10 x 7-9 μm , isodiametrical, 5-6-angled in side-view; gill edge heterogeneous; pileipellis a cutis of 2-7 μm wide, cylindrical hyphae with minutely incrusting pigment; clamps present. In groups on mosses (e.g. *Leucobryum glaucum*), also on rotten, mossy trunks of deciduous and coniferous wood in forests on nutrient poor, sandy soil, once found in a flower pot (Svb); summer to autumn; common in temp.-hemib., occasional in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FE 5:81c, 86a, FE 5A:1362, Lud 94.11, Svp 55:17, Ves 247, .
- E. rhodocalix* (Lasch: Fr.) M.M. Moser ('*rhodocylis*')
 - Cheilocystidia absent. Cap 8-13 mm, low convex to depressed, glabrous, hygrophanous, deeply translucently striate, very pale greyish brown; gills arcuate-decurrent, medium spaced, pale pink; stem 7-20 x 1-2 mm, polished, hyaline ochre grey; smell like iodoform; taste mild. Sp (7.5-)8-9.5(-10) x (6-)6.5-8 μm , Q = 1.05-1.25(-1.3), isodiametrical, 5-7-angled in side-view; pileipellis a cutis of 3-9 μm wide, cylindrical hyphae with minutely incrusting pigment; clamps absent. In small groups in mossy vegetation on calcareous sandy soil; NL. – FE 5A:1362.
- E. iodiolens* Arnolds & Noordel.
12. Pileipellis of up to 25 μm broad, inflated elements with intracellular pigment; hyphae in lower layers of pileipellis minutely incrusting; clamps present. Cap 10-30 mm, convex, umbilicate, glabrous except for the slightly scaly centre, hygrophanous, translucently striate, dark brown; gills arcuate, decurrent, distant, pale pink; stem c. 30 x 2-3 mm, cylindrical, dark brown, polished; smell and taste indistinct. Sp 9-11 x 7-8 μm , heterodiametrical, 5-6-angled in side-view; cheilocystidia absent. In deciduous forests under *Fraxinus*, in *Salix* bogs and in xerophytic grassland on calcareous soil; summer to autumn; rare in temp.; DK (vu). – FE 5A:1350, .
- E. parkensis* (Fr.) Noordel.
 - Pileipellis a cutis of 5-15 μm wide hyphae with incrusting walls, in addition some intracellular pigment present; clamps absent. Cap 5-20 mm, convex to plane, subumbilicate, glabrous, hygrophanous, translucently striate, very dark brown to blackish brown; gills decurrent, thick, distant, dark grey brown with pink tinge; stem 10-20 x 1-2.5 mm, very dark brown to blackish brown; smell and taste farinaceous. Sp 9-12 x 7-9 μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia absent. In groups in coastal sand dunes among scanty vegetation, often with *Salix repens*; also found on very rotten wood; summer to autumn; very rare in temp.-hemib.; DK (DD, no recent finds), NO (NE, Busk: Hurum).
- E. nigellum* (Quél.) Noordel.
13. Basidia exclusively 2-spored. Cap 10-35(-55) mm, convex or flattened, slightly depressed, glabrous, strongly hygrophanous, translucently striate, sepia or greyish brown, horn brown or reddish brown; gills adnate with a decurrent tooth or adnate-emarginate, medium spaced, white, then pink; stem 15-50 x 1.5-4 mm, cylindrical, polished, white to pale yellow or yellow-brown; smell farinaceous; taste farinaceous-rancid. Sp (9.5-)10-12(-13) x (7-)8-9.5(-10.5) μm , heterodiametrical, 6-9-angled in side-view; cheilocystidia absent; pileipellis a cutis of 3-12(-18) μm wide, cylindrical hyphae with intracellular pigment; clamps abundant.



Spores, caulocystidia and cheilocystidia: A: *Entoloma cephalotrichum*, B: *E. rhodocalix*, C: *E. nausiosme*. Spores: D: *E. vinaceum*, E: *E. phaeocyathus*, F: *E. chelone*.

Terrestrial, in groups in moist deciduous forests (*Salix*, *Populus*, *Fraxinus*, *Alnus*); summer to autumn; rare in temp.-bore.; DK (LC), NO (NE, Østf: Halden, Troms: Tromsø), SE (NE). – FE 5:20b, FE 5A:1198.

E. bisporigerum (P.D. Orton) Noordel.

- Basidia, at least in majority, 4-spored 14
- 14. Smell strong, of ripe apples; stem polished or substriate with scattered fibrils. Cap 20-50 mm, convex, umbilicate or weakly umbonate, glabrous, hygrophanous, translucently striate, moderately dark brown; gills adnate-emarginate, medium spaced, white, then pink; stem 30-50 x 3-7 mm, yellow brown; taste farinaceous. Sp 8-10 x 7-8 μm , heterodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2-9 μm wide hyphae with intracellular pigment; clamps abundant. In groups in grassy spots near *Betula*; late summer; very rare in suba.; IS (Au: Egilsstaðaskógur). – FE 5A:1199.

E. melenosmum Noordel.

- Smell different or indistinct; stem polished 15
- 15. Cheilocystidia present 16
- Cheilocystidia absent 17

- 16. Smell strong, unpleasant, reminiscent of burnt rubber or burnt meat; sp 5-7 angular, 9-11.5 x 7-9.5 μm (fig. 457C). Cap 10-40 mm, convex, umbilicate, almost glabrous when moist, but becoming rather strongly radially fibrillose-felty when dry, hygrophanous, not translucently striate, dark grey to almost black; gills arcuate-decurrent, medium spaced, dark grey, then brownish pink; stem 20-70 x 2-7 mm, cylindrical, polished, dark grey brown to blackish; taste rancid. Sp heterodiametrical; cheilocystidia 30-100 x 8-30 μm , clavate to globose; pileipellis a cutis of up to 9 μm wide, cylindrical hyphae, at centre sometimes with \pm ascending, clavate terminal elements, 30-90 x 10-20 μm , with brown, intracellular pigment; clamps abundant. Terrestrial in moist places in mixed deciduous forests, often on \pm peaty soil, found under *Alnus*, *Betula*, *Salix* and *Quercus*; late summer to autumn; very rare in hemib.; NO (DD, S&F: Bremanger). – FE 5:21a, FE 5A:1200.

E. nausiosme Noordel.

- Smell absent or farinaceous; sp 5-9-angled in side-view, 7.5-12.5 x 5.5-8.5(-9) μm . Cap 10-50 mm, convex, umbilicate, glabrous, weakly hygrophanous, not translucently striate, dark reddish or greyish brown; gills adnate-decurrent, distant, white, then pink; stem 20-60 x 1-5 mm, yellow brown to grey brown, polished; taste indistinct. Sp heterodiametrical; cheilocystidia 40-90 x 12-25 μm , clavate to globose; pileipellis a cutis of cylindrical, 2-8 μm wide

hyphae with brown, intracellular pigment; clamps abundant. In dry grasslands, on sandy or loamy, often somewhat calcareous soil; *NL*. – FE 5A:1201.

E. fridolfingense Noordel. & Lohmeyer

17. Sp (sub-)isodiametrical, $Q = 1-1.2$ 18
 - Sp heterodiametrical, $Q > 1.3$ 19
18. Sp 6-8 x 5.5-7 μm , very thin-walled, many-angled in side-view (fig. 457D). Cap 20-40 mm, convex, slightly depressed, glabrous, hygrophanous, deeply translucently striate, brown, grey brown or reddish brown; gills adnate-emarginate, medium spaced, grey, then grey pink; stem 25-60 x 1-3 mm, polished, yellow; smell and taste indistinct. Cheilocystidia absent; pileipellis an ixocutis of 2.5-7 μm wide, cylindrical hyphae with brown, intracellular pigment; clamps present. In grassland and heathland, on acidulous, sandy or peaty soil; late summer to early winter; occasional in temp.-bore.; DK (LC), FI (DD), NO (LC), SE (LC). – FE 5:23a, 88e, FE 5A:1210-1211, Jordst 9(2), Ves 249.
E. vinaceum (Scop.) Arnolds & Noordel. var. *vinaceum*
 var. *fumosipes* Arnolds & Noordel. differs in having a smoke grey stem. FI.
 - Sp (7.5-)8-10(-10.5) x (6.5-)7-8(-8.5) μm , with walls of normal thickness, 5-6-angled in side-view. Cap 5-50 mm, convex, slightly depressed to umbilicate, glabrous, hygrophanous, translucently striate, dark grey brown, sepia, yellow brown; gills adnate-emarginate or with a decurrent tooth, medium spaced to distant, white, then pink; stem 15-85 x 1-6 mm, polished, pale grey brown or yellow brown; smell nitrous or inconspicuous; taste oily-rancid. Cheilocystidia absent; pileipellis an (ixo-)cutis of 2-7 μm wide, cylindrical hyphae with intracellular pigment; clamps present. In groups in moist forests (*Alnus*, *Salix*, *Fraxinus*), also in subalpine and arctic habitats; summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – FE 5:20a, FE 5A:1196, Lud 94.37, Ves 246, ☉.
E. politum (Pers.: Fr.) Donk
19. Sp 8-9 x 5.5-6.5 μm . Cap 5-15 mm, hemispherical to convex, umbilicate, glabrous, hygrophanous, translucently striate, dark grey brown to almost black; gills adnate-emarginate, medium spaced, pinkish grey; stem 15-40 x 1-3 mm, polished, sordid grey; smell and taste farinaceous. Sp heterodiametrical, nodulose-angled; cheilocystidia absent; pileipellis a cutis of 1-7 μm wide, cylindrical hyphae with brown, intracellular pigment; clamps abundant. In small groups among mosses in subalpine *Picea abies* forests and in alpine *Salix* heathland and snow bed communities; late summer to autumn; rare in arc./alp.; NO (LC, Svb). – FE 5A:1198.
E. engadinum (E. Horak) Noordel.
 - Sp 6.5-10 μm wide 20
20. Whole frb almost black; cap not translucently striate; in dwarf-shrub vegetation in arc./alp. Cap 15-30 mm, convex, depressed, glabrous or somewhat rugulose at centre, hygrophanous, not translucently striate; gills adnate-emarginate, medium spaced, white, then grey brown with a pink tinge; stem 10-40 x 2-8 mm, polished; smell and taste farinaceous. Sp 8.5-12 x 6.5-10 μm , $Q = 1.1-1.4$, heterodiametrical, in outline with 5-8 angles in side-view; basidia 4-spored, clamped; cheilocystidia absent; pileipellis a cutis to thin ixocutis of narrow, cylindrical hyphae, 3-15 μm wide; with brown, intracellular pigment; clamps present in all tissues. In moist places, often in association with dwarf *Salix* species; summer to autumn; rare; NO (LC, Svb). – FE 5A:1199.
E. anthracinum (J. Favre) Noordel.
 - Cap dark red brown or grey brown; stem paler, in forests or grassland at lower altitudes and latitudes 21
21. Sp 7.5-12.5 x 6.5-9.5(-10) μm , $Q_{\text{av}} = 1.3-1.4$; smell farinaceous; in moist deciduous forests (*Alnus*, *Fraxinus*, *Salix*, etc.). Cap 10-40 mm, convex to concave, depressed, glabrous, hygrophanous, translucently striate at margin, dark red brown; gills arcuate-decurrent,

medium spaced, pale brown, then pinkish brown; stem 10-50 x 1-3(-4) mm, polished, yellow brown to grey brown; taste farinaceous-rancid. Sp heterodiametrical; cheilocystidia absent; pileipellis a (ixo-)cutis of 7-15 μm wide, cylindrical hyphae with brown, intracellular pigment; clamps abundant. In groups on humus-rich soil; summer to autumn; occasional in temp.-bore.; DK (LC), FI (DD, PK: Valtimo), NO (NE), SE (LC). – FE 5:20C, FE 5A:1197, Lud 94.88, ☉.

E. caccabus (Kühner) Noordel.

- Sp 9-16(-18) x 6-9 μm , $Q_{av} > 1.5$; smell none; in grassland. Cap 20-35 mm, convex, umbilicate centre, glabrous, hygrophanous, slightly translucently striate, dark sepia brown; gills adnate to subdecurrent, distant, brown pink; stem 20-40 x 2-4 mm, brown, innately fibrillose, slightly striate; taste mild. Sp heterodiametrical, irregularly 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 10-25 μm wide hyphae with brown, intracellular pigment; clamps present. Summer to autumn; very rare in hemib.; SE (LC, Dls). – FE 5A:1355, Lud 94.21.

E. sarcitum (Fr.) Noordel.

Key G: Frb collybioid or omphalinoid; cap fibrillose, tomentose or finely scaly, sometimes zonate; gills decurrent; pigment parietal-incrusting

1. Cap distinctly zonate with concentric zones, with or without aeriferous fibrils 2
 - Cap not distinctly zonate, without aeriferous fibrils 3
2. Cap aeriferous-fibrillose; sp (7-)7.5-10 x 6-7 μm ; stem with scattered longitudinal fibrils. Cap 8-40 mm, convex-umbilicate to funnel-shaped, zonate, not hygrophanous, not translucently striate, dark grey brown; gills adnate-decurrent to arcuate-decurrent, medium spaced, grey, then grey pink; stem 10-30 x 1-4 mm, pale brown to yellow brown; smell and taste farinaceous-rancid. Sp heterodiametrical, 6-8-angled in side-view; cheilocystidia absent; pileipellis a cutis of 5-15 μm wide, cylindrical hyphae with incrusting pigment; clamps present. In groups in open spots, grassy or mossy places, also on naked soil, in or near deciduous forests, also on \pm sandy soils under *Juniperus* and in *Pinus* plantations; summer to autumn; common in temp.-bore., occasional in suba.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – FAD 79A, FE 5:71a, FE 5A:1360, R&H 387, Ves 246, ☉.

E. undatum (Fr.) M.M. Moser

 - Cap not aeriferous-fibrillose; sp 9.5-11.5(-11.5) x 6.5-8 μm ; stem with white floccose covering. Cap 8-25 mm, zonate, not hygrophanous, not translucently striate, sepia with almost black centre. In other characters like the main variety. In small groups in grassland on calcareous soil; late summer; very rare or overlooked in temp.; SE (Sk: Ivö). – Lud 94.20.

E. korhonenii Noordel. var. *gradizonatum* E. Ludw. & Noordel.
3. Cheilocystidia 15-40(-50) x 5-20 μm , often septate (fig. 457E). Cap 5-20 mm, convex, umbilicate to funnel-shaped, tomentose, then finely scaly, weakly hygrophanous, translucently striate, dark grey brown or reddish brown; gills decurrent, distant, dark grey brown, then brown pink; stem 5-20 x 0.5-2 mm, yellow brown to dark brown, polished; smell and taste farinaceous-rancid. Sp (7.5-)8-10 x (6.5-)7-9 μm , isodiametrical; 5-9-angled in side-view; pileipellis a cutis to a trichoderm of inflated terminal elements, 50-120 x 15-35 μm , with coarsely incrusting pigment; clamps absent. In groups on bare sandy or gravelly, slightly to distinctly calcareous soil, at roadsides, also in coastal dunes with *Ammophila arenaria*; autumn; rare in temp.-hemib.; DK (DD, WJyl: Rømø), NO (EN, M&R: Fræna), SE (LC). – Bol Bres 39:42, FE 5A:1364, RdM 43:221.

E. phaeocyathus Noordel.

 - Cheilocystidia absent 4
4. Sp 6.5-7.5 x 5-6.5 μm (fig. 457F). Cap 5-12 mm, convex, then plane, weakly hygrophanous, translucently striate, horn brown with darker striae and centre, dry, cracked in irregu-

lar scaly patches with age; gills emarginate, broadly adnate, distant, pale beige, then pink; stem 10-15 x 0.5-1 mm, pale yellow brown, fibrillose; smell and taste indistinct. Sp isodiametrical, 5-8-angled in side-view; cheilocystidia absent; pileipellis a cutis of cylindrical, 3-6 μm wide hyphae with minutely incrusting pigment; clamps present. In small groups on rotten wood (*Picea*, *Alnus viridis*) or on soil under *Alnus viridis*, in subarctic and subalpine forests; late summer to autumn; very rare; NO (DD, Nordl: Mo [type]). – FE 5A:1364.

E. chelone Noordel. & E. Horak

- Sp > 7.5 μm long 5
- 5. Gills adnate with a short decurrent tooth; cap with slightly depressed centre 6
- Gills deeply decurrent; cap deeply depressed to funnel-shaped 7
- 6. Cap finely rugulose at centre, \pm glabrous and translucently striate towards margin. Cap 10-30 mm, low convex to depressed, rugulose, particularly at centre, slightly hygrophanous, slightly translucently striate, reddish brown; gills adnate-emarginate, medium spaced, brownish pink; stem 30-50 x 1-3 mm, brown, polished; smell very weak; taste unknown. Sp (7-)9-11 x 6-7.5 μm , heterodiametrical, 5-6-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 3-9 μm wide, cylindrical hyphae with incrusting pigment; clamps present. In small groups, terrestrial in clearing in a deciduous forest; autumn; very rare in temp.; DK (NA, EJyl: Gærum Hede [type]). – FE 5A:1361, Svp 51:58.

E. depressum Noordel. & Vesterh.

- Cap entirely tomentose to minutely scaly. Cap 10-40 mm, convex, depressed, finally funnel-shaped, felty-tomentose, dark brown; gills broadly adnate with a long decurrent tooth, medium spaced, brown to grey brown, then red brown; stem 20-70 x 2-5 mm, brown, silvery fibrillose to subtomentose; smell and taste farinaceous-rancid. Sp 8-10.5(-11.5) x 5.5-7(-7.5) μm , heterodiametrical, 6-7(-8)-angled in side-view; cheilocystidia absent; pileipellis a cutis or a trichoderm of septate, 5-12 μm wide hyphae with dark brown, rather coarsely incrusting walls; clamps present. In groups in grassy roadsides and in grassland, on slightly calcareous soil; summer to autumn; very rare in bore.; FI, NO (Finm), SE (Mpd). – FE 5A:1361.

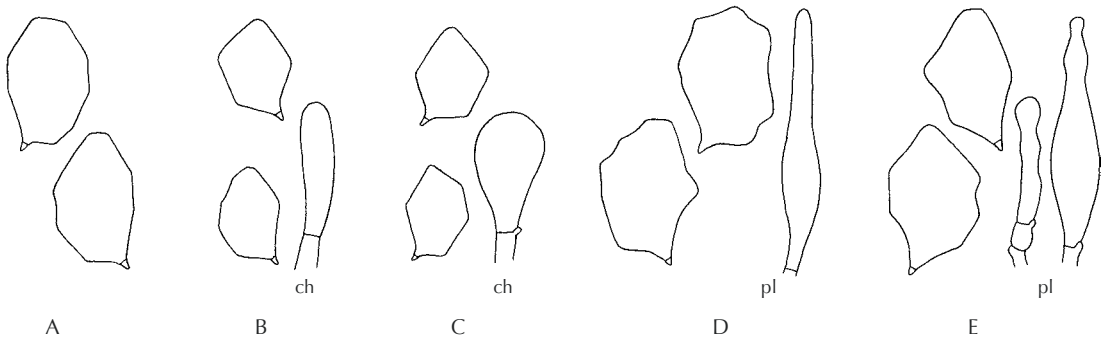
E. korhonenii Noordel. var. *korhonenii*

- 7. Cap very dark brown; cap diam. about equal to length of stem. Cap 5-20 mm, convex, umbilicate, glabrous or slightly rugulose at centre, hygrophanous, deeply translucently striate; gills brownish pink; stem 3-30 x 1-2 mm, yellow brown; smell and taste indistinct. Sp 8-10.5(-11) x 7-9(-9.5) μm , rounded-isodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis a cutis of cylindrical to inflated, 5-35 μm wide hyphae with incrusting pigment and intracellular pigment in lower pileitrama; clamps absent. In humus-rich places in gardens, parks and deciduous forests, at roadsides and in open, sun-lit xerophytic vegetation; spring to autumn; rare or overlooked in temp.-bore.; DK (LC), FI (DD), NO (NE), SE. – FE 5:72a, FE 5A:1363, Lud 94.18.

E. rusticoides (Gillet) Noordel.

- Cap pinkish brown; cap diam. smaller than length of stem. Cap 5-20(-30) mm, convex to low convex, depressed, finely felty, weakly hygrophanous, not translucently striate, not zonate; gills adnate-decurrent, medium spaced, pinkish brown to pinkish grey; stem 10-20 x 1-2 mm, brown with a pink tinge, white pruinose; smell and taste farinaceous. Sp 7-9 x 5.5-7 μm , heterodiametrical, 5-9-angled in side-view; cheilocystidia absent; pileipellis a cutis of 1.5-7 μm wide, cylindrical hyphae with minutely incrusting pigment; clamps present. In groups, terrestrial in open spots, paths, lawns, seminatural grasslands, etc.; summer to autumn; very rare or overlooked in temp.; DK (DD, no recent finds). – FAD 800, FE 5:86g, Lud 94.14.

E. lanicum (Romagn.) Noordel.



Spores, cheilocystidia and cheilocystidia: A: *Entoloma neglectum*, B: *E. olivaceotinctum*, C: *E. weholtii*, D: *E. indutooides* var. *pleurocystidiatum*, E: *E. insolitum*.

Key H: Frb collybioid or omphalinoid; cap fibrillose, tomentose or finely scaly, sometimes zonate; gills adnate to decurrent; pigment intracellular

1. Frb white 2
 - Frb pigmented 4
2. Stem central only in very young stages, soon eccentric; clamps absent. Cap 2-10 mm, conical-convex, expanding to plane and irregularly shaped, fibrillose-tomentose, white; gills often anastomosing or forked, distant; stem 2-6 x 0.2-1 mm, glabrous or with pubescent base, white; smell none. Sp 9-12.5 x 6-8 μm, 4-6-angled in side-view; cheilocystidia absent; clamps absent. On debris of grasses and sedges in marshy places; summer to autumn; very rare or overlooked in temp.-hemib.; DK (NA, EJyl: Åsted Ådal), NO (LC). – FE 5:72c, FE 5A:1358, Jordst 19(1), Lud 94.5, ☉.

E. albotomentosum Noordel. & Hauskn.

 - Stem central; clamps present 3
3. Stem innately fibrillose or glabrous, polished, without well-differentiated caulocystidia. Cap 5-40 mm, conical-convex to convex, slightly umbilicate, tomentose to finely scaly, not hygrophanous, not translucently striate, white; gills adnate-emarginate or subdecurrent, medium spaced, white, then pink; stem 20-60 x 2-4 mm, white to cream, hyaline; smell and taste none or faintly farinaceous. Sp 8-12 x 6-9 μm, heterodiametrical, 5-8-angled in side-view; cheilocystidia scattered among basidia, 25-85 x 8-16 μm, cylindrical to lageniform; pileipellis a trichoderm of inflated, 10-35 μm wide, pigmentless hyphae; clamps present. In groups in seminatural grassland, also in damp deciduous forests and along ditches; summer to late autumn; common in temp.-suba., rare in arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – FE 5:46a, FE 5A:1272-1273, FND 21:33, Phil 163e, R&H 380, ☉.

E. sericellum (Fr.: Fr.) P. Kumm. (*Rhodophyllus carnealbus* (With.) Quél.)

 - Stem minutely pruinose with cylindrical to coralloid caulocystidia. Cap 5-15 mm, convex, umbilicate, minutely tomentose, white; gills decurrent, medium spaced, white, then pink; stem 10-20 x 0.5-1 mm, hyaline; smell and taste indistinct. Sp 9.5-12 x 7.5-9 μm, heterodiametrical, many-angled to nodulose; cheilocystidia scattered, 24-50 x 3-8 μm, cylindrical to lageniform; pileipellis a cutis to a trichoderm of slightly inflated, pigmentless hyphae, 3-17 μm wide; clamps present. Among mosses in grassland, outside the area also in damp places in deciduous forests; summer to autumn; very rare in bore.; NO (DD, Nordl: Alstahaug). – FE 5A:1364.

E. rugosum (Malençon) Bon
4. Cap very pale cream to flesh-coloured; sp irregularly many-angled to nodulose (fig. 461A). Cap 5-40 mm, convex to plane, depressed to umbilicate, tomentose, not hygrophanous,

not translucently striate, pale creamy white, sometimes zonate; gills broadly adnate to decurrent, medium spaced, white, then pink; stem 10-25 x 2-2.5(-3) mm, fibrillose, white or hyaline; smell and taste farinaceous-rancid. Sp 9-12.5 x 6-9(-10) μm ; cheilocystidia absent; pileipellis a cutis to a trichoderm, of cylindrical to slightly inflated 4-16 μm wide hyphae with very pale intracellular pigment; clamps present. In mossy grassland, meadows, road sides, etc., preferably on (slightly) calcareous soil, also found in marshy vegetation with *Sphagnum*; summer to autumn; occasional in hemib.-bore., rare in temp.-suba.; DK (VU), FI (DD, EH: Tampere), IS (Au: Hengifossárgil, Fljótsdal), NO (DD), SE (LC). – FAD 79D, FE 5:71c, FE 5A:1354, Lud 94.12, ☉.

E. neglectum (Lasch: Fr.) M.M. Moser (*E. cancrinum* (Lasch: Fr.) M.M. Moser)


- Cap pale to rather dark yellow, green, brown or grey; sp regularly-angled, not nodulose 5
- 5. Cap very pale grey. Cap 15-35 mm, low convex, depressed, fibrillose, not hygrophanous, not translucently striate, pale yellow or grey pink with slightly darker concentric zones; gills decurrent, distant, white, then pink; stem 14-25 x 2-4 mm, fibrillose, white or pale ochre; smell and taste farinaceous. Sp 9.5-11 x 7-8 μm , regularly 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of cylindrical, 2-9 μm wide hyphae with very pale intracellular pigment; clamps present. In poorly manured grassland on nutrient poor soils; summer to autumn; very rare in bore.; SE (NE, Mpd: Borgsjö) – Lud 94.13.
- E. pallens* (Maire) Arnolds
- Cap pale to rather dark yellow, green, brown or grey 6
- 6. Cap pale yellow or ochre; cheilocystidia scattered among basidia, protruding through the hymenium, 25-85 x 8-16 μm , cylindrical to lageniform see *E. sericellum* 3
- Cap colour different; cheilocystidia different or absent 7
- 7. Stem bright yellow green, green or olivaceous green; smell strong, of mice excrements. Cap 10-40 mm, bell-shaped to convex, umbilicate, minutely scaly at centre, slightly hygrophanous, deeply translucently striate, olivaceous green, yellow green, yellow, yellow brown or reddish brown; gills adnate-emarginate or with a decurrent tooth, medium spaced, white or pale green, then pink; stem 20-80 x 1-4 mm, turning bright blue green when bruised, polished, at base white tomentose; taste unpleasant. Sp 10-14 x 7.5-10, heterodiametrical, 6-9-angled in side-view; cheilocystidia absent; pileipellis a trichoderm of 7-30 μm wide, inflated elements with intracellular pigment; clamps absent. In groups in calcareous unfertilized grassland, rarely also in deciduous forests; summer to autumn; rare, but locally occasional in temp.-suba.; DK (NT), FO, NO (NT), SE (LC). – FAD 77C, FE 5:58a, FE 5A:1306-1307, FND 21:22, R&H 380, ☉.
- E. incanum* (Fr.: Fr.) Hesler
- Stem without bright green tinges, with or without glaucous-greenish tinges; smell none or farinaceous to faintly aromatic 8
- 8. Clamps present 9
- Clamps absent 20
- 9. Cheilocystidia, if present, cylindrical, clavate or spheropedunculate and with about the same length as basidia 10
- Cheilocystidia well differentiated, fusiform, lageniform or clavate-mucronate, or with a capitate neck, much longer than basidia 15
- 10. Cheilocystidia present 11
- Cheilocystidia absent 12
- 11. Cap and stem very dark brown to blackish brown; smell very strong, nasty, like burnt rubber or meat see *E. nausiosme* key F 16
- Cap and stem yellow brown or grey brown, with or without an olivaceous tinge; smell indistinct 13

12. Cap and stem yellow brown or grey brown with a distinct olivaceous tinge; cheilocystidia 15-40 x 6-10 μm , clavate (fig. 461B). Cap 5-20 mm, bell-shaped to convex, umbilicate, fibrillose to finely scaly, hygrophanous, translucently striate; gills adnate-emarginate or with a decurrent tooth, medium spaced, white then pink; stem 10-40 x 1-3 mm, polished; smell and taste indistinct. Sp 7-9 x 5.5-7 μm , heterodiametrical, 5-7-angled in side-view; pileipellis a cutis to a trichoderm of inflated, 15-25 μm wide hyphae with intracellular pigment; clamps present. In groups in grassland and deciduous forests; summer to autumn; very rare in hemib.-suba.; FI (EN, PS: Kuopio), NO (DD, Tel: Bamble, STr: Midtre Gauldal), SE (Boh: Orust). – FE 5:50b.
E. olivaceotinctum Noordel.
- Cap and stem yellowish to ochraceous; cheilocystidia 20-70 x 10-20 μm broadly clavate (fig. 461C). Cap 10-25 mm, convex, umbilicate, finely scaly at centre, hygrophanous, translucently striate; gills adnate with a decurrent tooth, medium spaced to distant, pale brown, then pinkish brown; stem 30-50 x 1-3 mm, polished; smell and taste indistinct. Sp 7-9(-10) x 5.5-7 μm , heterodiametrical, 5-7-angled in side-view; pileipellis a cutis to a trichoderm, of inflated, 10-25 μm wide hyphae with intracellular pigment; clamps present. In unfertilized grassland and in open deciduous forests; summer to autumn; very rare in temp.-hemib.; DK (EN), NO (DD, Tel: Bamble). – FE 5:1349, FND 21:39, Svp 21:21.
E. weholtii Noordel.
13. Stem vivid yellow with a white basal mycelium; smell indistinct. Cap 10-35 mm, convex, umbilicate, finely scaly at centre, hygrophanous, translucently striate, yellow brown with a brown centre; gills adnate-emarginate or with a decurrent tooth, medium spaced, white, then pink; stem 30-50 x 1-2 mm, polished; taste indistinct. Sp 7-9.5 x 6-8.5 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated, 10-20 μm wide hyphae with intracellular pigment; clamps present. In grassland on calcareous soil; summer to autumn; rare in bore.-suba.; NO (VU). – FE 5:50a, FE 5A:1347.
E. politoflavipes Noordel. & Liiv
- Stem grey brown; smell farinaceous 14
14. Sp 9-16(-18) x 6-9 μm , irregularly angular-nodulose see *E. sarcitum* key F 21
 - Sp 8-10(-11) x 6.5-7.5 μm , 6-8-angled in side-view. Cap 5-25 mm, bell-shaped to convex, umbilicate, minutely tomentose in central part, hygrophanous, translucently striate, brown grey; gills adnexed, distant, greyish, then greyish pink; stem 20-40 x 1-4 mm, polished, grey brown; smell and taste strongly farinaceous. Sp heterodiametrical; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated, 10-20 μm wide hyphae with intracellular pigment; clamps present. In groups in unfertilized grassland or deciduous forests; late summer to autumn; very rare in hemib.-middle bore.; FI (DD), NO (NE). – BSMF 120:350,351, FE 5:81a, FE 5A:1346.
E. farinasprellum Arnolds
15. Pleurocystidia present 16
 - Pleurocystidia absent 17
16. Cheilo- and pleurocystidia lageniform with a long, tapering neck (fig. 461D). Except for the presence of 40-145 x 5-15 μm large cheilo- and pleurocystidia like the main variety. In groups in grassy places in mixed woodland on somewhat calcareous soil; late summer to autumn; very rare; SE.
E. indutoides (P.D. Orton) Noordel. var. *pleurocystidium* Noordel., Wölfel & Hauskn.
- Cheilo- and pleurocystidia in part \pm capitate (fig. 461E). Cap 15-20 mm, low convex, depressed, slightly hygrophanous, not translucently striate, very dark blackish brown, coarsely fibrillose; gills medium spaced, adnate with a decurrent tooth, grey brown; stem 10-30 x 1-2 mm, dark brown, slightly fibrillose; smell and taste indistinct. Sp 11-12.5 x 7-9.5 μm , heterodiametrical, 6-9-angled in side-view; cheilocystidia 20-60 x 5-17 μm , cylindri-

cal to lageniform; pleurocystidia 25-75 x 5-20 x 3-7 μm , similar to cheilocystidia, abundant; pileipellis a cutis of cylindrical to inflated 10-20 μm wide hyphae with intracellular pigment; clamps abundant. In groups in mossy, unfertilized grassland on calcareous soil; autumn; very rare in suba.; FO. – BSMF 122:opp. 132, Jordst 24(2):22, Lud 94.87.

E. insolitum Noordel.

17. Stem polished or with only a few scattered fibrils 18
 - Stem fibrillose or flocculose 19
18. Cap pale grey ochre to pale brown with dense fibrillose covering, reminiscent of an *Inocybe* species; sp 9-14 x 7-9 μm . Cap 15-20 mm, hemispherical to convex, depressed, not or weakly hygrophanous, translucently striate; gills medium spaced, adnate-emarginate, pale grey-brown, then greyish pink; stem 25-50 x 1-3 mm, polished, pale cream; smell and taste indistinct. Cheilocystidia 27-100 x 5-20 μm , cylindrical, clavate, lageniform to lecythiform; pileipellis a cutis to a trichoderm of inflated, 10-15 μm wide hyphae with intracellular pigment; clamps present. In groups in unfertilized grassland or open woodland on calcareous soil; late summer to autumn; very rare in hemib.; NO (NE, Hord: Bømlo, M&R: Giske).
E. calaminare Noordel.
- Cap dark brown, almost smooth; sp 9.5-14(-14.5) x 8-10.5 μm . Cap 10-20 mm, truncate-conical to convex, depressed to umbilicate, hygrophanous, translucently striate; gills medium spaced to distant, adnate to adnexed, pale grey, then greyish pink; stem 20-45 x 1-2 mm, pale brown, polished; smell and taste slightly farinaceous. Cheilocystidia 35-80 x 7.5-16 x 2.5-8 μm , lageniform to lecythiform; pileipellis a cutis to a trichoderm of inflated, 15-20 μm wide hyphae with intracellular pigment; clamps present. In groups in unfertilized grassland and heathland, on loamy soil; late summer to autumn; rare in temp.-bore.; DK (EN), NO (NT), SE (NE). – FE 5A:1345, FND 21:12, Svp 21:21.
E. cocles (Fr.) Noordel.
19. Cap yellow brown with an olivaceous tinge. Cap 10-20 mm, convex, umbilicate, minutely scaly, hygrophanous, short translucently striate; gills adnate-decurrent, medium spaced, grey, then pink, with entire, brown edge; stem 15-70 x 2-6 mm, finely floccose at top, fibrillose below, white at top, pale beige brown to brown below; smell and taste indistinct. Sp (9.5-)10-14 x 7.5-10.5 μm , heterodiametrical, 5-9-angled in side-view; gill edge sterile; cheilocystidia 38-85 x 10-22 x 4-7.5 μm , with brown intracellular pigment; pileipellis a trichoderm of clavate to fusiform elements, 40-90 x 10-25 μm with intracellular pigment; clamps present. In groups in grassland; late summer to autumn; very rare in bore.; SE (LC). – FE 5:49b, FE 5A:1344.
E. indutoides (P.D. Orton) Noordel. var. *indutoides*
- Cap brown, chocolate brown or grey brown, without olivaceous tinge
 see *E. indutoides* var. *griseorubidum* key B 20
- 20(8) Stem with glaucous-greenish tinges 21
 - Stem without glaucous-greenish tinges 22
21. Cheilocystidia absent. Cap 10-30 mm, convex, umbilicate, minutely scaly at centre, weakly hygrophanous, translucently striate, pale yellow brown or grey brown; gills adnate-emarginate, medium spaced, white, then pink; stem 20-40 x 1-2 mm, polished, pale grey with a glaucous tinge, often turning blood red at base; smell and taste indistinct. Sp 9-11 x 6.5-7.5 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm of inflated, 10-30 μm wide elements with intracellular pigment; clamps absent. In groups in unfertilized grassland and open deciduous forests; summer to autumn; rare in temp.-bore.; NO, SE (DD). – FE 5A:1330.
E. chloropolium (Fr.) M.M. Moser
- Cheilocystidia present see *E. exile* key B 13

22. Cap and stem deep red to wine-coloured. Cap 10-30 mm, bell-shaped to convex, then plane, umbilicate, tomentose or granulose to finely scaly, not hygrophanous, not translucently striate; gills adnate-emarginate or with a decurrent tooth, medium spaced, pale brown, then pinkish brown; stem 40-75 x 1-3 mm, fibrillose; smell and taste indistinct. Sp 10-12.5 x 7-8 μm , heterodiametrical, 5-6(-7)-angled in side-view; cheilocystidia absent; pileipellis a cutis to a trichoderm, of inflated terminal elements, 20-75 x 15-25 μm , with intracellular pigment; clamps absent. In small groups among mosses and herbs in grassy vegetation, in open forests, from lowland up into the subalpine meadows; late summer to autumn; *PL.* – FE 5:75a, FE 5A:1339.
E. rufocarneum (Berk.) Noordel.
- Cap and stem not red to wine-coloured 23
23. Frb ochre, yellow, orange yellow or reddish yellow 24
- Frb dull yellow, yellow brown, brown grey or dark greyish brown, porphyry brown to purplish grey 27
24. Cap yellow to orange yellow. Cap 10-50 mm, conical to convex, umbilicate, minutely scaly at centre, not hygrophanous, translucently striate; gills adnate-emarginate or with a decurrent tooth, medium spaced, white, then pink; stem 25-100 x 1-4 mm, pale yellow to yellow, polished; smell and taste indistinct. Sp 9-14 x 6-9 μm , heterodiametrical, 5-9-angled in side-view; cheilocystidia 20-50 x 5-15 μm , cylindrical to clavate; pileipellis a cutis to a trichoderm of inflated, 12-30 μm wide hyphae with intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; occasional in hemib.-suba., rare in temp.; DK (VU), FI (DD), FO, NO (LC), SE (LC). – FE 5:67a, FE 5A:1336-1337, FND 21:17, GBW 4:231, Jordst 24(3):39, .
- E. formosum* (Fr.: Fr.) Noordel. (*E. fulvum* (P.D. Orton) Arnolds)
- Cap ochre 25
25. Stem polished; cap not translucently striate, minutely micaceous-granulose all over see *E. ochromicaceum* key B 21
- Stem fibrillose-flocculose; cap fibrillose-finely scaly, translucently striate or not 26
26. Cap when fresh with a carmine flush, which soon disappears under the influence of sunlight see *E. queletii* key E 5
- Cap ochre without a carmine flush. Cap 10-40 mm, convex, umbilicate, tomentose to finely scaly, not hygrophanous, not translucently striate; gills adnate-emarginate or with a decurrent tooth, medium spaced, yellow, then yellow pink; stem 20-70 x 2-5 mm, fibrillose all over, ochre; smell and taste indistinct. Sp 9-11(-11.5) x 6-8 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 30-80 x 4-12 μm , cylindrical to clavate; pileipellis a trichoderm of inflated terminal elements, 25-70 x 10-25 μm , with intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; very rare in temp.-suba.; DK (NA, EJyl: Vingum), FO, NO (DD), SE (EN). – B&K 4:46, FE 5:76b, FE 5A:1340, FND 21:23, GBW 4:235.
E. kervernii (de Guern.) M.M. Moser
27. Cap distinctly translucently striate, slightly hygrophanous see *E. longistriatum* key B 25
- Cap not translucently striate, not hygrophanous 28
28. Stem fibrillose-striate 29
- Stem glabrous, polished 30
29. Cap porphyry brown to purplish grey; cheilocystidia abundant see *E. porphyrogriseum* D 16
- Cap sordid grey brown or yellowish grey; cheilocystidia absent. Cap 10-40 mm, conical, then convex, minutely scaly all over, not hygrophanous, not translucently striate; gills adnate-emarginate, medium spaced, white, then pink; stem 20-45 x 3-7 mm, densely silvery striate, very pale grey brown; smell and taste indistinct. Sp 9-12 x 6.5-8.5 μm , heterodiametrical, 5-7-angled in side-view; pileipellis a trichoderm of inflated elements, 50-110 x 8-22

μm , with intracellular pigment; clamps absent. In groups in unfertilized grassland; autumn; very rare in temp.-suba.; DK (EN), FI (EN, V: Korppoo, PS: Kuopio), NO (VU), SE (NA). – FE 5A:1343, FND 21:32, Svp 21:28.

E. scabropellis Noordel.

30. Cheilocystidia absent. Cap 10-40 mm, conical, then convex, umbilicate, granulose-finely scaly all over, not hygrophanous, not translucently striate, pale to dark yellowish grey; gills adnate-emarginate, medium spaced, white, then pink; stem 50-90 x 2-4 mm, polished, yellowish grey; smell none; taste bitter. Sp 9-13 x 7-8 μm , heterodiametrical, 5-9-angled in side-view; pileipellis a trichoderm to a hymeniderm of inflated elements, 100-300 x 4-25 μm , with intracellular pigment; clamps absent. In groups in unfertilized grassland and deciduous forests; EE. – FE 5:66a.

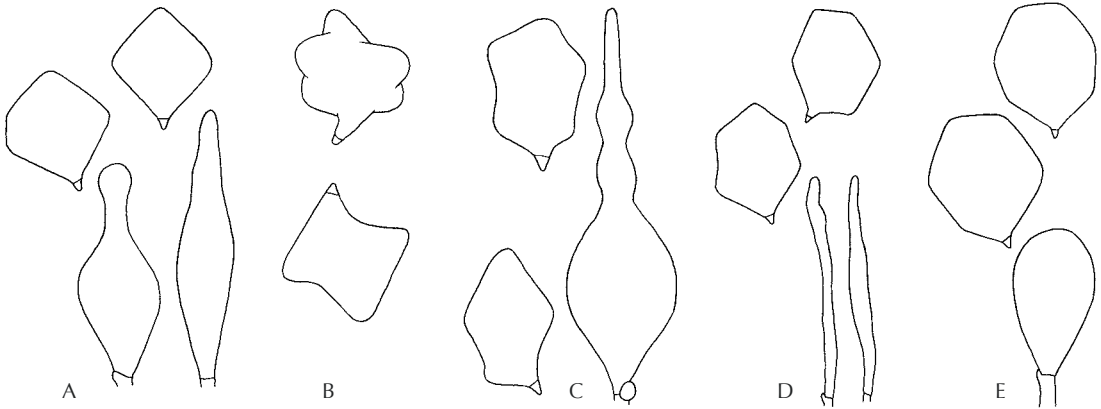
E. leochromus Noordel. & Liiv var. *leochromus*

var. *obscurum* Noordel. & Prüfert differs by having a dark brown-grey cap. DE. – FE 5A:1334.

- Cheilocystidia present 31
 - 31. Sp 10-12 x 7-8 μm ; base of stem usually turning red when handled see *E. turci* key B 24
 - Sp 8.5-10 x 6.5-7 μm ; base of stem not turning red. Cap 10-50 mm, truncate-conical to convex, umbilicate, tomentose to finely scaly, not hygrophanous, not or slightly translucently striate, dark red brown or grey brown; gills adnate-emarginate, medium spaced, brown, then pinkish brown; stem 25-50 x 2-4 mm, polished, dark grey brown or red brown; smell and taste indistinct or slightly aromatical. Sp heterodiametrical, 5-7-angled in side-view; cheilocystidia 20-60 x 5-15 μm , cylindrical to clavate; pileipellis a trichoderm of inflated elements, 25-90 x 5-20 μm , with intracellular pigment; clamps absent. In groups in unfertilized grassland; summer to autumn; rare in temp.-arc./alp.; DK (NA), FI (DD), NO (NE), SE (NE). – Bol Bres 39:47, 48, BSMF 120:343, 344, FE 5:70b, FE 5A:1342, GBW 4:235.
- E. pseudoturci* Noordel.

Key I: Sp cuboid or cruciform

1. Sp cuboid (fig. 467A). Cap 20-50 mm, conical, bell-shaped or hemispherical, expanding to plane, umbonate, glabrous, hygrophanous, deeply translucently striate, dark yellow brown; gills almost free, medium spaced, pink; stem 30-80(-110) x 2-5 mm, polished, yellow or yellow brown; smell faint, slightly aromatic; taste rancid-farinaceous. Sp 8-10.5(-11) x 7-10.5 μm ; gill edge sterile or heterogeneous; cheilocystidia 35-80 x 10-25 x 3-9 μm , fusiform, lageniform or tibiiform; pileipellis a cutis of cylindrical, 2-9 μm wide hyphae with intracellular and incrusting pigment; clamps abundant. Single or in small groups in moist, unfertilized grassland, often in *Sphagnum*; summer to autumn; rare in temp.-suba.; DK (EN), NO (NT), SE (LC). – FE 5:26b, FE 5A:1257, Lud 94.82, Ves 252, ☉.
E. rhombisporum (Kühner & Boursier) E. Horak var. *rhombisporum*
var. *floccipes* Noordel. differs by having an entirely floccose stem. DK, NO. – FE 5A:1258
- Sp cruciform-stellate (fig. 467B). Cap 20-60 mm, conical, hemispherical or bell-shaped, expanding with age, umbonate, glabrous, strongly hygrophanous, translucently striate, dark grey brown, sepia, reddish brown or yellow brown; gills adnate-emarginate to almost free, medium spaced; white, then pink with or without grey tinge; stem 20-80 x 1-7 mm, cylindrical or compressed, yellow brown or grey brown, densely silvery striate; smell and taste mild to farinaceous-rancid. Sp 7.5-13(-14) x 7-13 μm ; cheilocystidia absent; pileipellis a cutis to a trichoderm of 6-15 μm wide, cylindrical hyphae with slightly inflated terminal elements, 10-20 μm wide; with intracellular pigment; clamps absent. Terrestrial in groups in grasslands, marshes, pastures, meadows, hayfields, peat bogs among *Sphagnum* and damp places in deciduous and coniferous forests; spring to autumn; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:23, FAD 77A, FE 5:41, FE 5A:1256, Ves 250, ☉.
E. conferendum (Britzelm.) Noordel. var. *conferendum* (*E. staurosporium* (Bres.) E. Horak)



Spores and cheilocystidia: A: *Entoloma rhombisporum*, B: *E. conferendum*, C: *E. excentricum*, D: *E. kallioi*, E: *E. inusitatum*.

var. *incrustatum* (Largent & Thiers) Noordel. & Hauskn. differs in having incrusting pigment in pileipellis. NO.

var. *pusillum* (Velen.) Noordel. differs in being smaller, cap 10-15 mm, and growing on wood.

Key J: Frb tricholomatoid; cap glabrous; trama of short, inflated elements

- 1. Frb white or whitish 2
 - Frb pigmented 4
- 2. In spring, associated with *Rosaceae*. Cap 20-145 mm, conical to convex or plane, glabrous, indistinctly hygrophanous, translucently striate at margin, white; gills adnate-emarginate, medium spaced, white, then pink; stem 40-120 x 5-15(-20) mm, fibrillose-striate, white; smell and taste farinaceous. Sp 8-10(-11.5) x 7.5-10(-11) μm, 5-8-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2-10(-12) μm wide, not pigmented hyphae; clamps abundant. In groups under various *Rosaceae*, preferably *Prunus* and *Crataegus* in hedges and margins of deciduous forests; spring to early summer; very rare in temp.-hemib.; DK (DD, Lol), FI (DD), NO (NE, Vestf.: Larvik), SE (LC). – FE 5:7, FE 5A:1177, Lud 94.24.
 - E. niphoides* Noordel.
 - In summer and autumn, not associated with *Rosaceae* 3
- 3. Sp heterodiametrical, relatively thick-walled, 9-12.5(-13.5) x 7.5-10 μm. Cap 15-40 mm, convex, then plane, umbonate, weakly hygrophanous, translucently striate at margin or not, white; gills adnate-emarginate, medium spaced, white, then pink; stem 20-70 x 2-6 mm, silvery fibrillose, white; smell and taste weakly to distinctly farinaceous. Cheilocystidia absent; pileipellis a cutis of 2-7 μm wide, not pigmented hyphae; clamps abundant. In groups, terrestrial in deciduous forests on humus-rich soils; summer to autumn; rare in temp.-bore.; DK (NE), FI (DD, InL: Utsjoki), NO (STr: Trondheim), SE (NE). – FE 5A:1182, Lud 94.53.
 - E. speculum* (Fr.) Quél.
 - Sp isodiametrical, thin-walled, 6.5-8(-9) x 6.5-8 μm. Cap 20-70 mm, convex or plane, umbonate, glabrous to innately fibrillose, not hygrophanous, not translucently striate, white to pale cream or ochre brown; gills adnate-emarginate, distant, white, then pink; stem 30-80 x 3-12 mm, fibrillose striate, white, tinged yellow near base; smell and taste farinaceous. Cheilocystidia absent; pileipellis a cutis of cylindrical, 2-7 μm wide hyphae with intracellular pigment; clamps abundant. In poorly manured, and extensively grazed meadows,

especially on calcareous soil in montane to (sub-)alpine regions, occasionally also in the lowlands and on more acid soil; summer to autumn; occasional in hemib.-suba., rare in temp.; DK (VU), FI (EN, A: Jomala, U: Espoo), FO, NO (NT), SE (NT). – AAF 3:39, FAD 73A, FE 5:1, FE 5A:1165, Ves 243, ☉.

E. prunuloides (Fr.: Fr.) Quéf.

4. In spring, associated with *Rosaceae* or *Ulmus* 5
 - In summer and autumn, not particularly associated with *Rosaceae* or *Ulmus* 9
5. Cap with distinct aeriferous-fibrillose or micaceous aspect; sp 10-12(-14) x 10-12 μm , isodiametrical, many-angled; with *Ulmus*. Cap 30-130 mm, conical or convex, umbonate, not hygrophanous, not translucently striate, sordid white, then pale greyish or ochraceous brown; gills adnate-emarginate, white, then pink; stem 35-120 x 8-22 mm, fibrillose striate, white, then grey or greyish brown; smell and taste strongly farinaceous-rancid. Cheilocystidia absent; pileipellis an ixocutis of 4.5-7(-10) μm wide hyphae with pale grey-brown, intracellular pigment; clamps abundant. In groups on heavy clayey or loamy soil; (winter to) spring; very rare in temp.-southern bore.; NO (LC). – Bol Bres 39:51, FE 5:9, FE 5A:1178-1179.
E. saundersii (Fr.) Sacc.
- Cap glabrous; sp 8-11 x 7-10 μm , regularly 5-7-angled in side-view; with *Rosaceae* or *Ulmus* 6
6. Cap pale, cream or pale grey 7
 - Cap moderately dark to dark yellow brown or grey brown 8
7. Cap not hygrophanous; flesh and often also surface staining orange yellow when bruised or cut. Cap 25-125 mm, conical-convex, then low convex, umbonate, glabrous, not hygrophanous, not translucently striate, pale creamy or yellow brown, silky-shiny; gills adnate-emarginate, medium spaced; stem 30-120 x 5-22 mm, fibrillose, white, bruising yellowish red; smell and taste farinaceous. Sp (7.5-)8-11(-12) x (6.5-)7-10(-11) μm , Q= 1-1.3, (sub-)isodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 1.5-7(-9) μm wide hyphae with pale brown intracellular pigment; clamps abundant. Under various *Rosaceae* in forests, hedges, gardens, orchards, etc., often in large groups; spring to early summer; rare in temp.-bore.; DK (LC), NO (LC), SE (LC). – FE 5:8; FE 5A:1178, Däh 401, GBW 4:195, Ves 243.
E. sepium (Noulet & Dass.) Richon & Roze
- Cap distinctly hygrophanous; flesh and surface not staining orange yellow when bruised or cut. Cap pale creamy grey, brown grey or yellowish grey, fading or drying to almost white. In other characters like the main form. NL.
E. clypeatum (L) P. Kumm. f. *pallidogriseum* Noordel.
8. Frb relatively thin-fleshed; stem soon hollow and brittle; cap often translucently striate up to half the radius, under *Ulmus*. Cap 15-60 mm, conical to conical-convex, umbonate, hygrophanous, dark sepia, grey brown or reddish brown; gills adnate-emarginate, medium spaced, pale grey, then pink; stem 30-90 x 4-12 mm, fibrillose, grey to grey brown; smell and taste farinaceous-rancid. Sp 9-11(-12) x 7-10(-11) μm , subisodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2-7 μm wide hyphae with brown, intracellular pigment; clamps present. In groups in forests, parks, etc.; spring to early summer; occasional in hemib., rare in temp. and bore.; DK (VU), FI (DD, V: Turku), NO (NE), SE (LC). – B&K 4:9, FE 5:7, FE 5A:1175-1176, Phil 163g, R&H 378.
E. aprile (Britzelm.) Sacc.
- Frb relatively thick-fleshed; stem not hollow, firm; cap not or short translucently striate; under *Rosaceae*. Cap (20-)30-120 mm, conical, convex or low convex, umbonate, glabrous, hygrophanous, brown, usually with grey or olivaceous tinges; gills adnate-emarginate, medium spaced, white, pale grey, then brownish pink; stem 40-150 x 4-20 mm, fibrous, white or pale grey; smell and taste farinaceous to rancid. Sp (8.5-)9-11(-12) x (7-)7.5-10 μm , subiso-

diametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2-7 μm wide hyphae with brown, intracellular pigment; clamps abundant. In groups in forests, hedges and gardens; spring; very common in temp., common in hemib., rare, but locally occasional in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:22, FE 5:6, FE 5A:1173-1174, R&H 379, Ves 244, ☉.

E. clypeatum (L.) P. Kumm. f. *clypeatum* (*E. bahusiense* S. Lundell)

9. Cheilocystidia very prominent, 40-110 x 10-25 μm , lageniform to fusiform (fig. 467C); hymenial elements often with brown necropigment. Cap 20-80 mm, convex, then plane with a low umbo or not, not hygrophanous, not translucently striate, pale creamy-ochre to pale brown, glabrous; gills crowded, adnate-emarginate, white, then brownish pink, finally chocolate brown, with concolorous or brown edge; stem 30-100 x 4-8 mm, white with brown or yellow tinges, fibrillose; smell and taste subfarinaceous. Sp (10-)-11-12.5(-14) x 7-8.5(-9.5) μm , heterodiametrical, 5-8-angled in side-view; pileipellis a cutis or ixocutis of narrow, cylindrical, up to 10 μm wide hyphae with intracellular and minutely incrusting pigment; clamps present. In small groups in poorly manured, seminatural, xerophytic grasslands, preferably on calcareous soils; late summer to autumn; occasional in calcareous areas, otherwise very rare in temp.-hemib.; NO (EN), SE (NT). – B&K 4:30, Cet 240, FE 5:24, FE 5A:1216, Lud 94.25.
E. excentricum Bres.
 - Cheilocystidia, if present, not so prominent, and usually with about the same size as the basidia; necropigment absent 10
10. Cap and stem with olivaceous green tinges. Cap 30-40 mm, conical to convex, umbonate, glabrous to subrugulose, not hygrophanous, not translucently striate, dark grey brown; gills emarginate, medium spaced, greyish green, then pink; stem 40-60 x 6-9 mm, cylindrical, fibrillose-striate, greyish; smell and taste indistinct. Sp (7.5-)-8-9(-9.5) x 6.5-8 μm , isodiametrical, 6-8-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2.5-8 μm wide hyphae with intracellular pigment; clamps abundant. In moist places in deciduous forests (*Quercus*); autumn; very rare in temp.; SE. – Lud 94.27.
E. viridans (Fr.) P. Karst.
 - Cap and stem without olivaceous green tinges 11
11. Gills yellow, then salmon pink. Cap 30-250 mm, conical-convex to convex or plane, umbonate, glabrous, not hygrophanous, not translucently striate, pale grey livid, grey ochraceous or cream; gills adnate-emarginate, medium spaced to distant; stem 40-150 x 5-35 mm, glabrous, white to sordid cream-ochre; smell acidulous-nauseous; taste nasty-unpleasant. Sp 8-11 x 7-9.5 μm , 5-7-angled in side-view; cheilocystidia absent; pileipellis an (ixo-)cutis of 2-5 μm wide hyphae with pale yellow brown, intracellular pigment; clamps abundant. In deciduous forests (*Quercus*) on rich soil, up north also with *Betula*; summer to autumn; rare in temp.-hemib.; DK (VU), FI (NT, V: Turku), NO (NT), SE (LC). – FAD 74c, FE 5:2, FE 5A:1171, R&H 375, Ves 242, ☉. – Poisonous.
E. sinuatum (Bull.: Fr.) P. Kumm. (*E. lividum* (Bull.) Quél., *E. elividum* Noordel.)
 - Gills without yellow tinges 12
12. Frb staining yellow orange when bruised; cheilocystidia present. Cap 20-120 mm, conical, then hemispherical or convex, glabrous, not hygrophanous, not translucently striate, white to cream with an ochre tinge; gills adnate-emarginate, thick, medium spaced, white, then pink; stem 40-120 x 5-14 mm, fusiform, fibrillose, white; smell and taste mild to farinaceous. Sp 9-11.5(-12) x 8-9.5 μm , isodiametrical, 5-6-angled in side-view; cheilocystidia 20-70 x 4-10 μm , cylindrical to clavate; pileipellis an ixocutis of 2-5 μm wide hyphae without pigment; clamps abundant. In deciduous forests (*Quercus*), in relatively open, sun-lit places; summer to autumn; DE, NL. – FE 5A:1172, RdM 41:45.
E. moserianum Noordel.
 - Frb not staining yellow orange when bruised; cheilocystidia rarely present 13

13. Stem porphyry brown with yellow base. Cap 25-50 mm, conical-convex, then convex, umbonate, not hygrophanous, not translucently striate, dark sepia brown; gills adnate-emarginate, medium spaced, white, then pinkish; stem 60-80 x 8-14 mm, cylindrical; smell and taste farinaceous. Sp 6-8 x 6-7 μm ; cheilocystidia absent; pileipellis an ixocutis of 2-4.5 μm wide hyphae with brown, intracellular pigment; clamps abundant. In mixed deciduous forests, e.g. *Acer*, *Quercus*, *Fagus*, *Carpinus*, *Populus*, on calcareous loam; autumn; DE. – FE 5:73a, Lud 94.38.
E. luteobasis Ebert & E. Ludw.
- Stem white, grey or brown, mostly lacking yellow tinges at base 14
14. Sp 6-8(-8.5) μm long, thin-walled, often appearing weakly angled with many angles 15
- Sp on av > 8.5 μm long, with walls of normal thickness, definitely angled, with 5-7(-9) angles in side-view 17
15. Cap pale cream, yellow brown or ochre brown see *E. prunuloides* 3
- Cap grey brown to dark grey brown 16
16. Stem white, silvery striate; smell and taste indistinct. Cap 15-70 mm, conical, bell-shaped or convex, umbonate, hygrophanous, translucently striate at margin, grey brown to sepia, glabrous; gills medium spaced, adnate-emarginate, pale grey then pinkish grey; stem 25-100 x 3-15 mm, fusiform with a tapering, yellow-tinged base. Sp 6.5-8.5(-9) x 6-7(-7.5) μm , subsodiametrical, very thin-walled and many-angled with weak angles, appearing almost nodulose; cystidia absent; pileipellis an ixocutis of 2.5-5 μm wide hyphae with intracellular pigment; clamps present. In small groups in heathland and in coniferous forests on acid, peaty soil; late summer to autumn; very common in temp.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 4:89, FAD 76D, FE 5:22, FE 5A:1210, Ves 249, ☉.
E. turbidum (Fr.: Fr.) Quél.
- Stem brown grey, fibrillose-striate; smell and taste farinaceous. Cap 30-60 mm, conical to convex, hygrophanous, translucently striate at margin only, dark brown to sepia, glabrous; gills crowded, almost free, grey to grey brown, then tinged pink; stem 70-120 x 6-13 mm, fusiform. Sp 6.5-8 x 6.5-7.5 μm , subsodiametrical, 5-7-angled in side-view, with weak angles; cystidia absent; pileipellis of cylindrical 3.5-7 μm wide hyphae with intracellular pigment; clamps abundant. In groups in deciduous forests; late summer to autumn; rare in temp.-bore.; NO (NE), SE (NE, Sk). – B&K 4:66, Däh 399, FE 5:74, FE 5A:1212.
E. pseudoturbidum (Romagn.) M.M. Moser
17. Smell of older frb very peculiar, nasty, reminiscent or rotten cabbage or fishy. Cap 35-60 mm, conical-convex, umbonate, glabrous, not hygrophanous, not translucently striate; dark grey brown, often olivaceous; gills emarginate, crowded, white, then pink; stem 35-60 x 6-10 mm, cylindrical, fibrillose-striate, white; taste strong, like rotten cabbage. Sp 8.5-11 x 7-9 μm , subsodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-12 μm wide hyphae with intracellular pigment; clamps abundant. In *Salix* scrubs and *Betula* forests; summer to autumn; rare in bore.-arc. / alp.; NO (LC, incl. Sv), SE. – FE 5A:1172.
E. olidum Noordel. & T. Borgen
- Smell not like rotten cabbage or fishy, different 18
18. In arc. / alp. habitats, usually associated with *Salix*, *Betula*, *Dryas* or *Polygonum viviparum* 19
- Not in arc. / alp. habitats 30
19. Cheilocystidia present 20
- Cheilocystidia absent 22
20. Basidia 2-spored. Cap 5-20 mm, conical, then convex with a papilla, glabrous, not hygrophanous, not translucently striate, dark brown or black; gills adnate-decurrent, medium spaced, white, then brownish pink; stem 25-30 x 1-3 mm, smooth, brown to grey brown; smell and taste farinaceous. Sp 9-12 x 7-10 μm , heterodiametrical, 5-7-angled in side-view; gill edge

heterogeneous; cheilocystidia scattered, 18-50 x 5-15 x 2-8 μm , lageniform; pileipellis an ixocutis of 2-12 μm wide hyphae with minutely incrusting pigment; clamps abundant. In small groups in tundra with *Salix herbacea* and *Polygonum viviparum*; summer to autumn; very rare in arc./alp.; NO (LC).

E. bicornae Noordel.

- Basidia 4-spored 21
- 21. Cap rimulose; pigment incrusting. Cap 35-60 mm, convex to low convex, grey brown; gills adnate-emarginate, medium spaced, grey brown; stem 10-35 x 2-6 mm, densely fibrillose, watery grey; smell slightly nitrous; taste farinaceous. Sp 8-11 x 6.5-8(-9.5) μm , heterodiametrical, 6-8-angled in side-view; gill edge heterogeneous; cheilocystidia 20-55 x 4-12 μm , cylindrical to lecythiform; pileipellis a cutis to a trichoderm, of inflated elements, up to 15 μm wide; clamps present. Among grass and moss in tundra with *Salix* species and *Polygonum viviparum*; late summer; rare in suba.-arc./alp.; FO (Sornfelli), IS (Au: Neskaupstaður), NO (LC, Svb). – FE 5A:1205.
E. rimulosum Noordel.
- Cap smooth; pigment incrusting and intracellular. Cap 10-30 mm, low convex, umbonate, weakly hygrophanous, not translucently striate, sordid brown; gills adnate-emarginate, medium spaced, grey brown; stem 55-65 x 3-5 mm, fibrillose, grey brown; smell and taste farinaceous. Sp (8-9)-11 x (7-)-8-9 μm , isodiametrical, 5-7-angled in side-view; gill edge heterogeneous; cheilocystidia 35-50 x 5-8(-10) μm , cylindrical to clavate; pileipellis a cutis of 2-9 μm wide hyphae with incrustated walls; clamps abundant. In tundra among *Dryas*; late summer; rare in arc./alp.; NO (LC, Svb). – FND 32:45.
E. svalbardense Noordel.
- 22. Smell strong, like ripe apples see *E. melenosmum* key F 14
- Smell and taste indistinct or farinaceous 23
- 23. Pigment intracellular only 24
- Pigment incrusting, sometimes in addition intracellular 26
- 24. Gills and stem with grey tinges; stem 3-6 mm broad. Cap yellow brown to medium brown; gills with a grey tinge. Cap 25-70 mm, convex, umbonate, glabrous, hygrophanous, translucently striate, brown to grey brown; gills adnate, becoming pink; stem 35-40 mm long, fibrillose, pale grey; smell none; taste farinaceous. Sp 8-11 x 7-10 μm , subisodiametrical, 5-8-angled in side-view; cheilocystidia absent; pileipellis a cutis of 1.5-9 μm wide hyphae with brown intracellular pigment; clamps present. In groups in *Salix herbacea* communities, summer to autumn; occasional in arc./alp.; FO, NO (LC). – FE 5A:1205.
E. subsepiaceum (Kühner) Noordel.
- Gills and stem whitish; stem 3-20 mm broad 25
- 25. Cap dark brown to almost black. Cap 25-65 mm, conical to low convex, umbonate, glabrous, hygrophanous, short translucently striate or not; gills adnexed to adnate-emarginate, crowded, white, then pink; stem 20-70 x 3-15 mm, fibrillose, white; smell and taste mild to farinaceous. Sp 8-10 x 7-9 μm , subisodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2-9 μm wide hyphae with brown, intracellular pigment; clamps present. In groups in snow bed vegetations in association with *Salix herbacea* and other dwarf *Salix* species; summer to early autumn; common in arc./alp., rare in suba.; FO, IS, NO (LC, incl. Svb), SE (LC). – AAF 1:23, Bor 60, FE 5A:1204.
E. alpicola (J. Favre) Noordel.
- Cap yellowish brown to sepiaceous see *E. lividoalbum* 37
- 26. Pigment incrusting only 27
- Pigment incrusting and intracellular 29
- 27. Sp heterodiametrical, Q = 1.15-1.5. Cap 10-35 mm, conical then convex, glabrous to fibril-

lose, hygrophanous, translucently striate, very dark grey brown to blackish brown; gills deeply emarginate, almost free, medium spaced or adnate-decurrent, grey to brown grey; stem 10-35 x 1-4 mm, polished, dark brown grey; smell and taste weak to distinctly farinaceous. Sp 7.5-12.5 x (5.5-)6-10 μm ; cheilocystidia absent; pileipellis a cutis of 4-9 μm wide hyphae with coarsely incrustated walls; clamps abundant. In small groups among moss (*Sphagnum*) in snow beds with *Salix* and *Dryas*; late summer; rare in suba.-arc./alp.; FI (DD), NO (LC).

E. anthracinellum (M. Lange) Noordel.

- Sp isodiametrical, Q = 1-1.2 28
- 28. Cap moderately dark brown; gills white, then greyish pink; stem white to greyish. Cap 20-40 mm, glabrous, hygrophanous, translucently striate at margin; gills adnate-emarginate, medium spaced; stem 30-80 x 2-7 mm, fibrillose; smell and taste weak or slightly farinaceous. Sp 9-11 x 7.5-9 μm , 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-9 μm wide hyphae with incrustated walls. In groups in shrub vegetation; late summer; rare in suba.-arc./alp.; NO (LC). – Bor 61, FE 5A:1204.
E. subarcticum Noordel.
- Cap dark grey brown to black; stem grey brown. Cap 20-35 mm, bell-shaped, then convex or flattened, glabrous, hygrophanous, not translucently striate; gills adnate-emarginate, medium spaced, very dark brown to brown grey; stem 30-70 x 3-6 mm, cylindrical, fibrillose; smell and taste farinaceous. Sp 8-10 x 6.5-9 μm , subisodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-7 μm wide hyphae with incrusting pigment; clamps abundant. In groups in tundra; late summer; probably occasional in bore.-arc./alp.; NO (LC), SE (LC). – FE 5A:1202 (as var. *fusipes*), Lud 94.39.
E. atrosericeum (Kühner) Noordel. var. *atrosericeum*
var. *fusipes* Noordel. differs in cap 20-45 mm and stem 40-70 x 3-8 mm, fusiform. NO.
- 29. Cap 30-40 mm, umbonate; gills adnexed to adnate; incrusting pigment dominant in suprapellis, intracellular pigment only in subpellis. Cap glabrous, very dark brown, hygrophanous, not translucently striate; gills medium spaced to crowded, grey, then brownish pink; stem 35-60 x 4-8 mm, cylindrical, pale brown, silvery fibrillose; smell and taste farinaceous. Sp 7-10.5(-11) x 6-9(-10) μm , subisodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-9 μm wide hyphae; clamps abundant. In groups in heathland and tundra; late summer; rare in arc./alp.; FO (Sornfelli), NO (LC, incl. Svb). – FE 5A:1203.
E. bipelle Noordel. & T. Borgen
- Cap 15-30 mm, flattened to slightly depressed; gills often adnate with a decurrent tooth; intracellular pigment dominant in suprapellis, incrusting pigment mainly in subpellis. Cap glabrous, hygrophanous, not translucently striate, brown to almost black; gills medium spaced, brown grey with pink tinge; stem 10-25 x 1-4 mm, fibrillose, dark brown grey; smell and taste farinaceous. Sp (7.5-)8-10(-11) x 7-9 μm , subisodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-9 μm wide hyphae; clamps present. In alpine habitats; late summer; occasional in arc./alp.; FO, NO (LC, incl. Svb). – FE 5A:1203.
E. borgenii Noordel.
- 30⁽¹⁸⁾ Basal half of stem with a distinct red flush. Cap 25-70 mm, convex, umbonate, glabrous, hygrophanous, not translucently striate, dark grey brown or red brown; gills adnate-emarginate, medium spaced, sordid yellow grey, then grey pink; stem 15-100 x 4-15 mm, cylindrical to fusiform, fibrillose, pale brown; smell and taste strongly farinaceous. Sp 8-10.5 x 7-9 μm , subisodiametrical, 5-7-angled in side-view; cheilocystidia present or absent, 28-45 x 7-14 μm , spheropedunculate to lageniform, rarely weakly capitate; pileipellis an ixocutis of 3-10 μm wide hyphae with brown, intracellular pigment and minutely incrusting pigment; clamps abundant in all tissues. In groups in *Sphagnum* in moist *Picea* forests; late summer to early autumn; very rare in hemib.-bore.; FI (CR, PH: Saarijärvi), SE. – FE 5:14, FE 5A:1184.
E. rubrobasis Noordel.

- Stem without a reddish flush 31
- 31. Cheilocystidia present 32
- Cheilocystidia absent 33
- 32. Cheilocystidia narrow, up to 10 μm wide, filiform to subcylindrical (fig. 467D); cap very dark brown, almost black, not translucently striate. Cap 35-40 mm, convex, umbonate, hygrophanous; gills adnate-emarginate, medium spaced, brownish pink; stem 30-60 x 5-12 mm, fibrillose, pale brown grey; smell and taste farinaceous. Sp 8-10 x 7-8.5 μm , subisodiametrical, 5-6-angled in side-view; pileipellis an ixocutis of 4-12 μm wide hyphae with intracellular pigment; clamps abundant. In grassland; late summer to early autumn; rare in suba.; FI (DD, InL: Utsjoki). – FE 5A:1195.
E. kallioi Noordel.
- Cheilocystidia 10-30 μm wide, clavate (fig. 467E); cap pale to dark grey brown or yellow brown, translucently striate at margin. Cap 30-70 mm, convex with a small umbo, glabrous; gills adnate-emarginate, medium spaced, white, then pink to brown pink; stem 30-70 x 2-8 mm, innately fibrillose, pale brown; smell indistinct; taste mild to farinaceous. Sp 9-12 x 8.5-11 μm , subisodiametrical to subheterodiametrical, 5-7-angled in side-view; pileipellis a cutis of 3-9 μm wide hyphae with minutely incrusting walls and intracellular pigment in upper pileitrama; clamps present. In groups, often on bare soil in deciduous forests; DE, NL. – Bol Bres 39:36, FE 5A:1188, ZM 61:193, Lud 94.35.
E. inusitatum Noordel., Enderle & Lammers
- 33. Sp heterodiametrical, many-angled to almost nodulose in outline; cap with fibrillose patches at margin when young and fresh. Cap 15-120 mm, conical to bell-shaped, hygrophanous, not translucently striate, red brown; gills free or deeply emarginate, medium spaced, pale cream, then reddish brown; stem 35-150 x 3-17 mm, fusiform, fibrillose, grey brown to reddish brown; smell and taste mild to subfarinaceous. Sp 9.5-12.5 x 6.5-9 μm ; cheilocystidia absent; pileipellis an ixocutis of 2.5-9 μm wide hyphae with brown, intracellular pigment; clamps present. In groups on peat and in *Sphagnum* bogs; late summer to autumn; rare in temp.-bore.; DK (EN, EJyl), NO (LC), SE (LC). – FE 5:16, FE 5A:1195, Lud 94.43, Ves 248.
E. sphagneti Naveau
- Sp iso- to heterodiametrical, regularly 5-7-angled in side-view; cap without fibrillose patches 34
- 34. Pigment intracellular, sometimes hardly visible in pale specimens 35
- Pigment incrusting, at least the narrowest hyphae in pileipellis or subpellis, in addition frequently also with intracellular pigment present either in supra- or subpellis 39
- 35. Cap relatively pale; pigment difficult to locate, strongly hygrophanous, translucently striate at margin 36
- Cap yellow brown, brown, reddish brown or chocolate brown; pigment abundant and easy to locate in pileipellis, translucently striate or not 37
- 36. Smell none or nitrous; cap yellow brown to pale brown, hygrophanous, fading to sordid yellow brown. Cap 40-120 mm, convex to plane, umbonate or slightly depressed, glabrous, shortly translucently striate; gills adnate-emarginate or subdecurrent, medium spaced, white, then sordid; stem 60-150 x 3-15 mm, white to very pale greyish brown; taste nasty, petroleum-like or subfarinaceous. Sp 7.5-10 x 7-8.5 μm , 5-7-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2-7 μm wide hyphae with pale, intracellular pigment; clamps abundant. In large groups in deciduous and mixed, rarely also in coniferous forests; summer to autumn; common in temp.-bore, occasional in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – FE 5:10-11, FE 5A:1180-1181, Phil 161d, R&H 378, Ves 245, ☉.
E. rhodopolium (Fr.) P. Kumm. var. *rhodopolium* (*E. nidorosum* (Fr.) Quél.)
- Smell farinaceous; cap very pale brown mixed with grey, strongly hygrophanous, fading to

almost white. Cap 30-90 mm, convex, then plane, umbonate, translucently striate at margin; gills adnate-emarginate, white, then pink; stem 40-120 x 4-15 mm, fibrillose, white; smell and taste farinaceous. Sp 9.5-11.5(-12) x 7-8 μm , subisodiametrical, 6-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-9 μm wide hyphae with intracellular, hardly visible pigment; clamps present. In damp deciduous forests; *DE, NL*. – BSMF 115:162, FE 5A:1183.

E. pseudoexcentricum (Romagn.) Kreisel

37. Gills white, then pink; stem white. Cap 35-100 mm, convex, umbonate, glabrous or minutely rugulose, hygrophanous, not translucently striate, dark yellowish brown or sepia; gills adnate-emarginate, medium spaced; stem 30-100 x 5-20 mm, clavate, fibrillose; smell and taste farinaceous. Sp 8-10(-11) x 8-9 μm , subisodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2-9 μm wide hyphae with brown, intracellular pigment; clamps present. In groups in deciduous forests with *Quercus*, *Fagus*, rarely *Betula*, usually on heavy, base-rich or calcareous soils, frequently in open places, like old parks, at margin of forests or along paths where much light reaches the forest floor; autumn; occasional in temp.-arc. / alp.; DK (LC), FI (DD), NO (LC), SE (LC). – Cet 243, FE 5:12, FE 5A:1192, GBW 4:186, Ves 244, ☉.

E. lividoalbum (Kühner & Romagn.) Kubička

- Gills with grey-brown tinge; stem coloured 38
38. Flesh compact; cap grey brown with reddish or chocolate-brown tinges; gills not transversely veined. Cap 30-100 mm, convex to plane, unbonate, glabrous, hygrophanous, not translucently striate; gills adnate-emarginate, medium spaced, greyish, then grey pink to reddish grey; stem 30-100 x 8-15 mm, cylindrical-clavate, fibrillose-striate to subflocculose, pale to moderately dark grey or grey brown; smell and taste farinaceous-rancid. Sp 8.5-11 x 6.5-8.5 μm , 5-7-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 3-9 μm wide hyphae with brown, intracellular pigment; clamps abundant. In groups in deciduous forests (*Quercus*, *Carpinus*, *Fagus*) on calcareous soil; summer to autumn; very rare in hemib.-bore.; NO (NE, Akh: Oslo), SE (LC). – Cet 2319, FE 5:13; FE 5A:1192, Lud 94.44.

E. griseoluridum (Kühner) M.M. Moser

- Flesh relatively thin and brittle; cap lacking reddish or chocolate-brown tinges; gills often transversely veined. Cap 10-40 mm, convex to plane, slightly umbonate, glabrous, hygrophanous, translucently striate, dark brown; gills adnate-emarginate, medium spaced, grey pink; stem 20-50 x 2-7 mm, sordid white; smell and taste farinaceous-rancid. Sp 9-13 x 7-10 μm , sub- to heterodiametrical, 6-10-angled in side-view; cheilocystidia absent; pileipellis a cutis of 6-15 μm wide hyphae with brown, intracellular pigment; clamps abundant. In groups in grassy spots in and near deciduous forests, parks, etc., recorded under *Fagus*, *Quercus* and *Betula*; summer to autumn; very rare in temp.; DK (CR, Sj: Jægersborg Dyrehave). – FE 5A:1194.
- E. transvenosum* Noordel.
39. Cap pale brown, pale yellow brown or light brown, only with a slight grey tinge; flesh brittle 40
- Cap dark red brown, grey brown or blackish brown; flesh compact and firm 41
40. Cap yellow to yellow brown, without grey tinges; smell not or weakly farinaceous. Cap 30-90 mm, convex, then plane, umbonate, glabrous, hygrophanous, slightly translucently striate; gills adnate-emarginate, medium spaced to crowded, white, then pink; stem 60-130 x 5-14 mm, fibrillose-striate, pale brownish yellow. Sp 8-10.5 x 7-8 μm , subisodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-7 μm wide hyphae with minutely incrusting walls and intracellular pigment; clamps abundant. In groups in deciduous forests and parks; summer to autumn; very rare in temp.-bore.; DK (NA, EJyl: Vejle), NO (NE), SE (Ög). – FE 5:19, FE 5A:1186.

E. majaloides P.D. Orton

- Cap yellow brown mixed with grey, especially at centre; smell when fresh distinctly nitrous, soon farinaceous, especially when cut. Cap 20-100 mm, conical, then low convex, fibrillose, umbonate, hygrophanous, translucently striate at margin; gills adnate-emarginate, crowded to medium spaced, white, then pink; stem 30-120 x 3-12 mm, silvery fibrillose, white; taste farinaceous-rancid. Sp 9-12.5 x 7-8.5 μ m, subsodiametrical to heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 3-7 μ m wide hyphae with intracellular pigment; clamps abundant. In groups in damp deciduous forests, especially *Populus*, *Salix*, *Betula*, *Alnus*; summer to late autumn; common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – FE 5:18, FE 5A:1185-1186, Lud 94.49, Ves 245, ☉.
E. sericatum (Britzelm.) Sacc.
- 41. Cap 40-100 mm; stem > 5 mm thick in the middle 42
- Cap 10-30(-40) mm; stem up to 5 mm in the middle 43
- 42. Gills white to pale grey, then pink; sp (sub-)isodiametrical, $Q < 1.2$; in deciduous forests. Cap 30-90(-110) mm, conical, then convex or low convex, umbonate, glabrous, hygrophanous, not translucently striate, dark brown to blackish brown; gills adnate-emarginate, medium spaced; stem 40-110 x 4-12 mm, strongly fibrillose, pale brown; smell and taste farinaceous-rancid. Sp 8-11 x 7-8.5 μ m, 5-6-angled in side-view; cheilocystidia absent; pileipellis an ixocutis of 2-12 μ m wide hyphae with incrusting and intracellular pigment; clamps abundant. Autumn; rare in temp.-bore.; DK (DD), FI (LC), NO (NE), SE (LC). – FE 5:17, FE 5A:1189, Lud 94.45.
E. myrmecophilum (Romagn.) M.M. Moser
- Gills grey, then sordid grey pink; sp heterodiametrical, $Q > 1.3$; in coniferous forests. Cap (25-)35-120 mm, conical, expanding to plane, umbonate, glabrous or minutely rugulose, hygrophanous, not translucently striate, dark brown; gills adnate-emarginate, medium spaced; stem 35-110 x 3.5-15 mm, dark grey brown, white fibrillose; smell and taste strongly farinaceous-rancid. Sp 8-10.5 x 6.5-8 μ m, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis or ixocutis of 5-12 μ m wide hyphae with coarsely incrusting and dark brown, intracellular pigment; clamps abundant. Late summer to autumn; *DE*. – B&K 4:92, FE 5A:1190, GBW 4:202, Lud 94.40.
E. venosum Gillet
- 43. Cap blackish brown, not distinctly hygrophanous; stem dark grey brown, fibrillose; gills dark brown pink from the start, often transversely veined; sp in majority heterodiametrical, $Q_{av} > 1.3$. Cap 10-35 mm, almost flat, not translucently striate; gills medium spaced, adnate-emarginate often with a decurrent tooth; stem 10-50 x 2-10 mm; smell and taste farinaceous. Sp (8.5-)9-12.5 x 7-9 μ m, 5-7-angled in side-view; cystidia absent; pileipellis a cutis of 6-15 μ m wide, cylindrical hyphae with coarse brown incrusting pigment, in lower layers of pileipellis also with intracellular pigment; clamps present. In groups in deciduous forests; late summer to autumn; very rare in temp.; DK (DD). – FE 5A:1191, Lud 94.28.
E. gerriae Noordel.
- Cap moderately dark to dark red brown or grey brown; gills white or pale grey brown at first, never transversely veined; stem distinctly paler, polished or with scattered fibrils only; sp subsodiametrical, $Q_{av} < 1.2$ 44
- 44. Cap grey brown, not or only slightly translucently striate; pigment predominantly incrusting, but in addition often intracellular. Cap 5-50 mm, convex, umbonate, glabrous, strongly hygrophanous; gills adnate-emarginate, medium spaced, white, then pink; stem 20-60 x 2-6 mm, glabrous, polished or subfibrillose, white to pale grey; smell and taste farinaceous. Sp 8-11.5 x 7-8.5 μ m, subsodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-7 μ m wide hyphae; clamps abundant. In mixed and deciduous forests, often on bare clayey soil, often with *Quercus*; summer to autumn; common in temp.-hemib.; DK (LC), FI (DD, A: Maarianhamina), FO, NO (LC), SE (LC). – FE 5:15a, FE

5A:1187, GBW 4:199, Ves 248, ☉.

E. sordidulum (Kühner & Romagn.) P.D. Orton

- Cap yellow brown to reddish brown, deeply translucently striate; pigment intracellular. Cap 10-30 mm, convex, umbonate or ± depressed, hygrophanous; gills adnate-emarginate, medium spaced, white, then pink; stem 25-50 × 1-4 mm, pale grey, ± polished or weakly striate; smell and taste farinaceous. Sp 8-11(-12.5) × 7-8(-8.5) μm, subisodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2.5-7 μm wide hyphae; clamps abundant. In mixed and deciduous forests, often on bare soil; summer to autumn; common in temp.-southern bore.; DK (LC), FI (DD), NO (NE, Busk: Hole), SE (NE). – B&K 4:87, FE 5:15b, FE 5A:1187, Lud 94.36.

E. subradiatum (Kühner & Romagn.) M.M. Moser

Key K: Frb mycenoid with relatively thin-fleshed, conical to convex, often umbonate cap, slender stem; without cheilocystidia (*Nolanea* without cystidia)

1. Basidia 2-spored 2
 - Basidia in majority 4-spored 3
2. Stem strongly silvery fibrillose; smell indistinct or very weakly farinaceous; cap 20-40(-50) mm; stem 40-90 mm long. Cap conical to convex, umbonate or not, glabrous, hygrophanous, translucently striate, pale ochre, yellow brown or pale reddish brown; gills adnexed to free, medium spaced, yellow ochre, then tinged pink; stem 1-3 mm wide, concolorous with cap; taste indistinct. Sp 9.5-14 × 7-9.5 μm, heterodiametrical, 5-8-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-10 μm wide, cylindrical hyphae with pale intracellular pigment; clamps absent. In groups in humus and forest litter of coniferous forests on poor, acid soil, also in peaty areas; summer to autumn; common in temp.-arc. / alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – FAD 78F, FE 5:34c, Phil 163i, R&H 384, Ves 252, ☉.

E. cetratum (Fr.: Fr.) M.M. Moser

 - Stem glabrous, polished; smell farinaceous-rancid; cap 5-20 mm broad; stem 10-25 mm long. Cap bluntly conical-convex, then flattened, often slightly depressed, glabrous, hygrophanous, translucently striate, pale ochre, yellow brown or pale orange brown; gills narrowly adnate to almost free, medium spaced, yellow ochre, then tinged pink; stem 1-3 mm wide, yellow brown to pale orange brown; taste farinaceous. Sp 9.5-12.5 × 7-9 μm, heterodiametrical, 5-8-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-12 μm wide, cylindrical hyphae with pale intracellular pigment; clamps absent; *DE, NL.* – B&K 4:33, FE 5:78d, Lud 94.85.

E. farinogustus Arnolds & Noordel.
3. Sp nodulose-angular, heterodiametrical (fig. 483A) 4
 - Sp 5-7-angled in side-view, iso- to heterodiametrical 6
4. Clamps absent; pigment in pileipellis incrusting and intracellular in form of agglutinated, dark coloured granules. Cap 10-20 mm, convex to plane, with minute umbo or slightly depressed, glabrous, hygrophanous, deeply translucently striate, pale grey brown or brown; gills deeply emarginate to almost free, medium spaced, pale grey brown, then pink; stem 20-40 × 1-3 mm, polished, pale grey brown; smell and taste strongly farinaceous. Sp 9-12 × 6-8 μm, heterodiametrical, nodulose-angular (fig. 483A); cheilocystidia absent; pileipellis a cutis of 4-15 μm wide, cylindrical hyphae. In groups in grassland and heathland on poor, sandy or peaty soil; summer to late autumn; very rare in temp.; DK (DD). – FE 5A:1249, Lud 94.68.

E. cuniculorum Arnolds & Noordel.

 - Clamps present; pigment intracellular, but not in form of agglutinated granules 5
5. Sp 7.5-11(-12) × 6-7(-8) μm; cap often flattened to depressed. Cap 15-30 mm, glabrous, hygrophanous, not or slightly translucently striate, dark blackish brown; gills broadly adnate,

medium spaced, grey beige, then tinged pink; stem 10-25(-40) x 1.5-3.5 mm, polished or minutely fibrillose, grey brown; smell and taste farinaceous. Sp heterodiametrical, angular-nodulose; cheilocystidia absent; pileipellis a cutis to a trichoderm of 10-15 μm wide, cylindrical hyphae with intracellular pigment; clamps present. In groups on bare sandy or gravelly soil or among scanty vegetation of grasses and mosses. Autumn; very rare in bore-suba.; NO (DD, M&R: Averøy, STr: Oppdal). – Bol Bres 39:57, FE 5A:1262.

E. undulatosporum Arnolds & Noordel.

- Sp 10-12.5 x 7-9 μm ; cap conical to convex. Cap 10-20 mm, fibrillose to rugulose, hygrophanous, not translucently striate, dark brown to blackish brown; gills almost free, distant, grey ochre, then brownish pink; stem 15-40 x 1-3 mm, polished, yellow brown to reddish brown with grey brown base; smell and taste indistinct. Sp heterodiametrical, 6-8-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-10 μm wide, cylindrical hyphae with brown intracellular pigment; clamps present. Single or in small groups in grassy spots and among mosses (*Sphagnum*) on acid, peaty or sandy soil; spring to autumn; very rare in temp.-bore.; DK (DD, EJyl: Løvenholm), NO (NE, Busk: Nedre Eiker). – FE 5:79b, FE 5A:1261.
- E. triste* (Velen.) Noordel.

- 6. Sp subsodiametrical to isodiametrical, $Q = 1-1.2$ 7
- Sp heterodiametrical, $Q > 1.2$ 12

- 7. Pigment very pale, intracellular and/or parietal, not incrusting. Cap 20-50 mm, conical-convex, then plane, glabrous, umbonate or slightly depressed, hygrophanous, translucently striate, dark brown; gills adnate-emarginate, medium spaced to crowded, brownish pink; stem 30-100 x 2.5-9 mm, pale to dark grey brown, silvery fibrillose; smell and taste farinaceous. Sp 7.5-9.5 x 6.5-8.5 μm , subsodiametrical, 4-6-angled in side-view; cheilocystidia absent; pileipellis a cutis of 3-11 μm wide, cylindrical hyphae; clamps abundant. In groups in moist grassland; autumn; very rare in temp.; DK (DD, EJyl: Bredsgårde SØ), SE (NE, Sk). – B&K 4:57, FE 5:80b, FE 5A:1239, GBW 4:215.

E. occultipigmentatum Arnolds & Noordel.

- Pigment more intensely coloured, incrusting, sometimes in addition also intracellular 8
- 8. Sp weakly rounded-angular, isodiametrical, 6.5-8 x 5.5-7 μm ; clamps absent. Cap 10-25 mm, conical-convex, then low convex, weakly umbonate or depressed, glabrous, hygrophanous, translucently striate, sordid grey brown; gills adnate to almost free, medium spaced, brownish pink; stem 20-40 x 1-2 mm, dark grey brown, finely fibrillose-striate; smell and taste farinaceous-rancid. Cheilocystidia absent; pileipellis a cutis of cylindrical to slightly inflated, 5-15 μm wide hyphae with granulose-intracellular and incrusting pigment. In small groups in grassy and mossy places on acid, sandy or peaty soil; summer to late autumn; rare or overlooked in hemib.-bore.; NO (NE). – FE 5A:1248.

E. defibulatum Arnolds & Noordel.

- Sp more distinctly angled, 7-11 x 6-10 μm ; clamps present 9
- 9. Cap pale brown, strongly lustrous with aeriferous fibrils. Cap 10-40 mm, conical or bell-shaped, then convex, minutely umbonate, hygrophanous, not translucently striate; gills adnate to almost free, medium spaced, grey brown with pink tinge; stem 30-80 x 2-4 mm, polished, pale brown; smell and taste raphanoid to subfarinaceous. Sp 8-10 x 7.5-10 μm , isodiametrical, 5-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-11 μm wide, cylindrical hyphae with minutely incrustated walls. In groups in grassy-mossy spots; spring to autumn; rare or overlooked in temp.-bore.; DK (DD), NO (NE), SE (LC). – BCat 710, B&K 4:55, BSMF 120:340, 341, 122:opp. 114, FE 5:30c, 78c, FE 5A:1227.

E. nitens (Velen.) Noordel.

- Cap dark brown, red brown or grey brown to almost black, glabrous 10
- 10. Stem polished; in damp places, deciduous forests, rarely in grassland. Cap 10-40 mm, conical, then convex, minutely umbonate, glabrous, hygrophanous, translucently striate, dark

grey brown or red brown; gills adnate to almost free, medium spaced, sordid white, then brownish or greyish pink; stem 40-90 x 1-4 mm, dark grey brown or red brown; smell and taste weakly to distinctly farinaceous. Sp 8-10.5 x 7-9.5 μm , isodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-12 μm wide, cylindrical hyphae with minutely incrustated walls, sometimes with additional intracellular pigment; clamps present. Summer to autumn; common in temp.-bore, occasional in suba.-arc./alp.; DK (LC), FI (LC), IS, NO (LC, incl. Svb), SE (LC). – BCat 868, B&K 4:45, FE 5:29a, FE 5A:1227, Ves 251.

E. juncinum (Kühner & Romagn.) Noordel.

- Stem fibrillose-striate; in grassland or lawns 11
- 11. Cap dark (red-)brown, distinctly translucently striate when moist. Cap 20-70 mm, conical-convex to plane, usually umbonate, rarely depressed, glabrous, hygrophanous, sepia or grey brown; gills medium spaced, brown pink; stem 20-80 x 2-7 mm, dark brown, silvery fibrillose; smell and taste farinaceous-rancid. Sp 7-10.5 x 6.5-9.5 μm , isodiametrical, 5-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-10 μm wide, cylindrical hyphae with incrustated walls; clamps present. In groups in grassland including meadows, lawns at roadsides; spring to late autumn; very common in temp.-suba., occasional in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:81, FAD 76G,G1, FE 5:31a, FE 5A:1230, Ves 251, ☉.
- E. sericeum* Quél. var. *sericeum*
- Cap dark grey brown, sometimes almost black, not or indistinctly translucently striate, often somewhat zonate-fibrillose. In other characters like the main variety. In groups in grassland, preferably on poor, sandy soil; summer to early winter; occasional in temp.; DK. – FE 5:31b, FE 5A:1231-1232.
- E. sericeum* Quél. var. *cinereo-opacum* Noordel.
- 12. Pigment intracellular 13
- Pigment incrusting, sometimes in addition intracellular 21
- 13. Cap with olivaceous or green tinges 14
- Cap without olivaceous or green tinges 15
- 14. Stem with olivaceous tinges; clamps absent; smell none. Cap 20-25 mm, convex, umbonate, glabrous, hygrophanous, translucently striate, ochre grey to grey brown, then with an olivaceous tinge; gills adnate-emarginate, medium spaced, pink; stem 35-50 x 2-3 mm, polished; taste slightly bitter. Sp 8-12.5 x 6.5-8 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-9 μm wide, cylindrical hyphae with intracellular pigment. In groups in coniferous forests; summer to autumn; very rare in hemib.; SE (Ög).
- E. olivaceostipitatum* E. Ludw. & Karlsson
- Stem reddish brown, grey brown or yellowish; clamps present; smell strong, aromatical or absent. Cap 10-35 mm, bell-shaped, convex or plane, umbonate, glabrous, hygrophanous, translucently striate, pale to dark yellow green to olivaceous yellow, at centre often with brown or red-brown tinges; gills adnate to almost free, medium spaced, white, then pink; stem 20-80 x 1-5 mm, polished or with scattered fibrils. Sp 8-11.5 x 6.5-8 μm , heterodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-15 μm wide, cylindrical hyphae with intracellular pigment. In groups in humus-rich places in deciduous and mixed forests, parks and lawns; summer to late autumn; occasional, but locally common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 78a, FE 5:37a, FE 5A:1246, GBW 4:217, Ves 253, ☉.
- E. pleopodium* (Bull.: Fr.) Noordel. (*E. icterinum* (Fr.: Fr.) M.M. Moser)
- 15. Sp 5-7.5 μm wide 16
- Sp 7-10 μm wide 17
- 16. Smell nitrous; stem yellow brown without grey tinges see *E. infula* var. *chlorinosum* 33

- Smell none; stem yellow brown, tinged grey in basal part. Cap 10-30 mm, conical to convex, umbonate, glabrous, hygrophanous, translucently striate, dark brown to yellow brown; gills almost free, medium spaced, white, then pink; stem 20-80 x 1-2 mm, polished, yellow brown at top, greyish brown below; smell and taste indistinct. Sp 7-10 x 5-7 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 3-9 μm wide, cylindrical hyphae with intracellular pigment; clamps present. In groups in grassland; summer to late autumn; rare in temp.; DK (EN). – FE 5:36c, FE 5A:1243, Lud 94.57, Svp 40:43, Ves 252.
E. solstitiale (Fr.) Noordel.
- 17. Stem polished see *E. triste* 5
- Stem fibrillose-striate 18
- 18. Sp 8.5-11.5 μm long, Qav = 1.25; in relatively damp grassland. Cap 10-35 mm, conical, then convex, umbonate, glabrous, hygrophanous, translucently striate, reddish brown to grey brown; gills narrowly adnate to almost free, medium spaced to distant, grey, then grey pink; stem 15-50 x 2-4 mm, polished or finely striate, pale greyish or yellowish brown; smell and taste indistinct. Sp heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-9 μm wide, cylindrical hyphae with intracellular pigment; clamps present. Spring to autumn; very rare in suba.; FO. – FE 5:78a,b, FE 5A:1235-1236, Lud 94.80.
E. ventricosum Arnolds & Noordel. (*E. calthionis* Arnolds & Noordel.)
- Sp 10-14 μm long, Qav = 1.4; in forests 19
- 19. Cap red brown with a contrasting, yellowish umbo when fresh; stem pruinose in upper part. Cap 20-60 mm, conical, then convex, glabrous, hygrophanous, translucently striate; gills adnate to almost free, medium spaced, ochre pink; stem 25-90 x 2-7 mm, yellow brown; smell and taste indistinct. Sp 10-13 x 7.5-9 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 3-9 μm wide, cylindrical hyphae with intracellular pigment; clamps present. In groups in coniferous or mixed forests; summer to autumn; NL. – FE 5:34a, FE 5A:1237, GBW 4:205.
E. cuneatum (Bres.) M.M. Moser
- Cap uniformly coloured; stem pruinose at top only or entirely 20
- 20. Frb pale brown; stem entirely pruinose to tomentose. Cap 20-60 mm, conical, then convex, glabrous, hygrophanous, translucently striate; gills adnate to almost free, medium spaced, ochre pink; stem 20-90 x 1-4 mm, fibrillose; smell and taste indistinct. Sp 9-13 x 7.5-10 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-8 μm wide, cylindrical hyphae with intracellular pigment; clamps present. In groups in coniferous forests; spring to autumn; rare in temp. and suba.; DK (DD), FO. – FE 5:34b, FE 5A:1238.
E. lanuginosipes Noordel.
- Cap dark yellow brown or red brown; stem pale to moderately dark brown, densely silvery striate; pruinose at top only. Cap 25-100 mm, conical to low convex, umbonate, glabrous, hygrophanous, translucently striate; gills adnate to almost free, medium spaced, dark brown to pinkish brown; stem 60-160 x 4-15 mm, smell and taste indistinct. Sp 10-13 x 7.5-9 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-10 μm wide, cylindrical hyphae with intracellular pigment; clamps present. In groups in coniferous forests, often on damp ground; especially in spring, but also in summer to autumn; common in bore., occasional in temp.-hemib. and suba.; DK (DD), FI (LC), FO, NO (LC), SE (LC). – FE 5:35c, FE 5A:1238, ☉.
- E. pallescens* (P. Karst.) Noordel.
- 21. Pileipellis rather strongly differentiated, of septate hyphae with incrustated walls and dark, often agglutinated granular pigment clots inside the hyphae; clamps absent 22
- Pileipellis a cutis of radially oriented hyphae with incrusting and/or intracellular pigment, but not in form of agglutinated clots; clamps present 25

22. Stem distinctly silvery striate 23
 - Stem glabrous, polished 24
23. Cap grey brown with yellow or reddish tinges, fading to grey brown; gills white, then pink; flesh brittle. Cap 10-15 mm, conical-convex, then plane, umbonate, glabrous, hygrophanous, translucently striate; gills adnate to almost free, medium spaced; stem 10-30 x 1-2 mm, pale greyish brown; smell and taste farinaceous. Sp 8.5-10 x 6.5-8 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-7 μm wide, cylindrical hyphae with minutely incrustated walls and granulated intracellular pigment; clamps absent. In groups in mossy-grassy vegetation and heathland on acid, sandy or peaty soil; summer to autumn; *NL.* – FRIC 12:91a.
E. acidophilum Arnolds & Noordel.
- Cap very dark grey brown, only slightly fading on drying; gills sordid pink; flesh tough. Cap 10-25 mm, conical-convex, then plane, umbonate, glabrous, hygrophanous, translucently striate; gills adnate to almost free, medium spaced; stem 10-35 x 2-4 mm, pale greyish brown; smell and taste rancid-farinaceous. Sp 7.5-10 x 6.5-7.5 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-13 μm wide, cylindrical hyphae with minutely incrustated walls and granulated intracellular pigment; clamps absent. In groups in mossy-grassy vegetation and heathland on dry, acid, sandy or peaty soil; summer to autumn; *NL.* – FE 5A:1249.
E. argenteostriatum Arnolds & Noordel.
24. Stem greyish brown. Cap 10-35 mm, conical-convex, then plane, umbonate, glabrous to fibrillose, hygrophanous, translucently striate; gills adnate to almost free, medium spaced, pale brown grey, then sordid pink; stem 10-50 x 1-3 mm, polished; smell and taste rancid-farinaceous. Sp 7.5-10 x 5.5-7.5 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-20 μm wide, cylindrical hyphae, at centre sometimes transitional to a trichoderm of slightly inflated, 10-20 μm wide elements, with minutely incrustated walls and granulated intracellular pigment; clamps absent. In groups in mossy-grassy vegetation and heathland on dry, acid, sandy or peaty soil or in rocky habitats; late summer to autumn; common in temp.-arc./alp.; DK (LC), FI (DD), NO (LC), SE (LC). – BSMF 122:opp. 114, opp. 116, FE 35b, 79b, FE 5A:1247-1248, Lud 94.70, Ves 253, ☉.
E. fernandae (Romagn.) Noordel. (*E. psilopus* Arnolds & Noordel.)
- Stem yellowish. Cap 10-40 mm, conical-convex, then plane, umbonate, glabrous, hygrophanous, translucently striate, pale to rather dark reddish brown; gills adnate to almost free, medium spaced, pale brown, then sordid pink; stem 10-60 x 1-3 mm, polished; smell and taste rancid-farinaceous. Sp 7-9 x 5.5-7.5 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-12 μm wide, cylindrical to inflated hyphae with minutely incrustated walls and granulated intracellular pigment; clamps absent. In groups in mossy-grassy vegetation and heathland on dry, acid, sandy or peaty soil; late summer to autumn; occasional in temp.; DK (NE). – B&K 4:95, FE 5:79c, GBW 4:223.
E. xanthocaulon Arnolds & Noordel.
25. Smell strong, aromatic-fruity, reminiscent of that of *Hebeloma sacchariolens*. Cap 10-55 mm, conical, then convex, umbonate, glabrous, hygrophanous, translucently striate, greyish ochre to pale grey brown; gills adnate-emarginate to almost free, medium spaced, pale grey, then pinkish grey; stem 30-90 x 2-8 mm, fibrillose-striate, pale ochre; taste rancid. Sp 9.5-11 x 7-8 μm , heterodiametrical to subisodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis a cutis of 1.5-6 μm wide, cylindrical hyphae with minutely incrustated walls; clamps present. In groups on calcareous soil in grassland and scrub; summer to autumn; occasional in hemib.-bore., rare in temp.; DK (EN), FI (DD), FO, NO (NT), SE (LC). – B&K 4:8, FE 5:32a, FE 5A:1232, Svp 29:36, Ves 250.
E. ameides (Berk. & Broome) Sacc.
- Smell indistinct or farinaceous 26

26. Cap and stem pale brown, but cap often with a darker spot at centre; cap strongly translucently striate; smell indistinct 27
 - Cap and stem moderately dark to dark brown, sepia or blackish brown; smell none or farinaceous 29
27. Caulocystidia at top of stem distinctly capitate. Cap 5-15 mm, conical, then convex, umbonate, glabrous, hygrophanous, translucently striate, brown grey to beige grey; gills medium spaced, grey to brown, then with a pink tinge; stem 20-40 x 0.5-2 mm, polished, ochre brown to grey brown; smell and taste indistinct. Sp 8-12 x 7-10 μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia absent; pileipellis a cutis of 3-14 μm wide, cylindrical hyphae with minutely incrustated walls; clamps present. In marshy forests, at roadsides, among mosses; summer to autumn; rare in temp.-arc./alp.; DK (LC), NO (LC), SE (LC). – FE 5:29c, FE 5A:1229.
E. favrei Noordel.
 - Caulocystidia cylindrical to clavate 28
28. Cap 10-30 mm, blunt, often with a slight depression at centre; stem 40-70 x 0.5-2 mm; gills white, then pink; sp 8-11(-11.5) x 6.5-8.5 μm ; in thick humus and leaf-litter in damp forests. Cap glabrous, hygrophanous, translucently striate, pale brown; gills adnate-emarginate to decurrent, medium spaced to distant; stem yellowish to brownish, hyaline, polished; smell and taste weakly farinaceous or indistinct. Sp isodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis a cutis of 1.5-10 μm wide, cylindrical hyphae with minutely incrustated walls; clamps present. Summer to autumn; rare or overlooked in temp.-bore.; DK (LC), FI (DD), NO (LC), SE (LC). – FAD 79H, FE 5:29b, FE 5A:1228, Lud 94.64.
E. minutum (P. Karst.) Noordel.
 - Cap 5-10 mm, with a small, acute umbo; stem 10-20 x 0.5-1 mm; gills pale grey, then sordid pink; sp 7.5-9.5(-10.5) x 6-8(-8.5) μm ; in wet grassland and marshy places, often on naked soil. Cap bell-shaped to conical, glabrous, hygrophanous, translucently striate, grey brown; gills adnate-emarginate, distant; stem polished, pale greyish yellow, hyaline; smell and taste indistinct. Sp subisodiametrical, 5-6-angled in side-view; cheilocystidia absent; pileipellis a cutis of 3-9(-15) μm wide, cylindrical hyphae with minutely incrustated walls; clamps present. Summer to autumn; only a few records from bore.; FI (DD). – FE 5:30c, FE 5A:1230, Lud 94.86, Win 93:24.
E. pygmaeopapillatum Arnolds & Winterh.
29. Sp short heterodiametrical to subisodiametrical, $Q_{av} = 1.2-1.3$ 30
 - Sp heterodiametrical, $Q_{av} > 1.3$ 32
30. Sp weakly angular, almost rounded. Cap 10-40 mm, convex to plane, umbonate, glabrous, hygrophanous, translucently striate, dark grey brown, paler towards margin; gills adnate-emarginate, medium spaced, brown grey, then tinged pink; stem 40-100 x 2-5 mm, grey brown, silvery striate; smell and taste farinaceous-rancid. Sp 7.5-8.5 x 5.5-7.5 μm , 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of cylindrical, 2-9 μm wide hyphae with incrusting and pale intracellular pigment; clamps present. In groups in grassland; late summer to autumn; rare in temp.; DK (EN), SE (LC). – FE 5:28a, FE 5A:1224, Lud 94.66.
E. ortonii Arnolds & Noordel.
 - Sp pronouncedly angled 31
31. Smell raphanoid; caulocystidia capitate; in small groups among *Sphagnum* in moist grassland and peat bogs. Cap 15-40 mm, conical to convex, umbonate, glabrous, hygrophanous, translucently striate, grey brown or sepia; gills almost free, medium spaced, grey, then grey pink; stem 40-90 x 2-5 mm, fibrillose-striate, yellow brown; taste raphanoid. Sp 10-13 x 9.5-11 μm , subisodiametrical, 4-6-angled in side-view; gill edge heterogeneous; cheilocystidia scattered, 40-60 x 12-18 μm , lecythiform or lageniform; pileipellis a cutis of 2.5-10 μm wide, cylindrical hyphae with incrusting and intracellular pigment; clamps present. Summer to

late autumn; very rare in temp.-bore.; DK (VU), NO (NE), SE (LC). – BSMF 120:337, 338, FE 5:35a, FE 5A:1225, GBW 4:209, Lud 94.74.

E. cuspidiferum (Kühner & Romagn.) Noordel.

- Smell farinaceous-rancid; caulocystidia, if present, not capitate; in grassland and in open, grassy spots in deciduous forests. Cap 10-50 mm, conical, then convex, umbonate or blunt, glabrous, hygrophanous, translucently striate, brown, brown grey or sepia; gills adnate-emarginate to almost free, medium spaced, pinkish grey to brown-pink; stem 30-80 x 1-5 mm, brown, grey brown or yellowish brown, silvery fibrillose; taste farinaceous-rancid. Sp 8-10.5 x 6.5-9 μm , short heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-7 μm wide, cylindrical hyphae with incrusting pigment; clamps present. Summer to autumn; very rare in temp.; DK (DD, EJyl). – Bol Bres 39:38, FE 5:27c, FE 5A:1222, Lud 94.76, Phil 164c.

E. lucidum (P.D. Orton) M.M. Moser


32. Gills thick, distant, very dark brown, already when young. Cap 5-30 mm, conical, then convex, umbonate, glabrous, hygrophanous, slightly translucently striate, blackish brown with a reddish tinge or grey brown; gills adnate-emarginate to free; stem 15-50 x 1-3 mm, polished, dark reddish brown; smell and taste indistinct. Sp 8-10(-11) x 5.5-7.5 μm , heterodiametrical, 6-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-11 μm wide, cylindrical hyphae with incrusting and sometimes also intracellular pigment; clamps present. In groups in humus of deciduous forests, unfertilized grassland and dune grassland; summer to autumn; rare in temp.-bore.; DK (VU), NO (NE), SE (LC). – FAD 78c, FE 5:27b, FE 5A:1221, Lud 94.60.

E. clandestinum (Fr.: Fr.) Noordel.

- Gills of normal thickness, medium spaced to crowded; white or pale brown when young 33
33. Sp < 10.5 μm long; cap medium yellow brown. Cap 10-35 mm, conical to convex, umbonate, glabrous, hygrophanous, translucently striate; gills almost free, medium spaced, white, then pink; stem 20-60 x 1-4 mm, polished, yellow brown; smell and taste indistinct to farinaceous. Sp 7-10 x 5-7 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-9 μm wide, cylindrical hyphae with incrusting and intracellular pigment; clamps present. In groups in unfertilized grassland, in FI also in deciduous forests and parks; summer to late autumn; common in hemib.-suba., but only occasional in FI, rare in temp.; DK (NT), FI (LC), NO (LC), SE (LC). – BSMF 119:286, FE 5:36a, FE 5A:1242.

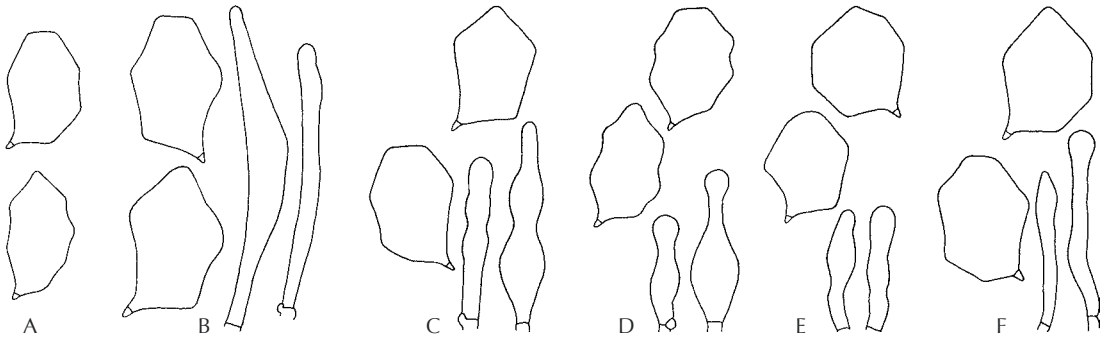
E. infula (Fr.: Fr.) Noordel. var. *infula*

var. *chlorinosum* (Arnolds & Noordel.) Noordel. differs in having a nitrous smell. In groups in unfertilized, dry grassland; summer to late autumn; occasional in temp.-arc./alp.; NO, SE (LC). – FE 5:36c, FE 5A:1242, GBW 4:213.

- Sp on av > 10.5 μm long; cap dark brown, sepia or greyish brown 34
34. Stem fibrillose-striate; cap dark brown to almost black; smell none; in spring; in coniferous forests among grass and moss, but also in deciduous forests, grassland, gardens and along roads. Cap 10-60 mm, conical, then convex, umbonate, glabrous, hygrophanous, translucently striate; gills almost free, medium spaced, grey brown, then brown pink; stem 30-90(-110) x 2-12 mm, dark brown like cap; taste mild. Sp 9-12 x 7-9 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia absent; pileipellis a cutis of 4-11 μm wide, cylindrical hyphae with coarsely incrusting and intracellular pigment; clamps present. Common in hemib.-bore., occasional in temp. and suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:93 (slender form), FE 5:33, FE 5A:1234, R&H 377, Lud 94.78, .

E. vernum S. Lundell

- Stem polished or almost so; cap reddish brown; smell farinaceous; in summer and autumn; in grassland, road verges and alpine heathland. Cap 5-40 mm, conical to convex, umbonate, glabrous, hygrophanous, translucently striate; gills almost free, medium spaced, grey



Spores and cheilocystidia: A: *Entoloma cuniculorum*, B: *E. velenovskyi*, C: *E. langei*, D: *E. inutile*, E: *E. cryptocystidium*, F: *E. testaceum*.

brown, then brown pink; stem 20-70 x 1-3 mm, dark red brown like cap; taste farinaceous-rancid. Sp 9-13 x 6.5-8.5 μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia absent; pileipellis a cutis of 2-12 μm wide, cylindrical hyphae with coarsely incrusting pigment; clamps present. Summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), FO, NO (LC, incl. Svb), SE (LC). – FE 5:27a, FE 5A:1220-1221; FRIC12 91d, FAD 78D,

E. papillatum (Bres.) Dennis

Key L: Frb mycenoid with relatively thin-fleshed, conical to convex, often umbonate cap and relatively slender stem; cheilocystidia present (*Nolanea* with cystidia)

1. Stem glabrous, polished 2
 - Stem fibrillose-striate 5
2. Pigment minutely incrusting; clamps absent. Cap 5-20 mm, convex, umbonate, glabrous, hygrophanous, translucently striate, grey brown with a reddish tinge; gills deeply emarginate to almost free, medium spaced, white, then brownish pink; stem 20-40 x 1-2 mm, polished, pale yellowish brown; smell and taste indistinct. Sp 8.5-11 x 6-8 μm , heterodiametrical, 6-8-angled in side-view; cheilocystidia 15-40 x 5-12 μm , subcylindrical to lageniform; pileipellis a cutis of 2-9 μm wide, minutely incrusting hyphae. In groups in humus of deciduous forests; summer to autumn; rare or overlooked in temp.-suba.; DK (LC), NO (LC), SE (LC). – FE 5A:1229, Lud 94.62.
E. tenellum (J. Favre) Noordel. 3
 - Pigment intracellular; clamps present
3. Sp 10-14(-16) x 7-11 μm (fig. 483B). Cap 10-30 mm, conical, then convex, umbonate, glabrous, hygrophanous, translucently striate, moderately dark grey brown; gills deeply emarginate to almost free, medium spaced, white, then pink; stem 15-70 x 1-3 mm, polished, pale grey brown; smell and taste indistinct. Sp heterodiametrical, 5-9-angled in side-view; cheilocystidia 50-150 x 6-20 x 2-5 μm , lageniform to fusiform; pileipellis a cutis of 6-12 μm wide, cylindrical hyphae with intracellular pigment; clamps present. Single or in small groups in grassland on moist, humus-rich soil; summer to autumn; very rare in temp.-suba.; DK (NA, EJyl: Skærsø), NO (NT), SE (LC). – FE 5:30a, FE 5A:1243.
E. velenovskyi Noordel. 4
 - Sp 8-11 μm long
4. Sp 4-6-angled in side-view. Cap 4-15 mm, conical, then convex, umbonate, glabrous, hygrophanous, translucently striate, dark red brown; gills deeply emarginate to almost free, distant, white, then pink; stem 20-40 x 1-2 mm, polished, pale brown; smell and taste

indistinct or farinaceous. Sp 8-11 x 6-9 μm , heterodiametrical; cheilocystidia 45-70 x 8-22 x 3-6 μm , lageniform to tibiiform; pileipellis a cutis of 6-16 μm wide, cylindrical hyphae with intracellular pigment; clamps present. Single or in small groups in grassland and heathland; summer to autumn; occasional in hemib.-arc. / alp., very rare in temp.; DK (NA, EJyl: Bygholm Å), FO, NO (NT), SE (NE, Mpd). – FE 5A:1244.

E. pratulense Noordel.

- Sp 5-7-angled in side-view (fig. 483C). Cap 7-30 mm, conical, then convex, umbonate, glabrous, hygrophanous, translucently striate, moderately dark brown; gills adnate-emarginate, medium spaced, white, then pink; stem 20-60 x 1-4 mm, polished, brown; smell and taste indistinct. Sp 8-11 x 7-9 μm , heterodiametrical; cheilocystidia 30-80 x 4-11 μm , lageniform to lecythiform with a mucronate capitulum; pileipellis a cutis of 2-9 μm wide, cylindrical hyphae with intracellular pigment; clamps present. Single or in small groups in moist places, often among dwarf *Salix*, in tundras, heathland and grassland; summer to autumn; common in suba.-arc. / alp.; FO, NO (LC), SE (Hjd). – FE 5A:1245.

E. langei Noordel. & T. Borgen

- | | | |
|----|---|---|
| 5. | Gills dark brown with pink tinge; cheilocystidia tibiiform with a distinct capitate apex | 6 |
| - | Gills white, then pink; cheilocystidia clavate, cylindrical or lageniform | 7 |
| 6. | Cap very dark brown to almost black. Cap 5-30 mm, convex, then plane, umbonate or not, radially fibrillose-villose to almost glabrous, hygrophanous, short translucently striate; gills adnate-emarginate to almost free, medium spaced, dark grey brown with pink tinge; stem 10-40 x 1-4 mm, pale to dark brown, silvery striate; smell and taste indistinct. Sp 9-11.5 x 7-8 μm , heterodiametrical, irregularly nodulose-angled (fig. 483D); cheilocystidia 25-80 x 6-20 x 2-7 μm , lecythiform; pileipellis a cutis of 3-19 μm wide, cylindrical to inflated hyphae with intracellular pigment; clamps present. In small groups in heathland and grasslands on poor, acid, sandy or peaty soil; summer to autumn; very rare in temp.-bore.; NO (NE). – Däh 438, FE 5:80a, FE 5A:1262. | |

E. inutile (Britzelm.) Noordel.

- | | | |
|----|--|--------------------------------------|
| - | Cap ochraceous | see <i>E. conocybecystis</i> key N 1 |
| 7. | Pigment intracellular in pileipellis | 8 |
| - | Pigment incrusting in pileipellis, sometimes also with intracellular pigment | 9 |
| 8. | Cap and stem pale grey brown; cap 10-25 mm; stem 1-3 mm wide. Cap conical-convex to convex, glabrous, hygrophanous, translucently striate; gills adnate-emarginate to almost free, medium spaced, pale greyish white, then pink; stem 40-60 mm long, pale brown, silvery striate; smell and taste indistinct. Sp 9-10 x 7.5-8.5 μm , heterodiametrical, 5-6-angled in side-view (fig. 483E); cheilocystidia 15-40 x 4-8 μm , subcylindrical, flexuous, mixed with basidia; pileipellis a cutis of 2-7 μm wide, cylindrical hyphae with intracellular pigment; clamps present. In groups in poorly manured grassland; late summer to autumn; very rare in temp.; DK (NA, EJyl: Laven). – FE 5A:1245. | |

E. cryptocystidium Arnolds & Noordel.

- Cap and stem yellow brown or red brown; cap 20-70 mm; stem 3-7(-11) mm wide. Cap conical, then convex, umbonate, glabrous, hygrophanous, translucently striate, red brown; gills adnate-emarginate to almost free, medium spaced, brown, then brown pink; stem 60-110 mm long, fibrillose-striate, brown to yellow brown; smell and taste farinaceous-rancid. Sp 9-12 x 7-8.5 μm , heterodiametrical, 5-7-angled in side-view (fig. 483F); cheilocystidia 25-60 x 5-11 μm , cylindrical to clavate, mixed with basidia; pileipellis a cutis of 3-9 μm wide, cylindrical hyphae with intracellular pigment; clamps present. In groups in coniferous or mixed forests; summer to autumn; occasional in temp.-bore.; DK (NA), NO (NE, Tel: Bondal, Hedm: Tynset). – Däh 396, FE 5:82b, FE 5A:1240, Ves 252.

E. testaceum (Bres.) Noordel.

- 9. Smell strong, fruity-aromatic, reminiscent of *Hebeloma sacchariolens*. Cap 20-50 mm, conical,

cal, then convex, umbonate, glabrous, hygrophanous, translucently striate, grey brown to greyish ochraceous; gills adnate-emarginate to almost free, medium spaced, brown, then pinkish brown; stem 20-75 x 2-5 mm, grey brown, silvery fibrillose; taste unpleasant. Sp 9.5-11 x 7-8 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 25-45 x 3-8(-12) μm , subcylindrical to lageniform, mixed with basidia; pileipellis a cutis of 2-7 μm wide, cylindrical hyphae with minutely incrusting pigment; clamps present. In groups in grassland and in *Juniperus* heathland, preferably on calcareous soil; summer to autumn; rare in hemib.-bore.; NO (VU). – Bol Bres 39:92, FE 5:32b, FE 5A:1233.

E. sacchariolens (Romagn.) Noordel.

- Smell none or farinaceous 10
- 10. Pileipellis a cutis with transitions to a trichoderm, with septate hyphae, frequently with clavate terminal elements; pigment incrusting and in form of dark coloured granules inside the hyphae; clamps absent. Cap 10-20 mm, conical, then convex, umbonate, glabrous, hygrophanous, translucently striate, brown grey; gills free, medium spaced, grey with pink tinge; stem 20-40 x 0.5-1 mm, fibrillose-striate, grey; smell and taste weakly perfume-like. Sp 9-11.5 x 6-7 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 20-35 x 5-9 μm , cylindrical to clavate. Terrestrial in swamp forests with *Salix* and *Alnus*; late summer; very rare in hemib.; NO (Østf: Borge, DD).
E. kristiansenii Noordel.
- Pileipellis a cutis of narrow hyphae; pigment incrusting, and, if intracellular pigment is present, then evenly distributed, not in form of granules; clamps present 11
- 11. Gills edge heterogeneous; cheilocystidia mixed with basidia. Cap 10-20 mm, convex to low convex, umbonate, glabrous or radially fibrillose, hygrophanous, short translucently striate, pale to moderately dark grey brown; gills almost free, distant, grey pink; stem 20-45 x 1-2 mm, grey brown, silvery striate; smell and taste farinaceous. Sp 7.5-11 x 6.5-9 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 15-60 x 3-10 μm , tibiiform to lageniform or subcylindrical; pileipellis a cutis of 2.5-9 μm wide, minutely incrusting hyphae; clamps present. In pastures and hayfields, often on rather moist places; autumn; very rare or overlooked in temp.; DK (DD, EJyl). – B&K 4:88, FE 5:28c, FE 5A:1235, Lud 94.59.
E. tibiicystidiatum Arnolds & Noordel.
- Gill edge sterile, consisting of cystidia only 12
- 12. Sp 8-12 x 5.5-8 μm . Cap 5-45 mm, conical to convex, umbonate, glabrous, hygrophanous, translucently striate, yellow brown to reddish brown, sepia or greyish brown; gills medium spaced, white, then pink; stem 20-120 x 1-5 mm, brown, silvery fibrillose; smell and taste farinaceous-rancid. Sp heterodiametrical, 5-8-angled in side-view; cheilocystidia 25-60 x 4-12 μm , cylindrical to lageniform, often weakly capitate; pileipellis a cutis of 2-9 μm wide, cylindrical hyphae with incrusting and intracellular pigment; clamps present. In humus, often in nitrogen-rich places in deciduous forests and scrub; summer to autumn; occasional, but locally common in temp.-hemib.; DK (LC), FO, NO (LC), SE (LC). – BSMF 119:286, B&K 4:37, FE 5:26a, FE 5A:1218, Phil 163h.
E. hebes (Romagn.) Trimbach
- Sp 8-10 μm wide 13
- 13. Frb robust with stem much longer than diam. of cap; spring to early summer, rarely also in late autumn; in coniferous, less often deciduous forests. Cap 30-100 mm, conical, then convex, umbonate, glabrous, hygrophanous, translucently striate, grey brown or red brown; gills medium spaced, white, then brownish pink; stem 70-160 x 3-10 mm, yellow brown or sepia, silvery fibrillose; smell and taste farinaceous-rancid. Sp 10-14(-15) x 8-10 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 35-70 x 6-15 μm , cylindrical to lageniform, often weakly capitate; pileipellis a cutis of 4-11 μm wide cylindrical hyphae with incrusting and intracellular pigment; clamps present. Occasional in temp.-bore.; DK (LC),


FO, NO (LC), SE (LC). – Cet 100, Däh 432-433, FAD 78G, FE 5:25, FE 5A:1217.

E. hirtipes (Schumach.: Fr.) M.M. Moser


- Frb with stem almost equal in length as diam. of cap; summer to autumn; in grassland. Cap 14-50 mm, conical to convex, umbonate, glabrous, hygrophanous, translucently striate, grey brown or dark red brown; gills adnate-emarginate to almost free, medium spaced, grey, then grey pink; stem 25-50 x 1.5-4 mm, grey brown, silvery striate; smell and taste strongly farinaceous-rancid. Sp 10-14 x 7-9 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 35-90 x 3-15 μm , cylindrical to lageniform often weakly capitate; pileipellis a cutis of 4-15 μm wide, cylindrical hyphae with incrusting and intracellular pigment; clamps present. Very rare in suba.; FO, SE (LC). – FE 5A:1216, BSMF 112:309.

E. kuehnerianum Noordel.

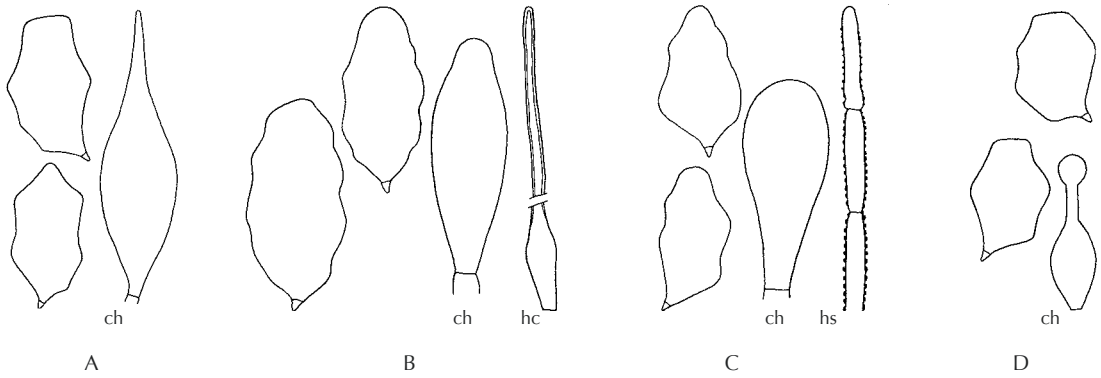
Key M: Habit mycenoid with a conical to convex, fibrillose, often somewhat lustrous cap, usually with an umbo; gills adnexed, free or rarely adnate with a decurrent tooth; stem slender, often rigid; cheilocystidia present

1. Cheilocystidia fusiform to lageniform with long, tapering neck (fig. 487A); pigment incrusting and intracellular 2
 - Cheilocystidia clavate, broadly clavate, cylindrical or vesiculose; pigment exclusively incrusting 3
2. Cap and stem with olivaceous green to olivaceous yellow tinges. Cap 15-45 mm, conical to bell-shaped, only slightly expanding, densely radially fibrillose; gills narrowly adnate to almost free, distant, grey then grey brown with slightly pink tinge; stem 25-70 x 2-5 mm, strongly fibrillose to almost scaly all over, with \pm pronounced red or grey strigose hairs at base; smell and taste indistinct to slightly spermatic. Sp (9-)9.5-11.5(-12.5) x 7-8(-9) μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia (40-)60-110 x 10-25 μm ; pileipellis a cutis to a trichoderm of inflated, up to 20 μm wide hyphae with intracellular and incrusting pigment; clamps absent. In small groups in raw humus and on soil in deciduous forests, parks and ruderal areas, rarely on burnt ground; autumn; rare in hemib.-bore., very rare in temp. and suba.; DK (NA), FI (LC), FO (Tórshavn), NO (DD), SE (NT). – FE 5:40b, FE 5A:1253, Nit 271, R&H 385, .

E. versatile (Fr.) M.M. Moser

 - Cap and stem grey. Cap 5-30 mm, conical to conico-convex or convex, densely radially fibrillose to appressed finely scaly, shiny; gills narrowly adnate to almost free, distant, grey then grey brown with a slight pink tinge; stem 25-70 x 1-5 mm, silvery fibrillose with \pm pronounced red or grey strigose hairs at base; smell and taste faint to subfarinaceous or spermatic. Sp 9.5(-)10-14(-15) x 7-8(-9) μm , heterodiametrical, 6-8-angled in side-view (fig. 487A); cheilocystidia 45-75(-100) x 10-30 μm , fusiform to lageniform with a long, tapering neck; pileipellis a cutis to a trichoderm of 15-30 μm wide, inflated elements with intracellular and incrusting pigment; clamps absent. Terrestrial, solitary or in small groups in humus of deciduous forests of rich, loamy or clayey soil, also in parks and gardens; late summer to autumn; occasional in temp.-southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:10, FE 5:40a, FE 5A:1253, 1254, GBW 4:226, Ves 253, .

E. araneosum (Quél.) M.M. Moser
3. Cap with long, non-septate, setiform hairs (fig. 487B). Cap 5-30 mm, conical to convex, dark red brown to grey brown, densely radially fibrillose; gills narrowly adnate to almost free, distant, grey then grey brown with a slight pink tinge; stem 20-70 x 1-4 mm, concolorous with cap; smell and taste indistinct. Sp (12.5-)14-19(-22) x 7-11 μm , nodulose-angular; cheilocystidia (25-)40-80 x 12-22 μm , clavate to lageniform; pileipellis a trichoderm of inflated elements, 17-30 μm wide, intermixed with thick-walled setae, 200-1000 x 10-12 μm , tapering towards apex; pigment incrusting; clamps absent. In grassy places and in deciduous forests and scrub, preferably on calcareous soil; summer-autumn; very rare in temp.-bore.; DK (EN),



Spores, cheilocystidium and hairs from cap and stem: A: *Entoloma araneosum*, B: *E. strigosissimum*, C: *E. dysthaloides*, D: *E. conocybecystis*.

FI (CR), NO (DD), SE (DD, Sk). – FE 5:49b, FE 5A:1250, Lud 94.173, RdM 33:172.

E. strigosissimum (Rea) Noordel.

- Cap with long, septate, non-setiform hairs 4
- 4. Sp on av > 15 μm long. Cap 5-20 mm, conical, then convex or plane, dark sepia to grey-brown, densely radially fibrillose-hairy; gills almost free, distant, grey, then grey pink; stem 10-50 x 0.5-2 mm, dark grey, silvery fibrillose-hairy all over; smell and taste indistinct. Sp 13.5-19.5(-21.5) x (7.5-)8-10.5(-11) μm , heterodiametrical, nodulose-angular; cheilocystidia 15-90 x 8-25 μm , broadly clavate; pileipellis a cutis to a trichoderm of septate, slightly inflated, strongly incrustated hyphae, 10-17 μm wide; clamps absent. In groups in damp places in deciduous forests (*Alnus*, *Fraxinus*); summer to autumn; occasional in temp.-bore.; DK (NT), FI (DD), FO, NO (NE, Busk: Hurum, Nordl: Rana), SE (LC). – Bol Bres 39:30, FE 5A:1251, GBW 4:224, Lud 94.175, Win 93:45.

E. dysthales (Peck) Sacc.

- Sp < 15 μm long 5
- 5. Cap and stem dark grey brown; stem with septate, often coarsely incrustated hairs (fig. 487C); in damp, marshy places. Cap 3-20 mm, conical to bell-shaped, then convex, strongly radially fibrillose-hairy; gills free to narrowly adnexed, medium spaced to distant, dark grey, then with a pink tinge; stem 15-60 x 0.5-2 mm, silvery-fibrillose to hairy; smell and taste indistinct. Sp 10.5-13.5(-15) x 7-8(-8.5) μm , nodulose-angular; cheilocystidia 25-60 x 15-30 μm , clavate; pileipellis a cutis to a trichoderm of septate, slightly inflated, strongly incrustated hyphae, 10-20 μm wide; clamps absent. Summer to autumn; rare in temp.-southern bore.; DK (LC), FI (DD), NO (DD, Vestf: Sande), SE (LC). – B&K 4:27, BSMF 121:177, FE 5:39a, FE 5A:1251, Lud 94.176, ☉.

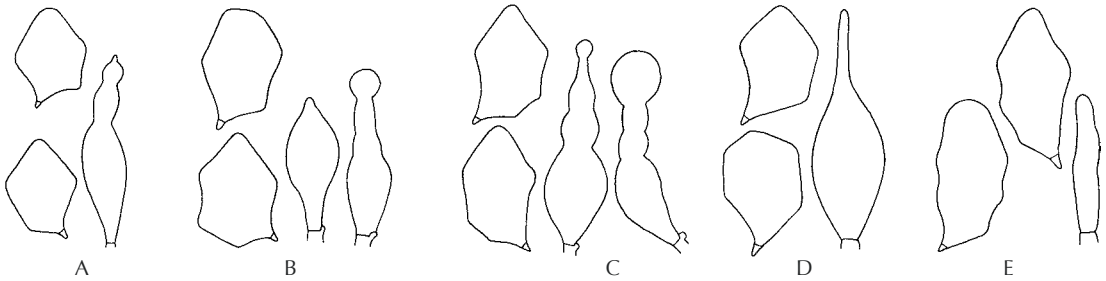
E. dysthaloides Noordel.

- Cap and stem mouse grey; stem with non- or one-septate, poorly or non-incrustated hairs; in scrubs in xerophytic grassland. Cap 5-20 mm, conical, expanding with age, densely radially fibrillose-aeriferous, shiny; gills free to narrowly adnexed, grey then grey-pink; stem 30-70 x 1-3 mm, fibrillose; smell none; taste mild to bitter. Sp (10-)10.5-15(-15.5) x 7-8(-9) μm , nodulose-angular; cheilocystidia 20-75 x 15-35 μm , clavate; pileipellis a cutis to a trichoderm of septate, slightly inflated, strongly incrustated hyphae, 10-18 μm wide; clamps absent. Summer to early autumn; very rare or overlooked in temp.-hemib.; DK (CR, Lol: Jydelejet, Høvblege), SE (NE, Sk, ÖI). – BSMF 121:177, B&K 4:40, Bol Bres 37:166, GBW 4:225.

E. hirtum (Velen.) Noordel.

Key N: Habit tricholomatoid or mycenoid; cap fibrillose to finely scaly; cheilocystidia capitate

1. Cap ochre; cheilocystidia regularly tibiiform to lecythiform (fig. 487D); clamps absent. Cap 20-45 mm, convex to plane, not hygrophanous, not translucently striate, radially fibrillose; gills free, medium spaced, brown with pink tinge; stem 60-95 x 3-5 mm, densely fibrillose-striate; smell and taste indistinct. Sp 8-10.5 x 6-8.5 μm , heterodiametrical, 6-7-angled in side-view; cheilocystidia 35-55 x 8-12 μm with a 4-8 μm wide capitulum; pileipellis trichoderm of inflated elements, 10-25 μm wide with intracellular pigment; clamps present. In dry grasslands and *Juniperus* heathland; autumn; *EE, UK*. – FE 5:38b.
E. conocybecystis Noordel. & Liiv
 - Cap brown, grey brown, blackish brown, reddish brown or porphyry brown; cheilocystidia not so regularly tibiiform as in *Conocybe*; clamps present or absent 2
2. Cap coarsely radially fibrillose, often radially split, showing the paler flesh between the fibrillose covering; cheilocystidia lecythiform to tibiiform, often with a mucronate capitulum (fig. 489A); clamps absent. Cap 15-80 mm, conical, soon convex to plane, with a weak umbo, not hygrophanous, not translucently striate, dark red-brown to blackish brown fibrillose-finely scaly on an almost white background; gills emarginate, medium spaced, white, then pink; stem 20-80 x 2-15 mm, fibrillose striate, pallid; smell and taste indistinct. Sp 7-8(-9) x 5.5-7 μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 25-90 x 5-20 μm ; pileipellis a trichoderm of inflated elements, 20-30 μm wide, with intracellular pigment. In nitrogen-rich places in deciduous forests and parks; late summer to autumn; rare in temp.; DK (DD), SE (DD). – B&K 4:75, FE 5:45, FE 5A:1271, GBW 4:169, ☉.
E. scabiosum (Fr.) Quél.
 - Cap regularly radially fibrillose, not splitting; capitulum of cheilocystidia not mucronate; clamps present 3
3. Cap 5-30 mm, very dark brown, almost black see *E. inutile* key L 6
 - Cap 20-70 mm, brown, grey brown, red brown or porphyry brown 4
4. Cap slightly but distinctly hygrophanous, finely radially fibrillose, often with a micaceous sheen; cheilocystidia in majority clavate with rounded apex, but always mixed with distinctly capitate ones (fig. 489B); smell farinaceous. Cap 25-70 mm, conical-convex to plane with an umbo, grey brown or red brown; gills adnate or emarginate, medium spaced, white then pink finally reddish brown; stem 20-80 x 3-8 mm, pale brown, silvery striate; taste farinaceous to rancid. Sp (8)-9-11.5(-12.5) x (6)-7-9(-9.5) μm , heterodiametrical, 5-8-angled in side-view; cheilocystidia 25-70 x 7-20 μm ; pileipellis a cutis to a trichoderm of inflated elements, 10-20 μm wide, with intracellular pigment; clamps present. In groups in dead and living *Sphagnum* of peat-bogs and boggy areas; late summer to autumn; rare in temp.-bore.; DK (EN), NO (LC), SE (LC). – FE 5:43b, FE 5A:1269, FRIC 12:94c, GBW 4:184.
E. elodes (Fr.: Fr.) P. Kumm.
 - Cap not hygrophanous, radially fibrillose, tomentose to finely scaly; cheilocystidia in majority capitate; smell usually indistinct 5
5. Cap and stem porphyry red to porphyry brown; gills white, then pink; cheilocystidia often with a moliniform neck and rounded capitulum (fig. 489C). Cap 35-150 mm, conical to convex with a low umbo, not hygrophanous, innately radially fibrillose; gills free to deeply emarginate, medium spaced; stem 40-75 x 4-20 mm; smell and taste indistinct. Sp 8-12 x (5.5)-6-8 μm heterodiametrical, many-angled to almost nodulose; cheilocystidia 20-60 x 7-20 μm with 3-15 μm wide capitulum; pileipellis a trichoderm of inflated elements, 5-25 μm wide with intracellular pigment; clamps present. In groups in poorly manured grassland, preferably on calcareous soil; late summer to autumn; rare in temp.-suba.; DK (VU), FI (DD), FO, IS, NO (NT), SE (NT). – FAD 73D, FE 5:44, FE 5A:1270, Phil 162c, Ves 242, ☉.
E. porphyrophaeum (Fr.) P. Karst.



Spores and cheilocystidia: A: *Entoloma scabiosum*, B: *E. elodes*, C: *E. porphyrophaeum*, D: *E. canosericeum*, E: *E. plebejum*.

- Cap and stem brown to grey brown; neck of cheilocystidia rarely moliniform 6
- 6. Cap tomentose, rarely distinctly scaly; gills dark grey brown, then with a pink tinge with concolorous or slightly paler edge; stem densely covered with brown fibrils on pale background. Cap 15-60 mm, conical, then convex to plane, weakly umbonate, dark red brown; gills adnate-emarginate, medium spaced; stem 30-90 x 2-8 mm; smell and taste indistinct to slightly acid. Sp 7-10(-11) x 5.5-7.5(-8) μm , heterodiametrical, 6-9-angled in side-view; cheilocystidia 20-70 x 5-15 μm with a 2-10 μm wide capitulum, rarely lageniform, utriform or clavate; pileipellis a cutis to a trichoderm of cylindrical to inflated, 5-20 μm wide hyphae with intracellular pigment; clamps present. In groups in seminatural grasslands, in mixed and rich *Picea* forests and along paths, on calcareous and acid soils; late summer to autumn; occasional in hemib.-bore., rare in temp. and suba.-arc./alp.; DK (VU), FI (LC), NO (NT), SE (NT). – BSMF 119:287, FAD 72E, FE 5:43, FE 5A:1269, FRIC 12:95b.
E. jubatum (Fr.: Fr.) P. Karst.
- Cap minutely to recurved scaly, with fine, pointed scales; gills white or pale grey, then sordid grey pink with white, fimbriate edge; stem silvery striate. Cap 10-40 mm, conical, then convex with an umbo, dark brown; gills adnate-emarginate, medium spaced; stem 30-90 x 1-5 mm; smell and taste indistinct to farinaceous-rancid. Sp 8-10(-11) x 6-8 μm , heterodiametrical, 6-8-angled in side-view; cheilocystidia 20-50 x 8-20 x 2-7 μm , lageniform to lecythiform; pileipellis a cutis to a trichoderm of inflated elements, 4-20 μm wide, with intracellular pigment; clamps present. In groups in grassland, at roadsides, in heathland and *Salix repens* copses on peaty or sandy, acid soil; late summer to autumn; occasional in bore.-suba., but common in FO, rare in arc./alp.; FO, IS, NO (NT, incl. SvB), SE (NE). – FE 5A:1269.
E. fuscotomentosum F.H. Møller

Key O: Habit tricholomatoid or mycenoid; cap pruinose, rimulose, rugulose, venose, fibrillose, finely scaly or tomentose; cheilocystidia present or absent, not capitate

1. Frb reminiscent of a *Dermoloma* species; cap minutely rugulose all over; pileipellis a calliderm of rounded cells; basidia 2-spored, clampless. Cap 30-60 mm, conical then low convex, not hygrophanous, not translucently striate, grey brown; gills adnate-emarginate, distant, white, then pale pink; stem 20-70 x 2-7 mm, white, fibrillose; smell and taste indistinct. Sp (9-)9.5-12 x 7.5-11 μm , subisodiametrical, 4-7-angled in side-view; cheilocystidia absent; pileipellis elements 10-20 μm broad, with intracellular pigment. In poorly manured grassland; late summer to autumn; UK. – B&K 4:38.
E. henrici E. Horak & Aeberhardt
- Frb mycenoid or tricholomatoid; pileipellis a cutis with transitions to a trichoderm, or a trichoderm, basidia 4-spored, clamped 2

2. Cheilocystidia prominent, lageniform, protruding (fig. 489D). Cap 10-25 mm, conical then convex with an umbo, not hygrophanous, translucently striate at margin only, dark grey brown, radially fibrillose; gills adnate to almost free, medium spaced, dark brown pink; stem 20-70 x 1-3 mm, grey brown, strongly silvery striate; smell and taste indistinct. Sp 9-11(-12) x 6.5-8(-9) μm , heterodiametrical, 5-7-angled in side-view; cheilocystidia 35-80 x 10.5-19 x 2-7 μm ; pileipellis a cutis of cylindrical, 4-10 μm wide hyphae, with incrusting pigment. In groups in grassy places on calcareous soil; late summer to autumn; very rare in temp.; DK (DD). – FE 5:38a.
E. canosericeum (J.E. Lange) Noordel.
- Cheilocystidia absent or inconspicuous, resembling basidioles 3
3. Sp regularly 5-7-angled in side-view, not nodulose 4
- Sp many-angled, nodulose 5
4. Cap 20-80 mm; stem 20-70 x 3-10 mm; sp 8-12 x 7-9 μm . Cap conical, then convex with an umbo, tomentose then minutely scaly all over, not hygrophanous, not translucently striate, dark grey brown; gills adnate-emarginate, medium spaced, white, then pink; stem pale to dark brown, fibrillose; smell and taste indistinct. Sp 8-12 x 7-9 μm , heterodiametrical, 5-7-angled in side-view; cystidia absent; pileipellis a cutis to a trichoderm of cylindrical to inflated, 6-25 μm wide hyphae with brown, intracellular pigment; clamps present. In groups in grassland and damp places in deciduous forests; late summer to autumn; very rare in suba.; NO (NE, Troms: Storfjord). – FE 5:42b, FE 5A:1260.
E. plebejoides (Schulzer) Noordel.
- Cap 10-30 mm; stem 15-35 x 3-6 mm; sp 8-11 x 6-8 μm . Cap conical, then convex, not hygrophanous, minutely scaly all over, not translucently striate, dark grey brown; gills narrowly adnate-emarginate, distant, grey brown with a pink tinge; stem grey brown, polished; smell and taste farinaceous. Sp 8-11 x 6-8 μm , heterodiametrical, 6-7-angled in side-view; cystidia absent; pileipellis a cutis to a trichoderm of inflated, 10-20 μm wide hyphae with intracellular pigment; clamps present. In groups in grassland on sandy soil; late summer to autumn; very rare in temp.; DK (DD, Fyn: Højby Ås). – BSMF 121:136, 122:opp. 122, FE 5A:1260.
E. resutum (Fr.) Quél.
5. Frb tricholomatoid; spring and early summer, rarely also in autumn. Cap 10-40 mm, conical, bell-shaped, then expanding with a low umbo, not hygrophanous, not translucently striate, dark grey brown, fibrillose-tomentose with micaceous patches; gills free to narrowly adnexed, grey, then grey pink; stem 30-100 x 3-9 mm, grey to grey brown, silvery striate; smell and taste weakly to distinctly farinaceous. Sp (9-)10.5-14.5(-17) x 7-11 μm , heterodiametrical, irregularly nodulose-angled; cheilocystidia 35-100 x 5-20 x 2-9 μm , fusiform to slenderly lageniform (fig. 489E), often sparse and scattered among basidia; pileipellis a cutis to a trichoderm of cylindrical to inflated, 10-20 μm wide hyphae with intracellular pigment; clamps present. Solitary or in groups in humus-rich soils, in deciduous or coniferous forests, and also in open sand dunes, parks and gardens; very rare in temp.-bore.; DK (EN), NO (DD), SE (NE). – B&K 4:60, FE 5:42a, FE 5A:1259, GBW 4:228, RdM 47:362.
E. plebejum (Kalchbr.) Noordel. (*E. erophilum* (Fr.) P. Karst.)
- Frb mycenoid; late summer and autumn 6
6. Pigment minutely incrusting and intracellular; cap pale to moderately dark brown; stem yellow brown, paler than cap, densely fibrillose-striate. Cap 5-20 mm, conical then convex, umbonate, not hygrophanous, not translucently striate, densely scaly; gills free to narrowly adnexed, medium spaced, white then pink; stem 10-60 x 1-3 mm, sometimes with reddish hairs at base; smell and taste indistinct. Sp 9.5-13(-14) x 6.5-8 μm , heterodiametrical, many-angled, nodulose-angular; cheilocystidia absent; pileipellis a trichoderm of inflated, septate, 10-35 μm wide hyphae; clamps present. In groups in grassy vegetation and in deciduous

forests, on various types of soil (sand, clay, peat); late summer to autumn; rare in temp. and suba.; DK (EN), NO (NE, Troms: Storfjord). – FE 5:81a,b, FE 5A:1265, 1266, Svp 21:20.

E. hispidulum (M. Lange) Noordel.

- Pigment intracellular; cap and stem with about the same dark brown to brown-grey colour; stem innately fibrillose or ± polished 7
- 7. Cap convex, umbilicate, glabrous or minutely tomentose (lens), hygrophanous, slightly translucently striate; in grassy and mossy places on nutrient poor, sandy or gravelly soil see *E. undulatosporum* and *E. triste* key K5
- Cap bell-shaped to convex with an umbo, not hygrophanous, not translucently striate, minutely scaly, particularly at centre; in arctic tundra with *Dryas* and *Salix polaris* among *Racomitrium*. Cap 10-25 mm, dark grey brown; gills adnate-emarginate, medium spaced, pale grey to brown grey; stem 10-30 x 1.5-3 mm, dark grey brown, innately fibrillose; smell and taste indistinct. Sp 9-12(-13) x 6.5-8(-9) μm, heterodiametrical, nodulose-angular; cystidia absent; pileipellis a cutis to a trichoderm of inflated elements, 10-15 μm wide, with intracellular pigment; clamps present. Late summer; occasional in arc./alp.; NO (LC, SvB).
E. milleri Noordel.

Episphaeria Donk

BEATRICE SENN-IRLET

Monotypic genus; see description below.

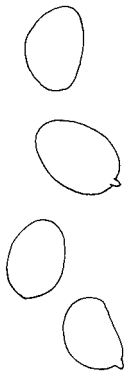
Lit.: Donk 1959, Siepe & Kasperek 2002.

Frb cyphelloid, shallowly cup-shaped, with involute margin, 0.2-1 mm, dorsally attached. Upper surface villose, dry, white to cream. Hymenium smooth, at times wrinkled, first cream, soon cinnamon brown. Stem absent. Veil absent. Smell indistinct. Sp deposit cinnamon brown.

Sp 6.5-8.5 x 4.5-6 μm , Q = 1.3-1.6, ellipsoid, amygdaloid in side view, moderately thick-walled, smooth, without germ pore (fig. 867E), without iodine reactions or at times faintly amyloid and dextrinoid respectively. Basidia 4-spored. Cystidia absent. Hairs (50-)65-150 x 1.5-3 μm , filiform, finely incrustated throughout. Pileipellis a trichodermal cutis. Clamps present.

Saprotrophic on old pyrenomycetes or on twigs and hanging branches of deciduous trees, not least *Fraxinus*; spring to autumn; occasional or overlooked in temp.-hemib.; DK (LC), NO (Vestf: Tønsberg), SE. – ZM 68:156, ⊕.

E. fraxinicola (Berk. & Broome) Donk



Spores.

Faerberia Pouzar

HENNING KNUDSEN

Geopetalum Pat. nom. illeg.

Monotypic genus; see description below.

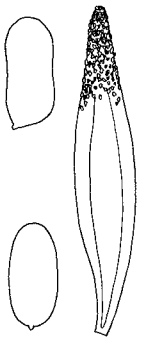
Lit.: Pouzar 1981, Singer & Cleméncon 1973.

Frb clitocyboid with veined hymenophore. Cap 30-60 mm, depressed to funnel-shaped, thin, smooth, slightly felty to fibrillose scaly, blackish brown to black. Gills decurrent, venose, narrow and obtuse, distant, usually forked, whitish, then cream. Stem 20-50 x 2-4 mm, pale grey brown, central, occasionally eccentric, solid. Flesh slightly leathery to fleshy, dry, pale, not gelatinous. Taste mild. Smell indistinct. Sp deposit white.

Sp 7-11 x 4-5 μm , cylindrical to allantoid (fig. 73A), hyaline, metachromatic. Basidia mostly 4-spored mixed with 1-, 2-, 3-spored. Metuloids c. 100 x 10-14 μm , lanceolate with slightly tapering base, thick-walled, smooth or with yellow crystalline incrustation, dextrinoid, strongly metachromatic. Clamps present. Hyphal system dimitic; generative hyphae hyaline; skeletal hyphae 3-5 μm broad, thick-walled. Pileipellis a cutis of brown, incrustated hyphae.

Saprotrophic on bonfires and charcoal on burnt soil after *Picea*, one to two years after the fire; summer to autumn; rare in temp.; DK (EN), SE (LC). – B&K 3:207, Cet 1545, GBW 3:12, Lud 23.1, Svp 15:14, ⊙.

F. carbonaria (Alb. & Schwein.) Pouzar



Spores and metuloid

Fayodia Kühner

MACHIEL NOORDELOOS

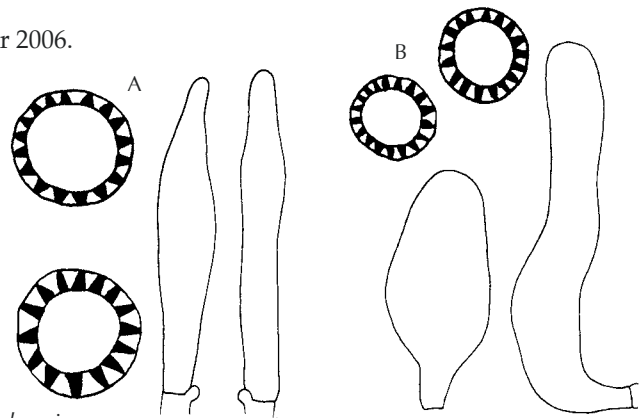
Frb with central stem, omphalinoid or mycenoid. Cap smooth, whitish-brownish to dark brown. Gills adnate to decurrent. Stem ± concolorous with cap. Smell indistinct to farinaceous. Taste mild to rancid. Sp deposit white.

Sp (sub)globose, hyaline, with a two-layered wall: a non-amyloid epispore with distinct echinulae or verruculae and a smooth, amyloid perispore. Basidia 2-spored. Cheilocystidia present. Pileipellis and stipitipellis not gelatinised. Hyphae without iodine reactions. Clamps present or absent.

Saprotrophic, solitary or in small groups on burnt soil in coniferous, less frequently in broad-leaved forests or on leaf litter, in grass, etc.

Two species in the Nordic countries.

Lit: Antonín & Noordeloos 2004, Gröger 2006.



Spores and cheilocystidia: A: *Fayodia bisphaerigera*, B: *F. anthracobia* var. *anthracobia*.

1. Frb mycenoid or omphalinoid; cap 10-30 mm, greyish, brownish, pale reddish brown; sp 8-12 μm , globose (fig. 279A); basidia 25-37 \times 10-12 μm ; clamps present. Cap hemispherical to convex, finally plane, translucently striate; gills medium spaced, L = 15-25, white; stem 20-50(-60) \times 2-3(-5) mm, pruinose-furfuraceous at top, glabrous below, white at top, greyish-brownish below. Cheilocystidia 35-80(-90) \times 8.5-17 μm , clavate to cylindrical or fusiform (fig. 279A). Summer to autumn; on e.g. *Picea*, *Fagus* and *Alnus* litter, also in grass; rare in temp.-hemib., occasional in bore., very rare in suba.; DK (LC), FI (LC), FO, IS (Ve), NO (LC), SE (LC). – A&N 04:133, B&K 3:208, FAD 59H, Lud 24.1, R&H 366, ⊙.

F. bisphaerigera (J.E. Lange) Singer (*Omphalia* b. J.E. Lange, *F. gracilipes* (Britzelm.) Bresinsky & Stangl s. auct.)

- Frb mycenoid; cap very dark grey brown to blackish brown, fading to dark brown on drying; sp 6-8.5 \times 6-8 μm , globose to subglobose; basidia 15-26 \times 6.5-10 μm ; clamps absent
2. On burnt soil; cap plane, obtusely umbonate to slightly depressed at centre; gills distant, L = 14-16; stem 10-18 \times 0.5-1.5 mm; basidia 21-26 \times 7.5-10 μm ; cheilocystidia 40-90 \times 11-23 μm , lageniform, subcylindrical or subfusiform. Cap 2-12(-15) mm. Sp 6-8.5 \times 6-8 μm , globose to subglobose (fig. 279B). Autumn; very rare in bore.; NO (NE). – Lud 24.2, M&J 1.
- F. anthracobia* (J. Favre) Knudsen var. *anthracobia*
- On peaty soil; cap umbonate; gills medium spaced, L = 16-20; stem 20-30 \times 0.5 mm; basidia 15-21 \times 6.5-9 μm ; cheilocystidia 32-87 \times 11-23 μm , clavate, broadly clavate, utriform, less frequently (sub)cylindrical. In other characters like the main variety. Summer to autumn; rare in temp.-bore; DK (DD, Sj: Grib Skov 1944), NO (S&F: Luster, NTr: Høylandet). – Lud 24.3.
- F. anthracobia* (J. Favre) Knudsen var. *bisphaerigerella* (M. Lange) Antonín & Noordel. (*F. bisphaerigerella* (M. Lange) M. Lange)

Fistulina Bull.: Fr.

HENNING KNUDSEN

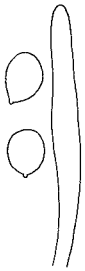
One species in the Nordic countries; see description below.

Frb compound, tongue-shaped, red. Frb of thousands of individual tubules hanging from a common fleshy stroma, 100-250 x 20-60 mm, semicircular, tongue- or kidney-shaped, the base often contracted to a short stem, very fibrous, soft, red marbled, exuding a red juice, upper side brownish red, papillate from short tufts of hairs, sometimes exuding red drops, lower side at first pale yellow, reddish to reddish brown when old and bruised. Tubules on the lower side crowded, not coherent, pale ochraceous, 5-15 x c. 0.5 mm. Taste acidulous. Smell indistinct. Sp deposit white.

Sp hyaline, smooth, 4-6 x 3-4 μm , broadly ellipsoid (fig. 249E), rather thick-walled, non-amyloid. Basidia clavate, 4-spored. Clamps present. Hyphae hyaline, irregular, 4-8 μm broad, mixed with scattered laticiferous hyphae with brownish, granulose contents. Hairs on upper side in dense fascicles, smooth, thick-walled, with irregular brownish contents, c. 5 μm broad.

A weak parasite on old *Quercus*, usually near the base, more rarely on newly cut stumps and trunks, also found on cultivated *Castanea sativa*; known from one tree for > 100 years; occasional in temp.-hemib., rare in FI; DK (LC), FI (NT), NO (NT), SE (NT). – Däh 1049, Phil 224, R&H 201, Svp 39:11, 50:52, ⊙.

F. hepatica (Schaeff.: Fr.) Fr.



Spores and pseudocystidia

Flagelloscypha Donk

HENNING KNUDSEN

Incl. *Cephaloscypha* Agerer, *Nochascypha* Agerer, *Setiscyphella* Agerer

Frb cyphelloid with white hairy outside. Frb low to deep cup-shaped or bell-shaped, sessile or very short stipitate, 0.1-1 mm in diam., resembling a small discomycete, white. Outside finely to coarsely hairy, white. Hymenium smooth, whitish.

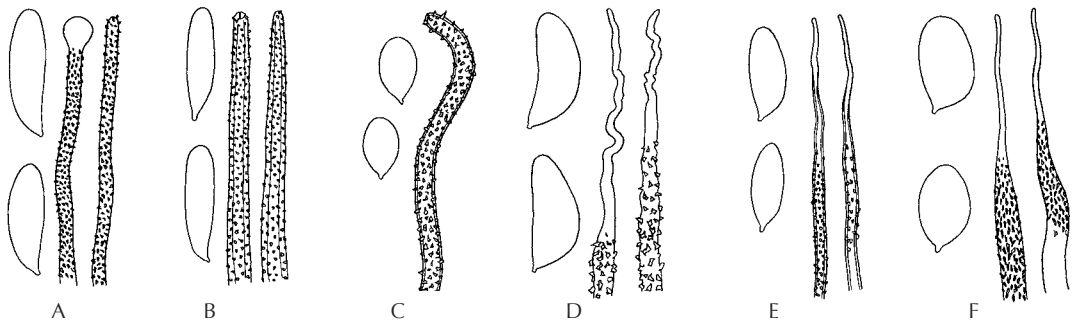
Sp pip-shaped or fusiform, often flattened on one side, more rarely ovoid to subglobose, hyaline, sometimes occurring in tetrads. Basidia clavate to suburniform, 2- or 4-spored, but mature basidia soon collapsing and often difficult to find. Clamps present. Cystidia absent. Outside covered with white or very pale brownish hairs, thin- to thick-walled, wholly or partly incrustated, cylindrical with an obtuse apex, or in most species apically tapering into a smooth flagellate apex or apex capitate swollen, without iodine reactions or slightly dextrinoid. Conidia sometimes formed from apex of the flagella or from other hyphae associated with the frb.

Saprotrophic on wood, dead leaves and stems of herbs. Spring to autumn.

11 species in the Nordic countries.

Agerer uses a more narrow generic concept than accepted here.

Lit.: Agerer 1973, 1975, 1979a, 1979b, 1983, Læssøe 2005, Reid 1964.



Spores and apical parts of hairs: A: *Flagelloscypha mairei*, B: *F. niveola*, C: *F. filicina*, D: *F. minutissima*, E: *F. pilatii*, F: *F. orthospora*

1. Apex of at least some hairs inflated and smooth (fig. 245D); hairs thin-walled at the base and often collapsing, otherwise thick-walled and coarsely incrustated with aciculate crystals. Frb cup-shaped, hairy, white. Sp 8.5-11 x 3-4 μ m, narrowly pip-shaped, Q = c. 2.9; basidia 18-21 x 5-6.5 μ m, 4-spored. On ferns, e.g. *Blechnum*. Distribution poorly known, but confirmed records from FI (DD, EH), NO, SE (LC).
F. mairei (Pilát) Knudsen (*Cyphella filicina* (Fr.) P. Karst. var. *mairei* Pilát, *Lachnella m.* (Pilát) W.B. Cooke, *Cephaloscypha m.* (Pilát) Agerer, *C. morlichensis* (W.B. Cooke) Agerer)
 - Apex of hairs either cylindrical-obtuse or attenuated 2
2. Apex of hairs cylindrical-obtuse; hairs \pm cylindrical, incrustated 3
 - Apex of hairs tapering, often smooth and flagellately attenuated 4
3. Outside with erect, strongly radiating hairs also when dried; frb obconical, short stipitate, white, up to 0.5 mm high and 0.3 mm broad. Sp 7.5-9 x 2-3 μ m, fusiform, with prominent apiculus, Q = 2.8-3.7 (fig. 245E); basidia 16-19 x 5-5.5 μ m, broadly clavate, 4-spored; hairs thick-walled, slightly attenuated, densely granulose incrustated, up to 10 μ m broad at the base. Saprotrophic, gregarious on dead leaves of deciduous trees and scrubs such as *Cratae-*

gus and *Corylus*; rare or overlooked, temp., only one record from DK (LC). – Svp 52:28, ☉.

F. niveola (Sacc.) Knudsen, see p. 913 (*Cyphella n.* Sacc., *Chaetocypha n.* (Sacc.) Kuntze, *Seticyphella n.* (Sacc.) Agerer non s. Lundell & Nannfeldt FES 2667).

- Outside hairs softer, ± curved at least when dry; frb cup-shaped, white, hairy, up to 0.8 high and 0.3 mm broad. Sp 5-6.5 × 3-3.5 μm, irregularly ellipsoid, Q = c. 1.8 (fig. 245F), hyaline; basidia 4-spored, 15 × 4.5-6 μm; hairs cylindrical with obtuse apex, finely incrustated, thick-walled, 3-4 μm broad, hyaline. Scattered on old fronds of ferns; distribution poorly known, but confirmed records from hemib. in NO (Akh) and bore. in FI (DD).

F. filicina (P. Karst.) Donk (*Cyphella f.* P. Karst., *Lachnella f.* (P. Karst.) W.B. Cooke, *Nochascypha f.* (P. Karst.) Agerer, *C. solenioides* P. Karst.)

- 4. Most basidia 2-spored. Frb up to 0.5 mm in diam., cup-shaped, hairy, white. Sp 7-10.5 × 4-5.5 μm, pip-shaped to citriform, Q = 1.7-2 (fig. 247A); basidia 17-23 × 5-6.5 μm, 2-spored; hairs thin-walled and easily collapsing at base, coarsely incrustated with aciculate or rhomboid crystals or more irregularly incrustated, apex flagellate, glabrous, up to 55 μm long. On wood of deciduous trees, more rarely on conifers and herbs; the most common species in the genus in the southern part of the area, but distribution and frequency poorly known; confirmed records from DK (LC), FI (DD, EH), NO, SE (LC). – B&K 2:228, ☉.

F. minutissima (Burt) Donk

- Most basidia 4-spored 5
- 5. At least some hairs thick-walled throughout their length, not collapsing at base 6
- Hairs thin-walled at the base and there often collapsing 7
- 6. On stems of herbs and leaves. Frb up to 0.6 mm in diam., slightly stipitate, deeply cup-shaped, hairy, white. Sp 7-9 × 3-4 μm, pip-shaped, Q = 2.1-2.5; basidia 18-22 × 5.5-6.5 μm, 4-spored; hairs thick-walled in their whole length, with coarse aciculate or rhomboid crystals or more irregularly incrustated, apex short flagellate, glabrous, up to 30 μm long. Distribution and frequency unknown, but confirmed records from DK, NO, SE (LC).

F. kavinae (Pilát) W.B. Cooke

- On dead stems and leaves of grasses and sedges. Frb up to 0.3 mm in diam., sessile, low cup-shaped, hairy, white. Sp 7-8.5 × 3-3.5 μm, ellipsoid, flattened on one side, Q = 2.2-2.6 (fig. 247B); basidia 18-21 × 5.5-6.5 μm, 4-spored; hairs thick-walled in their whole length, finely incrustated, apex flagellate, flagellum up to 35 μm long. Distribution and frequency unknown, but one record from DK (DD, EJyl: Vorsø) on *Poa*.

F. pilatii Agerer


- 7. On pyrenomycetes. Frb up to 0.6 × 0.1 mm, low cup-shaped, hairy, white. Sp 7.5-8.5 × 3.5-4.5 μm, ellipsoid to almost cylindrical, flattened on one side, Q = 1.9; basidia 20-25 × 6.5-7.5 μm, 4-spored; hairs coarsely incrustated, thin-walled and frequently collapsing at base, apex short flagellate and thin-walled, thick-walled in between. Distribution and frequency unknown, but one record from FI (DD, EH).

F. parasitica (Berk. & Broome) Agerer

- On other substrates 8
- 8. On wood of conifers; sp Q = 2.6-2.7. Frb with short thin stem, cup-shaped, finely hairy, white. Sp 7-8.5 × 2.5-3.5 μm, narrowly pip-shaped; basidia 15-19 × 4.5-5.5 μm, 4-spored; hairs coarsely incrustated with aciculate to rhomboid crystals, thin-walled and frequently collapsing at base, apex thin-walled and flagellate, glabrous, up to 10 μm long, remaining part thick-walled. Distribution and frequency unknown, but the type is from FI.

F. abieticola (P. Karst.) W.B. Cooke

- On leaves of deciduous trees or stems of herbs; sp Q either larger or smaller than 2.6-2.7 9

9. Sp Q = c. 3. Frb up to 0.3 mm in diam., cup-shaped, sessile. Sp 7.5-9.5 x 2-3 μm , pip-shaped; basidia 15-21 x 5.5-7 μm , 4-spored; hairs finely incrustated with aciculate crystals, thin-walled and frequently collapsing at base, apex \pm glabrous, about 10 μm long, but not flagellately attenuated. On leaves of *Betula*, *Salix*, *Alnus* and *Myrica*; records from temp.-bore., occasional; DK (LC), FI (DD, EH), NO (NE), SE (LC). – .
- F. punctiformis* (Fr.) Agerer
- Sp Q = 2 or smaller 10
10. Sp Q = c. 2. Frb up to 0.4 mm in diam., cup-shaped, slightly stipitate. Sp 6-8 x 2.5-3.5 μm , pip-shaped, ellipsoid, slightly flattened on one side; basidia 17-25 x 5-7.5 μm , 4-spored; hairs finely incrustated with aciculate to granulate crystals, thin-walled and frequently collapsing at base, otherwise thick-walled, apex \pm glabrous up to 15 μm , but not flagellately attenuated. On leaves of deciduous trees and on herbaceous stems like *Epilobium angustifolium*; distribution and frequency poorly known, but a number of records from FI (LC), NO, SE (LC).
- F. donkii* Agerer
- Sp Q = c. 1.5. Frb c. 0.3 mm in diam., cup-shaped, sessile, hairy, white. Sp 6.5-8 x 4-5 μm , broadly ellipsoid, flattened on one side, Q = 1.5-1.8 (fig. 247C); basidia 22-30 x 7-8.5 μm , 4-spored; hairs finely granulate, thin-walled and frequently collapsing at base, otherwise thick-walled, with flagellate apex. Distribution and frequency unknown, but one record from DK (DD, EJyl: Livø) on dead stems of the herb *Lycopus*.
- F. orthospora* (Bourdot & Galzin) Berthier & Malençon

Flammula (Fr.) P. Kumm.

STIG JACOBSSON

Pholiota subgen. *Flammula* (Fr.) Singer

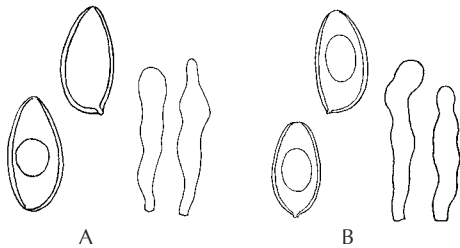
Frb collybioid. Cap 20-80(-120) mm, smooth except for evanescent velar remnants, sticky or greasy when moist, but not distinctly slimy, lustrous when dry, slightly hygrophanous. Gills adnexed to slightly emarginate with a small decurrent tooth, crowded. Stem with a thin ring-zone. Smell weak, pleasant. Taste mild, rarely bitter. Sp deposit rust brown.

Sp subamygdaloid, with germ pore, smooth. Cheilocystidia clavate or variable in shape, thin-walled, hyaline. Pleurocystidia absent. Pileipellis an ixocutis with parallel to flexuous hyphae, pigments parietal and incrusting. Clamps present in all tissues.

Saprotrophic on wood, ± fasciculate.

Two species in the Nordic countries.

Lit.: Holec 2001, Jacobsson 1990, Noordeloos in Bas et al. 1999.



Spores and cheilocystidia: A: *Flammula alnicola*, B: *F. pinicola*.

1. Frb predominantly yellow, on all kinds of deciduous trees, exceptionally also on *Picea*. Cap 20-80(-120) mm, convex to slightly umbonate, lemon to bright yellow, sometimes with appressed, brown velar patches when young, margin watersoaked in moist weather, but not translucently striate; gills adnate, crowded, at first pale yellow-ochre, becoming ferruginous brown; stem 40-100 × 4-10 mm, cylindrical or often with tapering base, pale yellow above the disrupted and disappearing ring-zone, downwards gradually rusty brown; smell weakly fragrant; taste generally mild, rarely bitter. Sp 7-10.5 × 4-5.5 μm, subamygdaloid (fig. 787A); cystidia ± clavate, but very variable in shape. Generally on decayed wood as stumps, old trunks, roots, etc., but sometimes on living, declining trees; autumn, but sometimes already from July; common in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Däh 632, Lud 65.21, Phil 213e, R&H 461, Sieniop 244, ⊙.

F. alnicola (Fr.: Fr.) P. Kumm. (*Pholiota a.* (Fr.: Fr.) Singer, *P. flavida* (Schaeff.: Fr.) Quél. s. auct.)

- Frb predominantly brownish, on *Pinus*, rarely on *Picea*. Cap 30-80 mm, fulvous brown when young and fresh, yellowish when old and dry and then easily confused with *F. alnicola*; stem 50-150 × 7-20 mm, typically tapering towards the base, distinctly fibrillose or with ridges. Sp 7-10.5 × 4-5.5 μm, subamygdaloid (fig. 787B); cystidia ± clavate, but very variable in shape. In dense clusters, generally old stumps, also on the base of old trunks; (late) autumn; occasional, but distribution poorly known and so far only known from hemib.-bore.; FI (DD), NO (LC), SE (LC). – C&D 1256, Holec 154, Jordst 8(3), Lud 65.19.

F. pinicola (Jacobsson) Jacobsson (*Pholiota p.* Jacobsson)

Flammulaster Earle

JAN VESTERHOLT & ERIK RALD

Flocculina P.D. Orton

Frb mycenoid to collybioid. Cap 2-60 mm, conical to convex, later plane, felty to scaly, granulose or mealy, often appendiculate, dry, hygrophanous or not, translucently striate or not, whitish, yellowish, pale ochraceous, buff or ± brown. Gills adnexed, adnate, emarginate or short decurrent, whitish to brownish or rust brown. Stem 7-60 × 0.2-7 mm, cylindrical, dry, fibrillose, finely scaly or granulose in lower part. Veil sometimes forming a fugacious ring zone. Smell and taste indistinct. Sp deposit pale cream or brown.

Sp ellipsoid, phaseoliform, dacryoid, ± rhomboid, fusiform or amygdaloid, smooth, thin- or thick-walled, without or with a small germ pore, hyaline to brown, dextrinoid or without iodine reactions. Cheilocystidia cylindrical, clavate, capitate or lageniform. Pleurocystidia absent. Pileipellis a paraderm or a conioderm. Clamps present.

Saprotrophic on wood, organic litter and soil.

11 species in Nordic countries.

Note: Molecular results show no clear limits towards *Phaeomarasmius* (Petersen et al. in press).

Lit.: Ludwig 2001, Orton 1984, Vellinga 1986, Watling 1967.

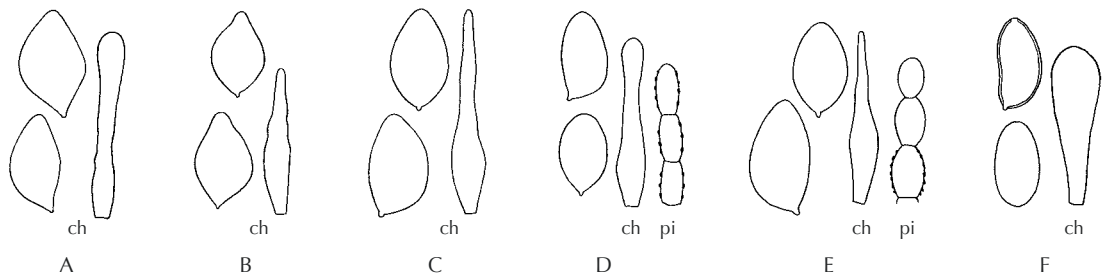


Fig. 779. Spores, cheilocystidia and pileipellis elements: A: *Flammulaster subincarnatus*, B: *F. rhombosporus*, C: *F. carpophilus*, D: *F. ferrugineus*, E: *F. granulosis*, F: *F. muricatus*.

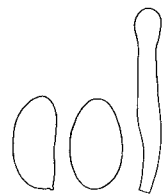


Fig. 781. Spores and cheilocystidia: *Flammulaster limulatus*.

1. Sp deposit pale cream; sp thin-walled 2
 - Sp deposit brown; sp slightly to distinctly thick-walled 5
2. On naked, rich soil in forests; sp 5-7 × 2.5-4 μm. Cap 2-5 mm, hemispherical to convex, slightly granulose to hairy under lens, dark orange brown at centre, paler towards margin; gills medium spaced to distant, cream to pale orange brown; stem 8-13 × 0.2-0.5 mm, cylindrical, with short, appressed hairs, cream at top, orange brown in lower part. Sp amygdaloid to ellipsoid or slightly phaseoliform, thin-walled; cheilocystidia 25-35 × 3-10 μm, cylindrical to narrowly lageniform. Summer to autumn; very rare or overlooked in temp.; DK (DD), SE (NE). – ⊙.
 - F. speireoides* (Romagn.) Watling
 - On plant debris; sp > 7 μm long 3

3. Cheilocystidia cylindrical to lageniform or clavate, sometimes capitate, apex on av > 4 μm broad (fig. 779A). Cap 3-10 mm, hemispherical to low convex, minutely granulose, translucently striate, pale cream with pinkish-ochraceous centre; gills distant, concolorous with the cap; stem 8-20 x 0.5-1 mm, cylindrical or slightly broadened at base, concolorous with cap or paler, slightly whitish flocculose in lower part. Sp 7-10 x 4.5-5.5 μm , amygdaloid to fusiform, thin-walled, often collapsed; cheilocystidia 30-45 x 4-8 μm . On many kinds of plant debris, e.g. *Salix* leaves, *Fagus* fruits, cupules and leaves, grass leaves, etc.; summer to autumn; very common in temp.-hemib., occasional in bore., in FI north to PeP; DK (LC), FI (LC), NO (NE), Østf: Hvaler, Rygge), SE (LC). – FAD 124F, F1, Lud 25.11, ☉.
- F. subincarnatus* (Joss. & Kühner) Watling (*F. carpophilus* (Fr.) Earle var. *subincarnatus* (Joss. & Kühner) Vellinga)
- Note: *Tubaria pallidospora* J.E. Lange described from wood chips is similar and possibly identical.
- Cheilocystidia lageniform, apex on av < 4 μm broad 4
4. Sp \pm rhomboid with a pronouncedly papilla-like apex (fig. 779B). Cap 4-12 mm, conical to convex, granulose, whitish to pale ochraceous; gills medium spaced, ochraceous; stem 5-25 x 0.5-2 mm, slightly widened at base, fibrillose to granulose, concolorous with cap. Sp 7-9.5 x 4-5.5 μm , thin-walled; cheilocystidia 35-50 x 3.5-6 μm , lageniform, with a 1-4 μm broad apex. On deciduous twigs and leaves, etc. in damp habitats, less often on leaves of grasses or *Carex*; spring to autumn; occasional in temp.-bore., in FI with a northern distribution, north to Ks; DK (LC), FI (LC), NO (NE), SE (LC). – Lud 25.9.
- F. rhombosporus* (G.F. Atk.) Watling (*F. carpophilus* (Fr.) Earle var. *rhombosporus* (G.F. Atk.) Vellinga)
- Sp amygdaloid to ovoid, without a pronouncedly papilla-like apex (fig. 779C). Cap 3-20 mm, hemispherical to convex, later plane, granulose, cream to pale ochraceous, sometimes with a dirty pink or brownish tinge; gills medium spaced to distant, pale brown; stem 5-20 x 0.5-2.5 mm, cylindrical with slightly widened base, slightly granulose, cream. Sp 7-10 x 4.5-6 μm , thin-walled; cheilocystidia 30-60 x 5-10 μm , lageniform with a 2-3.5 μm broad apex. On leaves of *Salix*, *Fagus*, *Quercus*, etc., very common on leaves of *Salix repens* in coastal dunes in temp.; summer to late autumn; occasional in temp.-suba.; DK (LC), FI (LC), IS (Au), NO (NE), SE (LC). – B&K 4:405, GBW 4:348, Lud 25.8, R&H 463, Ves 383, ☉.
- F. carpophilus* (Fr.) Earle (incl. *F. carpophiloides* (Kühner) Watling)
5. On soil, rarely on woody debris; sp without a germ pore 6
- On dead wood, including sawdust; sp with or without a germ pore 8
6. Sp ellipsoid, not narrowed towards apiculus, distinctly thick-walled. Cap 6-9 mm, low convex to plane, with or without a low umbo, dark reddish brown, with a paler, finely scaly covering; gills distant, rust brown; stem 11-20 x 0.5-2 mm, \pm cylindrical, fibrillose, dark reddish brown. Sp 7-9(-10) x (4-)4.5-5(-5.5) μm ; cheilocystidia 30-45 x 5-12 μm , \pm cylindrical to lageniform or subclavate. On soil in deciduous forests, parks and gardens; autumn; very rare in temp.-suba.; NO (NE), SE (NE, Sk).
- F. gracilis* (Quél.) Watling
- Sp \pm narrowed towards apiculus, slightly thick-walled 7
7. Cap striate in outer part; sp 6-8 x 4-5 μm (fig. 779D); pileipellis with permanent chains of elongate cells. Cap 5-15 mm, low conical to bell-shaped, later convex with or without a broad umbo, finely granulose at centre, rust brown to reddish brown; gills medium spaced to distant, rust brown; stem 7-20 x 0.5-3.5 mm, cylindrical or with a clavate base, pale at top, flocculose and reddish brown below ring zone. Sp ellipsoid to amygdaloid, slightly thick-walled; cheilocystidia 25-35 x 5-8 μm , narrowly clavate, sometimes lageniform. On naked soil in forests, rarely on dead wood; summer to late autumn; occasional in temp.-arc./alp.; DK (LC), FI (DD, EH), FO, NO (NE, ST: Dovre), SE (LC). – C&D 1232, FAD 124E, GBW 4:350, Lud 25.5.
- F. ferrugineus* (Maire) Watling
- Cap not striate; sp 8-10 x 4.5-5.5 μm (fig. 779E); pileipellis of \pm globose to pyriform elements, released as spherocysts. Cap 5-15 mm, conical to bell-shaped, later convex with a

broad umbo, finely granulose, rust brown to dark ochraceous brown; gills medium spaced to distant, brownish, often with an orange tinge; stem 10-40 x 1-3 mm, ± cylindrical, finely flocculose to scaly, concolorous with cap with paler top. Sp ellipsoid to amygdaloid, slightly thick-walled; cheilocystidia 25-75 x 5-6 μm, narrowly lageniform. On naked, rich soil in forests and parks, e.g. under *Petasites*; spring to late autumn or even in mild winters; occasional in temp., rare in hemib.-suba., only two records from NO (NE, M&R: Smøla, Nordl: Narvik); DK (LC), FO, NO, SE (LC). – B&K 4:407, FAD 124C, Lud 25.1, M&J 3, Phil 230a, ☉.

F. granulosis (J.E. Lange) Watling

8. Sp dextrinoid; cheilocystidia often strongly inflated, up to 16 μm broad in lower part. Cap 6-10 mm, convex to low convex, flocculose-granulose, ochraceous brown, paler in outer part; gills distant, dark purplish brown; stem 9-14 x 0.8-1 mm, cylindrical, pale reddish brown with a cream to ochraceous, fibrillose-flocculose covering. Sp 8.5-10.5 x 5-5.5 μm, ovoid, thick-walled; cheilocystidia 25-45 μm long, with a 4-8 μm broad apex, lageniform to utri-form, often non-pedunculate. On deciduous wood; autumn; very rare in middle bore.; NO (NE, Troms: Alta).

F. wieslandri (Fr.) M.M. Moser

- Sp without iodine reactions; cheilocystidia not or only moderately inflated in lower part 9
9. Cap and stem below ring zone with 0.1-1 mm long, slender, conical, crowded warts; cap margin with appendiculate, triangular, 1-2 mm long veil-scales when fresh; pileipellis scales of globose to broadly ellipsoid elements. Cap 5-30 mm, hemispherical to convex, rusty brown; gills medium spaced, at first yellowish, becoming rusty brown; stem 20-50 x 1.5-5 mm, cylindrical or with a clavate base, above the ring zone finely flocculose, yellowish, below ring zone buff to rusty brown. Sp 7-8 x 4-5 μm, ellipsoid to amygdaloid, not or slightly phaseoliform, thick-walled (fig. 779F), with germ pore; cheilocystidia 36-60 x 6-13 μm, clavate with distinctly swollen apex; pileipellis with rather rounded elements. On rotten wood of deciduous trees, especially *Faguss*, also on sawdust; summer to autumn; rare, but locally occasional in temp.-bore., in FI north to InL; DK (EN), FI (DD), NO (NE, Østf: Fredrikstad, Hord: Bergen), SE (NE). – Cet 1436, Lud 25.6, M&J 3. Svp 42:39, ☉.

F. muricatus (Fr.: Fr.) Watling

- Cap and stem below ring zone flocculose, hairy or scaly; cap margin appendiculate or not; pileipellis scales of ± cylindrical elements 10
10. Sp amygdaloid with an acute apex and a distinct germ pore. Cap 10-35 mm, convex to low convex, with appendiculate margin, fulvous to orange sienna; gills medium spaced to crowded, straw-coloured, becoming fulvous cinnamon; stem 20-55 x 1.5-4 mm, ± cylindrical, saffron to pale ochre with straw-coloured top. Sp 7.5-8.5(-10) x 4-5 μm, thick-walled; cheilocystidia 25-35 x 8-14 μm, mostly clavate. On deciduous wood; late summer to autumn; very rare in temp.; DK (LC, Sj: Suserup Skov), SE.

F. nova-silvensis P.D. Orton

- Sp with rounded apex and an indistinct germ pore (fig. 781A). Cap 8-40(-60) mm, convex to expanded, sometimes with a small umbo, granulose, slightly hygrophanous, rusty tawny or orange rusty, becoming cinnamon fulvous or ochraceous buff when dry; gills medium spaced to crowded, ochraceous yellow, becoming brown; stem 20-60 x 2-6 mm, ± cylindrical, rusty tawny with yellowish top. Sp 7-9(-10) x 4-4.5(-5) μm, distinctly phaseoliform in side view, slightly thick-walled; cheilocystidia 20-57 x 6-16(-20) μm, clavate without abruptly swollen apex. On sawdust, logs and stumps; autumn; occasional in hemib.-suba., rare in temp.; DK (EN), FI (LC), FO, NO (LC), SE (LC). – BCat 269, Lud 25.2, R&H 463, Sieniop 228.

F. limulatus (Fr.) Watling var. *limulatus* (*F. limulatoides* P.D. Orton)

var. *lituus* Vellinga differs in sp amygdaloid, not or only slightly phaseoliform in side view, 6.5-8.5(-9) x 4-4.5(-5) μm, with or without an indistinct germ pore; cheilocystidia 28-52 x 5-8 μm, variable, some clavate, but rarely with abruptly swollen apex. On sawdust or wood of deciduous trees or conifers; summer; very rare in temp.; SE.

Flammulina P. Karst.

JAN VESTERHOLT

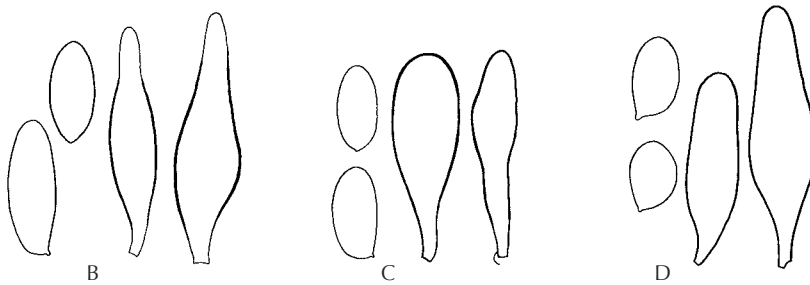
Frb collybioid with yellowish gills and velvety stem. Cap 5-60(-90) mm, smooth, viscid to slimy, whitish or yellow to orange yellow, mostly with darker centre. Gills adnate to emarginate, distant to crowded, white to yellowish. Stem cylindrical or tapering downwards, sometimes rooting, velvety, white to yellow in top, gradually darker brown downwards, often very dark in lower part. Smell insignificant. Taste mild. Sp deposit white to pale yellowish.

Sp ellipsoid to cylindrical, smooth, hyaline, without iodine reactions. Basidia 4-spored. Cheilo- and pleurocystidia mostly utriform to lageniform, thin-walled or slightly thick-walled. Pileipellis an ixotrichoderm on an ixotomentum, often with thick-walled pileocystidia. Clamps present.

Saprotrophic on wood or woody herbs, often fasciculate, often in winter.

Four species in the Nordic countries, five species in the key.

Lit.: Bas 1983, Bas in Bas et al. 1995, Ludwig 2001, Pérez-Butrón & Fernández-Vicente 2007, Redhead & Petersen 1999.



Spores and pleurocystidia: B: *Flammulina elastica*, C: *Flammulina velutipes* var. *velutipes*, D: *F. fenae*.

1. On or near *Ononis spinosa* in calcareous grassland. Cap 5-35 mm, convex to expanded, sometimes umbonate, viscid, honey yellow to pale orange brown, with darker orange-brown centre, translucently striate at margin; gills adnate, distant, yellowish white to pale ochraceous yellow; stem 15-55 x 1-4 mm, narrowed downwards, often rooting, velvety, pale yellow at top, towards base from orange brown and reddish brown to dark brown. Sp 8.5-12.5 x 4.5-5.5 μm , $Q = 1.7-2.5$, narrowly ellipsoid to cylindrical; cheilo- and pleurocystidia 30-55 x 5-15 μm , utriform to lageniform, thin-walled. Often fasciculate; autumn to early spring. *DE*. – Cet 2408, Lud 26.2, M&J 1.

F. ononidis Arnolds (*F. velutipes* (Curtis: Fr.) P. Karst. var. *pratensis* Schief.)

- On wood or roots of deciduous trees, rarely conifers 2
2. Sp 8-11.5 x 3-4 μm (fig. 255B). Cap 7-70 mm, hemispherical to convex, expanding, often with wavy margin, smooth, slimy, yellow to orange, often with brownish centre; gills adnate to emarginate, medium spaced, cream to pale yellow; stem 10-80 x 2-10 mm, cylindrical, often curved, velvety, cream yellow in top, reddish brown to umber towards base; frb often fasciculate. Sp cylindrical, $Q_{av} = 2.3-3$; cheilo- and pleurocystidia 30-70 x 6-20 μm , utriform to clavate or lageniform, thin-walled to slightly thick-walled. On wood of *Salix* and *Populus tremula*; winter; distribution poorly known due to confusion with *F. velutipes*, known from temp., locality in FI unknown; DK, FI. – Lud 26.3.

F. elastica (Lasch) Redhead & Petersen (*F. velutipes* (Curtis: Fr.) P. Karst. f. *longispora* Bas)

- Sp ≤ 10 μm long 3

3. Cap yellow to orange, often with a yellowish brown or reddish brown centre 4
 - Cap white to yellowish buff with ochraceous centre 5
4. Mostly directly on wood and not rooting; sp 6-9.5 x 3-4 μm , Q = 2-2.5 (fig. 255C); pileocystidia mostly embedded or collapsing in the ixocutis. Cap 7-60(-90) mm, hemispherical to convex, expanding, often with a low umbo, smooth, viscid to slimy, yellow to orange, often with a yellowish brown or reddish brown centre; gills adnate to emarginate, medium spaced to crowded, cream to pale yellow; stem 10-80 x 2-10 mm, cylindrical, often compressed, often curved, velvety, cream yellow in top, reddish brown to umber towards base; frb often fasciculate. Sp narrowly ellipsoid; cheilo- and pleurocystidia 30-70 x 6-21 μm , utriform to clavate or lageniform, thin-walled to slightly thick-walled. On dead or living wood or roots of deciduous trees, rarely on conifers; all year, but mainly late autumn to early spring; very common in temp.-hemib., common in bore.-suba., occasional arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 210, Lud 26.1, Phil 115de, R&H 370, Ves 228, ☉.
F. velutipes (Curtis : Fr.) P. Karst. var. *velutipes*
 var. *lactea* (Quél.) Bas differs in having a permanently white to cream cap and sp 7.5-10 x 3-4 μm , Q_{av} = 2.1-2.8; DK.
- Mostly rooting; sp 6-7.5 x 3.5-4.5 μm , Q = 1.5-1.7; pileocystidia typically conspicuously projecting. Cap 15-33 mm, convex to expanded, sometimes with a low umbo, pruinose to slightly viscid, orange yellow to yellowish brown; gills adnate, whitish; stem 50-80 x 2-7 mm, cylindrical, velvety, yellowish brown, darkening from the base upwards, finally becoming blackish brown. Sp ellipsoid to ovoid or amygdaloid; cheilo- and pleurocystidia lageniform. Solitary or fasciculate on deciduous or coniferous wood, especially *Populus*; winter to early spring; distribution poorly known due to confusion with *F. velutipes*, but with a confirmed record from SE.
F. populicola Redhead & Petersen
5. Sp narrowly ellipsoid to cylindrical, Q > 2 see *F. velutipes* var. *lactea* 4
 - Sp ellipsoid, Q = 1.4-1.8 (fig. 255D). Cap 20-60 mm, convex to expanded, smooth, viscid, white to yellowish buff with ochraceous centre; gills adnate to almost free, medium spaced to distant, white to pale cream; stem 25-120 x 1-10 mm, cylindrical with fusiform base, often rooting, velvety, whitish to pale ochraceous at top, downwards from yellowish brown and dull reddish brown to blackish at base; frb often fasciculate or connate. Sp 6-8 x 3-5 μm ; cheilo- and pleurocystidia 40-80 x 10-18 μm , utriform to lageniform, thin- to slightly thick-walled. On roots of deciduous trees, but sometimes apparently on soil, on rich soil; spring to late autumn; rare in temp.-hemib.; DK (LC), NO (NT), SE (VU). – Cet 2766, GBW 3:244, Lud 26.4, M&J 2, ☉.
F. femae Bas (*Collybia velutipes* (Curtis: Fr.) P. Kumm. var. *praecox* F.H. Møller)

Floccularia Pouzar

CHRISTIAN LANGE

Frb tricholomatoid to agaricoid, pyramidal scaly. Cap 30-100 mm, first hemispherical, expanding to plane, dry, white to cream, densely flocculose-tomentose, when young with almost pyramidal, yellowish scales, with age more radially fibrillose, with scattered scales, turning yellowish-brownish, at margin tufted-floccose from velar remnants. Gills adnate, adnexed to slightly emarginate, crowded, whitish, cream to yellow. Stem cylindrical to clavate, whitish, silky whitish above the flocculose, white to yellow ring zone, below dense, tufted flocculose, whitish to yellow. Flesh firm, white. Smell neutral. Taste indistinct. Sp deposit white to cream.

Sp ellipsoid to broadly ovoid, smooth, without germ pore, hyaline, amyloid. Cystidia absent. Pileipellis a trichoderm of irregular, 10-60 μm long cells in short chains. Clamps present.

Saprotrophic; terrestrial on \pm calcareous soil, in xerothermic grassland and in deciduous scrubs. Autumn to early winter.

Two species in the Nordic countries, both very rare.

Lit.: Jensen et al. 1990, Lange et al. 1995.



Spores: *Floccularia rickenii*.

1. Sp 6-9 \times 4.5-5 μm , ovoid to broadly ellipsoid. Cap 50-100 mm, hemispherical to plane, white, first densely scaly, with age more radially fibrillose with few scaly remnants left; gills whitish to yellow; stem 60-100 \times 10-20 mm, cylindrical, whitish flocculose to fibrillose. Primarily in xerothermic grasslands; autumn; very rare in hemib.; NO (CR, Busk: Hole), SE (EN). – Bon 163, GBW 3:247, Jordst 11(2), Nyl 271, Phil 105e (as *luteovirens*).
F. straminea (P. Kumm.) Pouzar
- Sp 4.5-6 \times 3-3.5 μm , broadly ellipsoid (fig. 517A). Cap 30-70 mm, hemispherical to flattened hemispherical, white, covered with pyramidal scales, even when expanded; gills whitish to yellowish cream; stem 30-60 \times 10-30 mm, clavate, whitish, flocculose. Found in *Crataegus* scrub in xerothermic grassland; autumn; very rare in hemib.; SE (CR, Ö1). – Jordst 16(3):21, 25(1):17, Svp 32:12, ⊙.
F. rickenii (Bohus) Wasser

Galerina Earle

GRO GULDEN

Frb mycenoid to collybioid, with main colour range from ochre to red brown. Cap conical, paraboloid or often bell-shaped, expanding to convex often umbonate or with a papilla, rarely plane or slightly depressed, with straight or initially incurved margin, typically membranous or thin-fleshed and translucently striate, generally smooth, very rarely felty to scurfy-subscaly, hygrophaneous, in moist condition mat, shiny, fatty-lubricous, viscid or glutinous, colours varying from pale alutaceous over yellow, fulvous, yellow brown, orange brown, red brown to date brown, generally darker at centre and striae, paler at margin and between striae, drying opaque and pale, sometimes with veil remnants at margin. Gills ascending to horizontal, adnexed, emarginate, adnate or decurrent with a small tooth, medium spaced to slightly, not distinctly distant, edge ± white fimbriate (lens!). Stem fistulose, usually 1-4 mm broad, occasionally up to 15 mm, generally cylindrical or slightly thicker downwards, in some species subclavate to bulbous at base, smooth or fibrillose, top always ± pruinose, in some species pruinose over the entire length, hyaline-whitish, yellow to yellow brown or red brown, in many species becoming date brown, bistre or blackish brown from the base, often with veil remnants. Veil absent or cobweb-like and evanescent, leaving only ± fibrils on the stem, in some species membranous forming a ring, ring-zone or patches, white, yellow or pale beige. Smell mostly insignificant, but farinaceous in a number of species. Taste farinaceous to raphanoid, mild or bitter. Sp deposit ochre to rusty brown.

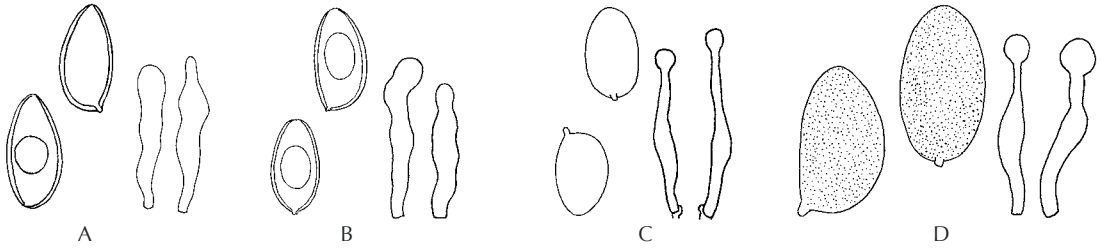
Sp amygdaloid to ellipsoid, in many species with an outdrawn and thin-walled apex (callus), rarely with an apical pore, generally verruculose to rugulose, but often the ornamentation is sublime, and the spores may appear smooth and even by × 1000 only faintly marbled, in a few species truly smooth, mostly with a plage, but in the practically smooth spores this is only discernable as a straight part of the dorsal periphery above the apiculus, sometimes limited above by a tiny hump, pale yellow to deep tawny in 5% KOH, in the keys the colours always refer to KOH mounts, dextrinoid, but without iodine reactions in most of the species with tibiiform cystidia; in a group of species the perispore separates from the main wall and form small blisters or 'ears', particularly in the basal end (calyprate spores), or it splits off ± around the whole surface. Basidia 4-spored, or constantly 2-spored in some taxa. Cystidia always present and their shape and topography of great diagnostic value, tibiiform (figs 787C-D), lageniform (fig. 795A), lageniform-fusiform (fig. 803B) to lageniform-capitate (fig. 796A), utriform or hyphoid-elongate without distinct ventral inflation and then often flexuous, also variously apically inflated (figs 795E, 796D, 797A), often becoming yellow brown or amber with age. Cheilocystidia always numerous, mostly rendering the edge sterile. Caulocystidia always present on top of stem, but in some species present over entire length and only then mentioned in the key. Pleuro- and pileocystidia present in some species. Pileipellis a cutis of radially repent, elongate, sometimes rather short-celled and inflated hyphae; some species with ixocutis on top, formed of narrow ± gelatinized hyphae. Pigment incrusting, asperulate to zebra-like. Clamps generally present and numerous in all tissues, but in some species absent or sporadic.

Saprotrophic, some possibly biotrophic, and at least *G. paludosa* is parasitic; most species grow on bryophytes, including some restricted to *Sphagnum*, others grow on rotting wood or woody or herbal debris, peat, grass turf, humus, sand, silt or clay. Spring and early summer to early winter.

48 species in the Nordic countries, 50 species in the key. Molecular analyses strongly indicate that the genus is polyphyletic. Species of sect. *Naucoriopsis*, e.g. *G. marginata*, contain amanitins and are strongly poisonous.

Lit.: Bon 1992, Bouteville & Moreau 2005, De Haan 1979, 1985, De Haan & Walleyn 2002, 2006, Gulden 1980, 2006, Gulden & Bonsdorff-Salminen 2006, Gulden & Hallgrimsson 2000, Gulden & Vesterholt 1999, Gulden et al. 2005, Kühner 1935, 1972, Smith & Singer 1964, Watling & Gregory 1993.

- | | | |
|----|--|---------------------|
| 1. | Cystidia tibiiform (figs 787C-D, 789A-B); clamps present or absent | Key A p. 787 |
| - | Cystidia not tibiiform; clamps present | 2 |
| 2. | Cheilo- and pleurocystidia as metuloids, thick-walled and ± topped with crystals | 3 |
| - | Metuloids absent | 4 |



Spores and cheilocystidia: A: *Flammula alnicola*, B: *F. pinicola*, C: *Galerina sideroides*, D: *G. subclavata*.

3. Sp very finely punctate, 7-7.5 x 4-4.5 μm ; metuloids amyloid see *Mythicomycetes* p. 907
 - Sp verruculose, (6.5-)-8-10.5(-13) x (4-)-5-6.5 μm , metuloids without iodine reactions see *G. nana* key C 3
4. Sp smooth, ellipsoid, with broad apical germ pore, appearing truncate, without iodine reactions see *Phaeogalera* p. 836
 - Sp practically smooth to distinctly verruculose, \pm amygdaloid, without or with a small germ pore, not truncate, dextrinoid 5
5. Pleurocystidia absent Key B p. 791
 - Pleurocystidia present, sometimes few, but always well differentiated Key C p. 799

Key A: Cystidia tibiiform

1. Sp $\leq 8 \mu\text{m}$ long, ellipsoid with a blunt apex, smooth; without iodine reactions; clamps present 2
 - Sp $> 8 \mu\text{m}$ long, amygdaloid to \pm ellipsoid, practically smooth or verruculose, dextrinoid or without iodine reactions; clamps present or absent 3
2. Cap viscid, shiny, 15-40 mm. Cap bell-shaped to convex-umbonate, somewhat fleshy, up to 4 mm thick at centre, with incurved margin when young, sometimes with veil remnants, striate at margin, yellow, fulvous to red brown; gills adnate-emarginate with tooth, ochre to yellow brown; stem 30-65 x 1.5-4(-6) mm, cylindrical or with \pm clavate base, top pale yellow brown, downwards red brown to bistre; veil leaving \pm fibrils, flocks and patches in the lower two thirds of stem, occasionally with a ring zone; smell and taste faintly farinaceous. Sp 6-8 x 4-5 μm , ellipsoid (fig. 787C), pale yellow brown; basidia 4-spored; cheilocystidia 20-45(-60) x 4-7(-10.5) x 1.5-3 x 2-7(-9.5) μm , narrowly lageniform-capitate to tibiiform, mostly with long necks and small heads. Subfasciculate or in groups on coniferous wood, mostly *Picea*, e.g. stumps, logs, buried wood and debris such as cones and needles, also on sawdust and wood chip piles; autumn, with maximum in late autumn; common in hemib.-bore., occasional in temp. and coniferous suba.; DK (LC), FI (LC), NO (LC), SE (NA). – B&K 5:426, FAD 124H, FND 23:38, M&J 5, R&H 527, .
 - G. sideroides* (Bull.) Kühner (*G. stylifera* (G.F. Atk.) A.H. Sm. & Singer)
 - Cap dry, mat, 7-20 mm. Cap \pm conical to bell-shaped, membranous to slightly fleshy, striate halfway to centre, pale yellow brown to beige; gills adnexed-adnate, beige to pale ochre; stem 15-45 x 1.2-3 mm, elastic-rigid, at top cream to pale ochre, downwards dark red brown to bistre, \pm silvery fibrillose from evanescent veil; smell and taste faintly farinaceous. Sp 6-7 x 4-4.5(-5) μm , ellipsoid, pale yellow brown; basidia 4-spored; cheilocystidia 22-45 x 4-6(-9.5) x 1.5-3(-5) x 2.5-5(-11) μm , narrowly lageniform-capitate to tibiiform, mainly with long necks and small heads. Gregarious to solitary on rotting coniferous wood and debris; summer to autumn, with maximum in early autumn; rare or overlooked in temp.-hemib.; FI (DD), NO (LC), SE (LC). – B&K 5:412.
 - G. camerina* (Fr.) Kühner (*G. pseudobadipes* Joss.)
3. Basidia 2-spored 4
 - Basidia 4-spored 6

4. Clamps absent; sp ellipsoid-amygdaloid (fig. 787D), without iodine reactions; veil evanescent; bryophilous. Cap 5-20 mm, hemispherical to bluntly conical, bright yellow to fulvous, shiny; gills ascending-adnate, medium spaced to distant, yellowish buff to yellow brown; stem 15-50 x 1-2(-3) mm, buff to pale beige, paler than cap, minutely pruinose, with scanty fibrils from veil; smell and taste indistinct. Sp 11-15.5(-17) x (6-)6.5-8 μm , finely verruculose, without plage, pale yellow brown; cheilocystidia 20-38(-62) x 4.5-10.5 x 1.5-4.5 x 2.5-7.5(-9.5) μm ; caulocystidia scattered over entire stem length; pileocystidia scattered. Solitary or in small groups, often in somewhat moist habitats, among grass and moss in coastal sand dunes, meadows, along fens, springs, snow-beds, occasionally among *Sphagnum*; autumn through mild winters; rare in temp.-arc./alp.; DK (NA, Wyl: Børsmose Strand), FI (DD, EH: Tampere), IS, NO (LC), SE. – B&K 5:427, FND 23:32.

G. subclavata Kühner

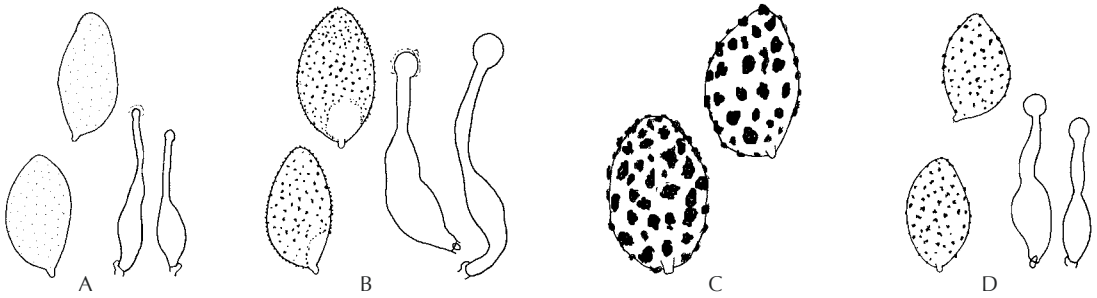
- Clamps present; sp narrowly amygdaloid, dextrinoid; veil substantial; on various debris 5
5. Cystidia 17-29(-48) x 3.5-10 x 1-2 x 1-3 μm , with very thin necks and small heads, some without heads, often with refractive mucilage at apex (fig. 789A); sp practically smooth, with indistinct plage; stem with a distinct, white ring-zone or a narrow, membranous ring and fibrils and scattered patches below. Cap 5-16 mm, young conical to convex, expanding with a prominent umbo, with veil remnants at margin when young, striate at margin, brightly red brown to orange brown, yellowish at margin, strongly fading to whitish ochre or nearly white with centre remaining darker; gills adnexed-adnate or slightly emarginate with a tooth, cream to ochre or yellow brown; stem 12-30(-45) x 0.8-2 mm, pale at top, downwards red brown; smell and taste farinaceous. Sp (9-)10-11(-13.5) x 5-7(-8) μm , pale, ochre to yellow brown. Gregarious, generally on conifer remains like small twigs, buried stumps and roots, in moist, swampy habitats such as banks of creeks and bogs, also among *Sphagnum girgensohnii*; spring to autumn, rarely in late autumn; rare in temp.-bore., in FI north to EnL; FI (LC), NO (LC), SE (LC). – B&K 5:406, 421, FND 11:5.

G. ampullaceocystis P.D. Orton (*G. pseudocamerina* Singer, *G. jösserandii* Kühner nom. nud.)

- Cystidia 25-45(-58) x 4.5-10 x 1.5-3.5 x 2-6(-8.5) μm , mostly with thicker and longer necks and larger heads (fig. 789B); sp verruculose to rugulose with distinct plage; veil remnants on stem generally as white fibrils in lower third, occasionally with a ring-zone or belt when young. Cap 6-15 mm, when young obtusely conical to convex, soon expanded and remaining with a papilla or obtusely umbonate, when old slightly depressed, striate halfway to centre, brightly yellow brown to orange brown, centre and striae red brown, margin pale and occasionally with veil remnants when young; gills fairly distant, adnexed-adnate or slightly emarginate with a small tooth, yellow, ochre to rusty brown; stem 8-30 x 0.5-1.5 mm, cylindrical or clavate-bulbose with an up to 2 mm broad base, often bent or flexuous, evenly yellow brown or paler at top and more red brown from base upwards; smell and taste farinaceous. Sp (8.5-)10-12.5(-13.5) x 5-6(-8) μm , pale tawny. Gregarious, in moist deciduous forests, among dead grass, on various plant debris, e.g. *Erica*, *Carex*, *Juncus* and *Molinia*, and rotting wood, on acid humus rich and clayey soil, also among *Sphagnum*; late spring to autumn; very rare in temp.-hemib.; DK (DD, Sj: Sorø), NO (LC, Vestf: Nøtterøy), SE (NE, Sk). – B&K 5:413, FND 33:42.

G. cinctula P.D. Orton


6. Clamps present; smell and taste farinaceous or not 7
 - Clamps absent or sporadic; smell and taste not farinaceous 10
7. Sp practically smooth see *G. cephalotricha* key B 23
 - Sp distinctly ornamented 8
8. In fairly dry sites among mosses, grass and herbs, calciphilous; smell and taste farinaceous; sp 10-14(-15) x 6-9.5 μm , without iodine reactions. Cap 5-25 mm, hemispherical to bell-shaped or convex-umbonate, somewhat fleshy, with incurved margin when young, faintly



Spores and cheilocystidia: A: *Galerina ampullaceocystis*, B: *G. cinctula*, C: *G. pseudocerina*, D: *G. tibiicystis*.

striate, mat to lubricous, fulvous, apricot to red brown; gills adnate to emarginate, \pm horizontal, medium spaced to distant, pale ochre, yellow brown to red brown; stem 15–40 \times 1–2.5 mm, white to pale beige at top, downwards with shades of cap colour, silky fibrillose from evanescent veil, at base white tomentose. Sp broadly ellipsoid, ovoid or amygdaloid, ornamentation coarse, of irregular ridges and rifts, appearing \pm cracked, with indistinct plage (fig. 789C); cheilocystidia 20–45(–65) \times 3–12 \times 1–3.5 \times 2.5–7 μm ; caulocystidia over entire stem length; pileocystidia absent. In small groups; summer to autumn, occasional in bore.-arc./alp.; FI (NT), FO, IS, NO (LC, incl. Sv), SE (LC). – AAF 2:53, B&K 5:422, NJB 19:691.

G. pseudocerina A.H. Sm. & Singer

- Sphagnicolous; smell and taste not farinaceous; sp (4–)5.5–6.5(–7) μm broad, dextrinoid 9
- 9. Sp amygdaloid, on av $> 6 \mu\text{m}$ wide, in dorsal profile convex, with \pm angular apex, without callus (fig. 789D); stem top of young frb greyish and darker than the gills; stem not fibrillose. Cap 5–33 mm, conical, bell-shaped to convex-umbonate, finally convex to plane, fatty-shiny, ochre, orange brown, red brown or brown; gills ascending to horizontal, adnexed-adnate, pale greyish ochre when young, becoming ochraceous to cinnamon brown; stem 40–100 \times 2–3 mm, minutely pruinose (lens!), pale ochre alutaceous, honey-coloured to evenly brownish, \pm translucent towards base, mostly paler downwards; veil absent. Sp (8–)8.5–11(–13.5) \times (4–)5.5–6.5(–7) μm , verruculose, yellow brown to golden tawny, with indistinct plage; cheilocystidia 27–55(–67) \times 6–9.5(–14) \times 2–4 \times 3–6(–8) μm ; caulocystidia capitate, present over entire stem length; pileocystidia occasional. Gregarious or in small groups in bogs and fens, also in dryer habitats, e.g. with *Sphagnum girgensohnii*; autumn, with peak in Sept.; common in FI, elsewhere occasional in temp.-suba., continental; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:429, BMDS 177:23, FND 33:27, M&J 2, Ves 378, .

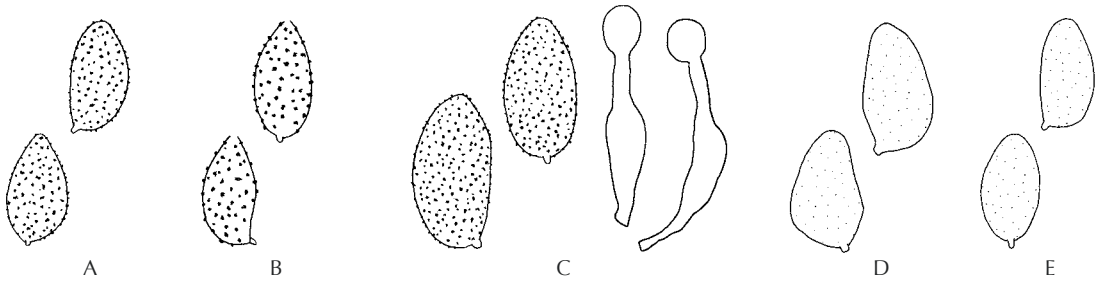
G. tibiicystis (G.F. Atk.) Kühner (*G. mairei* Boutev. & P.A. Moreau)

- Sp narrowly amygdaloid, on av $\leq 6 \mu\text{m}$ wide, in dorsal profile straight to only slightly convex, with acute, triangular apex, mostly outdrawn to a callus (fig. 791A); stem top of young frb translucent and paler than the gills, \pm fibrillose from mycelium at base (not veil). Cap 5–18 mm, when young conical to bell-shaped, expanding to almost plane with a distinct, and often subtransparent umbo, fatty-shiny, red brown when young, then yellow brown to ochre; gills ascending, adnexed-adnate, whitish to pinkish buff when young, becoming yellow brown to red brown; stem 40–100 \times 1.5–3 mm, minutely pruinose (lens!), initially translucent, soon becoming honey-coloured, ochre to beige in exposed parts; veil absent. Sp (7.5–)8.5–11(–11.5) \times 5–6(–6.5) μm , verruculose, with indistinct plage, golden brown to tawny; cheilocystidia 23–55 \times 2.5–10(–12.5) \times 2–3 \times 3–7(–9) μm , with long, thin, \pm attenuated necks that are \pm confluent with the ventral part, occasionally without heads and then \pm fusiform; caulocystidia present over entire stem length, often without heads and appearing \pm vermiform;

pileocystidia occasional. Gregarious or in small groups in bogs and oligotrophic mires, in dry parts, but also on floating mats of *Sphagnum*; summer to autumn with peak in July; occasional in temp.-bore., somewhat oceanic; DK (LC), FI, FO, NO, SE. – BMDS 177:17, FND 23:38 (as *tibiicystis*), R&H 526 (as *tibiicystis*).

G. hybrida Kühner

10. Clamps present at some septa and at base of basidia; sp with an apical germ pore (fig. 791B), faintly dextrinoid. Cap 3-10 mm, broadly conical, then plane to umbonate with reflexed margin, shiny, striate, yellow to fulvous; gills adnexed-adnate, medium spaced to distant, pale yellow to warm ochre; stem 12-30 x 1-1.5 mm, white to pale yellow, distinctly pruinose over entire length and somewhat fibrillose. Sp (7-)9-11 x 4.5-6(-6.5) μm , amygdaloid and \pm angular, with acute apex, fairly thick-walled, verruculose, without plage; cheilocystidia 19-35 x 4-10 x 1.5-2.5 x 2.5-5 μm ; caulocystidia present over entire stem length; pileocystidia \pm scattered. Solitary or in small groups in bogs, peat and moist snow-beds, mostly on *Sphagnum*; summer to autumn; rare in bore.-arc./alp.; FI (LC), FO, IS, NO (LC), SE (LC). – AAF 1:39.
G. stordalii A.H. Sm.
- Clamps absent from all septa; sp without germ pore, without iodine reactions 11
11. Sp distinctly verruculose, rather thick-walled (fig. 791C), not collapsing in mounts of KOH. Cap 5-30 mm, obtusely conical, bell-shaped to convex-umbonate, fatty-shiny, bright yellow to fulvous; gills ascending, adnexed-adnate, pale yellow, then ochre to yellow brown; stem 30-95 x 1.2-2 mm, at base up to 3 mm broad and \pm clavate, whitish to pale yellowish beige or honey-coloured, white silky fibrillose. Sp (9-)11-15(-18.5) x (5-)6-8.5(-9.5) μm , ellipsoid to subamygdaloid, without plage, tawny; cheilocystidia 25-60(-88) x 5-15 x 2-4(-5) x (2-)4-8(-12) μm ; caulocystidia scattered over entire stem length; pileocystidia rare to numerous. Gregarious or in groups in moss, also *Sphagnum*, and among grass, often in wet or moist moss mats at ponds, also in meadows and pastures, grassland and lawns; summer to autumn, very common temp.-arc./alp., but only occasional and locally common in FI; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – AAF 2:51, B&K 5:414, C&D 1218, FND 23:31, Ger 01:382.
G. clavata (Velen.) Kühner (*G. heterocystis* (G.F. Atk.) A.H. Sm. & Singer)
- Sp practically smooth to finely punctate-verruculose, thin-walled, collapsed or not in mounts of KOH 12
12. Sp ≥ 10 μm long, thin-walled (fig. 791D), mostly collapsed in mounts of KOH. Cap 5-17(-26) mm, conical, bell-shaped to convex-umbonate, fatty-shiny, fulvous to ochre; gills ascending, adnexed-adnate, medium spaced to distant, yellow, then warm ochre to cinnamon; stem 15-70 x 1-3 mm, \pm clavate at base, white silky fibrillose. Sp (9.5-)10-12.5(-13) x 5.5-7.5(-9) μm , ovoid-amygdaloid, broadest in the basal part and \pm attenuated towards apex, practically smooth, without plage, golden yellow to yellow amber; cheilocystidia 25-35(-70) x 5.5-12.5 x 2-3(-5) x 2.5-6.5(-10.5) μm ; caulocystidia scattered over entire stem length; pileocystidia rare to occasional. Gregarious in mats of various mosses such as *Calliergon*, *Drepanocladus*, *Philonotis* and *Tomenthypnum*, in moist sites; summer to autumn; common in Svb, elsewhere occasional in arc./alp.; NO (incl. Svb). – AAF 2:49, BMDS 169:18.
G. arctica (Singer) Nezdójm.
- Sp ≤ 10 μm long, thin-walled, but not collapsing 13
13. Sp amygdaloid with narrowing apex and often somewhat angular, on av ≤ 5 μm wide (fig. 791E); cap hemispherical when young, soon expanded and \pm umbonate; among grass in lawns, etc. Cap 5-15(-22) mm, at margin and centre \pm white pruinose, yellow ochre to yellow brown; gills adnexed-adnate or slightly emarginate with a tooth, medium spaced to distant, ochre; stem 18-40 x 1-2(-4) mm, cylindrical or base slightly widened, greyish yellow to honey-coloured, white silky fibrillose, when young with \pm woolly veil remnants. Sp 7-9.5 (-10) x 4-5(-5.5) μm , minutely, but distinctly punctate-verruculose, without plage, pale yellow brown; cheilocystidia 27-43 x 5-7 x 1.5-3 x 2-5 μm ; caulocystidia scattered over entire



Spores and cheilocystidia: A: *Galerina hybrida*, B: *G. stordalii*, C: *G. clavata*, D: *G. arctica*, E: *G. graminea*.

stem length; pileocystidia present. In groups among short mosses and grass, in lawns, pastures, sandy dune grasslands, at roadsides, calciphilous; summer to autumn; very common in temp., common in hemib., rare in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:416, FAD 131B, FND 23:31, R&H 526, ☉.

G. graminea (Velen.) Kühner (*G. laevis* (Pers.) Singer, nom. illeg.)

- Sp ellipsoid-ovoid, not angular, on av $\geq 5.5 \mu\text{m}$ wide (fig. 793A); cap conical when young, expanding with an acute, prominent umbo, among moss in moist forests. Cap 5-14 mm, striate, orange brown, yellow brown to red brown; gills adnate, medium spaced to distant, stem 10-50 \times 1.5-3 mm, cylindrical, yellowish buff to pale brown, pruinose, with fibrillose veil remnants. Sp 8-10 \times 4.5-6.5(-7) μm , practically smooth, without plage, yellow brown; cheilocystidia 28-50 \times 3.5-9 \times 2-2.5 \times 2.5-6 μm , mostly slender with fairly small heads; caulocystidia over entire stem length; pileocystidia present. On litter and on moss-covered logs and stones, in deciduous woods with *Alnus*, *Betula* or *Fagus*; autumn; very rare in temp.-southern bore.; NO (LC, NTr: Steinkjer), SE (Hl: Laholm).

G. similis Kühner

Key B: Cystidia not tibiiform; pleurocystidia absent

1. Caulocystidia present over entire stem length, rendering the stem \pm pruinose. Frb small, similar to *G. vittiformis*; cap 3-9 mm, conical to convex, pale orange brown, striate to centre; gills adnate, medium spaced to distant, slightly paler than cap; stem 14-35 \times 0.5-1.5 mm, initially evenly brownish orange, finally dark red brown at base, with ring-zone from appressed, fibrillose, white veil remnants; smell and taste farinaceous. Sp 9.5-11(-12.5) \times (5.5-6.5-7.5) μm , ovoid-amygdaloid, verruculose-rugulose, with plage; basidia 2-spored; cheilocystidia 38-47 \times 8-13 \times 4.5-6 μm , lageniform to lageniform-fusiform, numerous; caulocystidia similar. NL. – FND 33:23.

G. caulocystidiata Arnolds

- Caulocystidia only at top of stem, not lageniform-fusiform; stem not pruinose 2
 - 2. Sp \pm calyptrate 3
 - Sp not calyptrate 9
3. In old burnt sites, on burnt peat or soil; sp rugulose-verruculose (fig. 793B). Cap 5-20(-29) mm, bell-shaped to convex-umbonate, when fully expanded depressed around an umbo, when young with incurved margin and with veil remnants at margin, fatty-shiny, faintly striate up to 1/3 of radius, rusty brown to dark ochre brown; gills adnate, coloured \pm like the cap, paler when young; stem 15-35(-80) \times 1-3 mm, pale brown, downwards darker, grey brown with age; veil remnants as minute fibrils, occasionally as a weak ring-zone; smell and taste indistinct. Sp 9-10(-11.5) \times 5-5.5(-6) μm , narrowly amygdaloid-ellipsoid, with perispore leaving an apically outdrawn, smooth part and \pm distinct 'ears', with distinct plage, yellow

brown; cheilocystidia (22-)30-40(-50) × (8-)10-13(-15) × 3-5(-8) μm , lageniform to lageniform-fusiform. Subfasciculate and gregarious among low mosses and other carbonicolous fungi; autumn; rare in hemib.; SE (LC, Vg; Trollhättan, Srm: Österhaninge). – Jordst 17(2), Phil 228d, Sterb 12:17.

G. carbonicola A.H. Sm. (*G. phillipsii* D.A. Reid)

- Not in burnt sites; sp practically smooth to minutely verruculose-punctate 4
- 4. Stem (20-)50-100 × 1-3(-4) mm; cap 6-20(-30) mm 5
- Stem 5-50 × 0.5-1(-2) mm; cap 0.5-15 mm 6

5. Lignicolous on woody debris or needles; veil rather copious; sp somewhat angular with a long, conical apex in front view (fig. 793C). Cap 10-12(-30) mm, expanded with a distinct umbo, dark red brown, striate at margin; gills adnate or with small tooth, yellow brown; stem 20-40(-70) × 1-3(-4) mm, \pm widened at base, beige to brown, darkening greyish from base, with weak ring-zone and \pm patches and fibrils from veil; smell and taste farinaceous. Sp 10.5-12 × 6.5-7.5 μm , amygdaloid-angular, with a distinct plage, with 'ears' at base and in apical part, tawny to dark rusty brown; cheilocystidia 33-65 × 5-10 × 3-5 × 4-7 μm , subcylindrical to lageniform with blunt to subcapitate apices. Recorded on *Picea*; autumn; very rare in hemib.; NO (Akh: Oslo).

G. subarctica A.H. Sm. & Singer

- Sphagnicolous; veil evanescent, only leaving minute fibrils on stem; sp not angular (fig. 793D). Cap bluntly conical to bell-shaped, expanding to bluntly umbonate, striate almost to centre, shiny, young red brown, becoming yellow brown to ochre brown with a darker and more fulvous umbo; gills emarginate-adnate to slightly decurrent with tooth, yellowish brown; stem 35-100 × 1-3(-4) mm, cylindrical, somewhat undulating, pale yellowish brown with a paler base; smell and taste indistinct. Sp 9-11(-12) × 6-7.5 μm , ellipsoid to broadly ovoid, with a small pore or callus, smooth, with basal 'ears' or with perispore \pm loosening around entire basal part, with distinct plage, tawny; cheilocystidia 30-60 × 6-11 μm , variable, mostly lageniform with flexuous necks and acute to subcapitate, rarely capitate apices. In bogs; autumn; rare in hemib.; FI (EH: Siikaneva), NO (LC), SE (LC, Sm: Femsjö). – M&J 1.

G. sphagnicola (G.F. Atk.) A.H. Sm. & Singer

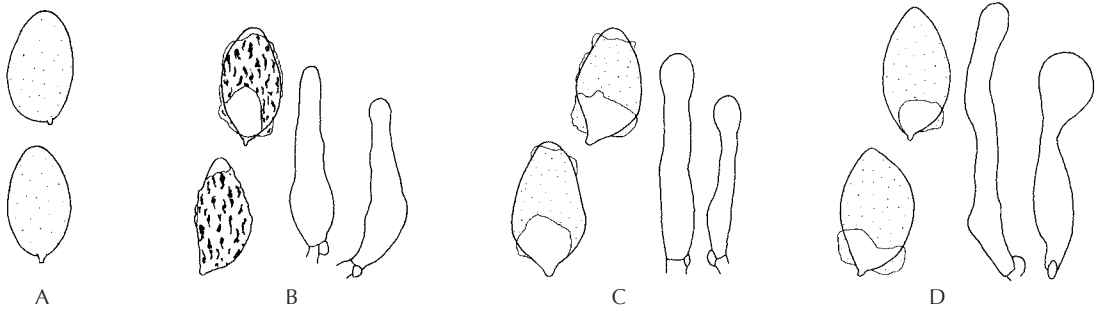
Note: the likewise sphagnicolous *G. farinacea* A.H. Sm. has no veil, a farinaceous smell and taste, and smaller spores, 8-10(-12) × 5-6 μm , and may be distinct, but many species has been described in this complex and observations on smell and taste are generally missing or arbitrary.

6. Sp up to 10-10.5 μm long, weakly to distinctly calyptrate with mostly small blisters, often only near apex and in few sp (fig. 795A). Cap 5-15 mm, broadly conical-paraboloid, expanding to bell-shaped and convex-umbonate, rusty ochraceous brown, fading to yellow brown, striate almost to centre, fatty-shiny; gills adnate to slightly decurrent with a tooth, ochraceous brown to rusty brown; stem 15-35 × 1-1.5(-2) mm, with bulbillose base, with evanescent veil fibrils, pale yellowish at apex, downwards rusty brown; smell and taste farinaceous. Sp (7.5-)8-10(-10.5) × (4.5-)5-5.5(-6) μm , finely verruculose to marbled, tawny; cheilocystidia 30-45 × 6-12 × 5-8 μm , \pm lageniform. On various mosses, on the ground in forests and often on moss-covered stumps and logs; common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – FND 23:4, M&J 11, Ves 378.

G. hypnorum (Schrank : Fr.) Kühner s. Horak 2005 and de Haan & Walleyn 2006

Note: the likewise small-spored *G. fallax* A.H. Sm. & Singer, occasionally with blisters, and *G. fennica* A.H. Sm (described on a single, dry collection, particular by a cap-like thickening over the spore apex) have similar cystidia and are recorded from NO and FI respectively by Smith & Singer (1964), both growing on *Sphagnum*.

- Sp > 10.5 μm long, distinctly calyptrate 7
- 7. Cap at first narrow and acutely to bluntly conical, expanded with a prominent papilla; stem up to 20 mm long, dark red brown from base; veil relatively well developed. Cap 3-9 mm, striate up to 2/3 of radius, fatty-shiny, ochre brown to yellow brown, with \pm veil remnants



Spores and cheilocystidia: A: *Galerina similis*, B: *G. carbonicola*, C: *G. subarctica*, D: *G. sphagnicola*.

at margin; gills rounded to adnate, initially pale yellow, then ochre to yellow brown; stem 5-20 x 0.5-1 mm, cylindrical, often bent, pale yellow brown at top, with veil remnants; smell and taste indistinct. Sp 10.5-13 x 5.5-7 μm , often with blisters at both ends, practically smooth, tawny; cheilocystidia 35-50 x 5-10 x 3-8 μm , lageniform with blunt to somewhat inflated apex. On and among small mosses, on peat, soil and rotting, moss-covered coniferous wood; autumn; occasional in temp.-bore.; NO (LC), SE (LC). – B&K 5:423, M&J 3.

G. calyptrospora Kühner (*G. sahleri* (Quél.) Kühner s. Favre 1948)

- Cap at first bluntly conical-paraboloid, expanding to broadly bell-shaped; stem up to 45 mm long, pale yellow brown to ochraceous brown; veil evanescent 8
8. Young cap fulvous to orange brown; taste farinaceous. Cap 3-15 mm, striate up to 2/3 of the radius, fatty-shiny, becoming ochre yellow to yellow brown at centre; gills adnate, ochre yellow to rusty brown; stem 15-45 x 0.5-1.5 mm, often with bulbillose base, pale and becoming \pm yellow ochre or concolorous with the cap, with faint veil remnants. Sp 10-12.5 x 6-6.5 μm , distinctly calyprate, practically smooth (fig. 795B), orange brown to tawny; cheilocystidia 25-45(-70) x 7-10 x 3-8(-10) μm , lageniform with a blunt to inflated apex. On various mosses, e.g. *Dicranum* and *Sphagnum*, gregarious in acid forests, bogs and ericaceous heathland; autumn; common in FI, elsewhere occasional in temp.-arc./alp.; DK (LC), FI (LC), FO, NO (LC, incl. Svb), SE (LC). – B&K 5:411, FND 23:8, IM 79.

G. calyprata P. D. Orton (*G. cerina* A.H. Sm. & Singer var. *calyprata* (P.D. Orton) Arnolds)

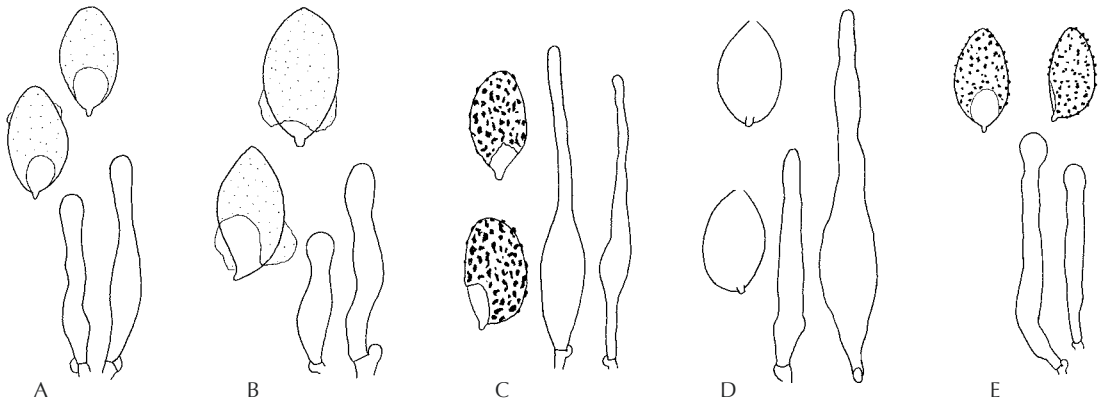
- Young cap yellow brown to tawny; taste not farinaceous. Cap 5-15 mm, fatty-shiny, striate up to 2/3 of the radius, red brown to yellow brown at centre, more ochraceous yellow towards margin; gills adnate, pale ochre to rusty brown; stem 20-45 x 1-2(-3) mm, cylindrical, pale or \pm concolorous with cap, with faint veil remnants. Sp 8.5-12.5 x 5.5-6.5(-7.5) μm , with 'ears' around the apiculus, practically smooth, tawny; cystidia 30-40(-50) x 6-12 x 3-5 x 5-10 μm , variable, in general with \pm inflated ventral part and broad necks with a blunt to clavate-subcapitate apex. Gregarious on mosses like *Polytrichum* and *Dicranum*, also on *Sphagnum* and peat, in bogs, acid forests and ericaceous heathland; late spring to autumn; probably common in temp.-suba.; FI, FO, NO, SE. – FND 23:6.

G. cerina A.H. Sm. & Singer

Note: *G. cerina* has been described with many varieties reflecting considerable variation in shape and size of cystidia and the veil colour, white or yellow. The sphagnicolous *G. leptocystis* V.L. Wells & Kempton, particular by filamentous to narrowly lageniform cheilocystidia with blunt apices, 34-53 x 3.5-6.5 μm , may be just a variety of *G. cerina* or a small variety of *G. sphagnicola* – NO.

- 9. Sp on av < 10 μm 10
- Sp on av > 10 μm 13

10. Bryophilous; veil evanescent; sp tawny, practically smooth with distinct plage and occasional tiny blisters see *G. hypnorum* 6
 - Lignicolous or terricolous, in pastures and sand dunes among grass, mosses and herbs; veil substantial; sp without blisters, smooth or ornamented 11
11. Terricolous, among grass and herbs. Cap 5-22(-30) mm, broadly conical or hemispherical, expanding to almost plane, becoming depressed when old, with margin incurved for a long time, not or faintly striate, shiny, slightly viscid when moist, dark yellow brown to dull rusty brown; gills adnexed to adnate or decurrent with a small tooth, pale yellow brown to rusty brown; stem 12-40 x 0.8-3(-5) mm, cylindrical or slightly thickened downwards, often curved, ochraceous brown at top, downwards soon dark reddish brown to bistre, with a pale fibrillose, almost membranous ring or a distinct ring-zone and \pm distinct fibrils and girdles below; smell and taste farinaceous. Sp 7.5-9.5(-10.5) x 4.5-5.5(-6.5) μ m, amygdaloid-ellipsoid, rarely outdrawn at apex, coarsely ornamented with warts and crusts, with distinct plage, perispore tightly fitting, only occasionally loosening slightly around apiculus (fig. 795C), tawny; cheilocystidia 33-60(-112) x 6-12.5 x (1-)3(-4) x 4.5-5 μ m, narrowly lageniform to lageniform-fusiform with slender necks, rarely subcapitate or rostrate at apex; pileipellis with gelatinized hyphae. Gregarious, in small groups or subfasciculate, among grass and mosses, in natural pastures and sand dunes, calciphilous; summer to autumn; very rare in hemib.; NO (Busk: N. Eiker). – B&K 5:430, C&D 1226, FND 33:20.
G. uncialis (Britzelm.) Kühner
 - Lignicolous or on woody debris, needles, etc. 12
12. Sp almost hyaline, smooth (fig. 795D); frb pale, ochre yellow. Cap 5-10 mm, convex, slightly viscid; gills adnate to decurrent with tooth, yellow; stem 20-45 x 0.5-3 mm, cylindrical or thickened at base, white at top, downwards yellow brown, covered by a fibrillose veil; smell farinaceous. Sp 8-10 x 4.5-5.5 μ m, amygdaloid with \pm protracted apex and pore; cheilocystidia 40-53(-60) x 7-11 x 5-6 x 2.5-6 μ m, lageniform-fusiform to lageniform. On fallen twigs of *Fagus* and *Picea*; late autumn; very rare in temp.-southern bore.; only with a single record from SE (Hl: Halmstad).
G. pallida (Pilát) E. Horak & M.M. Moser (*Velomyцена* p. Pilát)
 - Sp normally dark for the genus, verruculose (fig. 795E); frb much darker. Cap 3-13 mm, acutely conical, then convex with prominent, acute umbo, striate to umbo, mat, pale cinnamon to chestnut brown; gills adnexed to adnate, rarely with a small tooth, ochre to cinnamon brown, slightly paler than cap; stem 10-40 x 8-1.5(-2.5) mm, cylindrical or somewhat widened at base, yellow brown, soon dark red brown and darker than cap, in lower part \pm fibrillose from veil, occasionally also with a ring-zone; smell and taste indistinct to somewhat farinaceous. Sp 6-9 x 3.5-5(-5.5) μ m, amygdaloid-ovoid, with a distinct plage, yellow brown to tawny; cheilocystidia (16-)20-52(-60) x (3-)4-10.5 x 2-5 x 2-6(-8) μ m, subcylindrical, lageniform-fusiform, lageniform to lageniform-subcapitate; pileocystidia sometimes present. Gregarious or in small groups on rotting wood of conifers, esp. *Picea* in damp woodland, more rarely on wood of deciduous trees; from spring (rare) to late autumn; common in hemib.-bore. in FI, elsewhere occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 123b, Ger 01:380, M&J 4, R&H 528, ☉.
G. triscopa (Fr.) Kühner
13. Basidia 2-spored 14
 - Basidia 4-spored 15
14. Bryophilous; cap yellow brown, ochre at margin; stem with a small ring. Cap 4-18 mm, bell-shaped to convex, \pm umbonate, striate up to 2/3 of the radius; gills ascending-adnate, becoming horizontal, distant, medium spaced to distant, pale brownish, later ochre tawny; stem 20-100 x 1-2.5 mm, pale honey-coloured, darkening to rusty brown from base; smell and taste indistinct. Sp 10-14(-19) x 5-7(-7.5) μ m, narrowly amygdaloid, thin-walled at apex,



Spores and cheilocystidia: A: *Galerina hypnorum*, B: *G. calyptrata*, C: *G. uncialis*, D: *G. pallida*, E: *G. triscopa*.

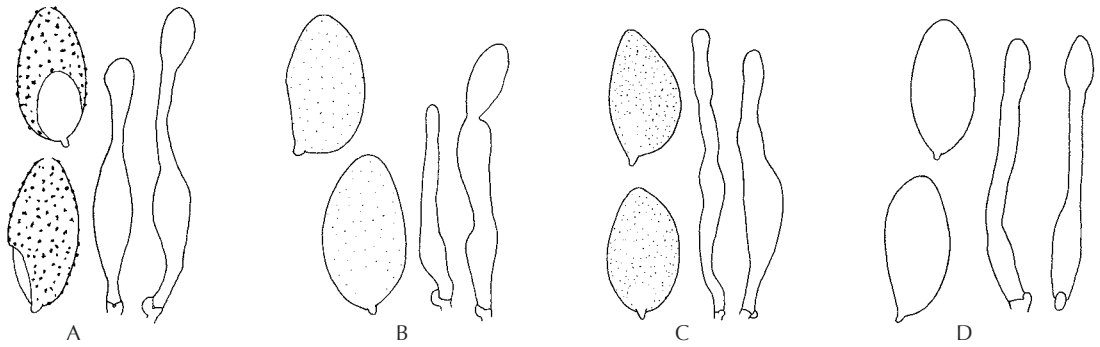
apparently with a pore, finely verruculose, with distinct plage (fig. 796A), tawny; cheilocystidia $35-80 \times 6-10(-15) \times 3-6 \times 3-11 \mu\text{m}$, lageniform-capitate. Scattered to gregarious on moss, not *Sphagnum*, in wet sites such as banks of streams and ponds, along margins of bogs; summer to autumn; occasional in hemib.-bore in FI, elsewhere rare in temp.-arc./alp.; DK (DD), FI (LC), IS, NO (LC), SE (LC). – FND 33:29, Ves 378.

G. jaapii A.H. Sm. & Singer (*G. mycenoides* (Fr.) Kühner)

- Terricolous, on naked peat and soil and among wet moss and grass; cap hazel brown to red brown, yellow brown at margin; without a ring. Cap 1-3 mm, broadly conical, expanding to convex and finally depressed, slightly umbonate, striate up to 2/3 of the radius, fatty to viscid, shiny, red brown to hazel brown, yellow brown at margin; gills emarginate to adnate, medium spaced to distant, pale yellow, warm ochre becoming brown, \pm like the cap; stem 20-40 \times 1-3 mm, when young with yellow-brown top, becoming evenly ochre brown to red brown from base, somewhat silky fibrillose from veil; smell and taste indistinct. Sp 12-14.5 \times 6.5-8(-9) μm , ellipsoid-amygdaloid, marbled, with an indistinct plage (fig. 796B), rather pale yellow brown; cheilocystidia 35-50 \times 6-11 \times 3-4.5 \times 2.5-12.5 μm , lageniform or lageniform-capitate, head often wider than ventral part. Gregarious among wet moss in grass snowbeds, also on naked peat and soil; autumn; rare in suba.-arc./alp.; FI, FO, IS (Na), NO (LC), SE (LC).

G. lubrica A.H. Sm. (*G. pseudotundrae* Kühner, *Naucoria macrospora* J.E. Lange var. *borealis* F.H. Møller)

15. Cystidia variable, often long, not or only narrowly lageniform, some \pm flexuous-cylindrical, some distinctly inflated at apex, then clavate or capitate with tips as wide or wider than basal part 16
 - Cystidia distinctly lageniform to lageniform-capitate 19
16. Cystidia cylindrical-flexuous, irregular, tapering or apically somewhat inflated, often repeatedly 17
 - Many cystidia with considerably inflated, ovoid to globose heads 18
17. Sp verruculose, with a plage (fig. 796C); veil substantial; strictly alpine, in late melting snowbeds with *Polytrichum sexangulare* and *Salix herbacea*. Cap 3-17 mm, broadly conical to hemispherical, expanding to convex-plane, slightly umbonate, with incurved margin when young, mat, striate up to 1/2 of the radius, cinnamon brown to rusty brown; gills adnate, ascending to horizontal, thickish, ochraceous brown to rusty brown; stem 10-22 \times 1-2 mm, cylindrical, often bent, yellowish ochre, darkening to dark brown from the base, with a



Spores and cheilocystidia: A: *Galerina jaapii*, B: *G. lubrica*, C: *G. chionophila*, D: *G. pumila*.

cream to beige ring or ring-zone, below with fibrils, veil remnants sometimes present also on cap margin; smell and taste indistinct. Sp 10-12.5(-13.5) × (6-)6.5-8 μm, broadly ellipsoid, amygdaloid to citriform, with callus, tawny; cheilocystidia (30-)42-85(-100) × 5-8(-16) × 2-7 μm, cylindrical or narrowly lageniform, often flexuous and constricted, with blunt apex, rarely more acute or rostrate. In groups; autumn; very rare in arc./alp.; one record from NO (LC, Hord: Ulvik). – FND 2:3.

G. chionophila Senn-Irlet

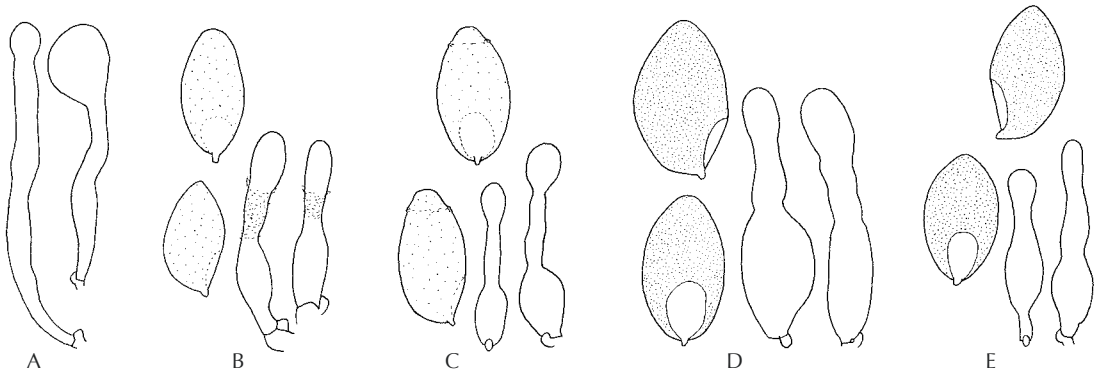
- Sp smooth, without plage (fig. 796D); veil fairly evanescent; in lowland and alpine habitats, on bryophytes such as *Hylocomium*, *Dicranum*, *Ptilidium*, *Polytrichum* and *Racomitrium*. Cap 8-20(-35) mm, hemispherical, conical to bell-shaped, expanding to convex and ± umbonate, striate almost to centre, fatty to viscid and shiny, bright yellow, fulvous to warm yellow brown, at margin often more yellow and centre more rusty brown, white veil remnants often present at margin; gills adnexed-adnate, medium spaced to distant, pale yellow, then rusty yellow brown; stem 20-85 × 1-3 mm, cylindrical or slightly thicker downwards, hollow and often flexuous and brittle, shiny, pale yellow brown, fibrillose from veil remnants; smell and taste indistinct. Sp (8.5-)10-13.5(-15) × (4.5-)5-7(-8) μm, ellipsoid, in frontal view with rounded apex, more amygdaloid in profile, pale fulvous, pale ochre to beige; cheilocystidia 22-60 × 5-11 × (2-)3-5(-7) × (2-)3-8(-10) μm, subcylindrical-sublageniform, with blunt or slightly inflated or beak-like tips with blunt, slightly inflated or rostrate apex, often repeatedly constricted near apex. Bryophilous, often among lichens, in acid forests, ericaceous heathland and mossy, poor grassland; autumn; common in bore.-arc./alp., occasional in temp.-hemib., rare in IS; DK (LC), FI (LC), IS, NO (LC, incl. SvB), SE (LC). – FND 23:12, Ger 01:380, IM 83, ☉.

G. pumila (Pers. : Fr.) M. Lange var. *pumila* (*G. mycenopsis* (Fr. : Fr.) Kühner, *G. vexans* A.H. Sm. & Singer, *G. viscidula* P.D. Orton, *G. nybergii* A.H. Sm.)

18. Sphagnicolous, in bogs; cap yellow to ochre; stem yellowish. Cap 5-11(-16) mm, conical-umbonate, expanding to convex-umbonate, fatty-shiny, striate to the umbo; gills broadly adnate and mostly with a small tooth, ± horizontal, medium spaced to distant, initially white, becoming ochraceous yellow brown; stem 20-40(-70) × 1-1.5(-3) mm, cylindrical or slightly clavate at base, with evanescent veil fibrils; smell and taste farinaceous. Sp 9.5-11(-12) × 5-6(-6.5) μm, amygdaloid, practically smooth, with indistinct plage, yellow brown; cheilocystidia 30-68(-80) × 5-8(-11.5) × 5-7 × 5-12.5 μm, without or with a narrow ventral inflation and many with distinctly inflated, globose tips, some acute or blunt (fig. 797A). Autumn; occasional in hemib.-arc./alp.; FI, NO (LC). – M&J 2.

G. norvegica A. H. Sm. (*G. gibbosa* J. Favre nom. nud.)

- On soil and herbal debris; in swampy sites; cap rusty brown with ochre to yellow margin; stem yellowish at top, red brown to dark brown downwards. Cap 5-20 mm, conical



Spores and cheilocystidia: A: *Galerina norvegica*, B: *G. lacustris*, C: *G. allospora*, D: *G. harrisonii*, E: *G. paludosa*.


to bell-shaped, with papilla to bluntly umbonate, expanding to convex-plane or slightly depressed around the umbo, \pm fatty-shiny, striate up to $1/3$ of radius, initially with faintly incurved margin and often faint veil remnants; gills adnexed-adnate or with a decurrent tooth, \pm horizontal, medium spaced to distant, yellow to ochre brown; stem 15-30(-60) \times 1-2(-3) mm, cylindrical or subbulbous at base, often curved or flexuous, with faint fibrils and sometimes patches from veil; flesh brittle; smell indistinct, taste subfarinaceous. Sp (7-) 9-10(-12.5) \times (4-)5-5.5(-6) μm , ovoid-amygdaloid with conical to rounded apex, practically smooth, faintly marbled, with indistinct plage, without a callus (fig. 797B), pale yellow brown; cheilocystidia (29-)35-55(-70) \times (3-)6-7(-15) \times 2-6(-7) \times (2-)5-9(-22.5) μm , variable, some lageniform, some clavate and mostly with long, narrow base, some narrowly lageniform with inflated, ovoid, cylindrical or rarely rostrate tips, some also subcylindrical or subutriform, sometimes with a collar of incrustations under inflated tip. Gregarious, in moist sites with *Salix*, *Alnus* and *Populus*, in regularly inundated places and dried-up pools, on soil, peat, on and among dead parts of *Scirpus*, *Carex* and *Juncus*; late autumn; very rare in temp.-suba.; IS (Au), NO (AA: Froland), SE (Vg: Vänersnäs, HI: Lindberg). – FND 23:13, 33:32, Jordst 12(1), M&J 5.

G. lacustris A.H. Sm. (*G. tundrae* A.H. Sm. & Singer, *Naucoria permixta* P.D. Orton, *G. p.* (P.D. Orton) Pegler & T.W.K. Young, *G. cephalescens* (T.J. Wallace) Pegler & T.W.K. Young)

19. Sp apically with a faint, band-like thickening (fig. 797C); cheilocystidia with thin necks and mostly a distinctly set, small head. Cap 5-18 mm, bluntly conical to bell-shaped, expanding to convex or almost plane, \pm umbonate, fatty-shiny, striate up to $2/3$ of the radius, with red-brown centre, more yellow at margin, young margin with evanescent veil; gills emarginate-adnate or with a small tooth, honey-coloured, yellow to rusty ochraceous; stem 15-45 \times 1-2.5 mm, cylindrical or base slightly thicker, honey yellow to ochre, with evanescent veil fibrils; taste and smell indistinct. Sp (8-)9.5-12.5(-13.5) \times 5-6.5(-7) μm , ovoid to amygdaloid, at apex often tapering and rounded, practically smooth, with plage, yellow brown; cheilocystidia (25-)30-50(-70) \times 4-10.5(-13.5) \times 2-5 \times 2-7(-9.5) μm , lageniform-capitate, occasionally without heads or rostrate or with secondary heads. In small groups among moss on old *Picea* stumps and litter, also recorded on dead or lightly burnt *Sphagnum* in bogs and on *Sphagnum girgensohnii*, in swampy, acid *Picea* forests; autumn; occasional, but locally common in bore.-suba.; FI (LC), NO (LC), SE (LC). – FND 23:30, IM 81, M&J 4.

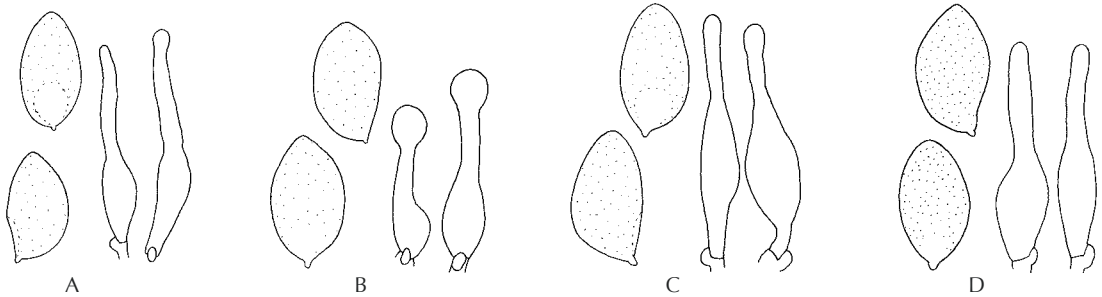
G. allospora A.H. Sm. & Singer (*G. luteofulva* P.D. Orton)

- Sp without apical thickenings; cystidia with generally broader necks, attenuated to blunt or when capitate with more gradually inflated at apex

20. Among *Anthelia juratzkana* and *Polytrichum sexangulare* in late melting alpine snow-beds. Cap 5-15(-25) mm, broadly conical to hemispherical, expanding to almost plane or slightly depressed, initially with incurved margin, mat, striate up to 2/3 of the radius, deep yellow brown to red brown, margin pale from veil remnants; gills emarginate-adnate, \pm horizontal, whitish, warm ochre to yellow brown; stem 5-20 x 1-2 mm, cylindrical, white pruinose at top, yellow brown, bistre from base upwards, with fibrils from veil, occasionally a fibrillose ring-zone; smell and taste indistinct. Sp 11.5-16 x (7.5-)8-9.5(-10.5) μm , ovoid to broadly amygdaloid-ellipsoid, thick-walled, practically smooth, marbled, with plage, callus absent (fig. 797D), tawny; cheilocystidia 45-75 x 7-14 x 3-6 x 2.5-12(-16) μm , lageniform with blunt to inflated apex. Gregarious; autumn; occasional in arc./alp.; FI (DD), FO, IS, NO (LC, incl. Svb), SE (LC). – AAF 1:43.
G. harrisonii (Dennis) Bas & Vellinga (*G. antheliae* Gulden)
- Bryophilous, in forests, bogs, fens and oligotrophic mires 21
21. Sphagnicolous 22
- Not sphagnicolous (but *G. cephalotricha* with almost tibiiform cystidia, occasionally on *Sphagnum*) 23
22. Veil well developed, forming a white ring-zone on the stem and \pm remnants on cap margin and lower part of stem; spring to autumn. Cap 10-28 mm, conical to bell-shaped, expanding to broadly convex, with an acute to rounded umbo, mat, finely felty-scurfy, becoming striate up to 2/3 of the radius, yellow brown to red brown, when young covered by white veil fibrils and appearing greyish brown, with a brim of white veil remnants at margin when young; gills adnate or with a small decurrent tooth, yellow brown to rusty brown; stem 30-120 x 1-4 mm, cylindrical, evenly honey-coloured to yellow brown, paler than cap; smell and taste faintly farinaceous. Sp (7.5-)9-12.5 x 5-7(-8) μm , broadly amygdaloid, often tapering at apex, with a tiny callus, marbled to weakly verruculose, with a distinct plage, with callus (fig. 797E), yellow brown to tawny; cheilocystidia 20-35(-52) x 5-12.5 x 5-8 μm , lageniform to lageniform-capitate. Gregarious or in small groups, on *Sphagnum* in bogs and oligotrophic mires, in dry parts, but also on floating mats, also in wet meadows and swampy forests; very common in temp.-suba., occasional in arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 5:419, C&D 1221, FND 23:14, Ger 01:378, Ves 379, .
- G. paludosa*** (Fr.) Kühner
- Veil evanescent; late autumn. Cap 15-30 mm, when young conical, expanding convex-umbonate, striate almost to the centre, ochre to yellow brown at margin, at centre more red brown, with fugacious veil at the margin when young; gills ascending-adnate, pale beige to yellow brown; stem 30-100 x 1-3 mm, cylindrical or thickened at base, pale beige to yellowish ochre, with scanty veil fibrils; smell and taste faintly farinaceous. Sp (8-)9-11.5(-12.5) x 5-6(-7) μm , amygdaloid to citriform, practically smooth, marbled, with a faint plage (fig. 799A), ochre to pale yellow brown; cheilocystidia (22-)30-40(-68) x 4-9(-13) x 3-4 x 3-7(-12.5) μm , lageniform to lageniform-capitate. Gregarious in bogs, oligotrophic mires and swampy, acid forests; common in hemib.-bore. in FI, elsewhere occasional in hemib.-suba., rare in temp. and arc./alp.; DK (DD), FI (LC), IS (Na), NO (LC), SE (LC). – B&K 5:425, M&J 7.

G. sphagnorum (Pers. : Fr.) Kühner

23. Cystidia distinctly apically inflated (fig. 799B); sp with plage only visible in profile view; smell and taste farinaceous. Cap 5-15 mm, bluntly conical to bell-shaped, expanding to convex, honey-coloured to dull yellow brown, paler towards margin, striate almost to centre, when young with evanescent veil remnants at margin; gills ascending-adnate, pale beige to dull yellow brown; stem 28-60 x 0.5-1.5 mm, cylindrical, slightly clavate to bulbillose at base, evenly buff to hyaline grey brown, with evanescent veil fibrils. Sp (8-)8.5-11.5(-12.5) x 5-6.5 μm , amygdaloid, practically smooth, pale ochre to pale yellow brown; cheilocystidia 21-44 x (2.5-)6-8.5(-10) x 2-3 x 2.5-8(-10) μm , lageniform-capitate, sometimes nearly tibiiform. In small groups on bryophytes such as *Dicranum*, *Polytrichum*, *Ptilidium* and *Hypnum*, also



Spores and cheilocystidia: A: *Galerina sphagnorum*, B: *G. cephalotricha*, C: *G. mniophila*, D: *G. pseudomniophila*.

on *Sphagnum* in forests, not in bogs and mires; autumn; common in bore.-suba, occasional in temp.; DK (DD), FI, FO, NO (LC). – FND 23:11.

G. cephalotricha Kühner (*G. mniophila* (Lasch : Fr.) Kühner var. *cephalotricha* (Kühner) De Haan & Walley)

- Cystidia with a blunt to slightly inflated apex; plage visible, but faint; smell and taste indistinct 24
24. Cap dull brown to olive brown, becoming remarkably pale on drying; gills cream when young, becoming beige and dull brown. Cap 5-15(-20) mm, paraboloid to bluntly conical-convex, with obtuse top, not or weakly umbonate, generally not much expanding, fatty-shiny, striate to 2/3 of the radius, margin with faint veil remnants when young; gills ascending-adnate; stem 17-50(-65) × 1-2(-3) mm, cylindrical or somewhat clavate at base, whitish, then pale honey-coloured to pale brownish, with scattered evanescent veil fibrils. Sp (8-)9.5-12.5 × 5-6.5(-7) μm, amygdaloid, practically smooth, finely marbled, with a faint plage (fig. 799C), pale yellow brown; cheilocystidia (27-)33-50(-70) × 6-10(-12) × (2.5-)3-5 × 3-6(-7) μm, lageniform with a blunt apex or apex slightly clavate to subcapitate. In groups on bryophytes such as *Dicranum*, *Hylocomium* and *Polytrichum*; summer to late autumn; common in temp.-suba., occasional in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – C&D 1222, FAD 131A, FND 23:9, NJB 19:702.

G. mniophila (Lasch : Fr.) Kühner

- Cap brownish ochre to cinnamon brown; gills young ochre, becoming ochraceous brown. Cap 5-15(-20) mm, conical, bell-shaped to convex, striate to 2/3 of the radius; gills ascending, adnexed to adnate; stem 30-50 × 1-2(-3.5) mm, cylindrical, ± clavate at base, nearly hyaline, cream to pale yellow brown, slightly darker in lower part, with traces of veil fibrils. Sp 9.5-12(-14) × (5.5-)6-7(-7.5) μm, amygdaloid, ± protracted at apex, practically smooth, marbled, with almost inconspicuous plage (fig. 799D), yellowish; cheilocystidia 33-47 × 8.5-12 × 3.5-7 × 3.5-10 μm, lageniform, with blunt, clavate or subcapitate apex. In groups on various mosses, in nutrient-poor alpine heathland, *Salix herbacea* snow-beds and in grassland; late summer to autumn; occasional in arc./alp.; FO, NO (LC, incl. Svb). – FND 23:10 (as *mniophila* var. *pseudomniophila*)

G. pseudomniophila Kühner

Key C: Cystidia not tibiiform; pleurocystidia present

1. Caulocystidia present at stem top only; stem not pruinose, generally 2-5(-15 mm) thick; veil present, mostly substantial and leaving fibrils or patches on stem or forming a membranous ring or a ring-zone 2
- Caulocystidia present over entire stem length; stem ± pruinose, in most species

0.5-2 mm thick; veil absent or evanescent, occasionally forming a tiny, fibrillose ring on stem

7

2. Cystidia as metuloids (fig. 801A), appearing thick-walled from adhering mucilage or utriform or broadly lageniform (fig. 801B). 3
 - Cystidia lageniform-fusiform, thin-walled, with acute, blunt to subcapitate apex 5
3. Cheilo- and pleurocystida as metuloids (fig. 801A). Cap 6-20 mm, conical to bell-shaped, expanding to \pm plane, but retaining a central papilla or umbo, with straight margin, fatty-subviscid, striate up to 2/3 of the radius, bright ochre brown with darker, rusty brown centre; gills adnate to decurrent with a small tooth, medium spaced to distant, lageniform, ventricose, \pm ochre, then rusty brown; stem 12-35 \times 1-2(-4) mm, cylindrical or slightly thicker downwards, often flexuous-curved, deep brownish ochre at top, downwards darkening to date brown, finely silky fibrillose to girdled in lower part, occasionally with a weak ring-zone; smell and taste faint, farinaceous-raphanoid. Sp 8-10.5 \times 4-5 μ m, in mainly 2-spored frb 9.5-13 \times 5-6.5 μ m, ovoid-amygdaloid, attenuated towards apex, verruculose, with distinct plage, yellow brown; basidia 4-spored, less often 2-spored, or mixed 1-2-3-spored; metuloids 40-75 \times 10.5-22 \times 6-9.5 \times 6-8 μ m, lageniform to subutriform, numerous; caulocystidia at top of stem similar; pileocystidia absent; gelatinized hyphae present in pileipellis. Gregarious to subfasciculate, often connected to buried particles of wood, on rotting straw, living fern rhizomes, in manured gardens, also in forests on dry sandy soil and in wet alder thickets, also found in flower pots, greenhouses and cellars; autumn to late autumn; rare or overlooked in temp., probably adventive in NO and SE; DK (DD), in NO (LC), SE (LC). – C&D 1224, FAD 127H, FND 33:33.

G. nana (Petri) Kühner

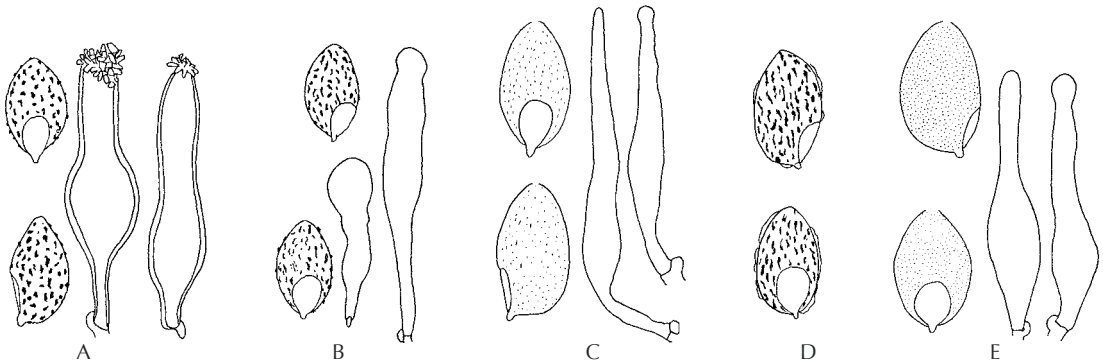
- Metuloids absent, cystidia thin-walled, but adhering mucilage may be present, utriform or broadly lageniform 4
4. Basidia 4-spored; cystidial walls without mucilage (fig. 801B). Cap 10-25(-30) mm, convex with a prominent umbo, with incurved margin when young, striate to 1/3 of the radius, ochre to rusty brown with darker centre, with yellowish veil fibrils at margin when young; gills ascending, adnexed to adnate with a decurrent tooth, medium spaced to distant, yellowish to rusty brown; stem 15-35 \times 1.5-3(-5) mm, \pm widened at base, \pm concolorous with cap, darkening to date brown from base, with a yellowish, fugacious ring-zone and fibrils and patches below; smell and taste indistinct to somewhat farinaceous. Sp 7.5-8.5(-10) \times 4.5-5.5 μ m, amygdaloid-citriform, with callus, rugulose, with distinct plage, tawny; cheilocystidia 30-58 \times 5-12(-20) \times (3.5-)-6-8.5(-15) \times 6-9.5(-13) μ m; pleurocystidia numerous. Late autumn, in moist sites on old, mossy stumps (*Salix*, *Alnus*), scattered to gregarious or fasciculate; UK. – C&D 1225, FND 33:34, 35.

G. salicicola P.D. Orton

- Basidia 2-spored; cystidial walls and tops with \pm adhering mucilage. Cap 5-10(-15) mm, hemispherical to bell-shaped, expanding to plane or depressed with a small umbo, with straight margin, slightly viscid, striate up to 2/3 of the radius, centre dark red brown, more yellow to orange brown towards margin; gills adnexed-adnate to slightly emarginate, medium spaced to distant, broad, at first bright ochre, then rusty ochraceous brown; stem 15-20 \times 1-1.5 mm, slightly bulbous at base, beige, dark brown towards base, when young with a velar ring-zone at top, white fibrillose in lower part; smell and taste indistinct to faintly raphanoid. Sp (7.5-)-8.5-10(-11) \times (4.5-)-5-5.5(-6) μ m, amygdaloid, verruculose-rugulose, with a distinct plage, rusty brown; cheilo- and pleurocystidia 35-60 \times 12-20 \times 8-13 μ m, numerous. In marshy scrubs, esp. *Salix* scrubs, on rotting wood, in acid woods, also in flower pots; late winter and early spring; very rare; DK (DD). – FND 33:18.

G. heimansii Reijnders

5. Basidia 2-spored; stem rigid and becoming very dark from the base upwards. Cap 5-23 mm,



Spores and cheilocystidia: A: *Galerina nana*, B: *G. salicicola*, C: *G. badipes*, D: *G. marginata*, E: *G. pseudomycesis*.

hemispherical to convex, faintly striate, fatty-sticky to viscid when moist, ochre to yellow brown, when young with white veil remnants at margin; gills adnexed to adnate with a tooth, cream to ochre or rusty brown; stem 2-50 x 1.5-3(-4) mm, pale at top, darkening to chestnut brown from base, with \pm distinct veil remnants, at the most with a fibrillose ring-zone and patches and fibrils below; smell indistinct; taste farinaceous to bitter. Sp (7.5-)9.5-12 x (5-)5.5-7 μ m, amygdaloid to narrowly amygdaloid, minutely verruculose-rugulose, with a distinct plage, with a minute apical pore (fig. 801C), yellow brown to tawny; cheilocystidia 35-90 x 7-12(-15) μ m, 2-3 μ m or up to 9 μ m broad at apex when subcapitate, lageniform-fusiform; pleurocystidia similar, numerous; gelatinized hyphae present in pileipellis. Single to subfasciculate, on woody and herbaceous litter, rhizomes of ferns; late summer to autumn; occasional in temp.-suba., rare in arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 5:410, FAD 131F, Ger 01:378, M&J 8. – Poisonous, contains γ -amanitin.

G. badipes (Pers.) Kühner (*G. cedretorum* (Maire) Singer var. *bispora* A.H. Sm. & Singer)

- Basidia 4-spored; stem more soft and fleshy, darkening from base less pronounced 6
- 6. Sp rugulose-verruculose, with a slightly loosening perispore, yellow brown, 7.5-10.5(-13) x 4.5-6.5(-7) μ m (fig. 801D); lignicolous or terricolous. Cap 5-30(-70) mm, generally hemispherical with incurved margin when young, rarely conical, expanding to convex or slightly depressed, rarely umbonate, sticky to viscid and shiny when moist, striate at margin, ochre, yellow brown to red brown; gills adnate or with a small decurrent tooth, pale yellowish to yellow brown; stem 20-70 x (1-)2-5(-10) mm, cylindrical or thicker downwards, becoming fistulose, silky white fibrillose below a membranous ring or a distinct ring-zone, beige at top, downwards greyish brown to dark brown; smell faintly farinaceous; taste mild. Sp amygdaloid, ellipsoid to \pm citriform, with a callus, with a distinct plage; cheilocystidia 28-77(-95) x (5-)8-18 μ m, tapering to 2-4 μ m, apex up to 8 μ m broad when subcapitate, lageniform-fusiform; pleurocystidia similar, numerous; pileipellis with an upper layer of gelatinized hyphae. Gregarious to clustered, generally on rotting coniferous wood such as stumps, branches, duff, chips and sawdust, but also common on larger trunks of deciduous wood, also appearing non-lignicolous when growing in pastures and coastal ericaceous heaths, among grass, bryophytes, herbs and *Calluna*; summer to autumn; very common in temp., common in hemib.-suba., rare in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC) – B&K 5:417, C&D 1228, 1229, Ger 01:378, R&H 527, Ves 379, \odot . – Strongly poisonous, contains α -, β - and γ -amanitins.

G. marginata (Batsch) Kühner s.l.

Note: Probably a species complex; many names in the complex are on record from the Nordic countries, e.g. *G. unicolor* (Vahl) Singer, *G. praticola* (F.H. Møller) P.D. Orton, *G. autumnalis* (Peck) A.H. Sm.

& Singer, *G. helvoliceps* (Berk. & M.A. Curtis) Singer, but distinctive differences are lacking and further studies are needed in the complex.

- Sp practically smooth, with tightly fitting perispore, deep tawny, (8.5-)10-11(-15) x (6-)6.5-8(-10) μm (fig. 801E); in moist, grassy-mossy habitats in suba.-arc. / alp. Cap 5-40(-55) mm, hemispherical with incurved margin when young, expanding to convex or slightly depressed, rarely conical or umbonate, fatty-viscid and shiny when moist, faintly striate at margin, dark red brown to yellow brown; gills adnate or with a small tooth, when young pale yellow brown to ochre, then cinnamon brown; stem 20-50(-80) x 1-4(-6) mm, cylindrical or slightly thicker downwards, becoming hollow, with a thin, membranous ring or ring-zone, below white silky fibrillose, pale yellow brown at top, turning brown to bistre from base; smell farinaceous; taste farinaceous, mild. Sp ovoid to broadly amygdaloid, marbled to minutely rugulose, with a distinct plage and tiny apical pore; cheilocystidia 37-65(-100) x 6-13(-19) μm , tapering to 3.5-6 μm , but up to 10 μm at apex when subcapitate; pleurocystidia scattered, sometimes few; pileipellis with a thin layer of gelatinized hyphae. Gregarious, sometimes forming arcs or rings, among grass and moss in moist, eutrophic sites such as snow-beds, marshes, fens, arctic wet tundra, possibly parasitic (dead, brown moss observed); summer-autumn; common in suba.-arc. / alp.; FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – AAF 1:41, B&K 5:418, M&J 8, NJB 19:694, ☉.

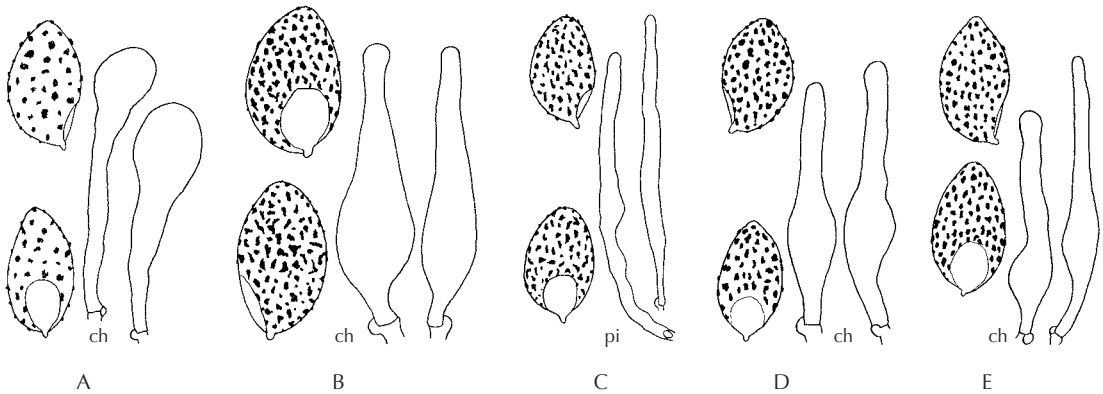
G. pseudomycenopsis Pilát (*G. moelleri* Bas)

7. Cap somewhat fleshy, weakly striate up to about half the radius, \pm scurfy-subscaly at centre; stem up to 3.5 mm broad at base; cystidia utriform or cylindrical-capitate with large heads, abruptly set apart and mostly equally wide as or wider than the ventral part (fig. 803A). Cap 10-22 mm, bluntly conical to bell-shaped, then convex, mat, honey-coloured, yellow brown to tawny; gills adnate, pale beige to dark yellow brown; stem 30-60 x 1-2(-3.5) mm, sometimes thicker at base, \pm white pruinose over the entire length, pale brown at top, dark red brown to blackish brown downwards, with yellow to brown fibrils from the base to near the top; smell indistinct; taste bitter. Sp 10-11.5(-12.5) x 6-7.5 μm , amygdaloid-citriform, verruculose-cracked, with a distinct plage, tawny; cheilo- and pleurocystidia 45-73 x 7.5-22 x 5-9.5 x 8-25 μm , with a strongly elongate basal part, numerous; pileo- and caulocystidia similar, but longer. In moist coniferous and mixed forests, on moss covered, rotting stumps and trunks of deciduous trees (*Betula*, *Alnus*), often reported from coniferous wood; autumn; very rare in bore.-suba.; FI (EH, SoL). – Bres 785, Fav 60:4.1.

G. pruinatipes A.H. Sm. (*Gymnopilus laricicola* J. Favre)

- Cap membranous and distinctly translucently striate-subsulcate to the centre, smooth; stem 0.5-2 mm thick; cystidia lageniform-fusiform 8
8. Pileocystidia present 9
 - Pileocystidia absent 10
9. Pileocystidia lageniform-fusiform, numerous, visible on cap of young, fresh frb (lens!). Cap 3-10 mm, paraboloid, bluntly conical to bell-shaped, distinctly striate-subsulcate to the top, shiny, ochre with a red-brown centre and striae; gills ascending-adnate, pale ochre when young, then yellow brown to red brown; stem 25-50 x 0.5-1.5 mm, pale yellow to ochre at top and brightly red brown from base upwards, generally without visible veil remnants; smell and taste indistinct. Sp 10-13(-16.5) x (6-)7.5-9 μm , amygdaloid, often with outdrawn apex, distinctly verruculose, with a plage (fig. 803B), tawny; basidia 2-spored; hymenial cystidia 42-70 x 12.5-16.5 μm , 2.5-5 μm at apex, lageniform-fusiform with a blunt to subcapitate apex; pileo- and caulocystidia similar. Gregarious or in small groups on bryophytes, esp. *Polytrichum* and *Dicranum*, occasionally *Sphagnum*, in acid forests, lichen heathland, grassland, bogs, on soil and on moss-covered rotting wood; summer to autumn; common in temp.-suba., occasional in arc. / alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 5:407, 420 (as *pruinatipes*), FND 33:24, Ger 01:371.

G. atkinsoniana A.H. Sm.



Spores, cheilocystidia and pileocystidia: A: *Galerina pruinatipes*, B: *G. atkinsoniana*, C: *G. perplexa*, D: *G. vittiformis* var. *vittiformis* f. *tetraspora*, E: *G. vittiformis* var. *vittiformis* f. *bispora*.

Note: several varieties and forms have been described, and the complex needs revision based on molecular studies; f. *quadrispora* Gulden is a 4-spored form with smaller sp 9-11 x 5.5-6.5(-7) μm ; rare – IS (Au, Na), NO.

- Pileocystidia narrower and more seta-like, but thin-walled (fig. 803C), mostly rather few. Cap 7-15 mm, conical, bell-shaped to convex, striate up to 2/3 of radius, yellow to orange brown with paler, more yellow margin; gills adnexed; stem 30-60(-80) x 1-2 mm, pale yellow to ochre, darkening to red brown at base, veil absent or as minute fibrils; smell and taste indistinct. Sp 7.5-10.5 x 5-6.5 μm , broadly amygdaloid, distinctly verruculose, with a plage; hymenial cystidia 50-75 x 9-12, apex 3-4 μm wide; caulocystidia similar; basidia 4-spored; pileocystidia (24-)45-60(-80) x 3.5-7(-10) μm , with apex 2.5-3 μm wide, narrowly fusiform to narrowly lageniform. In small groups on mosses (*Rhytidiadelphus*), among grass, in forests, pastures and grassland; autumn; rare in temp.-middle bore.; DK (DD), IS (Hveragerdi), NO (LC), SE. – FND 2:4, 33:25.

G. perplexa A.H. Sm.

10. Veil absent; smell and taste indistinct 11
 - Veil present, as fibrils or a tiny fibrillose ring on the stem, often also at cap margin; smell and taste farinaceous 12
11. Pleurocystidia numerous; sp distinctly verruculose (fig. 803D). Cap 5-20 mm, conical to paraboloid, expanding to bell-shaped and convex, rarely umbonate, distinctly striate to sulcate almost to the centre, fatty-shiny, young dark rusty brown, then yellow brown, ochre to yellow between striae and towards margin; gills ascending-adnate, young pale yellow, then ochre, yellow brown to rusty brown; stem 20-100 x (0.5-)1-2 mm, densely pruinose, \pm evenly yellow brown, later becoming red brown to chestnut brown from base. Sp 8-10.5(-11) x 5.5-7 μm , ovoid to ellipsoid-amygdaloid, often with tapering apex, distinctly verruculose, with a plage, tawny; hymenial cystidia 31-80 x 6-14(-18), apex 2.5-6(-10) μm , lageniform-fusiform, with a blunt to subcapitate apex; caulocystidia similar. In groups on mosses, such as *Rhytidiadelphus*, *Drepanocladus*, *Racomitrium*, *Hypnum* and *Hylocomium*, often in fairly eutrophic and dry sites, also in more moist sites on *Paludella* and *Tomenthypnum*, in forests, grasslands, dunes, fens; summer to autumn, very common in temp.-bore., common in suba.-arc. / alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 5:434, C&D 1220, FND 33:21, IM 87, Ves 378, \odot .

G. vittiformis (Fr.) Singer var. *vittiformis* f. *tetraspora* A.H. Sm. & Singer var. *vittiformis* f. *bispora* A.H. Sm. & Singer (*G. muricellospora* G.F. Atk., *G. rubiginosa* (Pers.: Fr.) Kühner s. Kühner 1972) has a pale, ochraceous brown, fulvous brown to yellow-brown

cap, contrasting a red-brown to chestnut-brown stem, 2-spored basidia and sp 10-13 x 5.5-7 μm (fig. 803E). Apparently rare; FO, IS (Au, Na), NO. – B&K 5:433 (as *vittiformis* var. *pachyspora*)

Note: several varieties and forms have been described, and the complex needs revision based on molecular studies.

- Pleurocystidia very few; sp faintly ornamented with an indistinct plage. Frb similar to *G. vittiformis*; cap 10-15 mm; gills ascending-adnate, broad, medium spaced; stem 30-50 x 1-2 mm, pruinose; veil absent. Sp 7.5-9.5 x 6-7 μm , broadly amygdaloid, tawny; basidia 4-spored; cheilocystidia 30-45 x 8-12 μm , apex 4-5 μm wide, lageniform-fusiform. Bryophilous; very rare and little known species. – FI.

G. karstenii A.H. Sm. & Singer

12. Stem with a tiny, fibrillose ring in the upper part, pruinose above and \pm fibrillose below the ring. Cap 4-13 mm, conical-convex, ochre, tawny to rusty brown, striate to the centre; gills ascending-adnate, broad, medium spaced to distant, ochre brown to rusty brown; stem 15-30 x 0.5-1(-1.5) mm, gradually becoming evenly rusty brown from base. Sp (10-)11.5-13(-14) x (6.5-)7.5-8.5 μm , amygdaloid, verruculose, with a plage, tawny; basidia 2-spored; cheilo-, pleuro- and caulocystidia lageniform-fusiform. In wet moss, along brooks, ponds and small mires, in acid sites; late summer to autumn; rare in middle bore.-suba.; NO (Oppl: Sel, and Nordl: Tysfjord).

G. annulata (J. Favre) Singer

Note: a 4-spored form with broadly amygdaloid, verruculose, tawny sp, 8.5-10.5 x 5.5-7 μm , awaits formal description. In small groups, on bryophytes, in mossy, moist sites, in fens and late-melting *Salix herbacea* snow-beds, eutrophic sites; autumn; rare in suba.- arc./alp.; IS, NO (incl. Svb). The similar *G. caulocystidiata* Arnolds (p. 791) lacks pleurocystidia.

- Ring absent, veil present as fibrils on stem and often as white brim at cap margin; stem not appearing pruinose in lower part. Cap 3-8 mm, hemispherical, conical to convex, distinctly striate, fatty-shiny, red brown to ochraceous brown, paler at margin; gills adnate, medium spaced to distant, beige, ochre to red brown; stem 15-30 x 0.5-1 mm, yellow to ochre, more red brown downwards. Sp (8.5-)9-11 x 5-7 μm , ovoid to broadly amygdaloid, verruculose, with plage, tawny to yellow brown; hymenial cystidia 42-68 x 8-20 μm , at apex 2.5-7.5 μm wide, lageniform-fusiform with a blunt to subcapitate apex; caulocystidia similar, numerous at stem top, more scanty in basal half. Gregarious in moss cushions, esp. *Racomitrium*, but not growing directly on the moss, on silt and sand in moist pioneer habitats; late summer to autumn; occasional in suba.-arc./alp.; IS (Au, Na), NO (LC). – B&K 5:428.

G. minima (Peck) A.H. Sm. & Singer (*G. terrestris* V.L. Wells & Kempton)

Hebeloma (Fr.) P. Kumm.

JAN VESTERHOLT

Hebelomina Maire

Frb collybioid to tricholomatoid, with viscid cap and often with raphanoid or sweetish smell. Cap slightly hygrophanous or not, glabrous, rarely tomentose, viscid to dry, whitish, pinkish buff, clay buff, cinnamon, umber or sepia. Gills emarginate or adnate, white to pale greyish or pale buff, becoming clay buff to brown, in some species exuding droplets. Stem minutely to coarsely floccose, at least at the top, in many species discolouring brown from the base. Universal veil present or absent, in one species membranous; partial veil cobweb-like or absent. Smell raphanoid in most species, in other species sweetish, like marzipan, cocoa, soap, tea or fruit or indistinct. Taste raphanoid, indistinct or bitter. Sp deposit clay buff to brown.

Sp ellipsoid, amygdaloid or almost citriform, almost smooth to rugose or verrucose under light microscope, SEM shows a fine to coarse ornamentation of branched ridges, in some species with a loosening perispore, dextrinoid or without iodine reactions, a positive reaction best observed after

Gamundia Raitheh.

MACHIEL NOORDELOOS

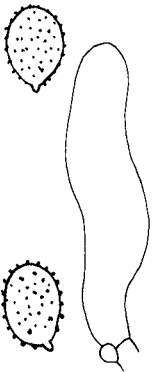
Frb omphalinoid to collybioid. Cap usually hygrophanous and translucently striate, rarely opaque. Gills adnate-emarginate to decurrent. Stem cylindrical, pruinose to floccose, at least at top. Smell none or weakly farinaceous-spermiatic. Taste mild to slightly rancid. Sp deposit white.

Sp ellipsoid, minutely echinulate to verruculose, hyaline, without iodine reactions. Cheilocystidia present. Pleurocystidia mostly present. Pileipellis an ixocutis or cutis of smooth hyphae. Hyphae without iodine reactions. Clamps present.

Saprotrophic, solitary, in small groups or in small clusters, in various biotopes, preferably in coniferous, more rarely in mixed woods, parks and lawns, along roads and paths, among mosses and lichens. Widely distributed, especially in northern temperate zone with some species in arc./alp. regions.

Two species in the Nordic countries.

Lit: Antonín & Noordeloos 2004, Gröger 2006.



Spores and cheilocystidia: *Gamundia striatula*.

1. Cap dark brown or blackish brown, not hygrophanous, not or very faintly translucently striate at outermost margin only; gill edge turning reddish with age; in arc./alp. with *Dryas* and dwarf *Salix*. Cap 15-35 mm, convex to plane; stem 15-40 x 2-3.5 mm. Sp 6-7(-8) x 4.5-5.5(-6) μm , ellipsoid; cheilocystidia 42-80(-98) x 6.5-13 μm , subcylindrical to clavate or pedicellate, scattered. Rare in arc./alp.; NO (NE, Svb). – AAF 2:39, A&N 151, C&D 347, Lud 28.1.
G. arctica (Gulden) E. Ludw. (*Fayodia a.* Gulden)
- Cap reddish brown, yellow brown or grey brown, sometimes with dark brown centre, hygrophanous, distinctly translucently striate, fading on drying; gills edge not changing colour with age; in different habitats. Cap 7-50 mm, hemispherical to convex, expanding to plane with age; stem (10-)15-55 x 1-8 mm. Sp 6-8.5(-9) x (4-)4.5-5(-6) μm , ellipsoid (fig. 279C); cheilocystidia 36-96 x 9-15(-20) μm , clavate, fusiform or lageniform, often pedicellate. Autumn to late autumn; occasional in hemib.-bore, rare in temp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – A&N 04:145, B&K 3:209, C&D 349, 350, FAD 59F, Lud 28.2, ⊙.
G. striatula (Kühner) Raitheh. (*G. leucophylla* (Gillet) H.E. Bigelow, *Fayodia pseudoclusilis* (Joss. & Konrad) Singer)

Gerhardtia Bon

KUULO KALAMEES

Lyophyllum subgen. *Lyophyllopsis* Ew. Gerhardt

One species in the Nordic countries; see description below.

Lit.: Bon 1994, 1999, Gerhardt 1982, Kalamees 2004, Riva 1993.

Frb tricholomatoid to clitocyboid. Cap 30-80 mm, convex to convex-umbonate, slightly wavy at margin, smooth and glabrous, dry, but slightly viscid on umbo, hardly hygrophanous, not translucently striate, buff. Gills sinuate-adnate with a tooth, pale cream. Stem 40-70 x 9-14 mm, cylindrical, sometimes slightly twisted, silky fibrillose, pruinose at top, dry, concolorous with cap, but paler. Taste and smell indistinct or sometimes faintly farinaceous. Sp deposit white.

Sp 4.5-6.5 x 2.5-3.5 μ m, cylindrical-ellipsoid, verruculose (fig. 497E), without iodine reactions. Basidia up to 35 μ m long, conspicuously and constantly siderophilous. Cystidia absent. Pileipellis a trichoderm. Clamps absent.

Saprotrophic in coniferous and deciduous forests, shrubs and open grassland; summer to autumn; rare in hemib.-bore., very rare in temp.; DK (LC), FI (LC), NO (NE), SE (NA, Sm). – Däh 390, Lud 7.8, RdM 30:91-93, SZP 71:203, ZM 48:240bis, ☉.

G. borealis (Fr.) Contu & A. Ortega (*Calocybe civilis* (Fr.) Gulden, *Lyophyllum serius* Romagn., *L. incarnatobrunneum* Ew. Gerhardt, *Gerhardtia i.* (Ew. Gerhardt) Bon, *Calocybe borealis* A. Riva 1988)



Spores.

Gerronema Singer

STEEN A. ELBORNE

Omphalina Quél. s. lato p.p., *Chrysomphalina* Cléménçon p.p.

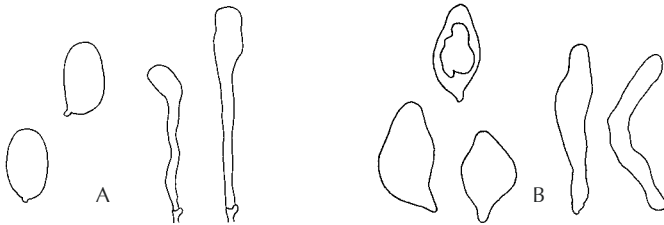
Frb omphalinoid. Cap 10-80 mm, convex to funnel-shaped or umbilicate, smooth, innately radially fibrillose, dry, yellowish to grey brown. Gills decurrent, often forked, white to pale yellowish. Stem 20-60 x 1.5-7 mm, central, white, yellowish to pale grey. Flesh soft to cartilaginous. Sp deposit white to yellowish.

Sp citriform, obpyriform, ellipsoid to dacryoid, smooth, thin-walled, hyaline, without iodine reactions, not metachromatic. Cheilocystidia subcylindrical, clavate or lageniform. Pleurocystidia present or absent. Pileipellis a cutis. Trama in stem and cap sarcodimitic, ± gelatinized. Clamps absent or present.

Saprotrophic on wood or debris. Summer to autumn.

Two species in the Nordic countries.

Lit.: Cléménçon 1982, Ludwig 2001, Norvell et al. 1994.



Spores and cheilocystidia: A: *Gerronema xanthophyllum*, B: *Gerronema minutum*

1. Cap not striate; cheilocystidia present; pleurocystidia absent; clamps present. Cap 15-60 (-80) mm, convex, centre ± depressed to funnel-shaped, with incurved to straight, later wavy and eroded margin, radially dark fibrillose, grey to grey brown, yellowish towards margin, when old cream to ochre brown; gills strongly decurrent, relatively thick, medium spaced to distant, forked and intervenose, with entire edge, white, then cream to pale yellow; stem 20-60 x 2-7 mm, hollow, fibrillose, top pruinose, white, yellowish to pale grey; flesh white, thin; smell faint, herb-like; taste mild to bitter; sp deposit yellowish. Sp (5-)-6-9(-11) x 3.5-5.5(-7) μm , ellipsoid to dacryoid, smooth (fig. 279D), hyaline; basidia 2- and 4-spored; cheilocystidia 30-45 x 6-8 μm , narrowly clavate to subcapitate, thin-walled, hyaline, smooth; pileipellis a cutis. Solitary or in small groups on rotten wood of deciduous trees and conifers and on soil; summer to autumn; occasional in eastern hemib.-southeastern bore., otherwise rare in temp.-bore.; FI (LC), NO (LC), SE (LC). – Bres 259, B&K 3:148, C&D 331, Jordst 25(1):29, Lud 55.8, ⊙.

G. xanthophyllum (Bres.) Norvell, Redhead & Ammirati (*Clitocybe* x. Bres., *Omphalia hypoxantha* Bres., *G. strombodes* (Berk. & Mont.) Singer s. auct., *Chrysomphalina* s. (Berk. & Mont.) Cléménçon)

- Cap translucently striate; cheilo- and pleurocystidia present; clamps absent. Cap 8-19 mm, hemispherical, then convex to plane, centre ± depressed, translucently striate 2/3 towards centre, with incurved, crenulate margin, viscid, whitish to beige with umber brown centre, striate; gills arcuate-decurrent, medium spaced to distant, thin, edge entire, white; stem 8-35 x 1-2.5 mm, cylindrical, stuffed, smooth, polished, viscid, white to pale hazelnut brown; flesh whitish; smell absent; taste unknown; sp deposit unknown. Sp 7.5-9.5 x 4-5.5 μm , obpyriform to citriform (fig. 281A); basidia 4-spored; cheilocystidia 34-81 x 4.5-8.5 μm , subcylindrical to lageniform, thin-walled to slightly thick-walled; pleurocystidia rare, similar to cheilocystidia; pileipellis a cutis, pigment intracellular. In the area only known from an introduced *Nothofagus* plantation in FO (Tórshavn); suba. – ⊙.

G. minutum (Singer & Digilio) Singer (*Armillariella minuta* Singer & Digilio, *Rickenella* m. (Singer & Digilio) Raithelth.)

Gloiocephala Masee

MACHIEL NOORDELOOS

Marasmius sect. *Gloiocephala* (Masee) A.E. Jansen & Noordel.

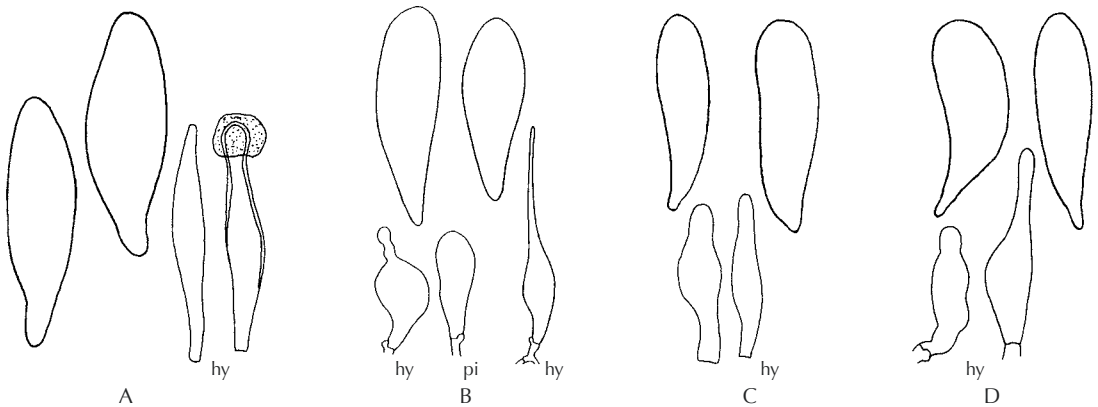
Frb spathulate or crepidotoid with smooth or veined hymenophore. Cap white or pale, rarely distinctly coloured. Gills usually strongly reduced, vein-like, sometimes absent. Stem lacking or reduced, often short, lateral or eccentric. Smell and taste indistinct. Sp deposit white.

Sp ellipsoid, fusiform, subcylindrical, cylindrical or clavate. Pileocystidia mostly present, often also hymenial cystidia, caulocystidia and gloeocystidia. Pileipellis hymeniform; trama gelatinized or not. Clamps present.

Saprotrophic on leaves and stems of monocotyledons (*Graminae*, *Cyperaceae*, *Juncaceae*), usually in wet places, such as swamps and fens.

Three species in the Nordic countries, four species in the key.

Lit.: Antonín & Noordeloos 1993, 2008, Gröger 2006.




Spores, hymenial cystidia and pileocystidia: A: *Gloiocephala menieri*, B: *G. cornelii*, C: *G. caricis*, D: *G. pseudocaricis*.

1. Cap 5-15 mm, brown or ochraceous pink; pileipellis of two types of elements; pileocystidia capitate; on old stems and leaf-sheaths of *Typha*, rarely on *Carex*. Cap convex to plane, radially wrinkled; gills strongly reduced to 1-6 vein-like structures which often do not reach the margin of the cap; stem up to 1 x 0.2 mm, strongly reduced and often invisible in mature frb. Sp 15-22 x 5.5-7.5 μm , fusiform to dacryoid (fig. 257A); hymenial cystidia abundant, 32-100 x 5-12(-20) μm , cylindrical, fusiform to clavate; pileipellis a hymeniderm of clavate, globose or spheropedunculate elements, with thin or thickened walls, 10-30(-40) x 10-20(-25) μm ; pileocystidia abundant near margin of cap, 32-80 x 6.5-12 μm , subcylindrical, fusiform or lageniform, thin- or slightly thick-walled, with brownish mucous cap over apex. Summer to autumn; rare in temp.; DK (DD, Lol). – ⊙.

G. menieri (Boud.) Singer (*Marasmius m.* Boud.)

- Cap 1-5 mm, white to pale ochraceous; pileipellis of one type of elements; pileocystidia not capitate; on different substrates 2
- 2. Gills absent, hymenium smooth or rarely slightly wrinkled; pileo- and caulocystidia very slender, tapering, setiform, 60-120 x 3-10 μm ; on leaf-sheaths of *Cladium mariscus*. Cap 1-2.5 (-4) mm, convex to plane, white to cream with centre turning brown at centre, covered with short hairs; stem 2-10 x 0.15-0.8 mm, lateral or eccentric, white above, brown towards base,

entirely white pubescent. Sp 12-18 x 3.5-6.5 μm , narrowly cylindrical to dacryoid (fig. 257B). Summer to autumn; very rare in temp., but possibly overlooked; DK (DD), SE. – A&N 93 pl. 2, Lud 47.5, .

G. cornelii (Læssøe & Noordel.) E. Horak (*Marasmius* c. Læssøe & Noordel.)

- Gills present; pileo- and caulocystidia not setiform or tapering into a pointed apex; on *Carex* species in marshes and fens 3
- 3. Cap white; gills fold-like, often forked and often not reaching cap margin; basidia 2-spored; sp (12-)16.5-22.5(-24.5) x (4.5-)5-6.5(-7) μm (fig. 257C). Cap 1.5-5 mm, convex to plane, white to pale ochre, finely pruinose; stem 1.5-4 x 0.3-0.5 mm, white at top, pale brown at base, densely white pruinose. Sp 16.5-22.5(-24.5) x (4.5-)5-6.5 μm , cylindrical-ellipsoid to oblong-ellipsoid; hymenial cystidia 25-62 x 4-12 μm , cylindrical, fusiform, lageniform or lecythiform; pileipellis a hymeniderm of broadly clavate to subglobose elements, 10-50 x 6-22 μm , with hyaline or pale yellow, thickened walls; pileocystidia sparse, cylindrical to fusiform, 17-55 x 4-14 μm . In swamps, fens and moist lake shore meadows and forests, in or near the waterline, on the rotting leaves of e.g. *Carex acuta*, *C. vesicaria* and *C. rostrata*; summer to early autumn; rare in bore.; FI (DD), NO (NE, Nordl: Rana), SE (LC). – Lud 47.27.
G. caricis (P. Karst.) Bas (*Marasmius* c. P. Karst.)
- Cap very pale ochraceous pink with paler margin; gills usually well developed and reaching the cap margin; basidia 4-spored; sp (11.5-)14-18(-22) x 4.5-6(-7) μm (fig. 257D). Cap 1-3 mm, hemispherical to convex, pinkish ochraceous; gills distant, L = 3-7; stem 0.5-2.5 x 0.5-1 mm, central, rarely eccentric, pale pinkish ochraceous; entirely white pruinose. Sp (11.5-) 14-18(-22) x 4.5-6(-7) μm , fusiform to cylindrical; hymenial cystidia 27-56 x 5-9(-12) μm , fusiform to lageniform, rarely capitate; pileipellis a hymeniderm of clavate to subglobose or fusiform elements, 12-35 x 5-19 μm , with thickened, hyaline to yellowish walls; pileocystidia 28-62 x 6-19 μm , lageniform. UK.
G. pseudocaricis (Noordel.) Antonín & Noordel. (*Marasmius* p. Noordel.)

Gomphidius Fr.

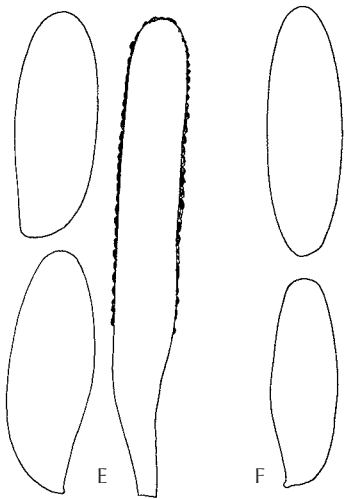
HENNING KNUDSEN & ANDY TAYLOR

Frb clitocyboid with gills becoming dark grey and with glutinous veil. Cap convex, viscid to glutinous. Gills thick, waxy and decurrent, whitish to dark grey. Stem with a ± fugacious, glutinous veil. Flesh whitish or strongly yellow in stem base. Taste mild. Smell indistinct. Sp deposit olivaceous grey to sepia.

Sp dark olivaceous grey, subfusiform. Cheilo- and pleurocystidia cylindrical, smooth or incrust-ed. Pileipellis an ixocutis. Clamps absent in the frb, but possibly present in the basal mycelium.

Ectomycorrhizal with conifers; sometimes occurring in already established mycorrhizae between *Suillus* and species of *Pinaceae* in a relationship that has been suggested to be parasitic ('episymbiotic').

Three species in the Nordic countries.



Spores and hymental cystidia: E: *Gomphidius maculatus*, F: *G. glutinosus*.

1. Cap bright red becoming rusty tawny; flesh unchanging, white. Cap 20-50 mm, soon plane, viscid or greasy, rugose; gills decurrent, whitish then fuscous black; stem 20-40 x 5-10 mm, whitish with a slight tinge of pink, with a glutinous white veil and an weakly defined ring, whitish or slightly yellow at base. Sp 17-20 x 5-5.5 μ m, subfusiform. Solitary or a few together under *Pinus* on acid soil, parasitizing (?) the mycorrhizae between *Suillus bovinus* and *Pinus* sp.; late summer to autumn; common in hemib.-bore., occasional in temp. and coniferous suba., in FI north to InL, in NO north to Finnm: Sør-Varanger; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:74, Däh 111, Phil 271e, R&H 237, Ves 152, 📍.

G. roseus (Fr.: Fr.) P. Karst.

- Cap greyish vinaceous or brownish with darker spots; flesh darkening, strongly yellow in stem base
2. Gills reddening, then blackening when bruised, becoming spotted rust brown, at first whitish grey with a tinge of violaceous, then strongly blackening. Cap 30-60 mm, umbonate to depressed, glutinous, striate at margin, hazel to drab with a brownish tinge, finally almost black; stem 45-75 x 5-10 mm, whitish, spotted with red brown to purplish black scales,

blackening. Sp 17-23 x 6-8 μm , subfusiform (fig. 153E). Mycorrhizal with *Larix* in plantations; late summer to autumn; very rare in temp., occasional in hemib.-suba., in NO north to Troms; DK (NT), FI (LC), FO, IS (NA: Akureyri, Kjarnaskógur), NO (NE), SE (LC). – B&K 3:73, Däh 111, Phil 270d, R&H 237, Ves 153.

G. maculatus (Scop.) Fr. (*G. gracilis* Berk. & Broome)

- Gills neither reddening nor becoming spotted, whitish to grey to vinaceous grey, later fuscous black. Cap 40-130 mm, glutinous, grey, later brown to fuscous black and somewhat vinaceous; gills decurrent, thick; stem to 100 x 10-20 mm, glutinous when young, with a glutinous veil, lemon yellow at the base. Sp 17-20 x 5.5-6.5 μm , subfusiform (fig. 153F). Mycorrhizal with *Picea* on acid soil, solitary or a few together; late summer to autumn; very common in temp. -bore., rare but locally occasional in suba., in NO north to Finnm: Alta; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:71, Phil 271f, R&H 238, Svp 33:17, Ves 152, ☉.
G. glutinosus (Schaeff.: Fr.) Fr.

Gymnopilus P. Karst.

JAN HOLEC

Frb collybioid to tricholomatoid, solitary, in groups or fasciculate, small to large, yellow, ochre, rusty, orange brown, rusty brown, red brown to dark brown, in one species with an olive tinge, in extra-Nordic species also with purple to violet colours. Cap hemispherical, conical, bell-shaped, convex to plane, with obtuse top or a low, broad umbo, glabrous or finely rugulose, fibrillose-to-tomentose to tomentose-finely scaly, mostly dry, not translucently striate, not hygrophanous, rarely slightly lustrous. Gills emarginate and with a decurrent tooth, mostly segmentiform to lageniform, yellow, rusty yellow to orange yellow, then rusty brown, rarely dark brown. Stem cylindrical or broadened towards base, glabrous, fibrillose or fibrillose-tomentose. Partial veil when present leaving ring zone or cortinoid fibrils, in one species with a membranous ring. Smell mostly indistinct. Taste mostly bitter. Sp deposit rusty brown.

Sp ellipsoid, ovoid-ellipsoid, amygdaloid-ellipsoid, amygdaloid, subglobose, verruculose, verrucose to verrucose-rugulose, in some species with a suprahilar depression and/or a suprahilar plage, without a germ pore, yellow rusty to rusty brown, slightly to distinctly dextrinoid. Basidia (2-)4-spored. Cheilocystidia subcylindrical, lageniform, utriform, fusiform, tibiiform, mostly with subcapitate to capitate apex. Pleurocystidia absent or rare. Chrysocystidia absent. Lamellar trama regular. Pileipellis a cutis, sometimes with transition to a trichoderm. Hyphae with incrusting pigment. Clamps present.

Saprotrophic on dead wood, soil, peaty soil, raw humus, peat, burnt wood or burnt ground, one species on grasses, rarely parasitic on roots or at bases of living trees.

10 species known from the Nordic countries, 12 species in the key. Taxa to be expected and requiring critical revision if found: *G. junonius* s. str. (small, glabrous, growing solitary), *G. purpuratus-igniculus* group in greenhouses or man-made thermophilic habitats like burning coal dumps, *G. spadiceus* Romagn., *G. sordidostipes* Hesler, *G. humicola* Singer (for remarks on the latter three taxa see Bon & Roux 2002).

Lit.: Breitenbach & Kränzlin 2000, Høiland 1990, Holec 2005a, b, Ludwig 2000, Orton 1993.

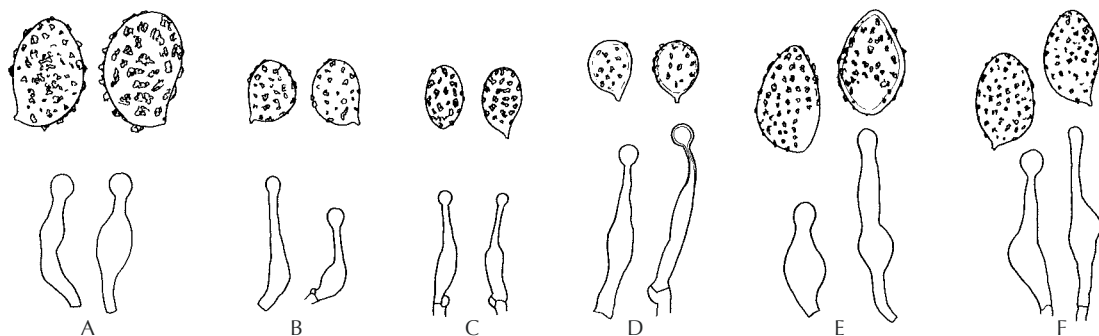


Fig. 859. Spores and cheilocystidia: A: *Gymnopilus spectabilis*, B: *G. flavus*, C: *G. bellulus*, D: *G. josserandii*, E: *G. picreus*, F: *G. penetrans*.

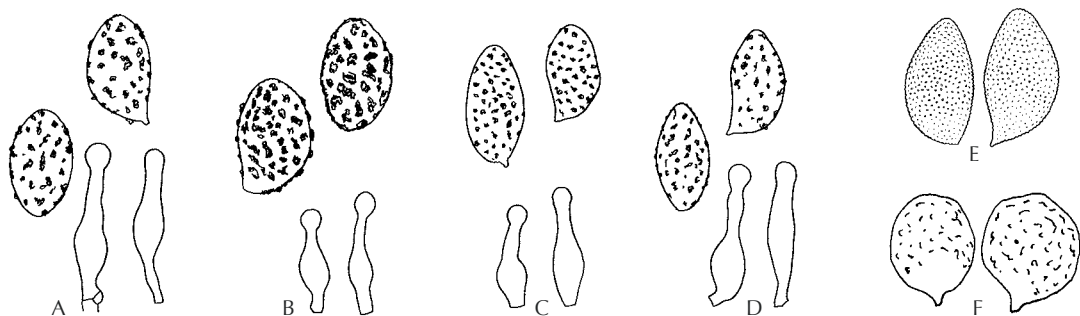


Fig. 861. Spores and cheilocystidia: A: *Gymnopilus sapineus*, B: *G. fulgens*, C: *G. turficola*, D: *G. decipiens*, E: *G. junonius*, F: *G. purpuratus-igniculus*.

1. Frb with a distinct membranous ring, robust, fleshy; cap 50-150(-200) mm; stem 50-150(-200) x 10-40 mm. Cap convex to broadly obtusely conical, yellow, ochre yellow, ochre rusty to rusty orange, tomentose-fibrillose to tomentose-finely scaly, with yellow rusty to rusty brown scales; gills rusty yellow to rusty yellow brown; stem often widened in lower part, up to 100 mm, rusty fibrillose to marbled, yellow to ochre; smell none to aromatical-fruity; taste bitter. Sp (8-)8.5-10.5(-11) x (5-)5.5-7 μm , ellipsoid, ovoid-ellipsoid to amygdaloid-ellipsoid, medium to coarsely verrucose to verrucose-rugulose, with a suprahilar depression and a poorly developed suprahilar plage (fig. 859A); cheilocystidia lageniform, fusiform, utriform, clavate, mostly with a subcapitate to capitate apex; pleurocystidia absent. On dead wood of broadleaved, rarely on coniferous trees, less frequently on roots or bases of living trees; summer to autumn; common in temp., occasional in hemib.-southern bore., in FI north to U; DK (LC), FI (LC), NO (LC), SE (LC). – Holec 05:pl. 3:2-3, pl. 4:1-2, Lud 31.4.A-C, Phil 210a, R&H 482, Ves 342, ☉.
G. spectabilis (Weinm.: Fr.) A.H. Sm. (*G. junonius* (Fr.: Fr.) P.D. Orton s. auct. non Fr.)
 - Frb without distinct membranous ring, at most with a ring zone or fibrils from partial veil, mostly smaller 2
2. Sp on av < 6 μm long 3
 - Sp on av > 6 μm long 5
3. In grassy places in tufts of grasses, typically among *Dactylis glomerata*. Frb rather fleshy, yellow, ochre to rusty ochre, without veil; cap 15-60 mm, fibrillose-tomentose; stem 20-50(-70) x 3-10(-15) mm, with bulbous or fusiform lower part and fusiform to rooting base; taste mild to slightly bitterish. Sp (4.5-)5-6(-6.5) x 3.5-4.5(-5) μm , broadly ellipsoid to ovoid-ellipsoid, exceptionally subamygdaloid to subglobose, coarsely verrucose to verrucose-rugulose, with a slight suprahilar depression, without suprahilar plage (fig. 859B); cheilocystidia cylindrical to narrowly lageniform with obtuse to capitate apex; pleurocystidia absent. In meadows, pastures, at roadsides, etc.; mostly autumn, rarely spring; very rare in temp.-bore.; DK (DD), NO (NE, Troms: Kåfjord), SE (LC). – B&K 5:142, Bres 795 (as *Naucoria flava*), Cet 2671, FAD 123G (as *Flammula flava*), Lud 31.7.
G. flavus (Bres.) Singer (*Flammula dactylidicola* J.E. Lange)
 - On decaying wood 4
4. Cap bright coloured, rusty orange to rusty brown with an orange tinge, slightly lustrous; gills bright, deep yellow, then yellow brown to yellow rusty; sp prolonged, ellipsoid to amygdaloid-ellipsoid, Q = 1.4-1.9, with a distinct suprahilar depression (fig. 859C); cheilocystidia narrowly lageniform with a globose head which is not sharply delimited from the neck. Cap 5-25(-30) mm, hemispherical, conical-convex to convex; stem 10-35 x 1-3 mm, cylindrical, yellow rusty to rusty brown, yellow, rusty fibrillose-tomentose; taste bitter. Sp 4.5-6(-6.5) x 3-3.5(-4) μm , medium to coarsely verrucose, without a suprahilar plage; pleurocystidia absent. On dead wood of coniferous, rarely broadleaved trees; summer to autumn; rare in hemib.-southern bore.; NO (NE, Akh, STr). – B&K 5:141, FND 17:3A, Holec 05: pl. 2:1-3, pl. 3:1, Lud 31.6, M&J 2.
G. bellulus (Peck) Murrill (*G. microsporus* Singer, *Flammula liquiritiae* (Pers.) P. Kumm. s. Bresadola)
 - Cap dull coloured, ochre brown, dark brown to rusty brown, fibrillose-tomentose; gills not bright, dark brown at maturity; sp subglobose, broadly ellipsoid to broadly obovoid, Q = 1.1-1.4, without a suprahilar depression (fig. 859D); cheilocystidia tibiiform with a sharply differentiated globose head, often with slightly thickened and rusty-brown wall. Cap 5-30(-35) mm; gills sordid ochre brownish, then brown, rusty brown to dark brown; stem 10-35(-45) x 1.5-4 mm, cylindrical or gradually thickened towards base, fibrillose-tomentose, concolorous with cap; taste mild. Sp (4-)4.5-6(-6.5) x (3-)3.5-4.5(-5) μm , sometimes with a slightly polygonate outline, without a suprahilar plage, rather thick-walled, verruculose; pleurocystidia absent. On dead wood of conifers, especially on strongly decayed stumps covered with mosses; summer to autumn; DE, NL. – B&K 5:150 (as *subbellulus*), FND 11:pl. 5, Holec 05: pl.1, Lud 31.3, M&J 4.
G. josserandii Antonín (*G. subsphaerosporus* (Joss.) Kühner & Romagn. nom. inval.)

5. On wood, often strongly decayed or hidden in soil, but not on burnt wood or burnt ground 6
 - On peat, raw humus, soil, burnt wood, ash, charcoal, etc. or burnt ground 8
6. Cap orange brown, red brown to reddish rusty brown at centre, but yellow rusty to rusty brown when dry; stem dark rusty brown to umber brown with a red or violet tinge; sp (8-) 8.5-10.5(-11) x (5-)5.5-6.5 μm , coarsely verrucose, with a suprahilar plage, without a suprahilar depression (fig. 859E). Cap 5-40(-55) mm, typically obtusely conical, but also hemispherical or convex, under lens finely tomentose-verruculose, tomentose-finely scaly to rugulose; gills deep yellow for a long time, then rusty yellow brown; stem 10-45(-60) x 1.5-5 mm, flocculose, flocculose-fibrillose to finely fibrillose-tomentose, yellow; taste bitter. Sp amygdaloid in side view, ovoid to ovoid-amygdaloid in front view; cheilocystidia narrowly lageniform or fusiform-lageniform with a subcapitate apex; pleurocystidia absent; pileipellis with large clavate to spheropedunculate terminal cells. On dead wood of coniferous, esp. *Pinus*, rarely on broadleaved trees; summer to autumn; common in hemib.-bore., rare in temp., in NO mostly in eastern, continental areas; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:150, Cet 1339, FND 17:7A, Lud 31.1, Holec 05: pl. 4:3, pl. 5:1-3, Ⓣ.
G. picreus (Pers.: Fr.) P. Karst. (*G. satur* Kühner nom. inval., *G. liquiritiae* (Pers.) P. Karst. s. auct.)
 - Cap and stem without red-brown to reddish-rusty tinges; stem not dark, at most rusty brown; sp on av 7-9.5 x 4-5 μm , medium verrucose to rugulose-verrucose, without a suprahilar plage, with a \pm distinct suprahilar depression 7
7. Hyphae of upper layer of pileipellis narrow, 3-10(-12) μm ; cap principally smooth, but rusty ochre to rusty brown fibrillose-striate or appressed fibrillose-finely scaly, when young covered with white to greyish white tomentose-arachnoid veil; cap flesh pale yellow; young gills pale yellow; stem covered with white tomentose-fibrillose veil remnants. Cap 20-80 (-100) mm, yellow, ochre to rusty brown; gills rusty brown at maturity, often rusty spotted; stem 20-80(-100) x 3-10(-12) mm, with a whitish, soon disappearing annular zone; taste bitter. Sp 7-9(-9.5) x (4-)4.5-5(5.5) μm , ellipsoid to amygdaloid-ellipsoid, medium verrucose to rugulose-verrucose, without a suprahilar plage, with a slight suprahilar depression (fig. 859F); cheilocystidia cylindrical, narrowly fusiform to lageniform, with an obtuse or subcapitate apex; pleurocystidia rare. On dead wood of coniferous, less frequently broadleaved trees; summer to late autumn; very common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:146, Däh 702 (as *hybridus*), 703, Holec 05: pl.6,7, Lud 31.10A-G, Ves 342 (as *sapineus*), Ⓣ.
G. penetrans (Fr.) Murrill (*G. hybridus* (Sowerby) Maire s. Fries, *G. stabilis* (Weinm.) Bon, *G. sapineus* (Fr.: Fr.) Maire s. Høiland 1990)
 - Hyphae of upper layer of pileipellis broad, (4-)6-20 μm , mostly 8-16 μm broad, coarsely incrustated, with clavate to pyriform terminal cells; cap fibrillose-tomentose to tomentose-finely scaly, without veil; cap flesh mostly deep yellow; gills deep yellow when young; stem yellow fibrillose-tomentose. Cap 15-70 mm, deep yellow to ochre at margin, deep ochre rusty to rusty brown at centre; gills rusty at maturity; stem 30-70 x 3-7(-10) mm; taste bitter. Sp 7-9.5(-10.5) x 4.5-5(-5.5) μm , ellipsoid to ellipsoid-amygdaloid, medium verrucose to rugulose-verrucose, without a suprahilar plage, with a suprahilar depression (fig. 861A); cheilocystidia cylindrical, narrowly fusiform to lageniform, with an obtuse to subcapitate apex; pleurocystidia rare or absent. On dead wood of coniferous, rarely broadleaved trees; late spring, mostly summer, rarely autumn; earlier often included in *G. penetrans*, and distribution therefore uncertain; DK (DD). – B&K 5:149 (too pale), Däh 700, Holec 05: pl.8, Lud 31.13A-C, M&J 4.
G. sapineus (Fr.: Fr.) Maire s. Kühner & Romagnesi, Moser, Ludwig, Breitenbach & Kränzlin, Horak, non Fries 1821, Høiland 1990

8. Sp on av 5.5-7 μm broad, coarsely verrucose-rugulose, ornamentation up to 0.8 μm high; stem dark red brown in lower part (fig. 861B). Cap 5-30(-40) mm, bright coloured, orange yellow when young, then orange rusty to red brown, smooth, slightly shiny, margin paler; gills rusty to saffron yellow, then cinnamon rusty; stem 15-40 x 1-3 mm, cylindrical, upper part orange yellow, yellowish pruinose, towards base rusty brown, red brown to blackish brown, yellowish fibrillose; taste mild. Sp (8-)8.5-11(-11.5) x (5-)5.5-7 μm , amygdaloid-ellipsoid, with a suprahilar depression, without a suprahilar plage; cheilocystidia lageniform with a subcapitate to capitate apex; pleurocystidia rare or absent. On peat or peaty soil among *Sphagnum*, other mosses or lichens, in moorlands, peat bogs, etc., also on peaty soil in sand-dune heathland; summer to autumn; very rare in temp.-bore.; DK (DD), FI (DD, EH: Ruovesi), NO (NE), SE (LC). – B&K 5:143, FAD 123E, FND 17:7B, M&J 3, Phil 211d.
G. fulgens (J. Favre & Maire) Singer (*Naucoria cerodes* (Fr.) P. Kumm. s. J.E. Lange)
- Sp on av 4-5.5 μm broad, less distinctly ornamented; stem without dark red-brown colours in the lower part 9
9. Cap with an olive tinge when young; young gills greenish yellow, even with a bluish green tinge at least near cap margin; on peat. Cap 8-40 mm, tomentose-fibrillose, later appressed finely scaly, at first dark brown, later yellow brown to orange brown, centre ochraceous with age; gills yellow to yellow brown at maturity; stem 10-35 x 2-7 mm, fibrillose, pale yellowish, then brownish; smell radish-like on section, after some hours like iodoform or carbol; taste bitter. Sp (7-)7.5-9(-10) x 4-5.5 μm , ellipsoid to subamygdaloid, with a suprahilar depression, without a suprahilar disc (plage), verrucose (fig. 861C); cheilocystidia lageniform, often subcapitate; pleurocystidia scattered, small. Hitherto known only from palsa mires in suba.-arc. / alp.; summer; very rare, in the area only with one record from NO (Finnm: Nesseby, Vadsø). – NJB 21:321-327.
G. turficola M.M. Moser & H. Ladurner
- Cap without an olive tinge; gills without greenish or bluish tinges; on soil, peaty soil, humus or burnt ground 10
10. Sp (8-)9-11(-11.5) x 4.5-5.5(-6) μm . Cap 10-30 mm, bell-shaped, conical to convex, glabrous but silky, dark rusty brown, paler when dry, rusty, fawn orange to ochre brown, at margin with yellowish silky scraps; gills yellow beige, then yellow rusty; stem 20-50 x 1.5-3 mm, upper part pruinose, cylindrical, amber rusty, then rusty brown with a darker base; smell herbaceous to farinaceous; taste bitter, sometimes farinaceous. Sp narrowly ellipsoid-subamygdaloid, finely verrucose, with a suprahilar plage; cheilocystidia lageniform with a subcapitate apex; pleurocystidia rare. Anthracophilous, on burnt sties often overgrown by mosses or heath, in groups or subfasciculate; summer to autumn; NL. – BSMF 95:143-145, FMDS 149:38-40.
G. pseudofulgens Romagn.
- Sp on av < 9 μm long 11
11. Cap dirty yellow brown, dirty rusty brown to greyish brown, distinctly fibrillose-tomentose to tomentose-finely scaly; sp (6.5-)7-9(-10) x (3.5-)4-5(-5.5) μm (fig. 861D); taste mild. Cap 7-30 mm, conical-convex, convex to plane; gills bright yellow, orange yellow, then orange ochre to rusty; stem (10-)20-45 x 2-6 mm, yellow at the top, towards base rusty to brown. Sp ellipsoid-amygdaloid to amygdaloid, with a suprahilar depression, without a suprahilar plage, medium to roughly verrucose; cheilocystidia lageniform-fusiform to utriform, with an obtuse to capitate apex; pleurocystidia rare. Terrestrial, on naked, mostly sandy soil, peaty soil, burnt ground, ash and charcoal, sawdust, in *Picea* or *Pinus* forests; summer; very rare in temp.-middle bore.; NO (NE), SE (LC, Sk). – Lud 31.11, TBMS 43/2:243-244.
G. decipiens (W.G. Sm.) P.D. Orton
- Cap bright coloured: orange red-brown, almost smooth, at most finely fibrillose-finely scaly, sp (6-)6.5-8(-8.5) x (3.5-)4-5(-5.5) μm ; taste bitterish. Cap 10-25 mm, hemispherical, convex to

plane; gills yellow to orange yellow, then with a brown tinge; stem (10-)20-40 × 2-5 mm, fibrillose, yellow brown to red brown. Sp ellipsoid to amygdaloid, verruculose; cheilocystidia lecythiform, lageniform to subutriform with a subcapitate to capitate apex. Terrestrial, on soil, peaty humus soil or burnt ground, in coniferous forests, heath vegetation and mires; summer to august; very rare in temp.-middle bore., only with few records; DK (DD), NO (NT), SE (DD). – Fr 114.3 (as *Agaricus odini*), Lud 31.15.
G. odini (Fr.) Bon & P. Roux

Gymnopus (Pers.) Roussel

MACHIEL NOORDELOOS

Setulipes Antonín, *Collybia* (Fr.) Stauder s. lato p.p.

Frb collybioid, rarely tricholomatoid, with white sp deposit. Cap convex to plane with inflexed or deflexed margin, with or without a slight central depression, rarely with an umbo, glabrous or innately radially fibrillose, dry or slightly viscid, hygrophanous or not, translucently striate or not. Gills emarginate or adnate, rarely almost free, distant to crowded. Stem central, cylindrical, with basal mycelium sometimes with deeply rooting pseudorrhiza, rarely arising from a sclerotium or insititious. Smell variable, from indistinct to sweetish or nasty, like rotten cabbage or garlic. Taste mild to bitter, nasty or acrid. Sp deposit white.

Sp ellipsoid to oblong, rarely subglobose to globose or dacryoid, thin-walled, hyaline. Cheilocystidia cylindrical, flexuous, clavate to irregularly coralloid, rarely with finger-like excrescences (broom-cells). Pleurocystidia generally absent. Pileipellis an (ixo-)cutis of radially orientated cylindrical smooth or rarely slightly diverticulate hyphae, or interwoven, more like a trichoderm, made up of irregular coralloid terminal elements, the so-called dryophila-structure. Clamps present in all tissues.

Saprotrophic, in groups, sometime caespitose, in humus or on wood.

25 species in the Nordic countries, 27 species in the key. The genus *Gymnopus* is polyphyletic, and the limits to *Marasmiellus* are difficult to draw, as is clearly demonstrated in the recent study of Wilson & Desjardin (2005). The genus, as conceived by Antonín & Noordeloos (1997) falls roughly apart in two distinct, non-related clades, one comprising sect. *Gymnopus* and sect. *Levipedes* (Fr.) Halling, characterized by the so-called dryophila-structure in the cap cuticle, and another clade, comprising sect. *Vestipedes* (Fr.) Antonín, Halling & Noordel., and part of the genus *Marasmiellus*, and possibly also sect. *Androsacei*. However, more taxa must be added to this study to create a new, phylogenetic classification of genera. For that reason *Gymnopus* and *Marasmiellus* are maintained here in the concept of Antonín & Noordeloos 1997, except for *Setulipes*, which is included in *Gymnopus* on account of molecular evidence and in agreement with Antonín & Noordeloos, 2008. See also *Marasmius* and *Mycetinis*.

Lit.: Antonín & Noordeloos 1997, 2008, Halling 1983, Noordeloos in Bas & al. 1995.

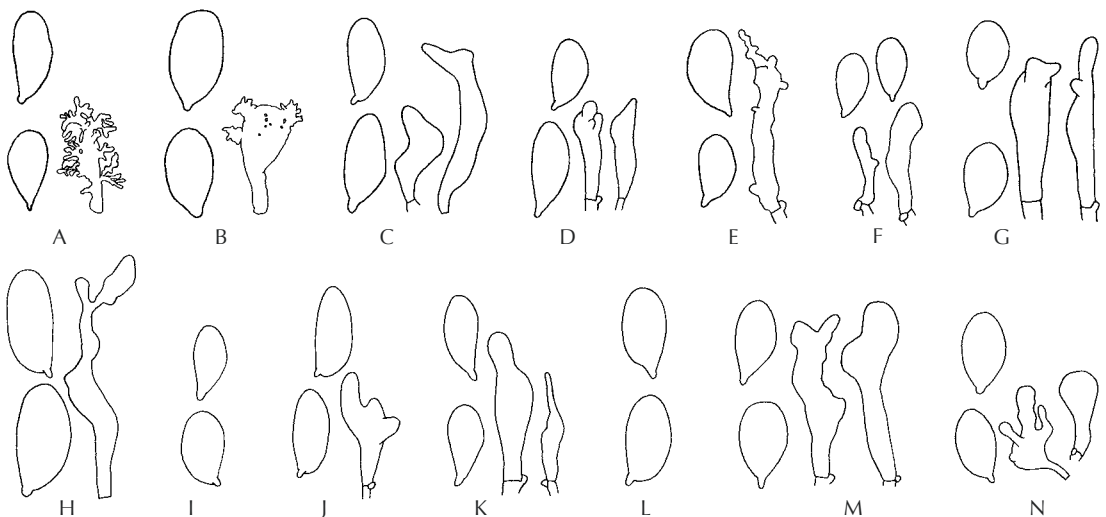


Fig. 297. Spores and cheilocystidia: A: *Gymnopus androsaceus*, B: *G. quercophilus*, C: *G. alpicola*, D: *G. brassicolens*, E: *G. hariolorum*, F: *G. impudicus*, G: *G. fusipes*, H: *G. luxurians*, I: *G. loiseleurietorum*, J: *G. acervatus*, K: *G. erythropus*, L: *G. vernus*, M: *G. ocior*, N: *G. alpinus*.

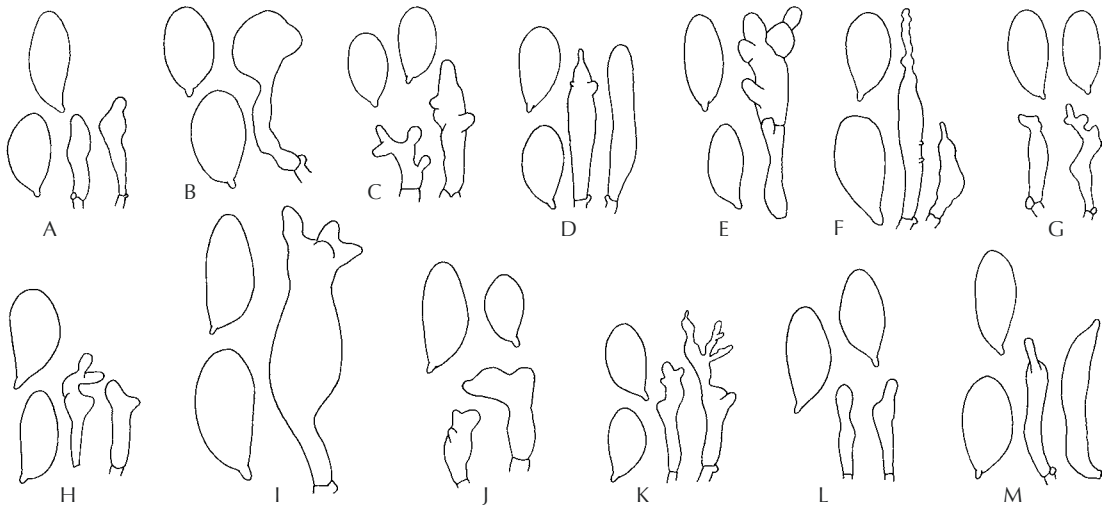


Fig. 299. Spores and cheilocystidia: A: *Gymnopus hybridus*, B: *G. aquosus*, C: *G. dryophilus*, D: *G. fuscopurpureus*, E: *G. confluens*, F: *G. peronatus*, G: *G. oreaidoides*, H: *G. putillus*, I: *G. inodorus*, J: *G. benoistii*, K: *G. fagiphilus*, L: *G. terginus*, M: *G. moseri*.

1. Stem insititious; cheilocystidia present, of the broom-cell type (figs 297A-B)
 - Stem with basal mycelium; cheilocystidia not of the broom-cell type, more rarely, absent 3
2. Stem 20-50 x 0.2-0.7(-1) mm, smooth, shiny, blackish brown. Cap 3-15 mm, hemispherical, then convex or plane, chocolate or reddish brown; gills pink to pinkish brown. Sp 6.5-9 x 3.5-5 μ m, ellipsoid to dacryoid (fig. 297A); cheilocystidia clavate to bilobed, of the broom-cell type. On sticks and needles of coniferous and deciduous trees and shrubs and on grasses and sedges, in oligotrophic localities; spring to late autumn; very common in temp.-suba., rare in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:277, Lud 47.19, M&J Marasmius 2, Phil 117g, R&H 328, .

G. androsaceus (L.: Fr.) Antonín & Noordel. (*Marasmius a.* (L.: Fr.) Fr., *Setulipes a.* (L.: Fr.) Antonín)

 - Stem 10-25(-35) x 0.1-0.3 mm, finely hairy, glabrescent with age, sordid red brown. Cap 3-10 mm, convex then plane, pale pink or whitish with a pink ochraceous centre; gills white. Sp 7.5-9 x 4.5-5.5 μ m (fig. 297B); cheilocystidia 20-40(-70) x 8-14 μ m, clavate, pyriform to globose, of the broom-cell type. On dead leaves of *Quercus*; late summer to autumn; occasional in temp.-hemib.; DK (LC), NO (LC), SE (LC). – BCat 778, Lud 47.22, M&J Marasmius 6, RdM 34:15, R&H 328.

G. quercophilus (Pouzar) Antonín & Noordel. (*Marasmius q.* Pouzar, *Setulipes q.* (Pouzar) Antonín, *M. splachnoides* (Hornem.: Fr.) Fr. s. auct.)
3. Smell strong, reminiscent of rotten cabbage or garlic 4
 - Smell indistinct or different 7
4. Stem with purplish blue tinges in lower part. Cap 10-30 mm, convex, pink to pinkish brown, hygrophanous, slightly translucently striate, fading to ochre pink; gills adnate to emarginate, medium spaced to distant, white with pink tinge; stem 20-40 x 1-4 mm, cylindrical, woolly tomentose all over, amber brown at top. Sp 6-8(-9) x 3-4 μ m, pip-shaped to dacryoid (fig. 297C); cheilocystidia 30-40 x 3-6 μ m, cylindrical to fusiform; pileipellis a cutis of 5-12 μ m broad, incrustated hyphae. In groups in alpine vegetation; summer to autumn; rare in arc./alp., only known from NO (LC, Hord: Ulvik). – ZM 64:69.

G. alpicola (Bon & Ballarà) Esteve-Rav., V. González, Arenal & E. Horak

 - Stem without purplish blue tinges 5

5. Stem distinctly bicoloured, orange yellow at top, dark red brown below, tapering towards base. Cap 15-45 mm, convex to plane with irregularly undulating margin, translucently striate, dark reddish brown to yellow brown, paler towards margin, fading; gills medium spaced, white to pale cream or pinkish brown, often turning darker with age; stem 15-75 x 1-4 mm, tapering towards base, with white to yellow basal tomentum, entirely finely white pruinose, insititious or pseudo-insititious; smell fetid like rotten cabbage, sewage, or sometimes more like garlic. Sp 5.5-7.5 x 2.5-4 μm , oblong to subcylindrical (fig. 297D); pileipellis a cutis of smooth or slightly diverticulate brown incrustated hyphae. On dead leaves and branches of deciduous trees, e.g. *Fagus*, *Quercus* and *Betula*, calciphilous; summer to autumn; rare in temp.-bore.; DK (LC), NO (VU), Busk: Hole, Nordl: Dønna, SE (VU). – A&N 97:75, B&K 3:308, Bon 177, GBW 3:209, Phil 78c, ☉.
- G. brassicolens* (Romagn.) Antonín & Noordel. (*Micromphale b.* (Romagn.) P.D. Orton)
- Stem uniformly coloured or gradually darkening towards base, equal or broadened towards base, with basal mycelium 6
6. Stem white or whitish; cap relatively pale brown, not translucently striate. Cap 20-50 mm, convex to plane; gills adnexed to free, medium spaced, sordid pale cream; stem 40-80 x 3-5(-10) mm, broadened towards base; flesh white. Sp 6-7.5 x 3-4 μm , ellipsoid to oblong or dacryoid (fig. 297E); cheilocystidia 19-40 x 4-10 μm , irregularly coralloid; pileipellis a cutis of smooth, slightly incrustated hyphae. Gregarious in humus or on litter of deciduous trees, e.g. *Fagus*, *Betula* and *Alnus* in mixed forests and parks and at lake shores, calciphilous; late spring to early autumn; rare in temp.-southern bore.; DK (VU), FI (DD, V), NO (NT), SE (VU). – A&N 97:81, B&K 3:193, Cet 551, GBW 3:218, M&J Collybia 3.
- G. hariolorum* (Bull.: Fr.) Antonín, Halling & Noordel. (*Collybia h.* (Bull.: Fr.) Quél.)
- Stem pinkish to sordid brown, much darker towards base; cap dark brown with pink or reddish tinge, translucently striate, at least at margin. Cap 10-40 mm, convex to plane, becoming paler; gills free to narrowly adnate, pale cream then pinkish or greyish brown; stem 20-35 x 1-3(-5) mm, white pruinose all over. Sp 5.5-7.5 x 3-4.5 μm , oblong to dacryoid (fig. 297F); cheilocystidia 16-40 x 3-9 μm , irregularly coralloid; pileipellis a cutis of 3-13 μm broad hyphae with incrustated walls and scattered projections. In groups in humus, on thick layers of *Juniperus* needles and on woody debris etc. in deciduous and coniferous forests, parks and gardens; summer to autumn; occasional in hemib., rare in temp. and southern-middle bore.; DK (VU), FI (LC), NO (LC), SE (LC). – A&N 97:67, Cet 2382, Jordst 21(3), M&J Collybia 4.
- G. impudicus* (Fr.) Antonín, Halling & Noordel. (*Collybia i.* (Fr.) Singer)
7. Cap up to 100 mm or more; stem strongly tapering towards base and rooting 8
 - Cap usually 15-50 mm; stem not strongly tapering and rooting 9
8. On roots or at the base of *Quercus*, less often *Fagus*; stem rooting, strongly costate-twisted lengthwise. Cap 30-90 mm, conical-convex to low convex, dark red brown, sometimes paler towards margin; gills broadly adnate to emarginate, distant to medium spaced, reddish brown, often with rusty spots; stem 50-110(-160) x 8-20 mm, concolorous with cap or paler. Sp 4.5-7(-7.5) x 3-4.5 μm , ellipsoid to oblong, sometimes subamygdaloid (fig. 297G); cheilocystidia 15-35 x 4-9 μm , clavate-coralloid or with projections; pileipellis with a dryophilast-structure with incrustated walls. Often in large clusters; summer to autumn; occasional in temp., rare in hemib.; DK (LC), NO (VU), SE (NT). – A&N 97:28, B&K 3:192, Däh 323, Phil 120d, 121e, ☉.
- G. fusipes* (Bull.: Fr.) Gray (*Collybia f.* (Bull.: Fr.) Quél.)
- On litter in coniferous forests; stem not rooting, strongly fibrillose-twisted. Cap 30-110 mm, convex to plane with undulating marginal zone, hardly striate, dark red brown, only slightly fading; gills narrowly adnate to almost free, very crowded, white, then sordid pink; stem 50-100 x 5-10 mm, cylindrical, tapering towards base, pale (yellow) brown. Sp 7-11 x 3.5-5.5 μm , ellipsoid, oblong to subcylindrical (fig. 297H); cheilocystidia irregularly coral-

loid; pileipellis a cutis with transitions to a trichoderm of cylindrical, densely incrustated hyphae. In large groups; summer to autumn; introduced from North America, very rare in temp.; DK (NA, Bornh: Ibsker Husmandspl.). – A&N 97:45, Bol Bres 41:108, FND 9:2, 11:6, 7. *G. luxurians* (Peck) Murrill

9. Stem glabrous over most of its length 10
 - Stem pruinose to hairy 18
10. On roots of *Loiseleuria procumbens* in suba.-arc. / alp. Cap 5-15 mm, convex, strongly hygrophanous, translucently striate, chocolate brown then paler; gills crowded, pale brown, then with pinkish tinges; stem 20-30 x 1-3 mm, cylindrical, top pruinose, downwards glabrous, pale pinkish brown, then brown. Sp 5.5-8.5 x 3.5-5 μ m, ellipsoid to oblong or somewhat dacryoid (fig. 297I); cheilocystidia absent; pileipellis with a dryophila-structure with finely incrustated walls. Often solitary; summer; occasional; NO (LC). – A&N 97:113, M&J Collybia 10.
G. loiseleurietorum (M.M. Moser, Gerhold & Tobies) Antonín & Noordel.
 - On a different substrate 11
11. Stem deep red brown or grey brown, often darker towards base 12
 - Stem yellowish, ochre, or yellow brown, at most with a red-brown basal part 13
12. In tight bundles of many specimens on rotten coniferous wood. Cap 5-50 mm, conical-convex to convex, hygrophanous, translucently striate, red brown, fading on drying; gills adnate-emarginate, narrow, crowded to very crowded, pale; stem 30-100 x 2-5 mm, cylindrical, finely grooved lengthwise, glabrous, red brown or grey brown. Sp 5.5-8 x 2.5-3.5 μ m, oblong to subcylindrical (fig. 297J); cheilocystidia 18-60 x 2-6 μ m, coralloid; pileipellis an ixocutis or cutis of cylindrical, incrustated hyphae with only scattered lateral projections. Late summer to autumn; common in hemib.-bore., occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – A&N 97:58, GBW 3:204, M&J Collybia 13, R&H 320, Ves 227.
G. acervatus (Fr.: Fr.) Murrill (*Collybia a.* (Fr.: Fr.) P. Kumm.)
 - In groups or small bundles among dead leaves and litter of deciduous trees, e.g. *Fagus* and *Quercus*, sometimes also on wood. Cap 10-40(-60) mm, convex to plane, hygrophanous, translucently striate, (dark) red brown, paler towards margin; gills free to narrowly adnate, medium spaced, pale cream; stem 10-50(-70) x 1-3(-5) mm, cylindrical, glabrous, red (brown). Sp 5.5-9 x 3.5-4.5 μ m, oblong or dacryoid (fig. 297K); cheilocystidia 13-40 x 5-10(-13) μ m, clavate to fusiform, occasionally with a few lateral projections; pileipellis with a dryophila-structure with finely incrustated walls. Autumn; occasional in temp., rare in hemib.; DK (LC), NO (EN, Hord: Bergen, Oslo), SE (NT). – A&N 97:103, B&K 3:196, GBW 3:213, Jordst 21(3):43, R&H 320, ☉.
G. erythropus (Pers.: Fr.) Antonín, Halling & Noordel. (*Collybia e.* (Pers.: Fr.) P. Kumm., *C. marasmioides* (Britzelm.) Bresinsky & Stangl, *C. bresadolae* (Kühner & Romagn.) Singer)
13. Pileipellis a cutis of diverticulate, incrustated hyphae, not showing a distinct dryophila-structure; cheilocystidia absent; in early spring, just after melting of the snow. Cap 20-50 mm, convex, expanding with age, not translucently striate, red brown, paler on drying; gills adnate-emarginate, distant, pale brown; stem 25-70 x 4-6 mm, cylindrical, broadened towards base, glabrous, brown red, paler than cap. Sp 6-9 x 4-5 μ m, ellipsoid to broadly ellipsoid (fig. 297L). In groups among litter in deciduous forests; spring; occasional in hemib.-bore., in FI only from few localities from southern bore.; FI (NT), NO (NT), SE (LC). – A&N 97:63, B&K 3:197.
G. vernus (Ryman) Antonín & Noordel. (*Collybia nivalis* Luthi & Plomb s. auct.)
 - Pileipellis with a distinct dryophila-structure; cheilocystidia present; spring to autumn 14

14. Cap relatively dark, purple brown or blackish brown, not or hardly translucently striate at margin; gills yellow or white 15
 - Cap relatively pale, distinctly translucently striate at margin, gills white to pale cream 16
15. Cap dark reddish brown with pale marginal zone; gills white, cream or yellow; sp 4.5-6 x 2.5-4 μm (fig. 297M); usually in spring and early summer. Cap 10-40 mm, convex to low convex, hygrophanous, not distinctly translucently striate; gills adnate-emarginate; stem 20-60 x 2-5 mm, cylindrical, glabrous, yellow or ochre, rarely moderately dark red brown. Sp ellipsoid to oblong; cheilocystidia 12-45 x 3-9 μm , irregularly clavate to broadly clavate, seldom coralloid; pileipellis with a dryophila-structure of incrustated hyphae. In groups in litter, humus, flowerbeds, barkheaps, wood chips, etc. in deciduous and mixed forests; very common in temp.-hemib., common in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – A&N 97:89, B&K 3:189, Cet 545, M&J Collybia 7, Ves 234.
G. ocior (Pers.) Antonín & Noordel. (*Collybia o.* (Pers.) Vilgalys & O.K. Mill., *C. exsculpta* (Fr.) Gillet, '*exsculpta*', *C. succinea* (Fr.) Quél.)
- Cap uniformly purplish brown to blackish brown; gills white to pale cream; sp 6-8.5 x 3-4.5 μm ; summer to autumn. Cap 15-30 mm, convex to plane, hygrophanous, not translucently striate; gills crowded; stem 30-60 x 2.5-6 mm, orange yellow to reddish brown, much paler than cap, glabrous. Sp broadly ellipsoid to oblong (fig. 297N); cheilocystidia 16-30(-45) x 2.5-8.5 μm , clavate to coralloid; pileipellis with a dryophila-structure of finely incrustated hyphae. In humus and coarse litter in coniferous forests, and in subalpine to subarctic *Betula nana* heathland and acid ericaceous heathland; common in suba.-arc./alp., rare, but locally common in bore.; FI (DD), NO (LC), SE (LC). – A&N 97:95, Jordst 21(3):42, M&J Collybia 6.
G. alpinus (Vilgalys & O.K. Mill.) Antonín & Noordel. (*Collybia a.* Vilgalys & O.K. Mill.)
16. Gills distant, becoming ochraceous to ochraceous brown; sp 7-9.5 x 3.5-5 μm . Cap 15-35 mm, convex to plane, hygrophanous, slightly translucently striate, ochre brown, pale brown, paler at margin; stem 25-50 x 1.5-3 mm, cylindrical, whitish in upper part, yellow to ochre brown at base, glabrous. Sp ellipsoid (fig. 299A); cheilocystidia 18-26 x 5-7 μm , subclavate or cylindrical, irregularly shaped; pileipellis with a dryophila-structure with finely incrustated walls. In groups on litter in deciduous forests; DE. – A&N 97:100, M&J Collybia 1.
G. hybridus (Kühner & Romagn.) Antonín & Noordel.
- Gills medium spaced to crowded, pale; sp up to 8 μm long 17
17. Stem bulbous, at base with pinkish rhizomorphs. Cap 25-65 mm, convex to plane, pale yellowish to ochre, strongly hygrophanous, translucently striate; gills adnate-emarginate, medium spaced, white to pale cream; stem 15-70 x 2-3.5 mm, glabrous, concolorous with or paler than cap. Sp 5-8 x 3-4 μm , ellipsoid to oblong or dacryoid (fig. 299B); cheilocystidia 15-47 x 5-15 μm , irregularly clavate or spheropedunculate, rarely lobed at apex; pileipellis with a dryophila-structure of finely incrustated hyphae. In groups in humus, forest litter, also in grassy spots; mainly in spring; very common in temp., common in hemib., rare in bore., only two records from NO (Rog: Strand, Vestf: Tønsberg); DK (LC), FI (DD), NO (NE), SE (LC). – A&N 97:93, BCat 1111, Cet 1906, M&J Collybia 6.
G. aquosus (Bull.: Fr.) Antonín & Noordel. (*Collybia a.* (Bull.: Fr.) P. Kumm.)
- Stem not bulbous, without pinkish rhizomorphs. Cap 10-60 mm, convex to plane, orange brown to ochre brown, hygrophanous, translucently striate; gills adnate-emarginate, crowded, white to pale cream, finally incarnate yellow; stem 30-120 x 1-5 mm, glabrous, concolorous or paler than cap. Sp 4-7 x 2.5-4 μm , ellipsoid to oblong or slightly dacryoid (fig. 299C); cheilocystidia 15-70 x 4-12 μm , irregularly clavate-coralloid; pileipellis with a dryophila-structure of finely incrustated hyphae. In groups in humus, forest litter, also in grassy spots, often in acid habitats; summer to late autumn; very common in temp.-arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – A&N 97:84, B&K 3:189, Phil 122a, R&H 322, Ves 224, ☉.
G. dryophilus (Bull.: Fr.) Murrill (*Collybia d.* (Bull.: Fr.) P. Kumm.)

18. Cap and stem staining green with a drop of 5-10 % KOH. Cap 20-35 mm, convex to plane, hygrophanous, dark red brown, grey brown or blackish brown, indistinctly translucently striate; gills adnexed to adnate, sometimes with a decurrent tooth, with pinkish or reddish tinge; stem 25-80 x 3-7 mm, cylindrical or compressed, concolorous with cap, pruinose in upper part, downwards tomentose with dark red-brown hairs. Sp 6-8.5 x 2.5-5 μ m, ellipsoid to dacryoid (fig. 299D); cheilocystidia clavate to cylindrical, with or without a few lateral projections; pileipellis with a dryophila-structure of incrustated hyphae. In groups in coarse litter of *Fagus*, *Betula*, etc. and in (sub-)alpine vegetations with dwarf shrubs; autumn; occasional in northern bore., elsewhere rare in temp.-suba.; DK (DD), FI (LC), IS, NO (LC), SE (LC). – A&N 97:110, B&K 3:184, Cet 2383, GBW 3:215.
G. fuscopurpureus (Pers.: Fr.) Antonín, Halling & Noordel (*Collybia* f. (Pers.: Fr.) P. Kumm., *C. obscura* J. Favre, *G. loiseleurietorum* (M.M. Moser, Gerhold & Tobies) Antonín & Noordel. s. Kytövuori et al. 2005)
- Frb paler or dark coloured, not staining green in KOH 19
19. Frb densely fasciculate; gills very crowded. Cap 15-40(-70) mm, convex to plane, pale brown, yellow brown, pale grey brown, hygrophanous, translucently striate; gills free, pale cream; stem 50-120 x 1.5-5 mm, cylindrical, entirely finely white pruinose-hairy, pale brown to orange brown, darker towards base. Sp 6.5-8 x 3-4 μ m, oblong, ellipsoid or dacryoid (fig. 299E); cheilocystidia 20-55 x 4-11 μ m, coralloid with broad projections; pileipellis a cutis of 3-10 μ m broad, cylindrical hyphae with minute incrustations, with scattered coralloid terminal elements. On leaf litter in deciduous and coniferous forests; summer to autumn; very common in temp., common in hemib.-middle bore., occasional in northern bore.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – A&N 97:33, B&K 3:187, Phil 120a, R&H 319, Ves 226, ☉.
G. confluens (Pers.: Fr.) Antonín, Halling & Noordel. (*Collybia* c. (Pers.: Fr.) P. Kumm.)
- Frb growing single or in groups; gills medium spaced to very distant 20
20. Gills very distant; taste acrid. Cap 25-60 mm, convex to plane, yellow brown to pinkish brown with paler margin, hygrophanous, translucently striate; gills free, pale pinkish brown to yellow brown, sometimes yellow; stem 30-75 x 3-8 mm, cylindrical or compressed, with fine pruinose covering at top, hairy-strigose below, pale at top, darker brown to red brown below. Sp 8-10(-11) x 3-4 μ m, oblong to subcylindrical (fig. 299F); cheilocystidia 25-90 x 4-10 μ m, irregularly coralloid; pileipellis a cutis of narrow, cylindrical hyphae, 3-8 μ m broad with incrustated walls, and scattered lateral projections. In large or small groups on leaf litter of deciduous and coniferous trees; summer to autumn; very common in temp.-southern bore., common in middle-northern bore., occasional in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – A&N 97:38, B&K 3:198, Phil 122c, R&H 319, Ves 226, ☉.
G. peronatus (Bolton: Fr.) Antonín, Halling & Noordel. (*Collybia* p. (Bolton: Fr.) P. Kumm.)
- Gills medium spaced; taste mild 21
21. Stem pruinose, sometimes glabrescent with age 22
- Stem hairy-tomentose to strigose, at least in lower part 23
22. Frb pale coloured, reminiscent of *Marasmius oreades*; stem glabrescent with age. Cap 20-60 mm, convex, pallid cream or ochre with pinkish tinge; hygrophanous, slightly translucently striate; gills narrowly adnexed to free, medium spaced, white to pale cream; stem 30-60 x 3-8 mm, cylindrical or compressed, finely pubescent, glabrescent, whitish or concolorous with cap. Sp 5.5-8.5 x 3-4 μ m, oblong to subcylindrical (fig. 299G); cheilocystidia 16-30 x 3.5-7 μ m, slender, coralloid; pileipellis an ixocutis of narrow, cylindrical to slightly inflated hyphae, 3.5-8.5 μ m broad, with incrustated walls. In large groups in forest litter (*Alnus incana*); late summer to autumn; rare in hemib.; NO (NE). – ZM 60:33, Phil 120c.
G. oreadeoides (Pass.) Antonín & Noordel. (*Collybia* o. (Pass.) P.D. Orton)
- Frb reddish brown; stem white to grey pruinose all over, not glabrescent. Cap 10-30 mm, convex to plane, glabrous to subtomentose, reddish brown to vinaceous brown, hygropha-

nous, slightly translucently striate at margin; gills adnexed, crowded, brown; stem 20-60 x 2-3 mm, cylindrical or broadened towards base, brown with grey pruinose covering. Sp 8-11 x 3-5 μm , subdactyoid to ellipsoid (fig. 299H); cheilocystidia few to abundant, 17-32 x 4-8.5 μm , subcylindrical to clavate, irregularly lobed; pileipellis a cutis of radially arranged, cylindrical, 3-6 μm broad hyphae, with or without coralloid terminal elements. In groups in litter of coniferous forests, especially in *Pinus* forests; autumn to late autumn; common in hemib.-bore., rare in suba.; FI (LC), NO (LC), SE (LC). – A&N 97:55, M&J *Collybia* 10, R&H 319. *G. putillus* (Fr.: Fr.) Antonín, Halling & Noordel. (*Collybia p.* (Fr.: Fr.) Singer)

23. Lignicolous; cheilocystidia and pileocystidia strongly inflated, with finger-like excrescences. Cap 8-30 mm, convex to plane, yellow brown with reddish brown centre, hygrophanous, translucently striate; gills adnexed to adnate, distant, pale grey, yellow or pinkish brown; stem 8-30 x 1-4 mm, pale yellow brown at top, darker red brown below, with white to grey pruinose covering. Sp 7-10 x 3.5-4.5 μm , oblong to subcylindrical (fig. 299I); cheilocystidia 25-75 x 5-22 μm ; pileipellis a cutis of 4-12 μm broad, incrustated hyphae with scattered pileocystidia. Solitary or in small groups on deciduous wood; summer to autumn; rare in temp.; DK (VU). – A&N 97:42, FND 7:4, ☉.
- G. inodorus* (Pat.) Antonín & Noordel. (*Micromphale i.* (Pat.) Svrček)
- On humus or litter; cheilocystidia cylindrical to clavate, with or without excrescences; pileocystidia absent 24
24. Pileipellis a distinct dryophila-structure 25
- Pileipellis a cutis, sometimes with transitions to a trichoderm, of cylindrical, weakly to distinctly diverticulate hyphae 26
25. Stem pale when young, basal part darkening to reddish brown; gills white to pale cream; cheilocystidia clavate to broadly clavate, often lobate (fig. 299J); on decaying leaves in *Quercus* forests. Cap 15-25 mm, convex to plane, smooth or finely rugulose, brown with pink, yellow or ochre tinge, hygrophanous, translucently striate; stem 20-50 x 1-3(-5) mm, cylindrical. Sp 5.5-10 x 3-4.5 μm , ellipsoid to oblong or subdactyoid; cheilocystidia 17-41 x 5-17 μm ; pileipellis with a dryophila-structure of incrustated hyphae. Spring to autumn; very rare in hemib.; SE (Vg). – A&N 97:98.
- G. benoistii* (Boud.) Antonín & Noordel.
- Stem orange brown to red brown, darker towards base; gills pinkish cream to pinkish brown; cheilocystidia irregularly clavate to coralloid with a few to rather many finger-like excrescences, sometimes narrowly lageniform (fig. 299K); usually on *Fagus* leaf litter. Cap 15-25(-35) mm, convex to plane, glabrous, yellow brown to red brown, hygrophanous, slightly translucently striate; gills free to narrowly adnate, medium spaced; stem 20-40(-70) x 1-3 mm, cylindrical, with fine white hairs, particularly in lower half. Sp 6-9 x 3-4.5 μm , ellipsoid to dactyoid; cheilocystidia 15-40(-60) x 4-8(-10) μm ; pileipellis with a dryophila-structure of incrustated hyphae. In bundles or solitary; autumn; very rare in temp. or confused with *G. fuscopurpureus*; DK (DD, Sj), SE. – B&K 3:191, ☉.
- G. fagiphilus* (Velen.) Antonín, Halling & Noordel. (*Collybia konradiana* Singer)
26. Sp 6-9 x 3-4(-4.5) μm (fig. 299L); cheilocystidia scattered; cap glabrous. Cap 7-25 mm, convex to plane, yellow brown to red brown, hygrophanous, translucently striate at margin; gills free, distant, white to cream, then yellowish or greyish brown; stem 15-50 x 1-6 mm, pruinose at top, hairy-strigose below, orange brown to red brown. Sp cylindrical to ellipsoid; cheilocystidia 15-65 x 3-8 μm , subcylindrical, fusiform or clavate, often irregular with finger-like excrescences; pileipellis a cutis of 3-9 μm broad, slightly diverticulate, incrustated hyphae. In groups on litter of deciduous trees, especially in *Betula* forests; autumn; common in northern bore.-arc. / alp., rare in southern-middle bore.; FI (LC), NO (LC), SE. – Cet 2384.
- G. terginus* (Fr.: Fr.) Antonín & Noordel. (*Collybia t.* (Fr.: Fr.) S. Lundell)
- Sp 8.5-11(-11.5) x 4-5 μm (fig. 299M); cheilocystidia abundant; cap rugulose to tomentose.

Cap 10-35 mm, convex to plane, beige incarnate to pale brown with reddish brown centre, slightly hygrophaneous, hardly translucently striate, often somewhat zonate; gills adnate, distant, white, then beige grey; stem 35-80 x 1.5-3 mm, cylindrical, pruinose in upper half, hairy-strigose in lower half, brown to red brown with paler top. Sp oblong to cylindrical or dacryoid; cheilocystidia 30-50 x 6-9 μm , fusiform to cylindrical, irregular, often with projections; pileipellis a cutis of cylindrical, incrusting hyphae. In groups on humus with deciduous trees (*Betula*, *Salix*); autumn; very rare in hemib.; SE. – A&N 97:50.

G. moseri Antonín & Noordel.

Gyrodon Opat.

HENNING KNUDSEN & ANDY TAYLOR

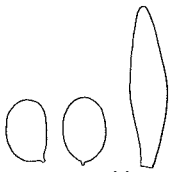
One species in the Nordic countries; see description below.

Frb boletoid with pale brown tubes. Cap 40-100 mm, convex, often with lobed margin, viscid to dry and felty, dirty straw or pale ochre to buff or pale cinnamon, frequently with a flush of rust colour. Tubes and pores dark sulphur yellow, greenish grey when bruised, fading to dirty brown, short, deeply decurrent, not easily separable from the cap. Pores large, angular, with sinuose walls. Stem 50-80 × 10-20 mm, cylindrical, concolorous with cap or paler, finally flushed brown vinaceous, often slightly eccentric. Flesh pale lemon in cap, sienna or rust towards stem base, blueing slightly above tubes and in stem top. Taste and smell indistinct. Sp deposit brown.

Sp 4.5-6 × 3-4 μm, ellipsoid (fig. 161B), pale brown. Cheilo- and pleurocystidia present. Clamps absent. Pileipellis a cutis to a trichoderm with a differentiated end-cell, 3-7 μm broad.

Ectomycorrhizal with *Alnus* in damp places, often subfasciculate and gregarious; summer to autumn; occasional in temp.-southern bore., rare in middle bore., north to 70°20'; DK (NT), FI (LC), NO (LC), SE (LC). – B&K 3:28, Phil 285g, R&H 211, Svp 39:4, Ves 134, ⊙.

G. lividus (Bull.: Fr.) P. Karst. (*Uloporus l.* (Bull.: Fr.) Quél.)



Spores and hymenial cystidia.

Gyroflexus Raithelh.

STEEN A. ELBORNE

Sphagnomphalia Redhead, Moncalvo, Vilgalys & Lutzoni

Monotypic genus; see description below.

Lit.: Cléménçon 1982, Redhead 1985.

Frb mycenoid to omphalinoid. Cap 4-15 mm, bell-shaped, paraboloid, convex to plane with papilla, margin straight, crisped to crenulate, translucently striate to centre, radially fibrillose to smooth, dry, dull, olive brown to pale grey brown or fulvous, paler between the striae, hygrophalous, fading whitish. Gills strongly arcuate-decurrent, moderately broad, medium spaced to distant, intervenose, sometimes forked, with even edge, pale grey, olivaceous grey, olive brown or watery white. Stem 10-35 x 0.5-2 mm, cylindrical or slightly tapered towards base, hollow, smooth to pruinose, dull to shiny, olivaceous yellow, then watery white, pale grey brown or yellow brown. Flesh membranous, thin, cartilaginous in stem, hyaline white or coloured like surface. Smell and taste indistinct. Sp deposit white.

Sp 5.5-7(-7.5) x 3-4.5 μ m, ellipsoid, ovoid or dacryoid, smooth (fig. 67H), thin-walled, hyaline, without iodine reactions. Basidia 2- and 4-spored. Cheilo- and pleurocystidia absent. Pileipellis a cutis. Clamps present.

Saprotrophic or biotrophic, solitary or in small groups in damp moss, esp. *Sphagnum* in fens and bogs, along streams and on lake shores; late summer to autumn; presumably common in bore.-arc./alp., but poorly known; FI (LC), NO (LC), SE (LC). – Fav 48: 2,11-12, Lud 55.5, ⊙.

G. brevbasidiatus (Singer) Raithelh. (*Omphalina b.* (Singer) Singer, *Gerronema b.* (Singer) Singer, *Sphagnophila b.* (Singer) Redhead, Moncalvo, Vilgalys & Lutzoni, *Omphalia cincta* J. Favre)



Spores

Gyroporus Quél.

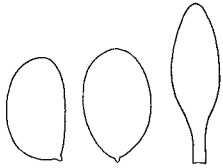
HENNING KNUDSEN & ANDY TAYLOR

Frb boletoid with whitish tubes. Cap convex, glabrous to floccose scaly, almost shaggy. Tubes free, white or straw to lemon. Pores white or lemon. Stem externally firm, inside spongy, becoming hollow, glabrous or fibrillose, cracking perpendicular to the length. Sp deposit straw to yellow or ochraceous.

Sp ellipsoid, hyaline. Cheilo- and pleurocystidia present. Clamps present. Pileipellis a cutis to a trichoderm with 5-20 μm broad hyphae with coloured contents.

Ectomycorrhizal with deciduous and coniferous trees in forests and heathland.

Two species in the Nordic countries.



Spores and hymental cystidia: A: *Gyroporus cyanescens*.

1. Flesh white or pale brown in cortex, unchanging when cut. Cap 30-100 mm, convex, chestnut or rusty tawny; pores unchanging when bruised; stem 40-100 x 10-30 mm, cylindrical or slightly swollen in the middle, concolorous with cap. Sp 8-11 x 5-6 μm , ellipsoid. In deciduous forests on rich soil, mainly with *Quercus*; late summer to autumn; rare in temp. and hemib., in FI only a few records from A, V and U; DK (NT), FI (EN), NO (NT), SE (NT). – B&K 3:29, Däh 22, Phil 286c, R&H 210, Ves 135, ⊙.
G. castaneus (Bull.: Fr.) Quél.
- Flesh white, strongly blueing when cut. Cap 30-150 mm, convex, pale ochre to straw, fibrillose scaly to coarsely velvety, often with shaggy margin; pores blueing when bruised; stem 50-100 x 20-30 mm, cylindrical or swollen below, pruinose at top, fibrillose to tomentose below, concolorous with cap. Sp 9-11 x 4.5-6 μm , ellipsoid (fig. 161A). In heathland and copses on acid soil, often with *Betula* or *Picea*, also with *Corylus*, *Tilia*, *Quercus* and *Pinus*; late summer to autumn; occasional in temp.-hemib., rare in bore., up to 68°30' N; DK (NT), FI (LC), NO (LC), SE (LC). – B&K 3:30, Däh 23, Phil 286e, R&H 210, Ves 135, ⊙.
G. cyanescens (Bull.: Fr.) Quél.

Haasiella Kotl. & Pouzar

STEEN A. ELBORNE

One species in the Nordic countries; see description below.

Lit.: Cléménçon 1982, Døssing 1980, Haas 1965, Horak 1968, Kotlaba & Pouzar 1966; Ludwig 2001.

Frb omphalinoid, on wood of deciduous trees and scrubs. Cap (5-)10-50 mm, convex, then plane, umbilicate to funnel-shaped, smooth, with minutely pubescent margin, dry to sticky when wet, pale to bright orange. Gills decurrent, distant, narrow, somewhat intervenose, sometimes forked, pale to bright orange. Stem 20-50 x 1-7 mm, cylindrical to compressed and widened towards both ends, smooth to fibrillose, towards top minutely scaly, at base white strigose, pale to bright orange, stuffed to hollow. Flesh white to orange. Smell fruity, farinaceous or soap-like. Taste indistinct. Sp deposit cream to pink.

Sp 6-8 x 4-5(-6) μm , ellipsoid, smooth (fig. 193C), thick-walled, hyaline, without iodine reactions, cyanophilous, metachromatic with inner wall turning red. Basidia 1-2-spored. Cheilo- and pleurocystidia absent. Pileipellis a cutis or ixocutis. Clamps absent.

Saprotrophic; in small groups or fasciculate on fallen, \pm buried branches and stumps of deciduous trees and bushes, esp. *Sambucus* and *Syringa*, more rarely in needle beds under *Picea*; late autumn to winter; very rare in temp.-hemib.; DK (DD), SE. – Fr 50.2, Lud 55.1, M&H 3:193, Svp 1:16, 2:88, ⊙.

H. venustissima (Fr.) Kotl. & Pouzar (*Clitocybe v.* (Fr.) P. Karst., *Gerronema v.* (Fr.) Singer)

Note: *H. splendidissima* Kotl. & Pouzar found in neighbouring countries, e.g. PL and CZ differs in having 4-spored basidia and hyphae with clamps. – CM 20:62.



Spores.

Hebeloma (Fr.) P. Kumm.

JAN VESTERHOLT

Hebelomina Maire

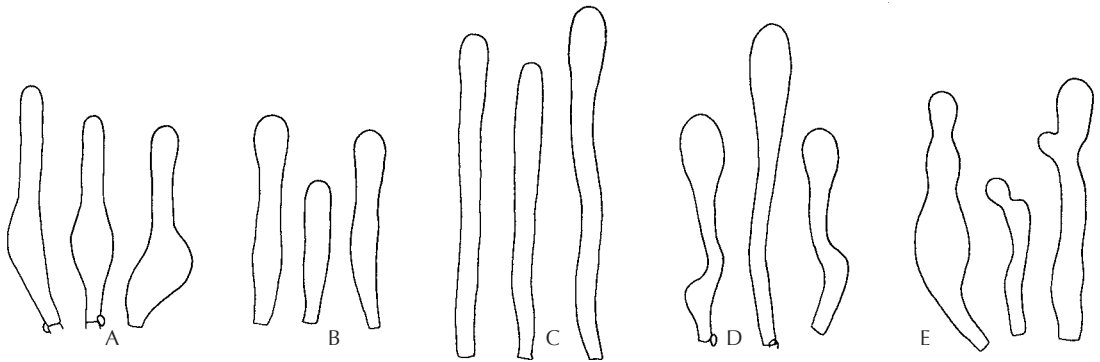
Frb collybioid to tricholomatoid, with viscid cap and often with raphanoid or sweetish smell. Cap slightly hygrophanous or not, glabrous, rarely tomentose, viscid to dry, whitish, pinkish buff, clay buff, cinnamon, umber or sepia. Gills emarginate or adnate, white to pale greyish or pale buff, becoming clay buff to brown, in some species exuding droplets. Stem minutely to coarsely floccose, at least at the top, in many species discolouring brown from the base. Universal veil present or absent, in one species membranous; partial veil cobweb-like or absent. Smell raphanoid in most species, in other species sweetish, like marzipan, cocoa, soap, tea or fruit or indistinct. Taste raphanoid, indistinct or bitter. Sp deposit clay buff to brown.

Sp ellipsoid, amygdaloid or almost citriform, almost smooth to rugose or verrucose under light microscope, SEM shows a fine to coarse ornamentation of branched ridges, in some species with a loosening perispore, dextrinoid or without iodine reactions, a positive reaction best observed after a short while in sp floating freely in the preparation. Cheilocystidia present. Pleurocystidia mostly absent. Pileipellis an ixocutis to an ixotrichoderm. Clamps present.

Mycorrhizal, on soil in association with trees and shrubs, some species playing an important role as pioneer mycorrhizal species.

39 species in the Nordic countries, 40 species in the key. Several species are slightly poisonous and none are considered edible.

Lit.: Bruchet 1970, Gröger & Zschieschang 1981, La Chiusa 1999, Romagnesi 1965, 1984, Vesterholt 1989, 1995, 2005.



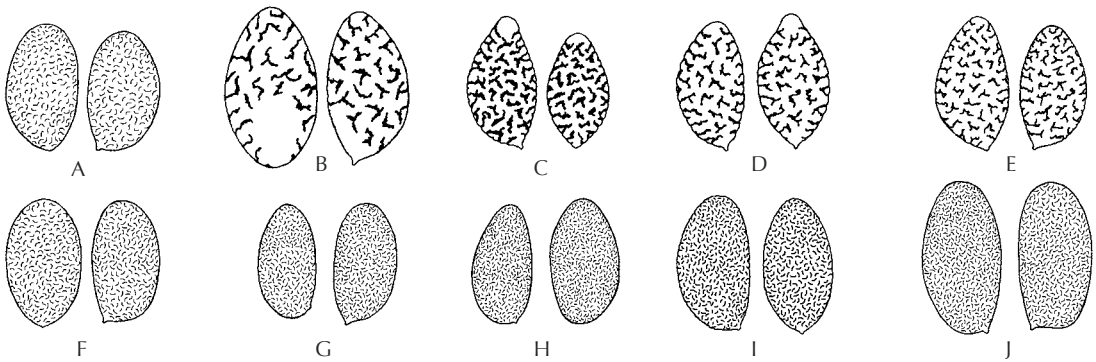
Cheilocystidia typical for *Hebeloma* sections: A: sects *Hebeloma* and *Sinapizantia*, B: sect. *Theobromina*, C: sect. *Velutipes*, D: sect. *Denudata*, E: sects *Myxocybe* and *Sacchariolentia*.

Main key

1. Universal veil forming a membranous ring on the stem; stem continuing into a strongly rooting base; smell like marzipan, rarely weak Key F sect. *Myxocybe* p. 814
 - Universal veil present or absent, but not forming a membranous ring on the stem; stem rooting or not; smell not like marzipan 2
2. Partial veil cobweb-like, but often fugacious; stem only pruinose at the top; cheilocystidia with a ± cylindrical apical part, often widened in lower half (fig. 347A); perispore not loosening Key A sect. *Hebeloma* p. 807
 - Partial veil absent; stem often entirely pruinose or floccose; cheilocystidia often with a different shape; perispore loosening or not 3
3. Smell strong and sweet Key G sect. *Sacchariolentia* p. 816
 - Smell indistinct or like radish, cocoa, soap, tea or fruit 4
4. Stem often ± rooting; smell without radish-like components; gills without droplets; cheilocystidia ± cylindrical or variable in shape (fig. 805E) Key F sect. *Myxocybe* p. 814
 - Stem not rooting; smell usually with radish-like components; gills with or without droplets; cheilocystidia well differentiated and cylindrical, clavate, capitate or lageniform 5
5. Sp without iodine reactions or faintly dextrinoid Key E sect. *Denudata* p. 810
 - Sp distinctly to strongly dextrinoid 6
6. Sp on av 4.4-5.3 μm broad Key C sect. *Theobromina* p. 809
 - Sp on av > 5.5 μm broad 7
7. Many cheilocystidia lageniform with a cylindrical, apical part (fig. 805A) 8
 - Cheilocystidia cylindrical to clavate or capitate, sometimes both widened at apex and at base (fig. 805D) 9
8. Stem coarsely floccose in transverse belts, especially in upper part, not discolouring from base; nearly all cheilocystidia lageniform Key B sect. *Sinapizantia* p. 808
 - Stem finely pruinose, especially in upper part, discolouring from base; lageniform cheilocystidia are intermixed with clavate cheilocystidia Key D sect. *Velutipes* p. 809
9. Cheilocystidia typically widened both at apex and base Key E sect. *Denudata* p. 810
 - Cheilocystidia cylindrical to subclavate, typically not much widened at apex or base (fig. 805C) Key D sect. *Velutipes* p. 809

Key A: Sect. *Hebeloma*

1. Sp ovoid-amygdaloid to citriform, mostly brownish, weakly to strongly dextrinoid, rarely almost without iodine reactions (subsect. *Amygdalina* Vesterh.) 2
 - Sp ellipsoid to ellipsoid-ovoid, mostly yellowish in water and KOH mounts, without iodine reactions or weakly dextrinoid (subsect. *Hebeloma*) 7
2. Cap dark reddish brown, umber, sepia or almost black, sometimes almost to the margin 3
 - Cap clay buff to orange brown with a paler margin 4
3. Sp ellipsoid to ovoid (fig. 807A); with dwarf *Salix* in arc./alp.; exsiccates rather coriaceous. Cap 10-45 mm, hemispherical, then convex to expanded with or without an umbo, almost dry, umber to sepia; gills medium spaced; stem 30-60 x 3-6 mm, cylindrical, sparsely floccose above the cortina zone, whitish, turning clay buff from the base; smell raphanoid. Sp 9-13 x 5-7.5 μm , rugulose, without iodine reactions, perispore not loosening; cheilocystidia lageniform with a cylindrical to subclavate apex, apex on av 6-7 μm broad. Summer; locally common; IS, NO (LC, incl. SvB). – FNE 3:49.
H. polare Vesterh.
 - Sp ovoid to amygdaloid (fig. 807B); with *Salix* in arc./alp. and in lowland bogs and sand dunes; exsiccates rather fragile. Cap 8-30(-40) mm, hemispherical, then convex to expanded, viscid to nearly dry, umber to dark brick, sepia or almost black, margin sometimes paler; gills medium spaced to distant; stem 12-40(-65) x 1.5-4(-6) mm, cylindrical, sparsely floccose above the cortina zone, sordid whitish to clay buff, discolouring to sepia from the base; smell raphanoid. Sp 9-13.5 x 5.5-8 μm , rugulose, faintly to distinctly dextrinoid, perispore not loosening; cheilocystidia lageniform with a cylindrical apex, apex on av 4.5-6 μm broad. Summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – AAF 3:53, FNE 3:51&53, M&J 8,16, Ves 334.
H. nigellum Bruchet (*H. kuehneri* Bruchet, *H. atrobrunneum* Vesterh., *H. candidipes* s. auct. p.p.)
4. Sp amygdaloid to subcitriform, often with a papilla-like apex (fig. 807C), strongly dextrinoid; exsiccates nearly always discoloured to dark brown; under *Betula*, *Corylus*, *Quercus* and *Fagus*. Cap (15-)20-50 mm, hemispherical, then convex to expanded, viscid to slimy, clay buff to yellowish brown at centre, pale to white at margin; gills crowded; stem 25-90 x 4-8 mm, \pm clavate, sparsely floccose above the fugacious cortina zone, white, discolouring to sepia from the base; smell raphanoid. Sp 8-12.5 x 5-7.5 μm , rugose, perispore not loosening; cheilocystidia lageniform with a cylindrical apex, apex on av 5-5.5 μm broad. Mostly in humid places, also on landslide slopes; summer to autumn; rare in temp.-bore.; DK (VU), FI (DD), IS (Na), NO (LC), SE (LC). – B&K 123, End 3376, FAD 118E, FNE 3:59, Ves 335.
H. sordescens Vesterh. (*H. testaceum* Quél. s. auct.)
 - Sp amygdaloid to ovoid, not with a papilla-like apex, dextrinoid, but not strongly so; exsiccata typically not discoloured to dark brown; under *Salix*, possibly also other hosts 5
5. Stem 1-3 mm thick; cap 8-24 mm broad; in alpine habitats see *H. nigellum* 3
 - Stem (2-)3-8 mm thick; cap 15-50 mm broad; in lowland and alpine habitats 6
6. Cap margin white, contrasting the orange-brown centre; stem white with an orange-brown base; with *Salix* in humid forests. Cap 15-35 mm, convex to expanded, viscid; gills medium spaced; stem 35-70 x 3-5 mm, cylindrical or slightly widened at base, sparsely floccose above the cortina zone; smell raphanoid. Sp 9.5-13 x 5.5-6.5 μm , amygdaloid, rugose (fig. 807D), distinctly dextrinoid, perispore not loosening; cheilocystidia lageniform with a cylindrical apex; apex on av 4.5-5 μm broad. Autumn; very rare in temp.-bore., but possibly



Spores: A: *Hebeloma polare*, B: *H. nigellum*, C: *H. sordescens*, D: *H. candidipes*, E: *H. monticola*, F: *H. marginatum*, G: *H. sordidum*, H: *H. mesophaeum*, I: *H. collariatum*, J: *H. psammophilum*.

overlooked; DK (NA), SE. – FNE 3:57.

H. candidipes Bruchet

- Stem and cap less contrasting, appearance like *H. mesophaeum*; with *Salix* in arc./alp., less often with *Salix* or *Betula* in woodland and mires in bore.-suba. Cap 21-40(-55) mm, hemispherical, then convex to expanded or even depressed, viscid to almost dry, clay buff to dark brick at centre, paler towards margin; gills medium spaced to crowded; stem 25-80 (-110) × 2-6 mm, cylindrical, sparsely floccose above the cortina zone, pale cream, turning clay buff from base; smell raphanoid. Sp 9.5-13 × 5.5-7 μm, ovoid to amygdaloid, rugulose (fig. 807E), slightly dextrinoid, perispore not loosening; cheilocystidia lageniform with a cylindrical apex, apex on av 4.5-5.5 μm broad. Summer to autumn; common in suba., occasional in bore., rare in hemib.; FI (LC), IS, NO (LC), SE (LC). – FNE 3:55.

H. monticola Vesterh. (*H. remyi* Quad. s. Bruchet)

- | | | |
|----|--|------------------------|
| 7. | With dwarf <i>Salix</i> or <i>Dryas</i> in suba.-arc./alp. | 8 |
| - | In different habitats | 10 |
| 8. | Cap umber to sepia, almost to the margin; exsiccates coriaceous | see <i>H. polare</i> 3 |
| - | Cap ± unicoloured clay buff, Isabella, cinnamon to yellowish brown, or margin distinctly paler than the centre; exsiccates fragile to fairly tough | 9 |
| 9. | Sp on av > 10.3 μm long and > 5.8 μm broad (fig. 807F); cap 10-24 mm broad, not fully expanding. Cap hemispherical, then convex, slightly viscid to dry, nearly unicoloured cinnamon to yellowish brown, often with veil remnants; gills medium spaced to distant; stem 15-32 × (2-)3-5 mm, cylindrical, pruinose above the cortina zone, whitish, turning clay buff; smell faintly raphanoid. Sp 9-12 × 5.5-7 μm, ellipsoid, slightly rugulose, without iodine reactions, perispore not loosening; cheilocystidia lageniform with a cylindrical to subclavate apex, apex on av 4.5-5.5 μm broad. With dwarf <i>Salix</i> ; summer; rare in suba.-arc./alp., but possibly overlooked; IS, NO (LC), SE. – FNE 3:43. | |

H. marginatum (J. Favre) Bruchet

- Sp on av < 10.5 μm long and < 6 μm broad; cap 15-50(-70) mm broad, fully expanding with age see *H. mesophaeum* 11
- 10. Cap initially fairly pale, ± unicoloured cream to clay buff; stem (4-)6-14 mm broad, often becoming sordid with age; with deciduous trees and conifers, not known from sand dunes.

Cap 25-60 mm, hemispherical to convex, then expanded, viscid to almost dry; gills crowded; stem 50-110 x (4-)6-14 mm, cylindrical, floccose above the cortina zone, whitish, soon turning clay buff to umber from the base; smell faint. Sp 8.5-12.5 x 5-7 μm , ellipsoid, slightly rugulose (fig. 807G), without iodine reactions, perispore not loosening; cheilocystidia lageniform with a cylindrical apex, apex on av 5-6 μm broad. Spring to autumn; rare in temp.-hemib.; DK (VU), FI (DD). – BCat 414, C&D 985, FAD 118F, FNE 3:39, M&J 17.

H. sordidum Maire (*H. pallidum* Malençon, *H. malenconii* Bellù & Lanzoni, *H. mesophaeum* (Pers.) Quél. var. *lacteum* Vesterh.)

- Cap mostly with a clay-buff to cinnamon or umber centre and a paler, often greyish margin; stem often narrower; in sand dunes or other habitats 11
- 11. Sp on av < 10.5 μm long. Cap 15-50(-70) mm, hemispherical to convex, then expanded, viscid to slimy, clay buff to cinnamon or umber at centre, usually paler and more greyish towards margin; gills medium spaced to crowded; stem 20-70(-90) x 2-8(-12) mm, cylindrical, floccose above the cortina zone, whitish to cream, turning clay buff to umber from the base; universal veil sometimes forming a woolly stem covering; smell faintly raphanoid. Sp 8-11 x 4.5-6.5 μm , ellipsoid to ovoid, appearing almost smooth (fig. 807H), without iodine reactions, perispore not loosening; cheilocystidia lageniform with a cylindrical apex, apex on av 4.5-5.5 μm broad. With deciduous and coniferous hosts in forests, dunes and arctic/alpine habitats; summer to autumn, less often in spring; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – C&D 986, 987, Däh 682, 683, FNE 3:35, 37 & 41, R&H 478, Ves 334, ☉.

H. mesophaeum (Pers.) Quél. (*H. strophosum* (Fr.) Sacc., *H. mesophaeum* (Pers.) Quél. var. *crassipes* Vesterh., incl. *H. bruchetii* Bon, *H. repandum* Bruchet)

- Sp on av > 10.5 μm long 12
- 12. Stem pale from the beginning, but not whitish, soon discolouring to brown from base; under *Salix*, *Betula* or *Populus*, often with *Salix* in coastal dunes; sp ellipsoid to ovoid (fig. 807I). Cap 10-55 mm, convex, then expanded, slightly viscid to almost dry, clay buff to dark brick at centre, paler and more greyish towards margin; stem (20-)30-90 x (2-)3-8(-12) mm, cylindrical, floccose above the cortina zone; smell faintly raphanoid. Sp 9.5-13 x 5.5-7 μm , rugulose, without iodine reactions or very faintly dextrinoid, perispore not loosening; cheilocystidia lageniform with a cylindrical apex, apex on av 5-6.5 μm broad. Sometimes subfasciculate; spring to autumn; common in sand dunes in DK, elsewhere rare or overlooked in temp.-middle bore.; DK (LC), FI (DD), U: Hanko, Kn: Valtimo), IS (Au), NO (LC), SE (LC). – B&K 3:105, FNE 3:45, Ves 335.

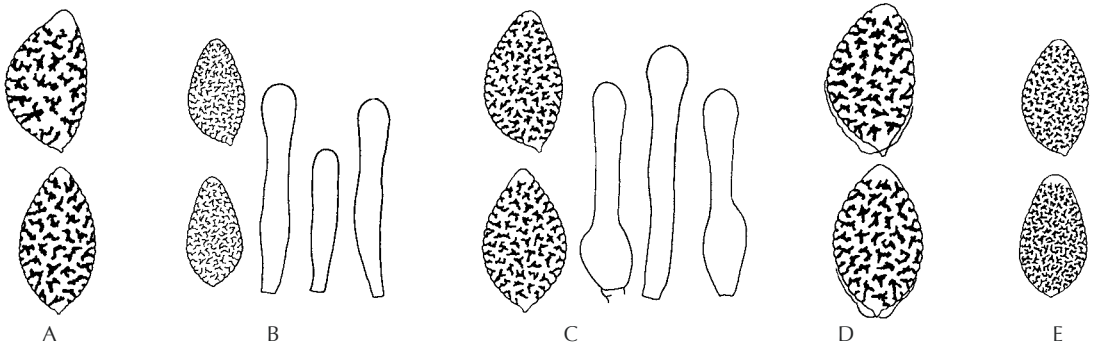
H. collariatum Bruchet

- Stem whitish, but discolouring and becoming brown striate with age; only recorded with *Salix* in coastal dunes; sp ellipsoid to subangular-cylindrical or ovoid (fig. 807J). Cap 23-55 mm, convex, then expanded, slightly viscid, mostly with appressed sand particles, nearly unicoloured cinnamon to umber or dark brick; gills crowded; stem 45-90 x 7-14 mm, cylindrical, floccose above the cortina zone; smell faintly raphanoid. Sp 10-13.5 x 5.5-7.5 μm , slightly rugulose, without iodine reactions, perispore not loosening; cheilocystidia lageniform with a cylindrical, less often subcapitate apex, apex on av 5.5-6.5 μm broad. Autumn; rare in temp.; DK (DD). – C&D 989, FNE 3:47.

H. psammophilum Bon

Key B: Sect. *Sinapizantia* (Quad.) Vesterh.

Cap 30-120 mm, hemispherical, then convex to expanded, viscid to slimy, pinkish buff to fawn or brick, unicoloured or paler towards margin; gills crowded; stem 30-135 x 8-25 mm, cylindrical with a bulbous, 10-35 mm broad base, strongly floccose in transverse belts, whitish; smell raphanoid. Sp 9.5-13.5 x 6-8 μm , broadly citriform, verrucose (fig. 809A), strongly dextrinoid, perispore rarely loosening; cheilocystidia lageniform with a cylindrical apex,



Spores and cheilocystidia: A: *Hebeloma sinapizans*, B: *H. theobrominum*, C: *H. quercetorum*, D: *H. aestivale*, E: *H. incarnatulum*.

apex on av 5-7 μm broad. On \pm calcareous soil with deciduous trees, less often conifers; summer to autumn; common in temp., occasional in hemib., rare in southern-middle bore.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 1005, FNE 3:61, Phil 215f, R&H 479, Ves 339, \odot .
H. sinapizans (Paulet) Sacc.

Key C: Sect. *Theobromina* Beker, U. Eberh. & Vesterh.

Cap 30-60 mm, hemispherical, then convex to expanded, viscid, fawn to brick or orange brown almost to margin, often with a greyish pruina when young; gills crowded; stem 22-65 \times 6-13 mm, cylindrical, pruinose in upper part, whitish; smell faintly cocoa-like to raphanoid. Sp 8-11 \times 4-5.5 μm , narrowly amygdaloid, rugulose (fig. 809B), strongly dextrinoid, perispore rarely loosening; cheilocystidia cylindrical to clavate and \pm widened in lower half, apex on av 5.5-7.5 μm broad. With deciduous trees or conifers; summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 992, Däh 692, 693, FNE 3:63, Phil 217f, Ves 339, \odot .

H. theobrominum Quad. (*H. truncatum* (Schaeff.) P. Kumm. s. auct.)

Key D: Sect. *Velutipes* Vesterh.

1. With a mixture of lageniform and clavate cheilocystidia (fig. 809C). Cap 20-55 mm, convex to expanded, viscid to slimy, pinkish buff to clay buff or yellowish brown; gills crowded; stem 28-80 \times 6-13 mm, cylindrical or widened to 12-17 mm at base, pruinose, whitish, but discolouring to brown from the base; smell raphanoid. Sp 10.5-13.5 \times 6-8 μm , amygdaloid to broadly citriform (fig. 807C), rugulose to verrucose, strongly dextrinoid, perispore sometimes loosening; apex of cheilocystidia on av 6-7 μm broad. With deciduous trees on calcareous soil; autumn; rare in temp.-hemib., but possibly overlooked; DK (NA), NO, SE. – FNE 3:71.

H. quercetorum Quad.

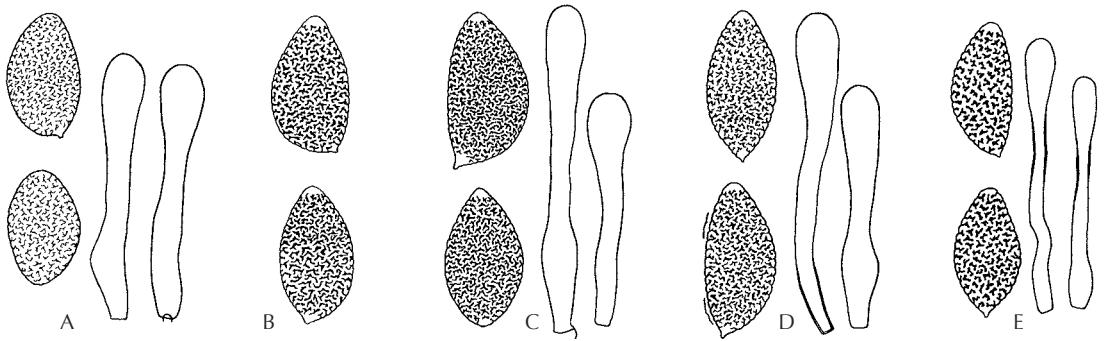
- Cheilocystidia cylindrical to subclavate (fig. 805C) 2
2. Perispore distinctly loosening in most sp (fig. 809D); stem base without a bulb, often with mycelial chords. Cap 17-70 mm, convex, then expanded, viscid to slimy, clay buff to cinnamon at centre, paler towards margin; gills crowded; stem 19-95 \times 5-15 mm, cylindrical, floccose, whitish; smell faintly cocoa-like to raphanoid. Sp 11-14 \times 6-8 μm , broadly amygdaloid to citriform, verrucose, dextrinoid; cheilocystidia cylindrical to subclavate, apex on av 5.5-7 μm broad. With deciduous trees in parks and forests; summer to autumn; occasional in temp.; DK (LC), SE. – FM 1:63, FNE 3:69, Ves 337.

H. aestivale Vesterh.

- Perispore not or only rarely slightly loosening; stem with a rounded basal bulb, without distinct mycelial chords 3
- 3. Cheilocystidia on av 4.6-5.9 μm broad at apex; in coniferous forests, often in *Sphagnum*. Cap 19-60 mm, hemispherical to convex, then expanded, viscid, pinkish buff to clay buff or cinnamon, sometimes with hygrophanous flecks; gills crowded; stem 40-130 x 4-13 mm, cylindrical, basally widened to 6-20(-30) mm, pruinose, whitish, with age turning buff from the base; smell raphanoid. Sp 8.5-11.5 x 5-6.5 μm , amygdaloid, rugulose (fig. 809E), strongly dextrinoid, perispore not loosening; cheilocystidia cylindrical to subclavate. Summer to autumn; rare in temp., common in hemib.-bore.; DK (LC), FI (LC), NO (NE), SE (LC). – FM 1(2) cover, FNE 3:67, Svp 40:10.
H. incarnatum A.H. Sm. (*H. bryogenes* Vesterh.)
- Cheilocystidia on av > 6.9 μm broad at apex; under various trees and shrubs 4
- 4. Frb dominated by greyish colours; cap 13-21 mm broad. Cap convex to expanded, almost dry, hygrophanous, fawn at centre, more greyish towards margin; gills medium spaced to distant; stem 14-21 x 2-3 mm, cylindrical, pruinose, pale greyish, turning brownish from the base; smell raphanoid. Sp 9.5-12.5 x 6-7.5 μm , ellipsoid-ovoid to subamygdaloid, rugulose (fig. 811A), slightly to distinctly dextrinoid, perispore not loosening; cheilocystidia clavate, sometimes widened in lower half, apex on av 8-9.5 μm broad. With dwarf *Salix*; summer; rare in suba.-arc./alp., but possibly overlooked; FO (Suduroy), NO (LC, Oppl: Vågå, S&F: Sogndal). – FNE 3:87.
H. subconcolor Bruchet
- Frb dominated by whitish colours; cap mostly larger 5
- 5. Cap 20-28 mm; sp on av > 6.7 μm broad; cheilocystidia distinctly clavate, apex on av 8.5-10.1 μm broad; only in alpine habitats see *H. alpinum* E 4
- Cap 19-75 mm; sp on av < 6.6 μm broad (fig. 811B); cheilocystidia subclavate, apex on av 6.9-8.9 μm broad; in lowland as well as in alpine habitats. Cap convex, then expanded, slightly viscid, whitish to cream, or centre pinkish buff to clay buff or cinnamon; gills crowded; stem 19-100 x 5-11 mm, cylindrical with a bulbous, up to 20 mm broad base, velvety, whitish, more brownish with age; gills often with small droplets; smell raphanoid. Sp 9-12.5 x 5.5-7 μm , broadly amygdaloid, rugose, strongly dextrinoid, perispore rarely loosening. With deciduous and coniferous trees, also in sand dunes and in arc./alp.; summer to autumn; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – FM 1:62, FNE 3:65, Svp 25:16, Ves 336.
H. velutipes Bruchet (*H. leucosarx* P.D. Orton s. auct. p.p.)

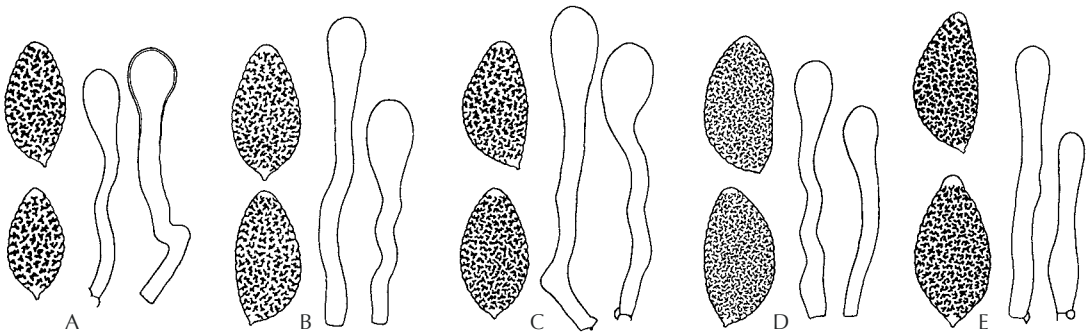
Key E: Sect. *Denudata* (Fr.) Sacc.

- 1. With dwarf *Salix* or *Dryas* in suba.-arc./alp. 2
- Not with dwarf *Salix* or *Dryas* in suba.-arc./alp. 6
- 2. Stem > 4 mm broad 3
- Stem < 4 mm broad 5
- 3. Cap 20-28 mm broad; sp on av 6.7-7.1 μm broad (fig. 811C). Cap hemispherical to bell-shaped, later expanded, viscid, not hygrophanous, yellowish cream to yellowish ochraceous; gills medium spaced; stem 20-30 x 4-8 mm, cylindrical or with slightly widened base, pruinose, whitish, turning brownish from base; smell raphanoid. Sp 11.5-14 x 6-7.5 μm , amygdaloid to subcitriform, rugose, weakly dextrinoid, perispore rarely loosening; cheilocystidia clavate, apex on av 8.5-10 μm broad. With dwarf *Salix* and *Dryas*; summer; often confused with other species and distribution poorly known; IS (Au). – FNE 3:79.
H. alpinum (J. Favre) Bruchet
- Cap often > 30 mm broad; sp on av 5.5-6.5 μm broad 4



Spores and cheilocystidia: A: *Hebeloma subconcolor*, B: *H. velutipes*, C: *H. alpinum*, D: *H. minus*, E: *H. fragilipes*.

4. Cheilocystidia clavate-stipitate, rarely widened in the lower part, apex on av 7.5-11 μm broad see *H. crustuliniforme* 9
 - Cheilocystidia clavate, often constricted and thick-walled in the median part and widened near the base, apex on av 6.5-7.5 μm broad see *H. hiemale* 13
5. Sp ellipsoid-ovoid to subamygdaloid, on av 10.1-11.4 \times 6.3-6.7 μm (fig. 811A); frb dominated by greyish colours see *H. subconcolor* key D 4
 - Sp amygdaloid to citriform, on av 11.4-12.8 \times 6.1-6.3 μm (fig. 811D); cap clay buff to yellowish brown; stem greyish white to pale cream. Cap 8-18 mm, convex to expanded, viscid to slimy, slightly hygrophanous; gills medium spaced to distant; stem 10-25 \times 1.5-3.5 mm, cylindrical, pruinose; smell slightly raphanoid. Sp 11-14 \times 5.5-7 μm , rugose, indistinctly dextrinoid, perispore sometimes loosening; cheilocystidia clavate, sometimes widened in lower half, apex on av 7.5-9 μm broad. With dwarf *Salix*; summer; rare in suba.-arc./alp., but possibly overlooked; IS (Au), NO (LC, Oppl: Øyer). – FNE 3:85.
H. minus Bruchet
6. Cap dominantly white or whitish, at least in outer part, at centre often with yellow or brownish yellow tinges; sp pale yellow in the microscope 7
 - Cap \pm brown or with greyish colours; sp brownish yellow to brownish in the microscope 10
7. Cheilocystidia on av < 7 μm broad at apex, in median part often remarkably constricted and/or with wall thickenings (fig. 811E). Cap 17-55 mm, convex to expanded, viscid, not hygrophanous, white to pale cream, at centre sometimes with a pinkish buff tinge; gills medium spaced to crowded, often with small droplets; stem 25-80 \times 3-8 mm, cylindrical or with slightly widened base, flocculose, whitish, occasionally turning brownish from the base; smell raphanoid. Sp 9.5-12 \times 5-6.5 μm , amygdaloid to narrowly citriform, verrucose, weakly dextrinoid, perispore sometimes loosening; cheilocystidia narrowly clavate. With deciduous trees; summer to autumn; occasional in temp.-suba.; DK (LC), FI (LC), IS, NO (LC, S&F: Luster), SE (LC). – Bol Bres 41:111, End 368, FNE 3:77, Ves 337.
H. fragilipes Romagn. s. lato
 - Cheilocystidia on av > 7 μm broad at apex, in median part not remarkably constricted or with wall thickenings 8
8. Stem 2-4(-5) mm broad; sp on av < 5.5 μm broad (fig. 812A). Cap 10-35 mm, hemispherical to convex, later expanded, often with a crenulate margin, viscid to slimy, not hygrophanous, whitish to pale cream with a clay-buff to cinnamon centre; gills medium spaced to crowded, often with conspicuous droplets; stem 15-70 mm long, cylindrical, floccose, whitish, some-



Spores and cheilocystidia: A: *Hebeloma helodes*, B: *H. lutense*, C: *H. crustuliniforme*, D: *H. pusillum*, E: *H. alvarens* var. *alvarens*.

times turning brownish from the base; smell raphanoid. Sp 9-11 x 4.5-6 μm , narrowly amygdaloid, verrucose, without iodine reactions, perispore sometimes loosening; cheilocystidia clavate to capitate, apex on av 8.5-10.5 μm broad. Under *Salix*, less often *Populus*; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), FO, NO (LC, S&F: Luster, Sogndal), SE (LC). – End 370, FM 1:63, FNE 3:75, M&J 14, ☉.

H. helodes J. Favre

- Stem mostly > 5 mm broad; sp on av > 5.5 μm broad 9

9. Sp distinctly dextrinoid; only recorded with *Salix* on \pm sandy or gravelly soil. Cap 14-60 mm, convex, later expanded, viscid, not hygrophanous, whitish to pale pinkish buff with a brick to orange-brown centre; gills medium spaced to crowded, often with small droplets; stem 35-70 x 3-11 mm, cylindrical, pruinose, whitish; smell raphanoid. Sp 10-12 x 5-6.5 μm , amygdaloid to narrowly citriform, verrucose (fig. 812B), perispore rarely loosening; cheilocystidia clavate, often flexuous, apex on av 6.5-8 μm broad. In deciduous and mixed forests, sometimes at lake shores; autumn; rare in temp. and suba., but possibly overlooked; DK (DD), SE. – C&D 998, FNE 3:101.

H. lutense Romagn.

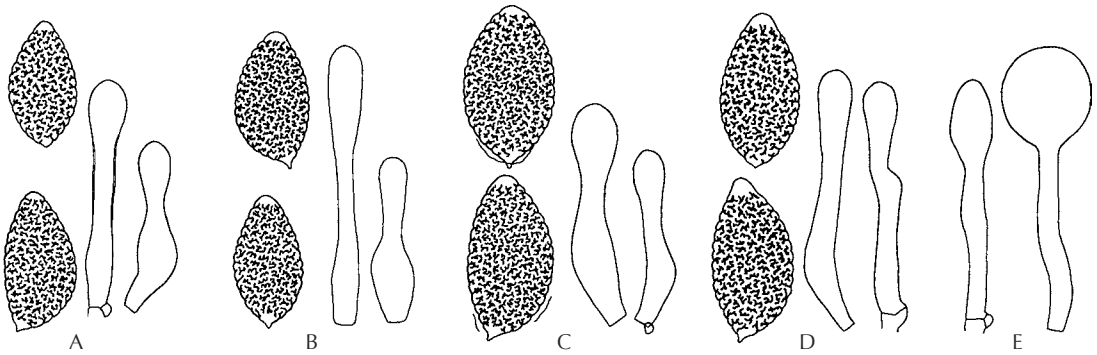
- Sp without iodine reactions; recorded with a wide range of broadleaved trees and conifers. Cap 20-100 mm, convex, later expanded, often with a crenulate margin, viscid, not hygrophanous, whitish to pale pinkish buff, at centre to pinkish buff or clay buff; gills crowded, often with conspicuous droplets; stem 25-70(-130) x 6-14 mm, cylindrical or widened near the base, transversely floccose, whitish; smell raphanoid. Sp 9.5-12.5 x 5-6.5 μm , amygdaloid, verrucose (fig. 812C), perispore sometimes loosening; cheilocystidia clavate-stipitate, often flexuous, apex on av 7.5-11 μm broad. Summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – C&D 993, Däh 687, FNE 3:73, R&H 479, Ves 336, ☉.

H. crustuliniforme (Bull.) Quéf. s. lato

10. Stem 1-3 mm broad; with *Salix* in bogs. Cap 5-23 mm, convex, later expanded, sometimes umbonate, viscid to slimy, not distinctly hygrophanous, cinnamon to brick at centre, much paler at margin; gills medium spaced, often with small droplets; stem 15-40 mm long, cylindrical, pruinose, whitish, often turning brownish from the base; smell raphanoid. Sp 10.5-13 x 5.5-6.5 μm , narrowly amygdaloid, rugose (fig. 812D), indistinctly dextrinoid, perispore not loosening; cheilocystidia clavate to capitate, apex on av 8-10 μm broad. Summer to autumn; locally common in temp.-bore.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – FAD 120C, FNE 3:83, Ves 338, Win 93:48, ☉.

H. pusillum J.E. Lange

- Stem 3-10 mm broad; with *Salix* or other hosts 11



Spores and cheilocystidia: A: *Hebeloma hiemale*, B: *H. cavipes*, C: *H. alvarens* var. *hinnuleum*, D: *H. vaccinum* var. *vaccinum*, E: *H. vaccinum* var. *cephalotum*.

11. Ixocutis very thin, about 25 μm ; cap cinnamon to the margin; sp narrowly amygdaloid to fusiform (fig. 812E); found in a *Juniperus* alvar with *Pinus sylvestris*. Cap 13-38 mm, convex, later expanded, dry; gills medium spaced; stem 30-38 x 3-6 mm, cylindrical, floccose, whitish; gills with small droplets; smell raphanoid. Sp 11.5-13.5 x 5.5-7 μm , verrucose, weakly dextrinoid, perispore often loosening; cheilocystidia clavate, often widened in lower half, apex on av 6.5-7.5 μm broad. Autumn; EE. – FNE 3:95.
H. alvarens Vesterh. & Vauras var. *alvarens*
- Ixocutis rather thick, 50-150 μm ; cap with less vivid colours, at least in the outer part; sp amygdaloid to citriform; with broadleaved trees or conifers 12
12. Sp on av < 6.5 μm 13
 - Sp on av > 6.5 μm 15
13. Some cheilocystidia thick-walled in the median part. Cap 15-55 mm, convex, later expanded, sometimes umbonate, viscid to slimy, not distinctly hygrophanous, clay buff to cinnamon to brick at centre, pinkish buff towards margin; gills medium spaced, often with small droplets; stem 25-75 x 3-8 mm, cylindrical or widened at base, pruinose, sordid whitish, turning brownish from the base; smell raphanoid. Sp 10.5-13 x 5.5-7 μm , amygdaloid to citriform, verrucose (fig. 813A), slightly dextrinoid, perispore rarely loosening; cheilocystidia clavate, often widened in the lower half, apex on av 6.5-7.5 μm broad. In deciduous forests; late summer to autumn; rare in temp.-bore., but possibly overlooked; DK (DD), NO (S&F: Hønefoss, Samsjöen). – FNE 3:81.
H. hiemale Bres.
- Cheilocystidia rarely thick-walled in the median part 14
14. Cheilocystidia often widened in the lower half, not remarkably flexuous; perispore sometimes loosening. Cap 28-74 mm, hemispherical to convex, later expanded, slightly viscid to almost dry, not hygrophanous, greyish buff to clay buff or pale pinkish buff; gills medium spaced to crowded; stem 37-55 x 7-15 mm, cylindrical, flocculose, whitish; smell raphanoid. Sp 9.5-12.5 x 5-6.5 μm , broadly amygdaloid to citriform, verrucose (fig. 813B), distinctly dextrinoid; cheilocystidia subclavate, apex on av 6-7.5 μm broad. In lawns and on naked soil under deciduous trees, less often with conifers; late summer to autumn; locally common in temp.; DK (NE), FI. – FNE 3:99.
H. cavipes Huijsman (incl. *H. vejlense* Vesterh.)
- Cheilocystidia rarely widened in the lower half, often remarkably flexuous in the lower part; perispore not loosening see *H. lutense* 9

15. Cap not hygrophanous; stem (5-)7-13 mm broad, not fragile. Cap 14-80 mm, bell-shaped to convex, later expanded, viscid, centre fawn, towards margin clay buff to whitish; gills medium spaced to crowded; stem 30-65 mm long, cylindrical or up to 19 mm broad at the base, floccose, whitish; smell raphanoid. Sp 11.5-14 × 6.5-8 μm, broadly amygdaloid to citriform, verrucose (fig. 813C), distinctly dextrinoid, perispore sometimes loosening; cheilocystidia clavate, often widened in lower half, apex on av 6.5-8 μm broad. Under deciduous trees on peaty or sandy soil; late summer to autumn; rare in temp.-suba., but possibly overlooked; DK (DD), IS (Au). – FNE 3:97.

H. alvarens Vesterh. & Vauras var. *hinnuleum* Vesterh.

Note: morphologically different from the main variety in several characters, but apparently not genetically.

- Cap ± hygrophanous; stem 2.5-7 mm broad, rather fragile 16
16. Cheilocystidia ± clavate, not abruptly capitate, 5-10(-12) μm broad (fig. 813D). Cap 13-40 mm, convex, later expanded, viscid to nearly dry, ± hygrophanous, fawn to dark brick at centre, paler and more greyish towards margin; gills medium spaced; stem 20-60 × 2.5-7 mm, cylindrical, pruinose, whitish to yellowish, sometimes turning clay buff from the base; smell raphanoid. Sp 12-14 × 6.5-7.5 μm, amygdaloid to citriform, verrucose, strongly dextrinoid, perispore sometimes loosening; apex of cheilocystidia on av 6.5-7.5 μm broad. Under *Salix* in bogs, dunes and mountains; summer to autumn; common in temp.-suba.; DK (LC), FI, IS (Au), SE (LC). – C&D 1003, FNE 3:89, Ger 01:292, Ves 338.

H. vaccinum Romagn. var. *vaccinum*

- Some cheilocystidia very strongly and abruptly capitate, 6-19(-22) μm broad, on av 9.7-11.8 μm broad (fig. 813E). In other characters like the main variety. In *Salix* bogs; autumn; rare in temp., but possibly overlooked; DK.
- H. vaccinum* Romagn. var. *cephalotum* Enderle & Vesterh.

Key F: Sect. *Myxocybe* (Fayod) Konrad & Maubl.

1. Universal veil forming a membranous ring on the stem; smell usually of marzipan (subsect. *Myxocybe*). Cap 25-110 mm, hemispherical to convex, later expanded, slimy, cream to buff, with appressed, brownish scales; gills crowded; stem 35-120 × 8-15 mm, cylindrical with a widened base, with a distinct to long pseudorrhiza, whitish, turning clay buff to brown from base. Sp 8-10 × 4.5-5.5 μm, amygdaloid, verrucose (fig. 815A), strongly dextrinoid, perispore sometimes loosening; cheilocystidia cylindrical or widened in the upper or lower part, apex on av 6.5-7.5 μm broad. In deciduous forests, favoured by nitrogen compounds, like in vole nests, badger burrows, etc.; summer to autumn; occasional in temp.-hemib.; DK (LC), NO (NT), SE (LC). – Däh 680, FNE 3:105, Phil 215e, Svp 29:17, Ves 340, ☉.

H. radicosum (Bull.: Fr.) Ricken

- Universal veil not forming a membranous ring on the stem; smell indistinct or like cocoa, soap, tea or fruit 2
2. Sp ± cylindrical (fig. 815B); in *Pinus* forests on poor and sandy soil. Cap 15-60 mm, hemispherical to convex, later expanded, viscid, hygrophanous, dark brick to orange brown at centre, clay buff towards margin; gills medium spaced to crowded; stem 30-90 × 3-10 mm, cylindrical or with widened base, often with a distinct pseudorrhiza, pruinose, whitish, turning clay buff to sepia from base; universal veil fugacious; smell faint or slightly fruity. Sp 8.5-11 × 4-5 μm, verruculose, strongly dextrinoid, sometimes with loosening perispore; cheilocystidia cylindrical to irregular, apex on av 4.5-5 μm broad. Late summer to autumn; common in temp.-bore.; DK (LC), FI, NO (LC, Østf: Hvaler), SE (LC). – C&D 991, FNE 3:115, M&J 7, Svp 29:21, Ves 341.

H. cylindrosporum Romagn.

Note: the widely used name *H. cylindrosporum* should be conserved against the older name *H. angustispermum* A. Pearson.



Spores: A: *Hebeloma radicosum*, B: *H. cylindrosporium*, C: *H. syrjense*, D: *H. birrus*, E: *H. lundqvistii*, F: *H. laterinum*.

- Sp ± amygdaloid to citriform or fusiform; often in different habitats 3
- 3. Cap appearing dry; epicutis < 30 μm thick; in eutrophic springs and fens in coniferous forests, calciphilius. Cap 20-55 mm, convex to expanded, hygrophanous, dark greyish buff to clay buff; gills crowded; stem 70-110 × 4-7 mm, cylindrical or with a widened base, sometimes with a distinct pseudorrhiza, pruinose, cream, soon turning greyish brown to sepia from the base; smell weak, soap-like. Sp 7.5-9.5 × 4.5-5.5 μm, amygdaloid to citriform, verrucose (fig. 815C), distinctly to strongly dextrinoid, sometimes with loosening perispore; cheilocystidia cylindrical to subclavate, apex on av 5-6.5 μm broad. Late summer to autumn; rare in bore.; FI (NT), NO (LC, M&R: Molde), SE (LC). – FNE 3:113, M&J 11.
H. syrjense P. Karst. (*H. subsaponaceum* P. Karst.)
- Cap viscid to slimy; epicutis > 50 μm thick; often in different habitats 4
- 4. Perispore loosening many sp (fig. 815D). Cap 10-75 mm, convex to expanded, with or without umbo, ± hygrophanous, dark brick to yellowish brown or clay buff at centre, paler to whitish towards margin; gills medium spaced to crowded; stem 25-85 × 3-14 mm, cylindrical, often with a distinct pseudorrhiza, pruinose, whitish, turning brownish from the base; universal veil mostly fugacious; smell weak, like chocolate or soap. Sp 8-11(-13.5) × 5-6(-7.5) μm, amygdaloid, verrucose, strongly dextrinoid; cheilocystidia cylindrical to irregular, apex on av 4.5-5(-7.5) μm broad. In deciduous or coniferous forests, favoured by nitrogen compounds, also on burnt ground; late summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 120A, FNE 3:117&119, M&J 4&6, Svp 29:21, Ves 341.
H. birrus (Fr.) Sacc. (*H. anthracophilum* Maire, *H. calyptrosporium* Bruchet, *H. danicum* Gröger, incl. *H. pumilum* J.E. Lange)
- Perispore not loosening or only slightly loosening in few sp 5
- 5. Under broadleaved trees 6
- Under conifers 7
- 6. Cap yellowish brown, sometimes slightly paler towards margin. Cap 23-50 mm, convex to expanded, viscid, not hygrophanous; gills crowded; stem 55-75 × 5-11 mm, cylindrical or with widened base, with a ± distinct pseudorrhiza, pruinose, whitish, turning ochraceous brown from the base; universal veil fugacious; smell weak, cocoa- or soap-like. Sp 9.5-11 × 5.5-6.5 μm, amygdaloid, verrucose (fig. 815E), strongly dextrinoid, perispore rarely loosening; cheilocystidia cylindrical to irregular, apex on av 6-6.5 μm broad. With broadleaved trees on calcareous soil; autumn; very rare in temp.-hemib.; DK (CR, Lol: Maribo), FI (A: Lemland), SE (NE, Dls: Ryrhalvön). – FNE 3:109.
H. lundqvistii Vesterh.
- Cap pale buff to pinkish buff. Cap 15-75 mm, convex to expanded, viscid to almost dry, not hygrophanous; gills crowded; stem 30-90 × 4-17 mm, cylindrical with a widened base, with a ± distinct pseudorrhiza, floccose, whitish, soon turning buff to sepia from base; universal veil fugacious; smell like cocoa or 'poires belle Helène'. Sp 8.5-11 × 5.5-6.5 μm, amygdaloid, verrucose (fig. 815F), distinctly dextrinoid, perispore rarely loosening; cheilocystidia cylindrical to irregular, apex on av 4.5-5.5 μm broad. With broadleaved trees and conifers on

calcareous soil; autumn; locally common in temp.-bore.; DK (LC), FI (NT), NO (LC), SE (LC). – C&D 1006, Däh 695, FNE 3:107, Svp 29:21, Ves 340.

H. laterinum (Batsch) Vesterh. (*H. senescens* Sacc., *H. edurum* Bon)

7. Sp on av 5.1-5.9 μm broad (fig. 817A); cap colours \pm marbled, often with a lilac tinge; smell like tea. Cap 19-57 mm, convex to expanded, viscid, \pm hygrophanous, a mixture of pinkish buff and clay buff; gills medium spaced; stem 30-160 \times 4-12 mm, cylindrical, with a \pm distinct pseudorrhiza, pruinose, whitish to pale pinkish buff, soon turning greyish brown to sepia from base. Sp 9-11 \times 5-6 μm , amygdaloid to fusiform, verrucose, distinctly dextrinoid, perispore rarely loosening; cheilocystidia cylindrical to irregular, apex on av 5.5-6 μm broad. With conifers on calcareous soil; autumn; rare in hemib.-middle bore.; FI (DD), NO (LC), SE (LC). – FNE 3:111.

H. circinans Quél.

- Sp on av 5.9-6.3 μm broad; cap colours not marbled, without a lilac tinge; smell like cocoa or 'poires belle Helène' see *H. laterinum* 6

Key G: Sect. *Sacchariolentia* (Bon) Boyle

1. Cap dry, soon velvety or cracking up into small scales; cheilocystidia 12-30 \times 3-8 μm . Cap 15-90 mm, hemispherical to convex, pale cream to pale pinkish buff; gills medium spaced to distant; stem 30-110 \times 3-17 mm, cylindrical or tapering downwards, whitish; smell strong and sweetish. Sp 12-15 \times 6.5-8.5 μm , citriform, verrucose (fig. 817B), distinctly dextrinoid, often with a loosening perispore; cheilocystidia cylindrical to irregular, apex on av 5.5-7 μm broad. With *Salix* and *Alnus* on \pm calcareous soil; summer to autumn; rare in temp.-hemib.; DK (VU), NO (LC, Akh: Asker), SE (LC). – Bol Bres 38:73, End 378, FNE 3:127, RdM 38:52, Svp 29:21.

H. hetieri Boud. (*H. tomentosum* M.M. Moser)

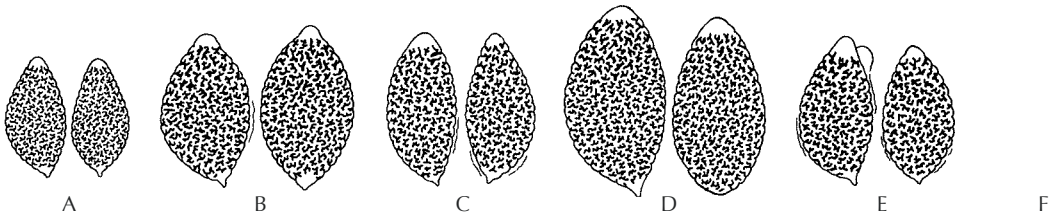
- Cap slightly to distinctly viscid, totally smooth or only slightly velvety at margin; cheilocystidia often longer 2
2. Sp narrowly amygdaloid to subfusiform, $Q_{av} > 1.9$ (fig. 817C); cap 10-28 mm broad, white to pale cream; exsiccates not discoloured to dark brown. Cap hemispherical to convex, later expanded, viscid; gills medium spaced to distant; stem 30-70 \times 2-6 mm, cylindrical with a \pm pointed base, pruinose, white, turning pale pinkish buff; smell strong and sweetish. Sp 10.5-13.5 \times 5.5-7 μm , verrucose, strongly dextrinoid, perispore often loosening; cheilocystidia cylindrical to clavate, apex on av 5.5-9.5 μm broad. With *Salix*, rarely with other deciduous hosts; late summer to autumn; rare in temp.; DK (VU), FI, SE (NE). – BSMF 122:167, FNE 3:129, Svp 29:21.

H. fusisporum Gröger & Zschiesch.


- Sp broader, Q mostly < 1.9 ; cap 15-60(-85) mm broad, pale pinkish buff to greyish buff, clay buff or cinnamon; exsiccates often partly discoloured to dark brown 3
3. Sp 13-17 \times 7-9 μm (fig. 817D); in bogs with *Salix* or *Alnus*. Cap 15-50 mm, hemispherical to convex, later expanded, viscid to almost dry, pale clay buff to cinnamon, but paler towards margin; gills medium spaced to distant; stem 40-95 \times 3-9 mm, cylindrical, sometimes with a \pm pointed base, pruinose, whitish to pale brownish, turning darker brown from base; smell strong and sweetish. Sp broadly amygdaloid to citriform, verrucose, strongly dextrinoid, perispore often loosening; cheilocystidia cylindrical to irregular, apex on av 7.5-9.5 μm broad. Late summer to autumn; rare in temp.-bore., but possibly overlooked; DK (VU), FI (DD), SE (LC). – Däh 694 (as *sacchariolens*), FNE 3:125, Svp 29:20, Ves 341.

H. gigaspermum Gröger & Zschiesch.

- Sp 11-14 \times 6-8 μm (fig. 817E); on rich soil in forests and gardens with broadleaved hosts, often with *Quercus*. Cap 15-60(-85) mm, hemispherical to convex, later expanded, viscid to almost dry, pale pinkish buff to greyish buff; gills medium spaced to distant; stem 13-70 \times



Spores: A: *Hebeloma circinans*, B: *H. hetieri*, C: *H. fuisporum*, D: *H. gigaspermum*, E: *H. sacchariolens*.

2.5-8(-10) mm, cylindrical, sometimes with a \pm pointed base, pruinose, whitish, turning clay buff to umber from base; smell strong and sweetish, often nauseating. Sp broadly amygdaloid to citriform, verrucose, strongly dextrinoid, perispore often loosening; cheilocystidia cylindrical to lageniform or irregular, apex on av 6-8.5 μ m broad. Summer to autumn; common in temp.-hemib., rare but locally occasional in bore.; DK (vU), FI (LC), NO (LC), SE (LC). – FNE 3:121, Phil 217g, R&H 480, Svp 29:20, Ves 341, .

H. sacchariolens Quél. (*H. latifolium* Gröger & Zschiesch. non P. Karst., *H. pallidoluctuosum* Gröger & Zschiesch.)

Hemimycena Singer

THOMAS LÆSSØE & STEEN A. ELBORNE

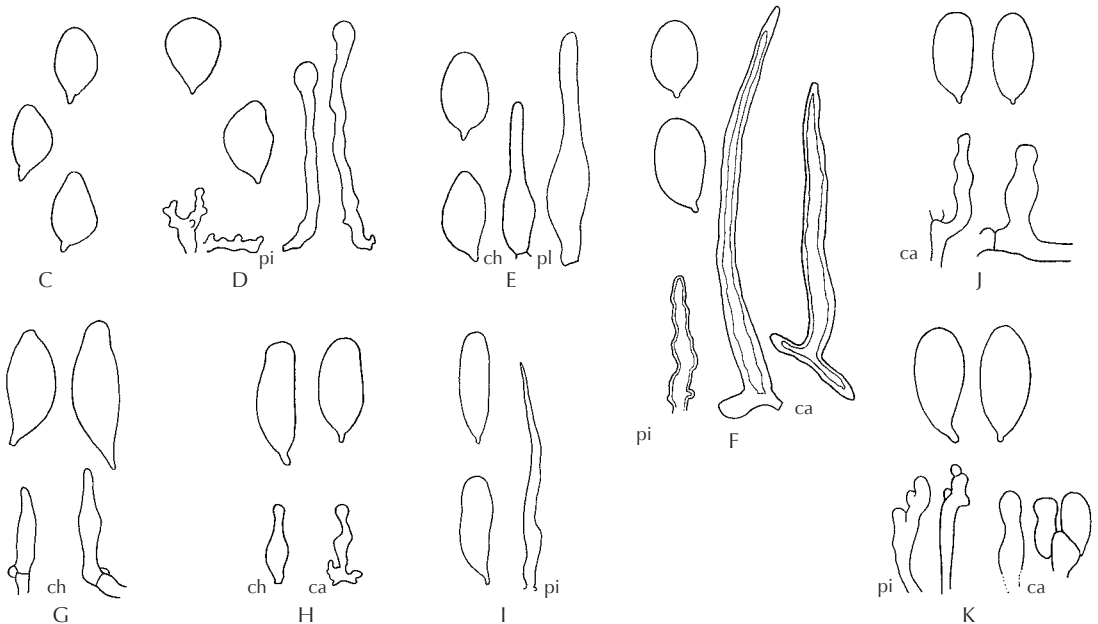
Frb omphalinoid or mycenoid, white or pale coloured with striate cap. Cap (0.5-)1-30 mm, conical, bell-shaped, convex to flat with ± depressed centre to funnel-shaped, with incurved to straight or wavy margin, sometimes with central papilla, pruinose, pubescent, hairy or rarely glabrous, translucently striate or not, mostly hygrophanous, white, but some with cream to pale yellowish brown to greyish colours. Gills absent to well developed with all intermediates, adnexed to decurrent, thin, often veined or forked, very distant to crowded, white or very pale greyish or yellowish white. Stem 2-60 × 0.1-2 mm, ± central, cylindrical to slightly clavate, smooth, pruinose, pubescent to hairy, dry, mostly white, often translucent. Flesh very thin. Smell indistinct, faintly fungoid-farinateous to sweetish aromatic or nitrous. Taste indistinct to bitter. Sp deposit white.

Sp globose-subglobose, ovoid, dacryoid, subfusiform, ellipsoid, amygdaloid, citriform, pyriform, cylindrical or sway-backed cylindrical, without iodine reactions, smooth, hyaline, thin-walled. Basidia (1-)2-4-spored, and several taxa occur in 2- or 4-spored forms, apparently with the latter becoming rarer in the colder regions. Cheilocystidia absent or present, versiform, often clavate-fusiform to lageniform, rarely digitate, thin- to thick-walled, hyaline. Pleurocystidia mostly absent but present and diagnostic in a few species. Pileipellis typically a cutis, often with distinct thin- to thick-walled cystidia, hyphae smooth or diverticulate to coralloid. Caulocystidia typically differentiated and versiform, thin- or thick-walled. Clamps present or absent.

Saprotrophic and possibly parasitic; solitary or in groups on litter, including leaves, needles, rotten bark, small woody items or on ± dead material at the base of living plants, including ferns and tall herbs, rarely seemingly on soil; all year, especially summer to autumn.

22 species in the Nordic countries, 25 in the key. It is to be expected that more species will appear in future keys since many collections at present cannot be keyed out in this or other published keys. The genus is in all likelihood polyphyletic.

Lit.: Antonín & Noordeloos 2004, Aronsen 1992, 1993, Bon 1983, Gminder & Krieglsteiner in Krieglsteiner 2001, Gröger 1994, Gulden & Jenssen 1982, Kühner 1938, Kühner & Valla 1972, Læssøe 1998, Montag & Münzmay 1989, Redhead 1982b, Romagnesi 1992.




Spores, pileipellis elements, pileocystidia, cheilocystidia, pleurocystidia and caulocystidia: C: *Hemimycena mairei*, D: *H. cephalotricha*, E: *H. delectabilis*, F: *H. crispula*, G: *H. cucullata*, H: *H. lactea*, I: *H. mauretanica* var. *mauretanica*, J: *H. pseudogracilis*, K: *H. epichloë*.

1. Frb yellow, greyish to olive brown, also when young 2
 - Frb white-translucently white, rarely staining cream to yellow with age 4

2. Frb distinctly yellow to pale ochraceous brown; typically with *Cirsium* in alpine habitats; caulocystidia thick-walled. Cap 5-12 mm, hemispherical to bell-shaped with a small umbo (papilla), hygrophanous, striate, pruinose, ochraceous yellow to darker brownish yellow; gills arcuate decurrent, distant to medium spaced, L = 14-26, whitish; stem 15-45 x 0.5-2 mm, pubescent, white to pale ochraceous; smell faint to aromatic. Sp 8-11 x 4.5-5.5(-6) μm , amygdaloid to \pm pyriform; basidia 4-spored; cheilocystidia 35-40(-57) x 7.5-10.5 μm , subfusiform, slightly thick-walled below, thin-walled further up; pleurocystidia absent; caulocystidia 15-42 x 3-6.5 μm , \pm thick-walled, undulating cylindrical to subcapitate; pileipellis a cutis with scattered, fairly small excrescences; clamps present. Autumn; very rare or overlooked; NO (NTr: Høylandet, Storgårningen). – A&N 04:49, C&D 538, Cou 93, Favre 55:4.8, M&J 4.

H. ochrogaleata (J. Favre) M.M. Moser

Note: see also aberrant colour forms of *H. cucullata* in p. 12 with much more crowded gills. *Cirsium* or similar plants were not noted on the label with the only known collection from the area. This material deviates from material described by Antonín & Noordeloos (2004) in having longer and broader cheilocystidia, that tend to be slightly thick-walled, and in having cylindrical caulocystidia. Further Norwegian material (2 collections from Hord.: Ulvik) deviates in being 2-spored, sp 10-12(-17) x 4.5-5.5(-7.5) μm and in having pleurocystidia and no clamps.

- Frb with greyish to yellowish olive brown colours, with monocotyledons; caulocystidia thin-walled 3
3. Cap without a dark central spot; cheilocystidia few or absent. Cap 5-20 mm, convex, with straight to upturned thin margin, slightly striate, hygrophanous, pruinose, mat, dirty greyish, rarely almost white; gills deeply arcuate decurrent, rather thick, sometimes forked or veined, distant, L = (12-)16-22, whitish to pale grey, paler towards margin; stem 10-25 x 1.5-3 mm, pruinose-pubescent in full length, white to translucently pale grey; smell indistinct. Sp 6-8(-9.5) x 3-5 μm , Q = 1.5-2, dacryoid-pyriform, with prominent apiculus (fig. 267C); basidia 4-spored; cheilocystidia simple, \pm clavate, scattered; caulocystidia 15-40 x 3-7 μm , simple, wavy cylindrical, thin-walled; pileipellis a cutis with scattered small excrescences on the hyphae; pileocystidia absent; clamps present. Typically in grass turf on clayey soil, often in places with many *Conocybe* species; summer to autumn; distribution poorly known, apparently overlooked, but locally common in temp.; DK (LC), SE. – A&N 04:39, BSMF Atlas 279, GBW 3:258, .


H. mairei (J.-E. Gilbert) Singer (*Hygrocybe griseopallida* Arnolds)

- Cap sometimes with a distinct, dark central spot; with many cheilocystidia. Cap 5-20 mm, hemispherical to conical convex or bell-shaped with upturned margins, striate, hygrophanous, pruinose, greyish yellow, with a \pm olive tinge; gills arcuate decurrent, distant, L = 12-20, pale grey; stem 12-40 x 1-3 mm, hyaline white, pruinose; smell insignificant or honey-like when crushed; taste unpleasant. Sp 5.5-8.5 x 3-4.5 μm , Q = c. 1.4, \pm dacryoid-ellipsoid; basidia 4-spored; cheilocystidia 30-55 x 6-12 μm , versiform, clavate to antler-like, thin-walled; caulocystidia 28-45 x 3-8 μm , shaped \pm as cheilocystidia; pileipellis a cutis with scattered, short excrescences; pileocystidia absent; clamps present. In nutrient poor grassland, including roadsides, on \pm clayey-sandy soil; summer to autumn; absent or overlooked in area; DE, NL. – A&N 04:42.

H. sordida Noordel. & Antonín

Note: this taxon is very close to *H. mairei*, and one of the claimed distinguishing characters has been observed for both taxa by the authors (presence/absence of caulocystidia). Danish collections with colours typical of *H. mairei* have been noted to have caulocystidia in full stem length. The pictures published by the authors show almost white frb, but this is not considered in the description.

4. Pileocystidia present, capitate, 23-70 μm long, somewhat uneven to spirally twisted 5
 - Pileocystidia absent or present, if capitate, < 25 μm long 6

5. Pileocystidia spirally twisted; cheilocystidia acute; sp subfusiform. Cap 0.5-12 mm, hemispherical to bell-shaped, soon plane, pubescent, often with droplets, white to cream; gills well developed, adnexed-adnate, narrow, medium spaced to crowded, L = 12-20, with many lamellules; stem (1-)3-30 x 0.1-1 mm, central to eccentric, pubescent-hairy, typically with droplets, base not strigose; smell and taste indistinct. Sp 8.5-11 x 2.5-4.4 μm , Q = 2.6-3, clavate-fusiform, tapering towards apiculus; basidia (1-)2-4-spored; cheilocystidia 20-30 x 4-8 μm , lageniform-rostrate, abundant; pleurocystidia absent or scarce; caulocystidia as pileocystidia, 28-65 x 5-9 μm , with head up to 10 μm wide, stipitipellis diverticulate; pileipellis diverticulate; clamps present, but often scarce. On rotten bark from broadleaved trees, including *Fagus*, *Quercus* and *Carpinus*; all year (NO: autumn); very rare in hemib., one record from NO (Vestf.: Stokke). – A&N 04:77, Cou 112, FM 7(1):18; Myc 7(4):179, .

H. tortuosa (P.D. Orton) Redhead

- Pileocystidia uneven-undulating (fig. 267D); cheilocystidia capitate; sp citriform. Cap 1-7 mm, hemispherical, conical-convex to convex or slightly depressed, pruinose-pubescent, sometimes covered by clear droplets; gills adnate-decurrent, distant, L = 8-11, rather thick, some forked; stem 2-10 x 0.3-0.7 mm, central to eccentric, pubescent, \pm covered by droplets, with basal hairs; smell insignificant. Sp 6.5-8(-9) x 4-5.5(-6) μm , Q = 1.5-1.8, \pm citriform; basidia (2-)4-spored; cheilo- and pleurocystidia (25-)30-42(-55) x 4-7 x 3.5-6 (head) μm , capitate; caulo- and pileocystidia similar; pileipellis of coarse coralloid-digitate elements; clamps present. On rotten coarse bark, especially *Quercus*, more rarely on other kinds of bark or wood; autumn to late autumn; rare in temp.-suba.; DK (Sj: Suserup), NO, SE (Mpd). – A&N 04:33, BSMF 109(4) Atlas 278, Svp 37:24.

H. cephalotricha (Redhead) Singer

6. Sp Q < 2.2 7
 - Sp Q > 2.3 12

7. At the base of living *Symphytum*; cheilo-, pileo- and caulocystidia \pm acute. Cap 3-20 mm, bell-shaped to convex, pruinose, \pm striate, white; gills well developed, deeply arcuate decurrent, distant, L = 17-22; stem 15-70 x 0.5-1.5 mm, pubescent, often rooting, sometimes fasciculate, base often strigose hairy; smell indistinct; taste indistinct to bitter. Sp 8-11 x (3-)4-5 μm , Q = c. 2.1, dacryoid-fusiform; basidia 4-spored; cheilocystidia 20-30 x 3-10 μm , awl-shaped to lageniform, slightly thick-walled; pleurocystidia absent; caulocystidia 14-31 x 2.5-5 μm , versiform, including lageniform to awl-shaped, often slightly thick-walled; stipitipellis smooth; pileipellis with scattered excrescences and pileocystidia, 11-25 x 2.5-4 μm , versiform; clamps present. Summer to autumn; very rare or more likely overlooked in temp.-hemib.; DK (Fyn: Våsemose), SE. – A&N 04:81; BSMF 109 Atlas 277, FAD 197C, R&H 344.


H. candida (Bres.) Singer

- On other substrates; cystidial shapes different 8
8. Without any cystidial elements; on soil. Frb \pm recalling a tiny *Clitopilus scyphoides*. Cap 3-6 mm, conical to undulating funnel-shaped, not striate, glabrous, white; gills decurrent, \pm triangular, well developed, very distant to distant, L = c. 10; stem 6-16 x 0.5-1 mm, glabrous, white. Sp (8.5-)9-11.5(-14) x (4-)4.5-6 μm , Q = 1.9-2.1, \pm dacryoid-ellipsoid; basidia 4-spored; pileipellis with scattered, slightly thick-walled excrescences; stipitipellis similar; clamps present. On naked soil with moss in oak forest; summer (Central Europe) to autumn; apparently very rare in hemib., but more common in Central Europe; NO. – A&N 04:97, M&J 6.

H. ignobilis Bon

Note: in all likelihood not a *Hemimycena*.

- With some kind of cystidial elements, on all kinds of litter, including rotten bark 9
9. Caulocystidia thin-walled 10
 - Caulocystidia \pm thick-walled 11

10. Sp ellipsoid-fusiform (fig. 267E); cystidia lageniform, often subcapitate; smell strongly nitrous. Cap 4-16 mm, conical, bell-shaped to convex, often acutely papillate, pruinose, striate, hygrophanous, white but may show faint greyish or yellowish tinges, especially at centre; gills arcuate decurrent, distant, L = 10-20; stem 5-40 x 0.5-1.5 mm, ± cylindrical, pubescent, basally hairy, translucently white; taste bitter. Sp 7-9 x (3.5-)4.5-5.5(-6) μm, Q = 1.7-1.9; hymenial cystidia 30-65 x 8-16 μm, numerous; caulocystidia 30-65 x 5-10 μm, lageniform with subcapitate to capitate apex; pileipellis with coarse excrescences and no cystidia; clamps present. Mainly on coarse herbs and grass culms, but also recorded on woody fragments, needle-beds etc; summer to autumn; common in temp.-suba., rare in arc./alp.; DK, FI (DD), NO, SE. – A&N 04:85, FAD 61A (as *Omphalia gracillima*), 61B (as *O. stellata*), M&J 3, Myc 7(4):179, .

H. delectabilis (Peck) Singer s. auct. Eur. (*H. delectabilis* (Peck) Singer var. *paucicystidiata* Gulden & K.M. Jenssen)

Note: the type grew in a needle-bed in North America and has pleurocystidia. A Swedish collection (ÖI) has 2-spored basidia, but differs from var. *bispora* (Kühner) Antonín in spore shape and shape of cystidia. A Danish collection from a *Hygrocybe* grassland has a more grey tinge, a more *Mycena*-like habit and smaller spores than typical material.

- Sp globose-subglobose; cystidia cylindrical to acute; smell insignificant. Cap 1-5 mm, hemispherical to convex, mostly papillate, striate, pruinose, hygrophanous, white; gills adnate-decurrent, often reduced, very distant, L ≤ 7; stem 8-15 x 0.1-0.5 mm, pubescent towards base, insititious. Sp (5.5-)6-7.5(-8) x 5-6.5(-7) μm, Q = 1.1-1.2; basidia 4-spored; hymenial cystidia 21-40 x 6-11 μm, versiform, often long rostrate, scarce or easily overlooked; caulocystidia versiform, sometimes branched, with long thin projections, thin-walled; pileipellis with short diverticulate and rostrate, thin-walled pileocystidia; clamps present. On *Phragmites* stems; summer to autumn; very rare or more likely overlooked, hemib.; NO (Vestf: Tønsberg).

H. subglobispora Aronsen

11. Pileocystidia absent or as very short setiform elements. Cap 2-10 mm, bell-shaped to depressed, pruinose-pubescent, white; gills not reaching the margin, decurrent, very distant, L = 8-10; stem 10-35 x 0.2-0.5 mm, pubescent-hairy, base not strigose; smell not recorded in authoritative sources. Sp 8-11.5 x (3.5-)4-5.5 μm, Q = 1.9-2.2, ovoid-ellipsoid to subfusiform, tapering towards apiculus; basidia 4-spored; hymenial cystidia absent; caulocystidia 7-50 x 3-9(-11) μm, ± awl-shaped and thick-walled; pileipellis densely diverticulate with scattered, thick-walled similar cystidia to 35 x 4-5 μm; clamps present. On dead leaves of *Salix*, in tall-herb meadow; autumn, very rare or overlooked in arc./alp.; one record from NO (Hord: Ulvik). – A&N 04:64, B&K 3:220.

H. pseudocrispula (Kühner) Singer



Note: similar material on *Petasites* has been seen in DK, but with 2-spored basidia and with thick-walled, utriform pleurocystidia and apparently without the diverticulate cheilocystidia of *H. crispuloides* Antonín & Noordeloos described from Czechia and Slovakia.


- Pileocystidia long and awl-shaped, up to 85 μm long (fig. 267F). Cap 2-4(-10) mm, hemispherical to irregularly funnel-shaped, pubescent-hirsute, white; gills reduced, decurrent, 2-5(-10) veins reaching 2/3 towards margin; stem 4-8(-12) x 0.2-0.3 mm, widened at the top, hairy, not strigose at base; smell indistinct. Sp 6.5-10 x 4-5.5 μm, Q = 1.4-2.1, dacryoid-ellipsoid; basidia 1-2-spored; caulocystidia 30-118 μm long, ± awl-shaped, thick-walled; pileipellis coralloid with setiform cystidia; clamps present. On rotten sticks of deciduous trees, *Larix*-cones, herb stems, e.g. *Geum urbanum*, monocotyledons, including *Carex* and *Phragmites*, in marshy habitats, on fern debris, etc.; summer to autumn; common in temp.-bore., rare in suba.; DK, FI (DD), NO, SE – A&N 04:59, 60, B&K 3:215 (var. *tetraspora*), FAD 62D.

H. crispula (Quél.) Singer (*H. hirsuta* (Tode) Singer s. auct., nom. dub. sec. Antonín & Noordeloos)

Note: var. *tetraspora* Antonín & Noordeloos with 4-spored basidia is not recorded with certainty in the area.

12. L = 29-50. Cap 5-30 mm, conical-convex, bell-shaped to plane with upturned margin, not or slightly striate, pruinose-pubescent, white, rarely staining yellow; gills narrow, but well developed, crowded, sinuate, adnexed-adnate with a decurrent tooth; stem (15-)20-50(-60) x (0.5-)1-2 mm, pubescent, hairy at base; smell faintly fungoid-farinaceous to sweetish aromatic; taste insignificant to slightly bitter. Sp 10.5-13.5 x 3.5-5 μm , Q = 2.4-2.7, dacryoid-fusiform to citriform (fig. 271A); cheilocystidia 20-30 x 4.5-8 μm , fusiform-lageniform, rarely subcapitate, thin-walled; pleurocystidia absent or few near edge; caulocystidia 15-35 x 4-6.6 μm , cylindrical to attenuated-fusiform, rarely subcapitate; pileipellis a trichoderm of cystidioid elements, 15-45 x 3-14 μm ; clamps present. On debris of deciduous trees, including old sawdust, and rooting on rich or calcareous soil in parks and shrubby woodland; late summer to late autumn; common in temp.-hemib.; DK, NO, SE. – A&N 04:23, 24 (yellow form), B&K 3:216, 217 (as *Mycena lactea*), GBW 3:253, Ger 97:196, ☉.
H. cucullata (Pers.: Fr.) Singer (*H. gypsea* (Fr.) Singer)
- L < 25 13
13. Capitate cystidioid elements present on cap, gills or stem 14
 - Capitate cystidioid elements absent 19
14. On *Dryopteris* litter. Cap 1-2(-5) mm, conical, convex to depressed, sometimes umbonate, pubescent, striate, white, sometimes staining yellowish; gills \pm arcuate decurrent, well developed, very distant to distant, L = 4-15, often interveined, some forked or branched, thin to thickish, edge fimbriate and with droplets; stem 4-10 x 0.2-0.3 mm, pubescent-hairy, strigose at base, white to yellowish when old; smell absent. Sp (7-)9-11 x 2.5-3 μm , Q = 3.5-4, narrowly dacryoid to fusiform, sometimes constricted apically; basidia 2-4-spored, cheilocystidia up to 25 μm long, undulating cylindrical, with capitate apex 3.5-4 μm broad; pleurocystidia absent or rare; caulocystidia 15-25(-40) x 3.5-4 μm , \pm capitate, thin-walled; pileipellis with irregular, coarsely coralloid elements and capitate cystidia, up to 25 μm long; clamps absent or present. The few collections seen all deep in living *Dryopteris felix-mas* growing on rich, \pm calcareous soil, on dead basal parts after prolonged summer rain; summer; rare or overlooked in temp., DK (Lol: Møn, Ejyl: Vorsø). – A&N 04:28.
H. gypsella (Kühner) Elborne & Læssøe
 Note: differs from the original description and the interpretation by Antonín & Noordeloos (2004) in the clearly decurrent gills and in presence of clamps in some of the collections, but Antonín & Noordeloos depict Danish material.
- Not on *Dryopteris* litter 15
15. Gills absent to very distant, often vein-like and not always reaching margin, L < 9 16
 - Gills distant to medium spaced, fully developed, L > 9 17
16. Caulocystidia with long necks ending in small, abruptly delimited head; cheilocystidia acute. Cap 1-2 mm, convex, hirsute, white; gills absent or vein-like, not reaching margin, L = 0-5, decurrent; stem 3-6 x 0.1-0.2 mm, hirsute, base not strigose; smell apparently absent. Sp 9.5-12 x 2-3.5 μm , Q = 4-5, sway backed fusiform-cylindrical, tapering towards apiculus (fig. 391B); basidia 2-spored (outside area only known as 4-spored and at least partly clamped); cheilocystidia \pm lageniform with long tapering, undulating necks; caulocystidia up to 38 μm long, capitate, slightly thick-walled; pileocystidia up to 51 μm long, very long necked lageniform and capitate, head up to 4.5 μm wide, slightly thick-walled, sometimes with adhering glutinous material; clamps absent. In area only known from one collection in tussocks of *Schoenus nigricans*; late summer, very rare or overlooked; DK (NJyl: Vandplasken). – A&N 04:56, ☉.
H. mauretanic (Maire) Singer var. *cystidiata* Antonín & Noordel.
- Caulocystidia mostly not capitate and never abruptly so; cheilocystidia absent
 see *H. epichloë* 26

17. Cheilocystidia absent; gills decurrent see *H. pseudocrispula* 11
 - Hymenial cystidia big, capitate 18
18. Pleuro- and cheilocystidia abundant, 25-65 x 6-12 μm , utriform-subcapitate, somewhat thick-walled. Cap (5-)10-20(-25) mm, conical-convex to bell-shaped, pruinose, only slightly striate, white; gills broad and well developed, adnexed-adnate, medium spaced, L = (13-)18-25; stem 15-50 x 1-2 mm, pubescent, hairy at base; smell faint; taste insignificant. Sp 6-8 x 2.5-3.5 μm , Q = c. 2.4, narrowly dacryoid; basidia (2-)4-spored; caulocystidia 16-28 x 3.5-7 μm , clavate to somewhat coralloid, with slightly thickened walls, abundant; pileipellis coralloid-diverticulate with abundant cystidia similar to caulocystidia; clamps present. On coniferous debris in damp forests, apparently also with deciduous trees; summer to autumn; common in hemib., occasional in bore.; FI (LC), NO, SE. – A&N 04:31, B&K 3:221.
H. pseudolactea (Kühner) Singer
 - Pleurocystidia only present near gill margin; cheilocystidia 21-30 x 5.5-7 μm , lageniform to tibiiform, thin-walled. Cap (3-)6-14 mm, conical, bell-shaped to convex with a broad umbo, pruinose, striate, white, sometimes slightly yellowish towards centre; gills sinuate adnate with a decurrent tooth, broad and well developed, often veined, distant to medium spaced, L = (10-)15-20; stem 10-40 x 0.3-1.5 mm, pruinose-pubescent, translucently white, hairy at base; smell indistinct. Sp (8-)9-13(-15) x (2.5-)3-4(-5) μm , Q = (2-)3-4, narrowly dacryoid to subfusiform, sometimes slightly constricted apically (fig. 271B); basidia 1-2-spored; caulocystidia 12-45 x 3-4 μm , versiform, with some coralloid and capitate elements; pileipellis with coarse excrescences and capitate, thin-walled cystidia to 25 x 4 μm ; clamps present. On old mossy, damp needle-beds under various conifers, including e.g. *Picea*, *Abies*, *Pinus* and *Juniperus*; summer to late autumn, rarely in spring; common in temp.-bore.; DK, FI (LC), IS, NO, SE. – A&N 04:17, FAD 53C, M&J 4, 
H. lactea (Pers.: Fr.) Singer (*H. pithya* (Fr.: Fr.) Dörfelt s. auct.)
 Note: var. *tetraspora* (Kühner & Valla) Courtec. with dominantly 4-spored basidia is apparently not recorded in area. A large form or separate taxon, matching *Mycena echinipes* s. J.E. Lange, occurs on *Fagus* leaves on rich soil in autumn. DK.
19. With distinct, tapering pileocystidia 20
 - Pileocystidia absent, digitate or simple, clavate to subcapitate 22
20. Gills well developed; pileipellis without excrescences; sp Q = 3.3-3.7. Cap 2-15 mm, conical, convex or plane, striate, hairy, white; gills \pm arcuate adnate to decurrent, very distant to distant, L = 6-12; stem 5-25 x 0.2-1 mm, pubescent-hairy, base strigose, white or tinged yellow or brown from base when old; smell absent or insignificant. Sp (7.5-)8-11.5(-12) x 2.5-3.5 μm , Q = 3.3-3.7, \pm cylindrical but tapering towards apiculus; basidia 4-spored; hymenial cystidia absent or some cheilocystidia present, similar to the pileocystidia; caulocystidia 16-78 x 3.5-10 μm , awl-shaped to setiform, with slightly thickened walls; pileocystidia 35-91 x 4.5-10 μm , awl-shaped or setiform with slightly thickened walls; clamps present. Outside area known from small litter items under *Fagus* and *Quercus* and also on herbaceous debris; summer to autumn; NL, UK. – A&N 04:72.
H. angustispora (P.D. Orton) Singer
 - Gills vein-like; pileipellis with distinct excrescences, sp Q \leq 3.2 21
21. With distinctly thick-walled pileo- and caulocystidia; basidia 2-spored; clamps absent. Cap 0.5-5 mm, \pm convex to plane, pubescent-hairy, white; gills absent or with few decurrent veins, not reaching cap margin; stem 2-20 x 0.1-0.4 mm, pubescent-hairy, base not strigose hairy, translucently white; smell and taste presumably indistinct. Sp 10-16 x 3.5-5 μm , Q = c. 3, clavate-fusiform, tapering towards apiculus; hymenial cystidia absent; pileipellis with numerous, irregular sized excrescences and thick-walled, \pm awl-shaped cystidia, up to 100 x 20-30 μm . Typically in marshy places on rotten herbaceous material; summer to autumn; rare or overlooked in temp.; DK (EJyl: Hald Sø), NO. – A&N 04:69, pl. 20!, 
H. subtilis (Velen.) Antonín (*H. cyphelloides* (P.D. Orton) Maas Geest.)

- Pileo- and caulocystidia only slightly thick-walled; basidia 4-spored; clamps present. Cap (0.5-)1-2.5 mm, hemispherical to bell-shaped or plane, pubescent-hairy, often with droplets, white; gills vein-like, not reaching cap margin, decurrent, L = 6-9, very distant to distant; stem 2-7 x 0.3-0.5 mm, hairy, often with droplets, base not strigose; smell insignificant. Sp 6.5-10 x 2-3.5(-4) μm , Q = c. 3.2, fusiform-cylindrical, tapering towards apiculus (fig. 271C); hymenial cystidia absent; caulocystidia 40-70 x 4-6.5 μm , awl-shaped or setiform; stipitipellis hyphae with excrescences; pileocystidia 20-70 x 2-6 μm , as caulocystidia. On a wide variety of dead organic matter, including rotten bark and woody fragments, in damp habitats; summer to autumn; probably very common, but highly overlooked, in temp.-bore.; DK, FI (DD), NO, SE. – A&N 04:54, 69 (pl. 19!), .
- H. mauretanic* (Maire) Singer var. *mauretanic*
22. Cheilo- and pileocystidia distinctly digitate. Cap 2-13 mm, bell-shaped to plane, hygrophanous, indistinctly striate, slightly pruinose, white; gills well developed, arcuate decurrent, very distant to distant, L = 9-15; stem 10-25 x 0.5-2 mm, pruinose-pubescent, not hairy at base; smell insignificant to faintly spermatic. Sp 7.5-9 x 2-4.5 μm , Q = 2.3-2.7, \pm dacryoid; basidia 4-spored; cheilocystidia 20-40 x 4-7 μm , irregularly shaped; pleurocystidia absent; caulocystidia 10-48 x 3-6 μm , versiform, often somewhat diverticulate, thin-walled; pileipellis coralloid-diverticulate; clamps present. Apparently on a very wide range of different substrates like bark, herbaceous debris, including grasses and at the base of large dead herbaceous stems, e.g. *Urtica*; summer to autumn; DE, NL, PL. – A&N 04:100.
- H. crispata* (Kühner) Singer
- Cheilo- and pileocystidia absent or not digitate 23
23. Gills well developed; cheilocystidia present 24
- Gills poorly or well developed; cheilocystidia absent 25
24. On rotten herbaceous material, incl. *Petasites* litter and decaying leaves; sp Q = 2.6-3.1; cystidia \pm acute. Cap 2-8 mm, \pm bell-shaped, with small central papilla or depressed, \pm striate, pruinose, white; gills well developed, arcuate decurrent, distant, L = 10-11; stem 10-20 x 0.3-0.5 mm, pruinose, insititious; smell and taste insignificant. Sp (9-)10-14.5(-15) x (3.5-)4-5(-5.5) μm , clavate-fusiform; basidia 4-spored; cheilocystidia 21-35 x 5-7 μm , \pm fusiform, \pm thick-walled; pleurocystidia possibly present; caulocystidia 15-65 x 2.5-7 μm , irregularly shaped from clavate to awl-shaped, \pm thick-walled, stipitipellis diverticulate; pileipellis diverticulate with scattered cystidioid, \pm smooth clavate elements, up to 40 μm long; clamps present. Summer to autumn; only few records from DK (EJy): Vorsø, Sj: Amager Fælled).
- H. subimmaculata* (Murrill) Elborne & Læssøe
- On conifer debris; sp Q = (2.9-)3.2-4.2; cystidia rounded apically. Cap 2-10 mm, \pm bell-shaped to plane, striate, pruinose-pubescent, sometimes rugose, white; gills well developed, \pm arcuate decurrent, distant, L = 9-15, somewhat veined; stem 15-40 x 0.3-0.7 mm, pubescent, strigose hairy at base; smell and taste indistinct. Sp (7-)-8-11(-12) x 2-3 μm , \pm cylindrical to cylindrical sway backed; basidia 4-spored; cheilocystidia 18-25 x 4.5-7 μm , clavate-lageniform, thin- to slightly thick-walled; pleurocystidia absent; caulocystidia 12-25 x 3.5-5 μm , versiform, clavate to \pm lageniform, slightly thick-walled; pileipellis densely diverticulate with few short cystidioid elements; clamps present. Summer to autumn; occasional in hemib.-bore., only few records from NO; FI (LC), NO, SE. – A&N 04:105, M&J 5.
- H. gracilis* (Quél.) Singer
25. Gills well developed. Cap 4-6 mm, conical to bell-shaped, finally with upturned margin, striate or not, hygrophanous, pruinose, white to cream; gills well to poorly developed, distant, L = 10-13, arcuate adnate-decurrent; stem 20-35 x 0.5-1.5 mm, glabrous to slightly pruinose, with strigose, radiating hairs at base; smell and taste insignificant. Sp 7.5-10 x 3-4 μm , Q = 2.4-2.7, \pm narrowly dacryoid (fig. 271D); basidia 4-spored; hymenial cystidia absent or with few sterile cells among basidia on edge; caulocystidia 18-35 x 4-7(-12) μm , some-

times scarce, clavate to irregular, thin- to very slightly thick-walled; pileipellis with rather coarse excrescences, but no cystidia; clamps present. On needle-beds or on thin roots in the litter; summer to autumn; rare in hemib.-bore., only few records from the area; NO (Akh: Oslo, Vestf: Tjøme), SE.– A&N 04:109.

H. pseudogracilis (Kühner & Maire) Singer

- Gills vein-like 26
- 26. Stipitipellis smooth. Cap 2-8 mm, convex with central depression to trumpet-shaped, pruinose, white; gills absent or poorly developed, L = 0-10, not reaching margin, deeply arcuate decurrent; stem 4-20 x 0.1-0.5 mm, pruinose, translucently white, ± strigose hairy at base; smell insignificant. Sp 8-12 x (2.5-)3-4.5 µm, Q = 2.7-3.4, dacryoid-fusiform, tapering towards apiculus (fig. 271E); basidia 4-spored; hymenial cystidia absent; caulocystidia 10-40 x 2-6 µm, versiform, thin-walled; epicutis with excrescences and short, clavate to subcapitate cystidioid elements; clamps present. On grass or other monocotyledons in wet grassland; summer to early autumn; rare, but probably highly overlooked in temp.-hemib., only with few records from DK (Sj: Kongelunden) and NO (Vestf: Horten, Tjøme). – A&N 04:103, ☉.
H. epichloë (Kühner) Singer
- Stipitipellis with excrescences 27
- 27. Sp dacryoid, < 10 µm long. Cap c. 2 mm, conical to convex, glabrous to pruinose; gills as few very short veins; stem c. 7 x 0.2 mm, pruinose; smell nitrous in type, not noted or absent in Danish material. Sp 8.5-9 x 2.5-3 µm, Q = c. 3, clavate-ellipsoid; basidia 4-spored; hymenial cystidia absent; caulocystidia 12-18 µm long, irregular, acute, thin-walled; pileipellis densely short diverticulate, without pileocystidia; clamps present. Late autumn; in the area only known from a single collection on leaves of *Salix viminalis* on calcareous soil in DK (DD, EJyl: Mønsted).
H. nitriolens (Valla) Antonín & Noordel.
- Sp subfusiform to curved clavate, > 10 µm long. Cap 0.4-4 mm, convex, pruinose; gills absent or with a few ribs; stem 5-10 x 0.1(-0.2) mm, pruinose to slightly hairy towards base; smell absent. Sp 10-12(-13) x 2.5-4 µm (in Danish material 10.5-13.2 x 2.6 µm); basidia 4-spored; hymenial cystidia absent or rare; stipitipellis with excrescences and short, poorly differentiated cystidia, up to c. 28 µm long; pileipellis with excrescences and a few short, cystidioid, thin-walled, non-capitate elements; clamps absent. On *Salix* leaves, elsewhere also on *Corylus* leaves; autumn; presumably overlooked, temp.; DK (DD, EJyl: Tolne Bakker)
H. pseudogibba (Valla) Antonín & Noordel. (*Mycena pseudogibba* Valla)

Hemipholiota (Singer) Bon

STIG JACOBSSON

Nemecomyces Pilát

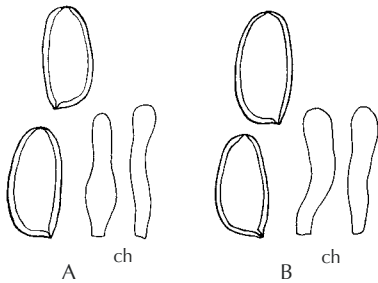
Frb tricholomatoid, on wood. Cap 50-200 mm, ± scaly, dry or slightly viscid. Gills adnate or emarginate with a decurrent tooth, crowded. Stem with a narrow, fibrillose ring. Smell aromatic-spicy or indistinct. Taste mild or slightly bitter. Sp deposit snuff brown.

Sp ellipsoid, with a germ pore. Cheilocystidia thin-walled, cylindrical to clavate, hyaline. Pleurocystidia absent. Pileipellis a dry cutis, pigments incrusting. Clamps present.

Parasitic or saprotrophic on wood of deciduous trees.

Two species in the Nordic countries.

Lit.: Holec 2001, Jacobsson 1990, Noordeloos in Bas et al. 1999.



Spores and cheilocystidia: A: *Hemipholiota heteroclita*, B: *H. populnea*.

1. On *Betula* and *Alnus*, rarely other deciduous trees. Cap 50-150 mm, pale yellow to ochre yellow, becoming brownish at centre with age, covered with thin, fibrillose, brownish scales, especially towards the margin; gills crowded, emarginate, at first pale ochraceous yellow, then brownish; stem 50-150 x 15-30 mm, length and shape depending on the attachment, with a fibrillose, brownish ring, at least when young, pale; smell aromatic-spicy; taste mild. Sp 7.5-10 x 4.5-6.5 μm , ellipsoid (fig. 831A); cheilocystidia narrowly clavate; gill edge sterile. On living, declining or dead trunks; autumn; occasional in hemib.-suba., rare in temp.; DK (VU), FI (LC), NO (LC), SE (LC). – Däh 616, FAD 108C, Lud 65.7, M&J 3, R&H 455, ⊙.
H. heteroclita (Fr.) Bon (*Pholiota h.* (Fr.) Quél.)
- On *Populus*, rarely on *Fagus*. Cap 50-200 mm, pale buff to greyish or ochre brown, covered with distinct, woolly-fibrillose, white to dull brown scales; gills with a greyish shade; stem 40-100 x 13-35 mm, mostly thickened towards the base, below the ring scaly like the cap; smell indistinct. Sp 7-9.5 x 4.5-6 μm , ellipsoid (fig. 831B); cheilocystidia ± clavate, but variable. Parasitic on living or saprotrophic on recently dead or cut trunks of various cultivated *Populus* species, rarely *P. tremula*; autumn; rare in temp.-hemib.; DK (LC), FI (LC), NO (NT), SE (NT). – B&K 4:437, FAD 107C, Holec 159, Lud 65.15, R&H 454, ⊙.
H. populnea (Pers.: Fr.) Bon (*Pholiota p.* (Pers.: Fr.) Kuyper & Tjall.-Beuk., *P. destruens* (Brond.) Gillet, *P. comosa* (Fr.) Quél.)
Note: collections on *Fagus* are by some authors considered as a separate species, *Pholiota comosa* Schulzer.

Hemistropharia Jacobsson & E. Larss.

STIG JACOBSSON

Monotypic genus; see description below.

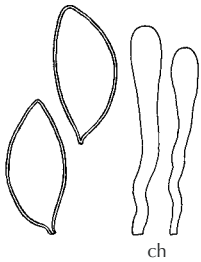
Lit.: Jacobsson 1990, Jacobsson & Larsson 2007, Noordeloos in Bas et al. 1999.

Frb collybioid with black sp deposit. Cap 30-100 mm, not hygrophanous, at first hemispherical to convex, when expanded often obtusely umbonate, glutinous, shiny when dry, covered with small, fibrillose, white to brownish veil remnants which also are present at margin, when young fulvous orange but soon becoming dark brown with a flush of violaceous. Gills adnate to subdecurrent, broad, crowded, when young whitish to violaceous grey, with serrate edge exuding white droplets in moist weather, finally dark greyish brown, but edge persistently whitish. Stem 30-120 x 5-15 mm, equal, becoming hollow with age, with a distinct ring, pale and pruinose in top, below the ring darker and with numerous \pm upraised, brown scales. Smell somewhat raphanoid. Taste bitter. Sp deposit dark rusty or chocolate brown.

Sp 11-14 x 5.5-7.5 μ m, amygdaloid to subfusiform with a distinct apiculus, rather thick-walled, with a germ pore (fig. 831C), brown. Basidia 4-spored, in certain collections partly 2-spored. Cheilocystidia 40-70 x 5-15 μ m, thin-walled, densely packed, basal part narrow and flexuous, with a clavate to subcapitate apex. Pleurocystidia absent. Pileipellis a thick ixocutis. Clamps present.

Saprotrophic or parasitic on wood of living trees, single or in small clusters at base of trunks or from injuries above the ground, sometimes on roots, most frequent on *Populus tremula*, but also on other deciduous trees or *Picea*; autumn; rare in temp.-hemib., very rare in bore., in NO north to Troms; FI (VU), NO (NT), SE (NT). – Lud 65.16, M&H 4:401, M&J *Stropharia* 2, R&H 445, ☉.

H. albocrenulata (Peck) Jacobsson & E. Larss. (*Pholiota a.* (Peck) Sacc., *Hemipholiota a.* (Peck) Bon, *Stropharia a.* (Peck) Kreisel)



Spores and cheilocystidia.

Henningsomyces O. Kuntze

HENNING KNUDSEN

Solenia Pers.: Fr. non J. Hill

Frb cyphelloid, tubular, whitish, smooth or hairy. Frb 1-2 mm long and 0.1-0.3 mm broad, sessile or short stipitate.

Sp broadly ellipsoid, subglobose to pyriform, smooth, hyaline, thin-walled, without iodine reactions. Hyphae hyaline, with somewhat thickened walls, somewhat glutinous and thus agglutinated, 1-3 μm in diam. Cystidia absent or few and irregularly scattered. Clamps present or absent. Basidia 15-30 \times 5-8 μm , cylindrical, clavate to suburniform, 2-4-spored. Hairs on outside unbranched or branched. Irregular crystals absent or present on outside.

Saprotrophic on decayed wood and debris, often densely gregarious in large numbers; late spring to autumn.

Two species in the Nordic countries.

Lit.: Agerer 1973.



Spores and hairs from margin: *Henningsomyces candidus*.

1. Outside smooth or finely granulose (lens!), whitish or pale yellow brown; mostly on *Fagus*. Frb up to 1 mm long and 0.3 mm in diam., cylindrical, finely pubescent, whitish or cream. Sp 4.5-6 \times 4-5 μm , subglobose to broadly ellipsoid (fig. 281B); hairs around margin irregular, slightly thick-walled, branched, resembling a tree with stiff, upright, short branches, base 2-3 μm thick, branches tapering to 0.5 μm at apex; irregular, hyaline crystals the size of the basidia abundant. Saprotrophic; gregarious, individual frb not merging sideways, on dead, often very rotten and moist wood of deciduous trees, south of the area also on *Abies*; late spring to autumn; occasional in temp.; DK (LC), NO (LC), SE (LC). – B&K 2:229, Bol Bres 37:118, Svp 41:21, ⊙.

H. candidus (Pers.: Fr.) Kuntze (*Solenia c.* Pers.: Fr.)

- Outside entirely or for most part pubescent white (lens!); mostly on *Betula*. Frb 1-3 mm long, c. 0.1 mm in diam., cylindrical and tubular to deeply cup-shaped with constricted base, pure white except at the white or pale yellow apex. Sp 4-6.5 \times 4-5.5 μm , subglobose, broadly ellipsoid or pyriform; hairs around the margin branched, slightly thick-walled, with irregular sinuose-wavy walls, at base 2-3 μm thick, with soft, flexible ramifications pointing in all directions, 6-12 \times 0.5-1 μm ; crystals absent. Saprotrophic; gregarious on bark and on rotten wood of trunks of *Betula*, forming white patches up to several cm, often with hundreds of crowded frb, some of which tend to fuse sideways; occasional in temp.-bore.; DK (LC), FI, NO (NT), SE (LC).

H. puber (W.B. Cooke) D.A. Reid (*Solenia p.* W.B. Cooke)

Hohenbuehelia Schulzer

STEEN A. ELBORNE

Geopetalum Pat., *Acanthocystis* (Fayod) Kühner, *Urceolus* Velen.

Frb crepidotoid to pleurotoid, with a gelatinous layer in the trama. Cap 2-100 mm, kidney-shaped, shell-shaped, circular, spathulate, spoon-shaped, fan-shaped or half funnel-shaped, dry or viscid, smooth to tomentose, white, grey, brown or black. Gills decurrent, distant to crowded, white to black. Stem absent or 3-80 × 1.5-20 mm, lateral and reduced, rarely eccentric to central. Veil absent. Flesh with upper gelatinous layer and lower non-gelatinous layer. Smell and taste mostly farinaceous. Sp deposit white or sordid cream.

Sp ovoid, broadly ellipsoid to cylindrical or phaseoliform, smooth, thin-walled, hyaline, without iodine reactions. Basidia 2- or 4-spored. Cheilocystidia numerous, thin-walled, hyaline, clavate to lageniform with 1-3 rostra, each with an apical subglobose, obovoid or constricted capitulum, separated by a ring-constriction, and mostly covered by a glutinous drop; metuloids present on gills and sometimes on cap surface or on stem, thick-walled, acute- to acuminate-lageniform, rarely clavate, with a crystal cap, hyaline to brown. Pileipellis a trichoderm or a cutis; pileal trama of three layers, an upper gelatinous layer of parallel ascending or interwoven hyphae, a median dense layer of parallel hyphae, and a lower main layer of interwoven, rarely parallel hyphae, metachromatic. Clamps present.

Saprotrophic, solitary or in small groups, on dead wood of deciduous trees and conifers, rarely on grasses and mosses. The associated anamorph *Nematoctonus* Drechsler produces conidia and traps nematodes on glutinous cells similar to the capitulum of the cheilocystidia.

16 species in the Nordic countries.

Lit.: Coker 1944, Elborne in Bas et al. 1995, Miller 1986, Pilát 1935, Thorn 1986, Thorn & Barron 1986, Watling & Gregory 1989.

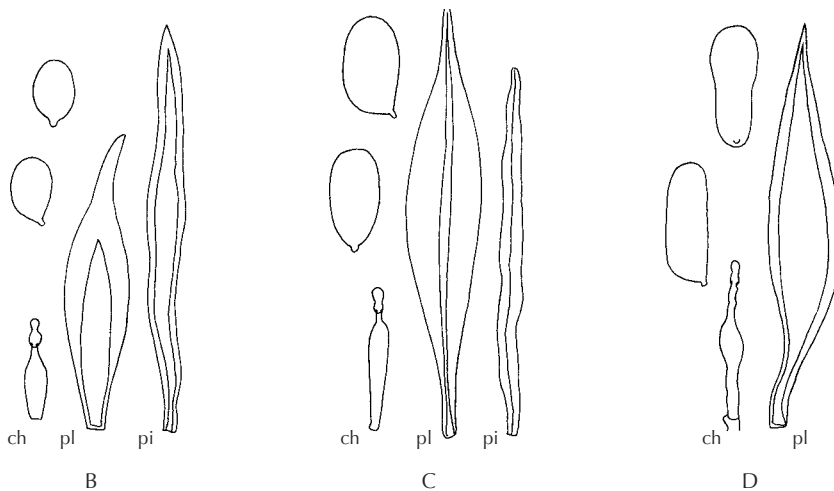


Fig. 315. Spores, hymenial cystidia, cheilocystidia, pleurometuloids and pileometuloids: A: *Macrocystidia cucumis*, B: *Hohenbuehelia petalodes*, C: *H. tremula*, D: *H. longipes*.

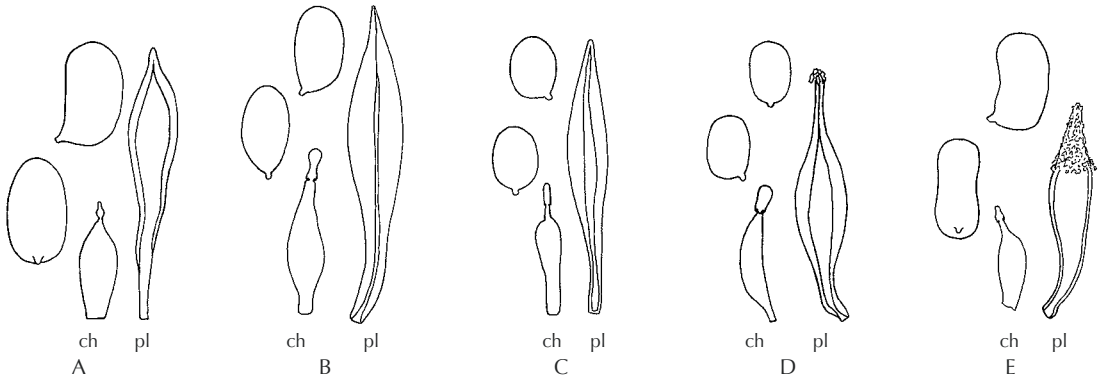


Fig. 317. Spores, cheilocystidia and pleurometuloids: A: *Hohenbuehelia culmicola*, B: *H. valesiaca*, C: *H. auriscalpium*, D: *H. abietina*, E: *H. unguicularis*.

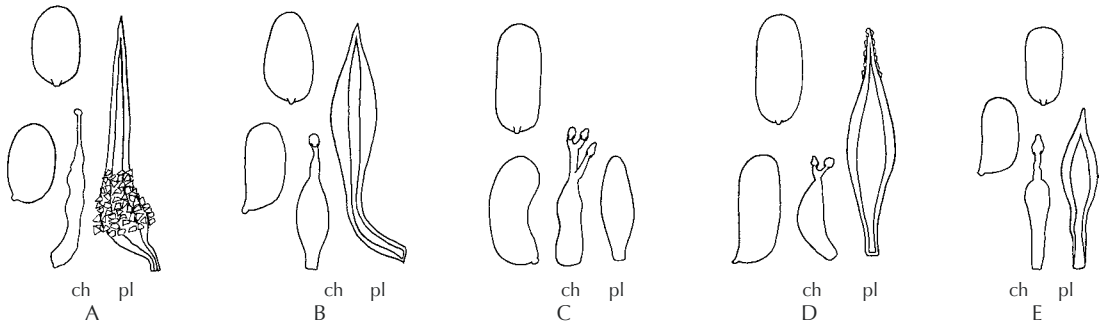


Fig. 319. Spores, cheilocystidia and pleurometuloids: A: *Hohenbuehelia nigra*, B: *H. mustialaënsis*, C: *H. cyphelliformis*, D: *H. fluxilis*, E: *H. mastrucata*.

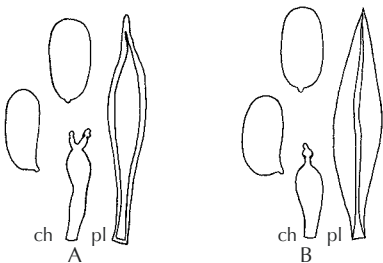




Fig. 321. Spores, cheilocystidia and pleurometuloids.: A: *Hohenbuehelia atrocoerulea*, B: *H. grisea*.

- | | | |
|----|--|---|
| 1. | Cap fan-shaped or half funnel-shaped from above; growing on soil, needle-beds, sawdust or wood chips | 2 |
| - | Cap spathulate, spoon-shaped, kidney-shaped, rounded fan-shaped, shell-shaped or circular from above; growing on wood, grasses, moss or soil | 3 |

2. Sp 5-7.5(-8.5) x 3.5-4.5(-5) μm , ovoid, broadly ellipsoid to ellipsoid (fig. 315B); gelatinous layer (65-)100-475 μm thick; caespitose or in small groups on clayey, often calcareous soil in deciduous forests or on wood chips or sawdust. Cap 13-85(-100) mm wide, 10-85 mm long, half funnel-shaped to fan-shaped, with inrolled to incurved, then straight margin, viscid to glutinous, white to greyish pruinose towards base, \pm smooth towards margin, dark brown, umber to chestnut, or alutaceous to golden brown; gills strongly decurrent, moderately broad, crowded, forked near stem, whitish to pale greyish cream; stem 5-35 x 3-20 mm, lateral, longitudinally depressed above or cylindrical to clavate, solid, pruinose at top, tomentose to strigose at base, greyish white to pale ochre brown, sometimes with white rhizomorphs at base; flesh < 4 mm thick in cap, white with a thin brown gelatinous layer; smell and taste farinaceous. Basidia 4-spored; cheilocystidia 16-34 x 3.5-9.5 μm , lageniform to clavate-rostrate, with 1(-3) rostra, capitulum 3.5-10 x 2-4 μm , constricted to pyriform; metuloids 31-100 x (8.5-)9.5-18(-23.5) μm , fusiform, acuminate to acute apex, with or without a thin crystal cap, wall 1.5-7 μm , hyaline to yellowish; pileocystidia sometimes present, similar to cheilocystidia but narrower; pileometuloids present, 75-100 x 6-7 μm , aculeate, thick-walled, yellow; pileipellis a cutis, rarely a trichoderm of interwoven, thin-walled hyphae; main trama 0.5-3 mm thick, of thin-walled, intervoven hyphae. Summer to autumn; rare in temp.-bore.; DK (VU), FI (LC), NO (LC), SE (LC). – B&K 3:323, GBW 3:264, C&D 157, 158, Lud 32.1A, B, Phil 268b, .

H. petalodes (Bull.: Fr.) Schulzer (*H. geogenia* (DC.) Singer, *H. semiinfundibuliformis* (P. Karst.) Singer)

- Sp (7-)7.5-9.5 x (4-)4.5-5(-5.5) μm , ovoid, ellipsoid to long ellipsoid (fig. 315C); gelatinous layer 46-92(-140) μm thick; solitary or in small groups on soil or needle-beds under conifers or on sawdust and wood chips. Cap 10-100 mm wide, 20-80 mm long, fan-shaped to half funnel-shaped, with incurved margin, shiny-lubricous or gelatinous, smooth or slightly white pruinose, minutely tomentose near base, chestnut to umber brown; gills strongly decurrent, narrow, sometimes forked or anastomosing, crowded, ochraceous yellow with white edge; stem 12-20 x 4.5-15 mm, short or absent; lateral, cylindrical to bulbous, upper side shallowly depressed, entirely white pruinose to tomentose, at base with rhizomorphs; flesh relatively thick, whitish to pale brownish; smell and taste farinaceous. Basidia 4-spored; cheilocystidia 22-50 x 3.5-22 μm , lageniform, ellipsoid- or clavate-rostrate, with 1-2 rostra, capitulum up to 9.5 x 4.5 μm , constricted; metuloids 38-92 x 10-21 μm , acuminate-lageniform, with a thin crystal cap, wall 2-7 μm ; pileocystidia rare, short, erect, cylindrical hyphae with a capitulum similar to cheilocystidia; pileometuloids 42-90 x 3.5-8 μm , aculeate to acuminate-lageniform, thick-walled, hyaline to yellow, without crystals; pileipellis a cutis or a trichoderm of erect or fasciculate hyphae; main trama 0.5-1.5 mm thick, of interwoven, inflated hyphae. Summer to autumn; very rare in temp.-bore., in DK only on piles of wood chips; DK (DD, WJyl), FI (DD, Ks), NO (NT), SE. – MHK 3:90, .

H. tremula (Schaeff.: Fr.) Thorn & G.L. Barron (*H. rickenii* Kühner)

3. Stem central, eccentric or lateral; on grasses in sand dunes or on mosses in fens and gravelly roadsides 4
- Stem absent or lateral; on wood or woody herbs 5
4. Cap plane with deeply depressed centre to funnel-shaped, surface moist to lubricous, smooth, shiny, dark umber to chestnut brown; in wet moss, e.g. *Aulacomnium* in calcareous fens or in gravelly roadsides with *Polytrichum*, *Betula nana* and *Salix* shrub. Cap 12-30(-60) mm, with incurved, undulating and crisped margin, sometimes split on one side, faintly striate at margin; gills strongly decurrent, distant to medium spaced, cream white to yellowish; stem 18-50(-80) x 2-5(-8) mm, central, hollow, cylindrical to slightly clavate, flexuose, dry, dull, minutely pruinose over entire length, base white tomentose, pale greyish brown; flesh thin, tough, white to pale brown; smell and taste farinaceous. Sp (7.5-)8.5-12.5(-14) x (3-)3.5-5.5(-6) μm , oblong ellipsoid, dacryoid to cylindrical (fig. 315D); basidia 2-spored,

rarely 4-spored; cheilocystidia 23-50 x 3-7 μm , lageniform to subcylindrical, with 1(-2) rostra, capitulum 4.5-8.5 x 2-4 μm , constricted; metuloids 50-120 x 7-20 μm , acute to acuminate-lageniform with thin to medium crystal cap, wall 1-6 μm ; hyaline pileocystidia rare, short, erect hyphae with a capitulum similar to cheilocystidia; pileometuloids absent; pileipellis an ixocutis, 58-115 μm thick, of interwoven, thin-walled hyphae; main trama 0.1-0.6 mm thick of parallel, thin-walled hyphae. Solitary or in small groups; spring to autumn; very rare in bore.-arc./alp., in FI with a northern distribution; FI (CR, KiL: Kittilä), NO (VU), SE. – C&D 159, Lud 32.6, SMT 27(3):3, ☉.

H. longipes (Boud.) M.M. Moser (*Omphalia aulacomnii* Jul. Schäff.)

- Cap circular, rounded fan-shaped, spatulate or kidney-shaped seen from above, entirely greyish white tomentose, floccose-scaly towards stem, centre blackish brown, dark brown towards margin; at ground level on culms of grasses esp. *Ammophila arenaria*, in the outermost zone of coastal sand-dunes. Cap (5-)10-24(-40) mm, margin downcurved to straight, often undulating, not striate nor hygrophanous; gills decurrent, crowded, narrow, pale greyish white, becoming cream to pale ochre, with entire, white to blackish grey edge; stem 2-10(-20) x 1.5-6(-10) mm, eccentric or lateral, rarely central, cylindrical, solid, tough, entirely whitish tomentose to velvety, concolorous with cap; flesh white, with a thin black gelatinous layer under cap surface; smell faint, farinaceous when cut; taste strongly farinaceous. Sp (8-9)-12(-14) x (4.5)-5-7(-7.5) μm , ellipsoid, long ellipsoid or subphaseoliform (fig. 317A), hyaline to yellowish; basidia (2-)4-spored; cheilocystidia 15-44(-51) x 5.5-10(-25) μm , lageniform to clavate-rostrate, with 1-2(-5) short rostra, capitulum 3-5.5 x 2-3 μm , obpyriform to stragulate; pleurocystidia rare, similar to cheilocystidia; metuloids 35-77(-95) x 5-12(-18) μm , acute- to acuminate-lageniform, with or without \pm thick crystal cap, wall 1.5-3.5 μm , hyaline to yellowish; caulometuloids similar to hymenial metuloids, but umber brown and without crystals; pileipellis a trichoderm of thin-walled, hyaline to dark brown incrustated hyphae; gelatinous layer 115-160 μm thick; main trama 0.3-0.6 mm thick of interwoven, thick-walled, hyaline, smooth to incrustated hyphae. Solitary or in small groups; autumn to winter; very rare in temp.; DK (DD). – C&D 162, Lud 32.4, Svp 33:45, ☉.

H. culmicola Bon

- 5. Cap spatulate, spoon- or fan-shaped; metuloids 50-100 μm long 6
- Cap shell-, kidney-, rounded fan-shaped or circular; metuloids 20-75 μm long 8
- 6. Cap surface entirely covered by a brownish white tomentum, appressed scaly towards margin; flesh white, up to 8.5 mm thick; gelatinous layer 1-2 mm thick. Cap 46-53 mm wide, 49-62 mm long, spatulate to narrowly fan-shaped, with inrolled margin, red brown below tomentum; gills crowded, radiating from point of attachment, ochraceous yellow brown with paler edge; stem absent. Sp (6-)6.5-7.5(-9) x (4-)4.5-5(-5.5) μm , broadly ellipsoid to ovoid (fig. 317B); basidia 4-spored; cheilocystidia 20-36 x 4.5-8.5 μm lageniform to clavate-rostrate, with 1-2 rostra, capitulum 5.5-7.5 x 3-4.4 μm pyriform to constricted; metuloids 50-90 x 9-18 μm , acuminate-lageniform, without apical crystals, wall 2.5-7 μm , yellow; pileocystidia short cylindrical with capitulum similar to cheilocystidia; pileometuloids absent; pileipellis 0.5-1.5 mm thick, a trichoderm of densely interwoven, thin-walled, hyaline hyphae; main trama 1-7 mm thick. Solitary on fallen log of *Picea* in mire; autumn; very rare in hemib.; NO (Akh: Oslo). – C&D 161 (as *mastrucata*).

H. valesiaca (Sacc.) Singer

- Cap surface minutely pubescent to punctate-scaly; flesh thin, < 1 mm thick; gelatinous layer 35-150 μm thick 7
- 7. Pileocystidia cylindrical, erect, with capitulum similar to cheilocystidia; pileometuloids absent; gelatinous layer 50-150 μm thick; on fallen logs of deciduous trees, esp. *Fagus*, more rarely *Betula*. Cap 7-38 mm wide, 12-39 mm long, spatulate, spoon-shaped to rounded fan-shaped, convex to plane, with decurved to straight margin, dry, dull, minutely white

pubescent to tomentose, sordid white, pale grey brown, yellowish brown to dark brown; gills strongly decurrent, narrow, crowded, white to ochre yellow with paler edge; stem 7-15 x 2.5-4.5 mm or absent, lateral, compressed from above, tapering towards base, solid, white tomentose; flesh thin, white to brownish; smell and taste farinaceous, mild. Sp (4.5-)-5-6.5(-7) x 3.5-4.5(-5) μm , subglobose, ovoid to broadly ellipsoid (fig. 317C); basidia (2-)-4-spored; cheilocystidia 14-39 x 2.5-7.5 μm , cylindrical, lageniform or clavate-rostrate with 1-2 rostra, capitulum 4-8.5 x 1.5-3 μm , cylindrical, clavate or slightly constricted; metuloids 45-100 x 8-15.5 μm , acute to acuminate lageniform, with or without thin crystal cap, wall 1-5 μm , hyaline to yellowish; pileipellis a trichoderm of interwoven, thin-walled hyphae with a dense tomentum or tufts of hyphae; main trama 0.2-0.7 mm thick. Solitary or in small groups; summer to autumn; rare in temp.-southern bore.; DK (VU), FI (DD, A: Lemland, U: Helsinki), SE. – Lud 32.3B, 32.14, SMT 27(2):21,48, ☉.

H. auriscalpium (Maire) Singer (*H. spatulina* Huijsman, *H. petalodes* (Bull.: Fr.) Schulzer s. auct.)

- Pileocystidia absent; pileometuloids absent or rare, 56-71 x 6-8 μm , wall 1.5-2 μm , aculeate, yellowish, without crystals; gelatinous layer 36-60 μm thick; on fallen logs of conifers, esp. *Picea*. Cap 21-37 mm wide, up to 45 mm long, spatulate to rounded fan-shaped, convex, then plane, with inrolled to straight, striate-sulcate margin, entirely minutely white pubescent, towards base punctate-scaly, white to pale grey; gills strongly decurrent, narrow, crowded, white to pale cream; stem up to 8 x 2.5 mm, lateral, almost cylindrical, solid, pruinose, white; flesh thin, white. Sp (5-)-5.5-6.5(-7) x 4-5(-5.5) μm , subglobose to broadly ellipsoid (fig. 317D); basidia 4-spored; cheilocystidia 17-35 x 4-8 μm lageniform to clavate-rostrate, with 1-3 rostra, capitulum 4.5-7 x 1.5-2.5 μm cylindrical to slightly constricted; metuloids 43-89 x 9.5-18 μm , acute to acuminate lageniform, with thin crystal cap, wall 2-4.5 μm , hyaline; pileipellis 15-100 μm thick, a cutis or trichoderm of interwoven, thin-walled hyphae, sometimes erect or ascending in fascicles; main trama 0.2-0.3 mm thick. Solitary; summer; very rare in temp.-southern bore.; NO (NE, Tel: Notodden, Oppl: Gausdal).

H. abietina Singer & Kuthan

Note: very closely related to *H. auriscalpium*, but differs in the above mentioned microscopic characters and in the habitat

- | | | |
|----|---|----|
| 8. | Gills turning grey to black with age or on drying | 9 |
| - | Gills constantly white to yellowish | 12 |
| 9. | On wood of deciduous trees | 10 |
| - | On wood of conifers | 11 |
10. Cap surface white pruinose to tomentose, strigose towards attachment point; gills distant, relatively narrow; metuloids \pm embedded in hymenium; pileipellis a trichoderm, with a tomentum of tufts, 45-210 μm high, of hyaline, smooth, thick-walled hyphae, and a repent layer of interwoven, thin- to thick-walled, brown incrustated hyphae. Cap 4-15 mm, circular, kidney-shaped or rounded fan-shaped seen from above, convex, umbonate or bell-shaped from the side, with straight, entire margin, translucently striate or not, brownish black to black; gills radiating from lateral, eccentric or central point, with entire edge, pale brown to black; stem absent or as a contraction of the cap, frb laterally to dorsally attached; flesh thin, with a dark brown gelatinous layer above and a pale brown non-gelatinous layer below; smell faintly farinaceous. Sp (6.5-)-7-9.5(-11.5) x 3.5-5(-6) μm , ellipsoid, cylindrical or phaseoliform (fig. 317E); basidia 4-spored; cheilocystidia 11-33 x 4-7.5 μm , subcylindrical, clavate- or lageniform-rostrate with 1-3 rostra, capitulum 2.5-5 x 1.5-3 μm , ovoid, obpyriform or oblong ellipsoid; metuloids 20-52 x 6-14 μm , clavate, acuminate- or acute-lageniform, thin- to thick-walled, with thick crystal cap, wall < 3.5 μm , hyaline to yellowish brown; pileocystidia sometimes present, short, erect, cylindrical hyphae with a capitulum similar to cheilocystidia; pileometuloids sometimes present, similar to hymenial metuloids; gelatinous layer 0.2-0.55 mm thick; main trama < 0.8 mm, of parallel to interwoven, thick-walled hyphae. In

small groups, sometimes fasciculate or connate on branches of deciduous trees and shrubs; spring to winter; very rare in temp.-middle bore.; DK (VU), FI (DD), NO, SE (LC). – FAD 66C, K&M 4:309 (as *Acanthocystis leightonii*), Lud 32.10, ☉.

H. unguicularis (Fr.: Fr.) O.K. Mill.

Note: the name *H. reniformis* (G. Mey.: Fr.) Singer has been used for many different taxa, but the original interpretation by Meyer and Fries in *Systema* is clearly not a *Hohenbuehelia*. The illustration by Fries in *Icones Selectae* based on material by von Post is *H. unguicularis*. All material examined said to be this taxon have been shown to fall within other well-known species.

- Cap surface entirely pale greyish pruinose; gills medium spaced, broad; metuloids projecting from hymenium; pileipellis a cutis of brown incrustated interwoven hyphae. Cap 2-5(-8) mm, circular to kidney-shaped seen from above, convex from the side, at first with incurved margin, then straight, slightly crenulate, not striate, dark grey; gills radiating from a lateral or eccentric point, lageniform, adnexed, with a blunt, gelatinous, entire edge, paler than the gills, dark grey to black; stem absent, frb laterally or dorsally attached; flesh thin, black. Sp (5.5-)6-8.5(-10.5) × 3.5-4.5(-5) μm , ellipsoid to oblong ellipsoid (fig. 319A); basidia 4-spored; cheilocystidia 14-43 × 4.5-10 μm , lageniform to clavate-rostrate, with 1-2 long and thin acuminate rostra, capitulum absent or 4 × 2.5 μm , ellipsoid; metuloids 28-88 × 3.5-11 μm , aculeate to acuminate-lageniform, 2/3 covered by a thick crystal cap, wall 0.5-3.5 μm , red brown; pileocystidia similar to cheilocystidia; pileometuloids present; gelatinous layer 0.2-0.8 mm thick; main trama absent or up to 75 μm , of thick-walled, parallel, pale brown hyphae; gill trama gelatinous. In small groups on decayed logs of deciduous trees, e.g. *Ulmus* and *Alnus*; autumn; very rare in bore.; NO (NE, Nordl: Rana and Beiarn).

H. nigra (Schwein.) Singer


11. Cap surface minutely yellowish to brown pubescent to tomentose, margin smooth; metuloids projecting from the hymenium; pileipellis partly a cutis of interwoven, thin-walled, brown incrustated hyphae, partly a trichoderm, up to 330 μm thick, of loosely interwoven, thick-walled, hyaline to yellow-brown hyphae, sometimes forming conical tufts. Cap 3-15 mm, circular, rounded fan-shaped to kidney-shaped seen from above, flat to low convex from the side, with incurved to decurved margin, black; gills radiating from lateral or eccentric attachment point, medium spaced to distant, narrow, first greyish yellow, soon grey-brown to black, with white to greyish edge; stem absent; frb laterally attached by a contraction of the cap or dorsally; flesh thin. Sp 7-9.5(-10.5) × (3.5-)4-5.5(-6) μm , ellipsoid, ovoid or subphaseoliform (fig. 319B); basidia 4-spored; cheilocystidia 18-36 × 5-8 μm , lageniform to clavate-rostrate with 1-2 rostra, capitulum 2-6 × 1.5-3 μm , ovoid to pyriform; metuloids 28-87 × 6-12(-15) μm , acuminate- to mucronate-lageniform, with thick crystal cap, wall 1.5-4.5 μm , yellowish brown to red brown; pileocystidia scattered, short, erect hyphae with capitulum similar to cheilocystidia; gelatinous layer 0.15-4 mm thick, of interwoven, thin-walled, hyaline to black incrustated hyphae; main trama 0.1-0.7 mm thick, of parallel, slightly thick-walled, brown incrustated hyphae, somewhat gelatinous. In small groups on fallen branches of *Pinus*; autumn to winter; southern bore.; FI (RE, Mustiala, not since 1877).

H. mustialaënsis (P. Karst.) Thorn


- Cap surface moist, smooth to minutely dispersed white flocculose towards margin; metuloids ± embedded in the hymenium; pileipellis partly a cutis of interwoven brown incrustated hyphae, partly a trichoderm, < 50 μm thick, of single or tufted, hyaline, erect hyphae. Cap 4-10 mm, circular, kidney-shaped to rounded fan-shaped seen from above, convex from the side, with incurved margin, not striate, black to bluish black; gills distant, radiating from a central to eccentric point, rather narrow, first grey then olive brown to black; stem absent; frb dorsally attached by a contraction of the cap or sessile; context thin, pale brown, with an upper black gelatinous layer. Sp 6-10(-11) × (2.5-)3-5.5 μm , ellipsoid, oblong to phaseoliform; basidia (2-)4-spored; cheilocystidia 22-45 × 4-8 μm , lageniform to clavate-rostrate with 1-4 short rostra, capitulum 5-8 × 2-3 μm , ovoid to obpyriform; metuloids 27-60 × 6-11 μm , clavate to acuminate-lageniform, with thick crystal cap, wall < 2 μm , hyaline; pileocystidia of

erect, cylindrical hyphae with capitulum similar to cheilocystidia; gelatinous layer 0.25-0.5 mm thick; main trama about 50 μm thick, of interwoven hyphae. On bark of *Pinus*, *Picea* and *Abies*, on trunks, fallen logs and branches; spring to autumn; very rare in temp.-hemib.; SE. – K&M 4:309.2 (as *Acanthocystis silvanus*).

H. pinacearum Thorn


12. Cap circular seen from above, smooth to dispersed white flocculose; metuloids scarce, clavate to lageniform with blunt apex, with $< 1 \mu\text{m}$ thick walls. Cap 2-9 mm, convex to paraboloid seen from side, with incurved to straight, entire to undulate margin, translucently striate, pale grey, grey brown to almost black; gills radiating from central to eccentric point, narrow to moderately broad, distant, white to pale ochre, with entire, concolorous edge; stem absent; frb laterally or dorsally attached; flesh thin, with upper greyish gelatinous layer and lower whitish non-gelatinous layer; smell and taste farinaceous; sp deposit white. Sp 7-10(-11.5) \times 3-4.5(-6) μm , cylindrical to allantoid, strongly curved (fig. 319C); basidia 4-spored; cheilocystidia 17-34 \times 3-7 μm , lageniform to clavate-rostrate with 1(-3) rostra, capitulum 1.5-3 \times 1.5-2.5 μm , subglobose, ovoid or obpyriform; metuloids 23-37 \times 7-11 μm , with thick crystal cap; pileipellis a cutis of interwoven, thin-walled, hyaline to minutely brown incrustated hyphae; gelatinous layer 100-300 μm thick; main trama 90-160 μm , of interwoven, thin- to thick-walled, hyaline hyphae. In small groups on stems of woody herbs or on branches of deciduous trees, e.g. *Ulmus*, *Sambucus*; autumn to spring; rare in temp.-hemib.; DK (LC), NO (NE, Akh: Oslo), SE (LC). – Lud 32.12, OPN 9C, ZM 71:190, .

H. cyphelliformis (Berk.) O.K. Mill. (*Pleurotus nivosus* Quél., *Resupinatus sylvanus* (Sacc.) Singer, *Urceolus sambucinus* Velen.)

- Cap rounded fan-, shell- or kidney-shaped seen from above, pubescent to tomentose; metuloids numerous, acuminate- to acute-lageniform, with 1-8.5 μm thick walls 13
13. Gills medium spaced to distant; basidia 2-spored. Cap 3-19 mm, rounded fan-shaped to kidney-shaped seen from above, convex to plane from the side, with entire, straight margin, viscid to gelatinous, scattered white punctate-scaly, near base pubescent, smooth near margin, translucently striate, young bluish black, soon paler almost white, greyish white to pale umber brown; gills free to adnexed, medium broad, with serrulate to entire edge, white to pale cream; stem absent, frb laterally attached by a contraction of the cap; flesh thin, two-layered, upper layer grey brown and gelatinous, lower layer white; smell faint, but rancid-farinaceous when cut; taste strongly farinaceous; sp deposit white. Sp (7.5-)8-10.5(-12.5) \times (3-)3.5-5(-5.5) μm , oblong ellipsoid to cylindrical (fig. 319D); cheilocystidia 16-38 \times 3.5-7 μm , narrowly lageniform with 1-2(-4) short rostra, capitulum 1.5-4 \times 1.5-3 μm , ovoid to obpyriform; metuloids 22-74 \times 5-10.5 μm , acuminate- to mucronate-lageniform, with thick crystal cap, wall 1.5-4 μm , hyaline; pileipellis partly a cutis of interwoven, gelatinous, thin-walled hyphae, partly a trichoderm with a tomentum, 100-400 μm thick, of conical tufts of hyphae; gelatinous layer 0.15-0.7 mm; main trama < 0.9 mm thick, of interwoven, thin- to thick-walled, hyaline hyphae. Solitary or in small groups on dead branches of deciduous trees, esp. *Salix* and *Alnus*; summer to autumn; occasional, but locally common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Lud 32.5, R&H 338, .

H. fluxilis (Fr.: Fr.) P.D. Orton (*H. myxotricha* (Lév.) Singer s. auct.)

- Gills crowded to medium spaced; basidia 4-spored 14
14. Cap greyish to sordid white; gelatinous layer 0.35-1.5 mm thick. Cap 9-50 mm, rounded fan- to shell-shaped seen from above, plane to convex, sometimes umbonate from the side, with incurved to straight, entire to crenate margin, not striate, entirely white tomentose with conical scales; gills subdecurrent to adnate, narrow, crowded, with entire concolorous to brownish edge, cream to yellowish cream; stem absent or lateral and short, 3 \times 3-5 mm, white tomentose; flesh white to pale brownish, with a thick upper gelatinous layer; smell faint, farinaceous when cut; taste farinaceous; sp deposit white. Sp (5.5-)6-8.5(-9.5) \times (3-)3.5-4.5 μm , ellipsoid to cylindrical, rarely ovoid (fig. 319E); basidia 4-spored; cheilocystidia 16-

33 x 3.5-8.5(-10.5) μm , clavate-rostrate to lageniform, with 1-3 short rostra, capitulum 2.5-7.5 x 15-3.5 μm , subglobose, obovoid or constricted; metuloids 22-59 x 6-11.5 μm , acuminate to mucronate-lageniform, without or with very thin crystal cap, wall 1-4 μm , yellow; pileipellis a trichoderm, 0.3-1 mm thick, with a thin lower layer of interwoven brown incrusting hyphae and an upper thick layer of conical tufts or a dense mat of hyaline hyphae; main trama 0.15-1.4 mm thick, of interwoven, thin- to thick-walled, hyaline hyphae. In groups, often imbricate on dead branches of deciduous trees, esp. *Quercus*, but also *Betula*, *Alnus* and *Populus*; summer to autumn; rare in temp.-southern bore.; DK (VU), FI (DD), NO (NE), SE (LC). – FRIC 17:129b, Lud 32.11, .

H. mastrucata (Fr.: Fr.) Singer

- Cap darker, grey, grey brown to blackish brown; gelatinous layer mostly thinner 15
- 15. Gills crowded; flesh rather thick; metuloids acuminate- to mucronate-lageniform with thick crystal cap (fig. 321A); main trama of thin-walled hyphae. Cap 7-35 mm, rounded fan-shaped to kidney-shaped seen from above, low convex to slightly umbonate from the side, with incurved to straight margin, entirely greyish white tomentose, near margin minutely tomentose pubescent, towards attachment point hirsute-tomentose or with conical tufts of hyphae, grey brown to blackish brown with bluish tinge, rarely cream; gills decurrent, medium broad, edge serrulate to entire, concolorous with gills, pale ochre-yellow to pale brownish; stem absent or very short, 2-3 x 2-3 mm, lateral, greyish white strigose; flesh whitish to pale brown, with an upper brown gelatinous layer; smell faint, farinaceous when cut, taste farinaceous; sp deposit sordid cream. Sp 5.5-8.5(-9.5) x 3-4.5(-5) μm , ellipsoid to cylindrical or phaseoliform, hyaline to yellowish; basidia 4-spored; cheilocystidia 16-39 x 4-7(-10) μm , clavate-rostrate to lageniform, with 1-3 rostra, capitulum 2.5-6 x 1.5-2.5 μm , subglobose, ovoid or constricted; metuloids 26-72 x 7-14 μm , wall 1-5.5 μm , yellowish; pileipellis a trichoderm, 100-600 μm thick, with a thin lower layer of interwoven, smooth to incrusting hyphae, and an upper thick layer of conical tufts or a dense mat of hyaline hyphae; gelatinous layer 0.16-0.7 mm thick; main trama 0.16-3.3 mm thick, of interwoven, smooth, hyaline hyphae. Solitary or in small groups on dead or living branches of deciduous trees and bushes, e.g. *Quercus*; spring to autumn; rare in temp.-bore.; DK (VU), FI (DD), IS, NO (LC), SE (LC). – Cet 1124, C&D 160, Lud 32.7, MHK 3:88.

H. atrocoerulea (Fr.: Fr.) Singer

- Gills medium spaced; flesh relatively thin; metuloids acute-obclavate to acuminate-lageniform, some strangulate, with small, thin crystal cap (fig. 321B); main trama of thick-walled hyphae. Cap 9-30(-40) mm, semicircular, shell-shaped to rounded fan-shaped seen from above, hoof-shaped to almost flat from the side, with decurved to straight, crenulate margin, slightly translucently striate, smooth near margin, white pubescent to strigose-tomentose towards base, pale grey, grey brown to dark sepia brown; gills narrow, adnate to decurrent, radiating from the point of attachment, white to yellowish; stem absent, frb laterally attached by a contraction of the cap; flesh white to yellowish with a distinct upper gelatinous layer; smell and taste farinaceous; sp deposit white. Sp (5)-6-8.5(-9) x 3-4.5 μm , ellipsoid to subcylindrical, subphaseoliform or dacryoid; basidia 4-spored; cheilocystidia 15.5-33 x 5-8.5 μm , lageniform to broadly clavate- or vesiculose-rostrate with 1-3 rostra, capitulum 2.5-4.5 x 2-3 μm , ovoid to obpyriform; metuloids 31-75(-86) x 8-18 μm , wall 1.5-8.5 μm , yellowish; pileipellis a trichoderm, 100-400 μm thick, with a thin lower layer of interwoven smooth yellowish hyphae, and an upper layer of conical tufts or a dense mat of hyaline hyphae; gelatinous layer 0.4-0.9 mm thick; main trama 0.2-1.8 mm thick, of parallel to slightly interwoven, smooth, hyaline hyphae, walls < 3.5 μm . Solitary or in small groups on fallen logs of deciduous trees, e.g. *Betula*, *Populus*, *Ulmus*, rarely on conifers, e.g. *Picea*; summer to autumn; rare in temp.-hemib.; SE. – Lud 32.2.

H. grisea (Peck) Singer

Hydropus Singer

THOMAS LÆSSØE

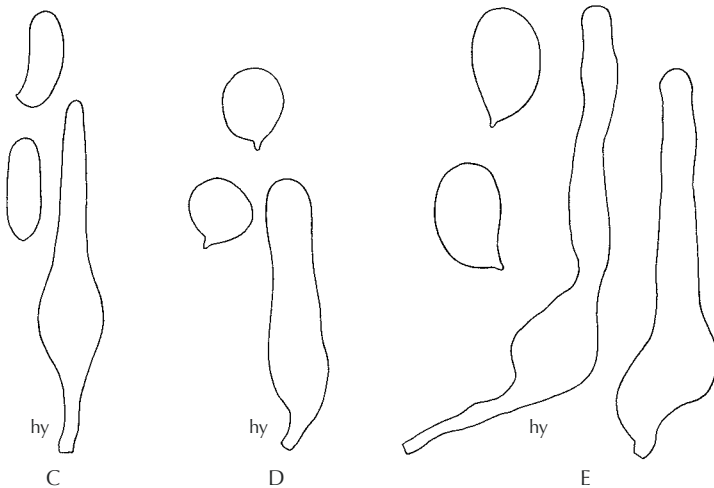
Frb mycenoid to collybioid, rarely omphalinoid. Cap 5-50(-80) mm, smooth, pruinose or pubescent, often innately fibrillose, dry to lubricous, hygrophane or not, striate or not, pale brownish yellow, grey to dark sooty grey brown or black, with or without olive tinges. Gills adnexed, sinuate adnate with a decurrent tooth to decurrent, distant to crowded, white to grey, sometimes with darker edge, or staining black. Stem ± cylindrical, smooth to pubescent, mostly paler than cap, pruinose to pubescent. Flesh thin to rather thin, sometimes staining, often watery in the stem. Smell and taste insignificant to sweetish-spermiac. Sp deposit white to whitish.

Sp globose, dacryoid-ellipsoid, cylindrical or allantoid, thin-walled, smooth, without germ pore, amyloid or non-amyloid, hyaline. Cheilocystidia present, mostly lageniform, often mixed with basidia. Pleurocystidia often present and very big, clavate to lageniform, sometimes with adhering glutinous matter. Pileocystidia or differentiated pileipellis end cells often present. Caulocystidia present. Pileipellis an (ixo)cutis with transitions to a trichoderm. Pigments typically vacuolar, but some species with incrusting pigments. Clamps mostly present.

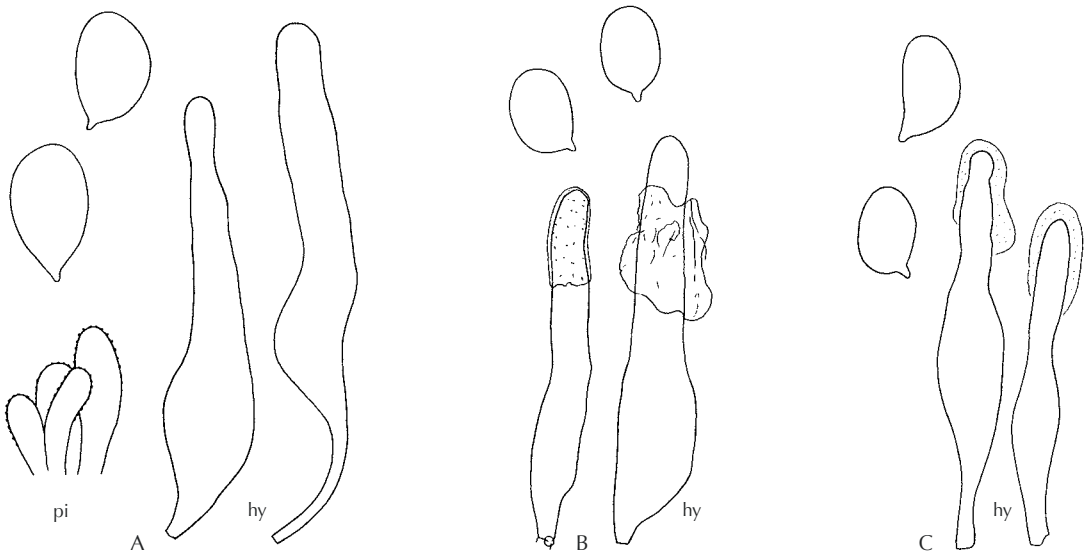
Saprotrophic. On rotten, often well decayed wood, wood chips or sawdust mixed with soil or directly on often calcareous soil.

Five species in the Nordic countries, eight species in the key. The genus is in all likelihood polyphyletic but unravelling its phylogeny must include a sampling of the huge tropical diversity found in this group.

Lit.: Bas in Bas & al. 1999, Bas & Weholt 1984, Esteve-Raventós & al. 2002, Gminder & Kriegelsteiner in Kriegelsteiner 2001, Hausknecht et al. 1997, Jossserand 1965, Kühner 1938, Ludwig 2001, Moreau et al. 1999, Weholt 1987.



Spores and hymenial cystidia: C: *Hydropus subalpinus*, D: *H. floccipes*, E: *H. marginellus*.



Spores, pileocystidia and hymenial cystidia: A: *Hydropus trichodermus*, B: *H. scabripes* var. *quadrisporus*, C: *H. scabripes* var. *scabripes*.

1. Sp cylindrical to allantoid (fig. 281C). Cap 10-50(-80) mm, conical to low convex or plane, with or without umbo, slightly hygrophanous and short striate, innately silky fibrillose, pruinose, dry to slightly lubricous, pale brownish yellow to ochraceous brown, with or without olive tinge; gills sinuate adnexed to adnate with a decurrent tooth, crowded, white, sometimes staining yellow; stem 20-80 x 1.5-5 mm, cylindrical or with clavate base, dry, pruinose-pubescent, often rooting, strigose at base, white to tinged in cap colour from base; flesh watery in stem, ± staining yellow; smell and taste indistinct. Sp 6.5-10 x 2.5-4.5 μm, thin-walled, without iodine reactions; basidia (2-)4-spored; cheilo- and pleurocystidia 40-100 x 8-20 μm, ± lageniform with long pedicels, thin- to slightly thick-walled; pileipellis an ixocutis with abundant, clavate pileocystidia, 30-100 x 4.5-15 μm, with yellow brown vacuolar pigment; clamps present. On ± buried, often small dimension wood of deciduous trees, including wood chips or sawdust, typically *Fagus*; late spring to autumn; occasional, but locally very common in temp.-hemib.; DK (LC), NO (LC), SE (NT). – BCat 718, FAD 43A, GBW 3:271, Lud 33.1A-D, Ves 212, ©.
H. subalpinus (Höhn.) Singer (*Mycena* s. Höhn., *Collybia pseudoradicata* J.E. Lange & F.H. Møller)
 - Sp globose, ellipsoid to almost cylindrical 2
2. Sp globose to subglobose 3
 - Sp dacryoid, ellipsoid to long ellipsoid 4
3. Frb strongly and instantly blackening. Cap 10-30 mm, bell shaped to convex or broadly umbonate, strongly whitish pruinose, somewhat rugulose, dirty yellowish to greyish brown, finally black; gills narrow, adnexed-adnate with a decurrent tooth, crowded, edge blackens heavily, whitish to blackish; stem 20-35 (-70) x 2-6 mm, fragile, cylindrical, whitish pubescent to blackish punctate, yellowish brown to black; flesh watery in stem; smell and taste insignificant. Sp 4-6 x 3-5.5 μm, globose to subglobose, thin-walled, amyloid; cheilocystidia 30-60 x 6-10 μm, fusiform, sublageniform to subcylindrical, thin-walled, with or without brown pigment; pleurocystidia absent; pileipellis a slightly irregular cutis with scattered projecting pileocystida, with brown vacuolar pigment; clamps present. On strongly decayed

conifer wood, esp. *Abies*; summer to autumn; *DE, LT, PL, RU*. – B&K 3: 225, C&D 634, GBW 3:267, Lud 33.10

H. atramentosus (Kalchbr.) Kotl. & Pouzar

- Frb not blackening. Cap 5-20(-25) mm, conical-convex to convex, with papilla or umbo, not striate or to 1/3 the radius, dry to slightly lubricous-waxy, innately silky fibrillose, minutely pruinose, dark grey olive brown, often with darker centre and pale margin; gills broad, sinuate, adnexed with a decurrent tooth, crowded, white; stem 15-50 x 0.8-2 mm, cylindrical, grey brown punctate-pubescent over entire length, almost translucently pale grey; smell and taste insignificant. Sp 5-7 μm , globose to subglobose, thin-walled (fig. 281D), non-amyloid; basidia 4-spored; cheilocystidia 20-80 x 8-15 μm , utriform, clavate to almost cylindrical; pleurocystidia 50-100 x 7-20 μm , similar in shape, thin- to slightly thick-walled, hyaline or with brown vacuolar pigment; pileipellis a cutis with endcells (pileocystidia) 28-50 x 5-15 μm ; clamps present. On well decayed, often moss covered trunks of deciduous trees in damp forests; autumn; very rare in temp.; DK (NA, Sj: Bredvig Mose), SE. – BCat 823, Lud 33.7A, Myc 15(2):60, ☉.

H. floccipes (Fr.) Singer

Note: the occurrence in SE rests on the original friesian account (a more recent collection has apparently gone missing) and some of the descriptive matter, e.g. subdistant and thick gills are not in accordance with current interpretations.

4. Sp without iodine reactions. Cap 10-37 mm, conical to bell-shaped, rarely semiglobose, margin flaring with age, striate to 3/4 the radius, dry to slightly lubricous, smooth, but some rugulose, dark grey to brownish grey or somewhat paler, with or without olive tinge; gills sinuate adnate with a decurrent tooth, ribbed, some forked, distant to medium spaced, whitish, greyish near base; stem 5-42 x 1.2-4 mm, dry, pruinose especially at top, shiny and lubricous downwards, whitish, downwards greyish; flesh watery in stem; smell faint, grasslike. Sp 8-9.5 x 4.5-5.5 μm , ellipsoid-dacryoid, thin-walled; basidia 2-4-spored; cheilocystidia mixed with basidia, 50-75 μm long, shaped like pleurocystidia; pleurocystidia 60-145 x 11-15 x 4-8 μm , lageniform with rather uneven outline with a tendency to become capitate; pileipellis a thin ixocutis over a layer of large inflated cells with greyish pigment; pileocystidia absent; clamps present. On debris, e.g. grass, pine needles and cones in open, damp *Pinus* forests; late autumn; very rare or overlooked in hemib., only known from NO (NE, Østf: Borge and NTr: Tautra). – Agar 16: pl. 6, C&D 639, Lud 33.9.

H. conicus Bas & Weholt

- Sp amyloid, but not strongly so, best seen on sp deposits 5
 - 5. Gills \pm decurrent 6
 - Gills adnexed to sinuate adnate 7
 - 6. Gill edge brown, contrasting paler gills, rarely concolorous; on conifer wood. Cap (5-)10-25 (-30) mm, conical-convex to low convex and umbonate to umbilicate with depressed centre, pruinose-punctate, initially very dark sooty grey brown then grey brown; gills arcuate decurrent, crowded, whitish to pale cream grey; stem 10-30 x 1-3(-7) mm, often compressed, widened towards top, pruinose-pubescent, coloured \pm as cap or darker; smell and taste insignificant to somewhat radish-like. Sp 6-8(-9) x 3.5-5 μm , dacryoid to oblong ellipsoid (fig. 281E), amyloid; basidia 2-4-spored; cheilocystidia 50-95 μm long, clavate, utriform to lageniform; pleurocystidia absent or only present near edge; pileipellis a clavicutis with pileocystidia shaped as cheilocystidia, with brown vacuolar pigment; clamps present (possibly absent when 2-spored). *DE, PL*. – B&K 3:226, C&D 636, GBW 3:268, Lud 33.4A, B.
- H. marginellus* (Pers.: Fr.) Singer
- Gill edge whitish or concolorous with gills; on soil. Cap 4-18 mm, paraboloid, conical or hemispherical to convex or low convex with central depression or small papilla, hygrophanous, short striate, dark grey brown to pale grey brown; gills arcuate to triangular, distant, thickish, veined, some forked, pale grey to dark grey brown, slightly paler outwards;

stem 14-26 × 0.3-1.5 mm, ± cylindrical, ± widened towards top and base, pruinose, solid, white to yellowish white, greyish brown from base; flesh somewhat watery in stem; smell and taste insignificant. Sp 7.5-11 × 4-6 μm, ellipsoid-dacryoid, thin-walled, amyloid; basidia (2-)4-spored; cheilocystidia mixed with basidia, 20-50 × 6-18 μm, ± clavate or ± lageniform with long and slender neck (up to 45 × 3.5 μm); pleurocystidia scarce to abundant, similar to cheilocystidia; pileipellis an irregular cutis with protruding, brown, irregularly shaped pileocystidia, 35-70(-135) × 8-30 μm; clamps present. In a variety of habitats including ditch banks in broadleaved forests, with *Salix repens* in dunes and with *Polytrichum* on sandy burnt soil; summer; NL.

H. moserianus Bas

7. Cap with distinct pileocystidia, brown from vacuolar pigment, and incrusting dark pigment in pileipellis. Cap (10-)15-30(-40) mm, broadly conical to bell-shaped or convex with a broad umbo, and sometimes with a papilla, dry, whitish pubescent, somewhat rugulose, hardly striate, dark greyish brown to greyish brown; gills sinuate adnexed to adnate with a decurrent tooth, medium spaced, often veined, greyish, paler towards edge; stem (25-)45-70 × 1.5-3(-5) mm, pubescent to dark punctate scaly, striate when young, brownish grey; flesh somewhat watery in stem; smell insignificant to slightly spermatic; taste slightly radishlike. Sp (7.5-)8.5-10 × (5-)6-7 μm, broadly ellipsoid with rounded base (fig. 285A), amyloid; basidia (2-)4-spored; cheilo- and pleurocystidia 80-160 × 12-20 × 7-12 μm, cylindrical to narrowly lageniform; pileipellis a somewhat irregular cutis with projecting, often somewhat capitate pileocystidia with incrusting and vacuolar pigmentation; clamps present at least in 4-spored material. On calcareous soil or very decayed wood in broadleaved woodland, outside the area also under conifers; autumn; very rare in temp.-hemib.; DK (VU), NO (NE, Vestf: Tjøme), SE (Sk: Segesholm). – Lud 33.6, ☉.

H. trichodermus (Joss.) Singer

- Cap with no or hardly differentiated pileocystidia and only vacuolar pigment in pileipellis. Cap 15-45 mm, striate almost to centre, hygrophanous, smooth or scurfy-warty, glabrous to pruinose, grey brown; gills adnexed-adnate with a decurrent tooth, distant to medium spaced, often rather thick and veined, greyish, paler towards edge; stem 27-80 × 3-5(-8) mm, yellowish grey brown, paler upwards, pruinose-pubescent to punctate; flesh fragile, watery in stem; smell insignificant to sweetish-spermatic. Sp 7-10 × 4.5-7.5 μm, dacryoid-ellipsoid (fig. 285B), amyloid; basidia (2-)4-spored; cheilocystidia 50-70 × 12-17 × 5-7 μm, utriform to lageniform; pleurocystidia 55-85 μm long, similar in shape, with a ± distinct, rather persistent mucoid covering at apex; pileipellis a thin cutis with some free, cystidioid elements over a layer of big, pigmented cells; caulocystidia very variable, clavate to lageniform, with brown vacuolar pigment; clamps present. In rich, broadleaved woodland, often near or on well decayed wood, rarely in more open habitats; late summer to late autumn; rare or overlooked in temp.-southern bore.; DK (EN), FI (DD), NO (LC, Vestf: Tønsberg), SE (NE). – C&D 637, Lud 33.2.

H. scabripes (Murrill) Singer var. *quadriflorus* Bas

var. *scabripes* differs in having 2-spored basidia, sp 8.5-11(-13) × 5.5-7 μm (fig. 285C) and no clamps. NL.

Notes: Material with *Dryas* and dwarf *Salix* in NO (Svb) possibly belong here or represent an undescribed taxon. The separation of *H. trichoderma* and *H. scabripes* may seem simple based on the key, but there are difficult collections, and this complex is in need of detailed revision, see also Bas 1999: 169.

Hygroaster Singer

HENNING KNUDSEN

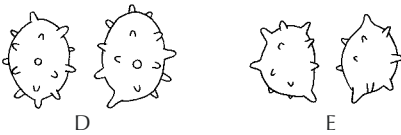
Omphaliaster Lamoure

Frb clitocyboid. Cap 10-50 mm, grey to brown, hygrophanous. Gills somewhat decurrent. Stem ± cylindrical. Smell indistinct or sweetish, farinaceous or of Russia leather. Taste indistinct or farinaceous. Sp deposit white.

Sp with conspicuous conical warts, without iodine reactions. Cystidia absent, but pseudocystidia present in some species. Clamps absent or present. Pileipellis a cutis of repent, incrustated hyphae Saprotrrophic, in coniferous and deciduous forests and in heathland.

Four species in the Nordic countries.

Lit: Gröger 2006, Horak 1979, Lamoure 1971, Lange & Sivertsen 1966, Ludwig 1997, Singer 1986.



Spores: D: *Hygroaster asterosporus*, E: *H. borealis*.

1. In heath-like areas in bore.-arc./alp. or in coniferous forests; cap pale to dark; clamps absent 2
 - In moist riverine forests with *Alnus*; cap pale; clamps present 3
2. Cap greyish brown; sp 5.5-7.5 x 5-6.5 μm (fig. 193D). Cap 10-25 mm, convex to plane or slightly depressed, hygrophanous, striate half way to centre; gills slightly decurrent, pale ochraceous grey; stem 20-60 x 1-3 mm, cylindrical, concolorous with cap; smell and taste farinaceous. Sp subglobose, with up to 1.5 μm long spines. In coniferous forests on acid soil and in rocky habitats, often solitary along mossy paths, in the north also outside forests; occasional in temp.-bore., rare in suba.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 59G, GBW 3:272, M&J *Omphaliaster* 1, Phil 95e, ☉.

H. asterosporus (J.E. Lange) Singer (*Omphalia a.* J.E. Lange, *Clitocybe a.* (J.E. Lange) M.M. Moser, *Omphaliaster a.* (J.E. Lange) Lamoure, *Rhodocybe a.* (J.E. Lange) M. Lange & Siverts.)

 - Cap dark bistre; sp 5-6(-7) x 4.5-5.5 μm (fig. 193E). Cap 15-40(-50) mm, convex to slightly depressed or umbilicate, shiny, greasy, hygrophanous, drying dark leather brown, margin short and finely striate; gills somewhat decurrent, moderately crowded; stem 20-35 x 2-3 mm, cylindrical, concolorous with cap or paler, at base with white tomentum; smell faintly farinaceous; taste indistinct. Sp subglobose, with up to 1.5 μm long coarse spines. In the north in mossy forests, subalpine birch forests and alpine heaths, in the south also in open bogs in *Sphagnum*; autumn to late autumn; occasional in bore.-arc./alp., most common in the northern part, in SE south to Vrm, in FI to U; FI (LC), NO (LC), SE (LC).

H. borealis (M. Lange & Skifte) M.M. Moser (*Rhodocybe b.* M. Lange & Skifte, *Omphaliaster b.* (M. Lange & Skifte) Lamoure)
3. Gills distant, whitish or greyish. Cap 8-20 mm, convex, then more flattened, with margin long time incurved, not striate, whitish, sometimes with an ochre tinge, smooth, mat; gills decurrent; stem 10-23 x 2-3 mm, cylindrical or slightly enlarged below, concolorous with cap; smell after some time in closed box of Russia leather; taste indistinct. Sp 7-10.5 μm in diam., almost globose or slightly ellipsoid, with conspicuous c. 2.5 μm long conical warts; pseudocystidia absent; clamps abundant. In a moist, riverine forests with *Alnus* and *Fraxi-*

nus on rich soil; recently described and so far only known from three records in SE (NE, BI).
– ZM 63:159.

H. lacteus E. Ludw. & Ryberg

- Gills crowded, pale brown with greyish tinge. Cap 12-40 mm, convex, then flattened or slightly depressed, not hygrophanous, greyish or greyish beige, with small, innate, dark spots, margin smooth, not striate; gills decurrent; stem 20-45 x 1-4 mm, concolorous with cap; smell strong, sweetish-nauseous. Sp 6-9 μm in diam., almost globose, with conspicuous 1.5-2 μm long conical warts; gill edge with pseudocystidia, protuberant, irregular, branched hyphal ends, 2-4 μm broad; pileipellis a cutis with incrustated hyphae and scattered hyphae resembling the pseudocystidia. In moist forests on rotting stumps of *Matteuccia struthiopteris* on rich soil, also known from an *Alnus* forest in Austria; in the area only known from the type collection in NO (NE, Nordl). – FND 14:6, 13.

H. nauseodulcis (E. Horak) E. Ludw. (*Rhodocybe n.* E. Horak, *Omphaliaster n.* (E. Horak) Noordel.)

Hygrocybe (Fr.) P. Kumm.

DAVID BOERTMANN

Camarophyllus (Fr.) P. Kumm., *Gliophorus* Herink, *Cuphophyllus* (Donk) Bon

Frb omphalinoid, clitocyboid, collybioid or tricholomatoid of many colours and with thick gills. Frb with bright colours in red orange and yellow, a few with green or lilac, but subgen. *Cuphophyllus* Donk and sect. *Neohygrocybe* Herink characterised by white, grey, brown and black colours; the brightly coloured species often show a significant variation in colours: entirely red species may occur in orange or even yellow forms and vice versa. Cap 5-120 mm, in most species 20-50 mm, dry and then either smooth, fibrillose, felty or finely scaly, or sticky/wet to distinctly slimy, but these characters are not reliable in frb collected in dry conditions, in most species ± hygrophanous. Gills usually thick and distant with attachment varying from free, over adnexed, emarginate, adnate to decurrent. Stem surface structure varying from dry and then either smooth or fibrillose, to moist and soon drying, to distinctly slimy; a dry and smooth stem is usually ± silky shiny, especially in young and small frb. Smell indistinct, in a few species distinct. Taste neutral except for some bitter or rancid species. Sp deposit white.

Sp subglobose, ellipsoid, ovoid, oblong to cylindrical, in some species a varying proportion shows a median constriction either in front view or both in side- and front view, smooth, hyaline, without iodine reactions. Basidia 25-70 μm long, slender, usually 4-spored, often intermixed with 1-, 2, and 3-spored, and frb with only 2-spored basidia occur frequently in some species. Gill trama structure interwoven in subgen. *Cuphophyllus* Donk, subregular with < 200 μm long cells in subgen. *Pseudohygrocybe* Bon, and regular with very long cells, > 200 μm in subgen. *Hygrocybe*. Cystidia usually absent, but in subgen. *Hygrocybe* trama cells often protrude from gill edge as pseudocystidia, in a few other species hair-like cells often protrude from gill edge and in two species gelatinised cells cover the gill edge. In *H. conica*, *H. olivaceonigra* and *H. acutoconica* the gill edge sometimes is covered by sterile cells which are either basidioles or true cheilocystidia. Pilei- and stipe structure corresponds to the morphology: viscid = ixotrichoderm or ixocutis, sticky = ixocutis intermixed with more ixotrichoderm-like areas, dry and smooth = cutis and felty/scaly = trichoderm.

On soil and probably saprotrophic, mostly in unfertilized, seminatural grassland, but also frequent in other open habitats as heathland, fixed dunes, lawns and bogs, occasionally on rich soil in deciduous scrubs and forests and in moist habitats, e.g. *Alnus*-swamps.

48 species in the Nordic countries, 49 species in the key. *H. viola* Geesink & Bas has also been reported, but omitted here as the identification seems doubtful. Some of the sections and subsections are in need of revision, e.g. subsect. *Squamulosae* (Bataille) Singer. Macroscopic characters important for identification include texture of cap and stem surface and gill attachment. Important microscopic characters include gill trama structure and pellis structure, which correspond to the macroscopic character states. Only *H. pratensis* can be recommended as edible. The number and composition of *Hygrocybe* species are useful as an indicators of grassland quality, and has been used in several countries to survey the conservation value of seminatural grassland.



A wide interpretation of *Hygrocybe* is kept here. However, recent molecular phylogenetic evidence (Matheny et al. 2006) support the point of view that *Hygrocybe* should be split into several genera (e.g. *Cuphophyllus*, *Humidicutis* and *Gliophorus*) which not necessarily form a monophyletic clade.

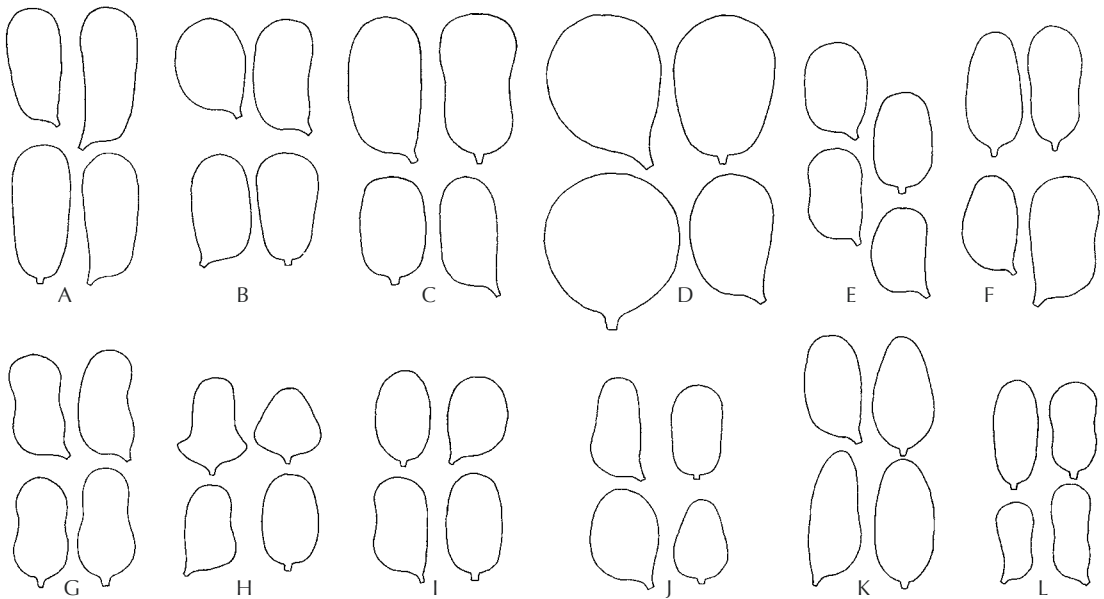
Lit.: Arnolds in Bas et al. 1990, Boertmann 1987, 1990, 1995, Bon 1990, Borgen & Arnolds 2004, Candusso 1997, Jordal 1997, Kristiansen 1981, Ludwig 2004, Newton et al. 2003, Orton 1960, Rald 1985.

- | | | |
|----|--|--------------|
| 1. | Frb entirely bright red, bright orange or yellow, but cap in a few species dark brown or with black covering or scales | Key A p. 195 |
| - | Frb entirely white, grey, brown, brownish orange, dull orange or at least with areas with green, blue, lilac or pink | 2 |
| 2. | Frb with green, blue, lilac, brick red, brownish orange, dull orange or pink colours | Key B p. 205 |
| - | Frb white, grey, brown or black | Key C p. 207 |

Key A: Frb brightly red, orange or yellow

- | | | |
|----|--|----|
| 1. | Frb becoming blackish with age and when handled | 2 |
| - | Frb not becoming blackish, but may slowly turn greyish in stem base or cap margin | 3 |
| 2. | Gills usually \pm reddish; sp oblong to cylindrical, occasionally slightly constricted (fig. 197A), $Q_{av} \geq 2$; in moving dunes. Frb turning rather slowly black compared to var. <i>conica</i> . Sp 10-12.5 x 5-6 μ m. In other characters like var. <i>conica</i> . Autumn; common in temp.-hemib.; DK (LC), FO (Sandoy), NO (NE). – FE 6:419, FNE 1:163, M&J 15, Ves 167.
<i>H. conica</i> (Schaeff.: Fr.) P. Kumm. var. <i>conicooides</i> (P.D. Orton) Boertm. (<i>Hygrophorus c.</i> P.D. Orton, <i>Hygrocybe conicooides</i> (P.D. Orton) P.D. Orton & Watling) | |
| - | Gills first whitish, then grey, yellow or rarely reddish; sp ellipsoid, ovoid or phaseoliform, occasionally constricted (fig. 197B), $Q_{av} < 2$; in grassland, fixed dunes, roadsides, lawns, swamps and deciduous copses and forest. Cap 5-100 mm, at first \pm acutely conical, later expanded with an umbo, sometimes with a papilla or with lobed margin, at first usually moist or slimy, but soon dry and finely fibrillose, scarlet red, orange to yellow, in some forms bronze, olive brownish or greenish, small forms often translucently striate from margin; gills free or adnexed; stem 15-120 x 2-20 mm, first slimy or moist, but soon dry and more or less fibrillose, yellow orange or concolorous with cap, rarely whitish; flesh turgid and fragile, all parts becoming black or blackish when handled or with age, old and weathered frb may be entirely black. Sp 8.5-10(-12) x 5-6.5(-8) μ m; basidia either 4- or 2-spored or a mixture; gill trama regular with fusiform cells ≥ 1000 μ m long, often protruding from gill edge as pseudocystidia. Summer to autumn; very common in temp.-arc./alp.; DK (LC), IS, FI (LC), FO, NO (LC), SE (LC). – FNE 1:159, 161, M&J 5, R&H 254, Ves 167, ☉.
<i>H. conica</i> (Schaeff.: Fr.) P. Kumm. var. <i>conica</i> (<i>Hygrophorus c.</i> (Schaeff.: Fr.) Fr., <i>Hygrocybe riparia</i> Kreisel, <i>H. veselskyi</i> Singer & Kuthan, <i>H. cinereifolia</i> Courtec. & Priou.)
Note: a very variable taxon and several infraspecific taxa have been described, some of the better defined include:
var. <i>pseudoconica</i> J.E. Lange (<i>H. nigrescens</i> (Quél.) Kühner s. auct.) is large and robust with a coarsely fibrillose stem; DK. – B&K 3:85, Däh 162, Phil 81:61.
var. <i>conicopalustris</i> Arnolds is a tiny red form from moist habitats; DK. – FNE 1:161.
var. <i>chloroides</i> (Malençon) Bon has yellow cap and stem; DK, NO. – Däh 158, FNE 1:161. | |
| 3. | Cap moist, sticky or slimy | 4 |
| - | Cap dry | 18 |
| 4. | Gills free to adnexed | 5 |
| - | Gills adnate to decurrent | 8 |

5. Gill trama regular with many cells $\geq 1000 \mu\text{m}$ long 6
 - Gill trama subregular with cells $\leq 250 \mu\text{m}$ long 7
6. Cap narrowly conical at first, later expanded, usually with \pm acute umbo; stem fibrillose. Cap 10-50 mm, margin often lobed, small frb occasionally low convex, slimy but often drying out, in some collections dry and fibrillose, lemon yellow to orange yellow, occasionally orange or flushed with orange; gills free to adnexed, whitish, pale yellow, occasionally pale orange; stem 35-80 x 2-10 mm, cylindrical, usually straight, sometimes slightly moist, yellow with whitish base, sometimes entirely orange, with orange fibres or orange flushes; flesh rather fragile, rarely becoming grey when cut or bruised particularly in stem base. Sp (8-) $10-12.5(-15) \times 4.5-6.5(-8) \mu\text{m}$, $Q = 1.5-2.5$, cylindrical, oblong, slightly phaseoliform and occasionally constricted (fig. 197C); gill trama regular; gill edge usually fertile with pseudocystidia, but in some frb sterile and covered with basidioles, which occasionally are glutinised. Mostly in seminatural grassland on basic soil, also in deciduous scrubs or woods; summer to autumn; occasional, but locally common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:97, FNE 1:153, 155, Phil 77g, Svp 12:46, Ves 166.
H. acutoconica (Clem.) Singer var. *acutoconica* (*H. persistens* (Britzelm.) Singer, *H. langei* Kühner, *H. aurantiolutescens* P.D. Orton)
 var. *konradii* (R. Haller Aar.) Boertm. (*H. konradii* R. Haller Aar., *H. subglobispora* (P.D. Orton) M.M. Moser) differs in globose to broadly ellipsoid sp, (8-) $9.5-12(-15) \times 6.5-10.5(-12.5) \mu\text{m}$, $Q = 1-1.7$ (fig. 197D); DK. – FE 6:439, FNE 1:157, M&J 13,16, Svp 12:46, 47.
- Cap hemispherical, convex to plane; stem smooth. Cap (10-) $20-70$ mm, slimy, lemon yellow to orange yellow or occasionally reddish orange; gills adnexed, lageniform and often broad, whitish at first, later more yellow or orange, paler than stem; stem 20-80 x 4-15 mm, concolorous with cap or paler, surface dry, sometimes wet or slightly slimy, often pruinose at top; flesh in stem brittle. Sp 7-9(- 10.5) x 4-5.5(- 6.5) μm , ellipsoid, ovoid or oblong (fig. 197E); gill trama regular with fusiform cells, many $\geq 1000 \mu\text{m}$ long, often seen as pseudocystidia. In seminatural grassland, lawns and fixed dunes; summer to autumn; very common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:81, FNE 1:141, R&H 253, Svp 13:2, Ves 174, .
- H. chlorophana* (Fr.: Fr.) Wünsche (*Hygrophorus c.* (Fr.: Fr.) Fr., *Hygrocybe c.* var. *aurantiaca* Bon, *H. euroflavescens* Kühner)
7. Cap blood red to dark red, sometimes with a narrow yellow margin; stem coarsely fibrillose. Cap 30-150 mm, convex, bell-shaped, broadly conical, finally plane and then often with a broad umbo, sticky to slimy, discolouring to ochre; gills adnexed, sometimes emarginate, cinnamon buff to brownish red with paler margin; stem 30-150 x 5-13 mm, cylindrical, dry, yellow, orange to reddish, fibres usually darker red than flesh, white at base, narrowly fistulose; flesh in stem pale yellowish and white at centre; smell indistinct. Sp (7-) $8.5-10(-11) \times (4-) $4.5-5.5(-7) \mu\text{m}$, oblong to ellipsoid, often constricted (fig. 197F); gill trama subregular; pileipellis a mixture of an ixotrichoderm and an ixocutis. In seminatural, high diversity grassland and fixed dunes; late summer to autumn; occasional, but locally common in temp.-suba., in FI north to PK and with southern distribution; DK (EN), FI (LC), FO, IS, NO (LC), SE (NT). – FNE 1:129, M&J 15, R&H 255, Svp 11:2, 43:50, Ves 172, .$
- H. punicea* (Fr.: Fr.) P. Kumm. (*Hygrophorus p.* (Fr.: Fr.) Fr., *Hygrocybe acuta* F.H. Møller)
- Cap yellow to orange; stem \pm smooth. Cap 20-50 mm, broadly conical, subumbonate to plane with a broad umbo, sticky to slimy, hygrophanity resembling *Kuehneromyces mutabilis*; gills adnexed or emarginate, concolorous with cap or paler; stem 30-85 x 5-15 mm, cylindrical to somewhat clavate, usually yellow and paler than cap and covered with white pruina, especially at the top. Sp (6.5-) $7.5-9(-11) \times 4-5(-6) \mu\text{m}$, ellipsoid, oblong or phaseoliform, usually more than 50 % of them constricted (fig. 197G); gill trama subregular; pileipellis an ixotrichoderm intermixed with more ixocutis-like areas. In seminatural, high diversity grassland, deciduous scrubs and calcareous *Pinus* forests; late summer to autumn; very rare



Spores: A: *Hygrocybe conica* var. *conicoides*, B: *H. conica* var. *conica*, C: *H. acutoconica* var. *acutoconica*, D: *H. acutoconica* var. *konradii*, E: *H. chlorophana*, F: *H. punicea*, G: *H. aurantiosplendens*, H: *H. mucronella*, I: *H. salicis-herbaceae*, J: *H. subpapillata*, K: *H. coccinea*, L: *H. ceracea*.

in temp.-suba., in FI north to EH; DK (EN), FI (EN), IS, NO (NT), SE (NT). – FE 6:511, FNE 1:131, Jords 9(3), N&S 492, Svp 13:2.

H. aurantiosplendens R. Haller Aar. (*Hygrophorus a.* (R. Haller Aar.) P.D. Orton)

- | | | |
|----|-------------------------------------|----|
| 8. | Taste bitter or unpleasantly rancid | 9 |
| - | Taste insignificant | 10 |
9. Taste bitter, often easily recognisable by tip of tongue on cap; sp in front view irregularly ellipsoid or almost triangular, irregularly ellipsoid to oblong, and many strongly constricted, almost triangular or with widened base (fig. 197H). Cap 3-35 mm, hemispherical, convex, bell-shaped to conical, at first sticky, soon dry and then mat often with aeriferous fibrils, scarlet, orange red, often with yellow margin, later paler reddish or orange; gills adnate to decurrent with a tooth, occasionally triangular, usually deep orange with paler margin; stem 10-40 x 1-4 mm, at first slimy, later dry and mat and remaining moist for longer time than cap, concolorous with cap or paler. Sp (6-)-7-8.5(-10.5) x (4-)-4.5-6(-7) μ m; gill trama subregular; pileipellis an ixocutis in young frb, in older a cutis. In seminatural grassland, lawns, fixed dunes and deciduous scrubs, on dry to damp soil; late summer to autumn; occasional in temp.-suba.; DK (NT), FI (NT), FO, NO (LC), SE (LC). – Däh 156, FE 6:631, FNE 1:133, M&J 4, Svp 15:38.

H. mucronella (Fr.) P. Karst. (*Hygrophorus m.* Fr., *Hygrocybe reae* (Maire) J.E. Lange)

- Taste very unpleasant bitterish-hot behind tongue and in throat after some minutes of chewing; sp broadly ellipsoid, ellipsoid or oblong, a few occasionally slightly constricted (fig. 197I). Cap 7-45 mm, hemispherical, convex, bell-shaped or umbonate, sticky, scarlet, orange red or even entirely yellow; gills adnate, pale yellow to orange or reddish, usually with paler margin; stem 20-40 x 2-9 mm, at first somewhat sticky or moist, but soon dry and mat. Sp (6.5-)-7.5-9(-10.5) x (4-)-4.5-5.5(-6) μ m; gill trama subregular; pileipellis a mixture of an ixotrichoderm and an ixocutis. In arctic/alpine dwarf scrub heathland, herb slopes and

subalpine grassland; late summer to autumn; occasional in suba.-arc./alp.; FI (NT), NO (NE).
– FE 6:507, FNE 1:127.

H. salicis-herbaceae Kühner

10. Stem dry 11
- Stem slimy or moist 13
11. Gill trama regular, with cells up to 800 μm or longer, often seen as pseudocystidia. Cap 5-30 mm, at first bell-shaped, conical or hemispherical, later low convex to plane, often with a central papilla, sticky, scarlet red to orange, translucently striate; gills broadly adnate, slightly emarginate or decurrent with a tooth, pale yellow to orange; stem 20-50 x 2-3 mm, dry and smooth to finely fibrillose, golden yellow to orange and occasionally flushed with red. Sp 7-9(-10) x 4.5-5.5(-7) μm , ellipsoid to oblong, sometimes broadly ellipsoid (fig. 197J). In seminatural grassland and lawns; summer to autumn; very rare or possibly overlooked in temp.-bore.; DK (EN), FI (VU), NO (VU), SE (DD). – FE 6:479, FNE 1:147.
H. subpapillata Kühner
- Gill trama subregular, with cells < 150 μm long 12
12. Stem 3-6 mm broad; cap bright red to blood red, rarely orange; sp > 4.5 μm broad. Cap 10-60 mm, hemispherical to bell-shaped, later plane, occasionally with a distinct papilla or umbo, becoming greyish white when weathering, small frb often with narrow yellow margin and translucently striate; gills adnate, occasionally with a decurrent tooth, reddish with yellow margin or entirely yellow to orange; stem 20-70 mm long, cylindrical or in large frb more irregularly compressed and twisted, concolorous with cap or orange to yellow, dry and smooth; flesh rather firm; smell and taste insignificant. Sp (6.5-)-7.5-10(-13) x (4-)-4.5-5.5(-7) μm , rather variable in shape, oblong to ellipsoid and many amygdaloid in front view, rarely slightly constricted (fig. 197K); gill trama subregular; pileipellis an ixotrichoderm intermixed with more ixocutis-like areas. In seminatural grassland, lawns and fixed dunes, less often in deciduous scrubs and forests; autumn; common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:83, FNE 1:117, R&H 256, Svp 11:3, Ves 172, ☉.
H. coccinea (Schaeff.: Fr.) P. Kumm. (*Hygrophorus* c. (Schaeff.: Fr.) Fr., *Hygrocybe marchii* (Bres.) F.H. Møller s. Boertmann 1995)
- Stem 1.5-3 mm broad; cap yellow, orange or rarely orange red; sp < 4.5 μm broad. Cap 5-30(-50) mm, at first hemispherical to convex, later low convex to plane, occasionally with slightly depressed centre, sticky, translucently striate and in small frb with translucent eye at centre; gills adnate to decurrent, rather thin and crowded, usually paler than cap; stem 15-50 mm long, concolorous with cap or paler, sometimes with orange base, dry and smooth. Sp (5.5-)-6-8(-10) x 3-4(-5.5) μm , oblong to cylindrical, usually > 50 % of them constricted (fig. 197L); gill trama subregular; pileipellis an ixotrichoderm intermixed with more ixocutis-like areas. In seminatural grassland, lawns and fixed dunes, less often deciduous scrubs and forests; late summer to autumn; very common in temp.-arc./alp., but in FI with a southern distribution; DK (LC), FI (LC), FO, NO (LC), SE (LC). – C&D 211, FNE 1:121, Phil 77e, Svp 12:42, Ves 174, ☉.
H. ceracea (Fr.: Fr.) P. Kumm. (*Hygrophorus* c. (Fr.: Fr.) Fr., *Hygrocybe vitellinoidea* Bon, *H. citrina* (Rea) J.E. Lange s. auct.)
13. Gill edge hyaline and slimy 14
- Gill edge normal and dry 15
14. Sp subglobose to broadly ellipsoid (fig. 201A); subhymenium not gelatinized. Cap 3-20 mm, convex to plane with slightly depressed centre and decurved margin, slimy, chrome yellow fading to ivory white, translucently striate; gills decurrent, arcuate, often broad, yellow and often remaining so after cap is faded, edge hyaline and slimy; stem 15-50 x 1.5-3 mm, distinctly slimy, concolorous with cap; smell occasionally aromatic. Sp 6.5-8(-9) x 5-7.5 μm ; gill edge sterile, resembling an ixotrichoderm, with clavate terminal cells, 12-45 x 2.5-7 μm ;

gill trama subregular, cells often strongly inflated; pileipellis an ixotrichoderm; stipitipellis an ixocutis. Mostly in rather wet, open habitats with *Juniperus*, seminatural grassland and heathland near the coast, oceanic; summer to autumn; very rare in temp.-bore.; DK (VU), NO (VU), SE (no recent finds). – Blyttia 60:199, FE 6:619, FNE 1:91, Phil 76c, Svp 13:3, ☉.

H. vitellina (Fr.) P. Karst. (*H. luteolaeta* Arnolds)

- Sp ellipsoid, ovoid or oblong (fig. 201B); subhymenium gelatinized. Cap yellow; stem 15-30 x 1.5-4 mm, concolorous with cap and occasional with slightly greyish top; in other characters like in the main variety. In grassland, dwarf scrub heathland and herb slopes; occasional in suba.-arc./alp.; FO, IS, NO (incl. SvB), SE. – AAF 3:9, FE 6:599, FNE 1:87, FG 2.

H. laeta (Pers.: Fr.) P. Kumm. var. *flava* Boertm. (*H. flava* (Boertm.) F. Rune)

- 15. In lowland habitats in temp.-suba. 16
- In arctic/alpine habitats 17

- 16. Stem distinctly slimy; sp 7-8(-10) x 4-5 μm . Cap 5-30 mm, at first hemispherical, low convex or bell-shaped, later plane and often with \pm depressed centre, distinctly slimy, lemon yellow to yellow with orange centre and striae, discolouring to greyish when old and weathered, usually distinctly translucently striate and with translucent central eye; gills broadly adnate to slightly decurrent and occasionally somewhat emarginate; stem 15-40 x 1.5-3 mm, yellow to orange. Sp oblong, cylindrical, ellipsoid and often slightly constricted (fig. 201C); gill trama regular with cells 55-510 x 6-25 μm , often seen as pseudocystidia; pileipellis an ixotrichoderm. Mostly in seminatural grassland and lawns, occasional in copses, rarely in deciduous forests on fertile soil; summer to autumn; occasional in temp.-bore.; DK (LC), FI (EN, V, U), NO (LC), SE (NT). – FAD 167E, FE 6:474, FNE 1:134, M&J 3, Svp 12:43.

H. glutinipes (J.E. Lange) R. Haller Aar. var. *glutinipes* (*Hygrophorus* g. (J.E. Lange) P.D. Orton, *Hygrocybe citrina* (Rea) J.E. Lange var. g. J.E. Lange, *H. aurantioviscida* Arnolds) var. *rubra* Bon differs in being bright red on cap and stem; DK, NO, SE. – FE 6:475, FNE 1:145.

- Stem not slimy, but moist or wet when fresh; sp (5-)6-7.5 x 3-4(-5) μm . Cap 3-25 mm, hemispherical to plane, sometimes with depressed centre, sticky, scarlet, reddish orange, orange to yellow; gills adnate to decurrent, yellow to orange, often with a whitish edge; stem 15-55 x 1-3 mm, when fresh moist, but soon dry and mat, concolorous with cap, but often more red, especially at top. Sp ellipsoid, cylindrical to oblong, some of them constricted (< 20 %) in both side- and front view (fig. 201D); gill trama subregular with \pm inflated elements, to 150 μm long; pileipellis an ixotrichoderm intermixed with an ixocutis; stipitipellis when young a 10-70 μm thick ixocutis. In seminatural grassland, parks and deciduous scrubs and woods; summer to autumn; common in FI, elsewhere occasional in temp.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – FAD 168C, FE 6:627, FNE 1:123, 125, Svp 12:42, Ves 175.

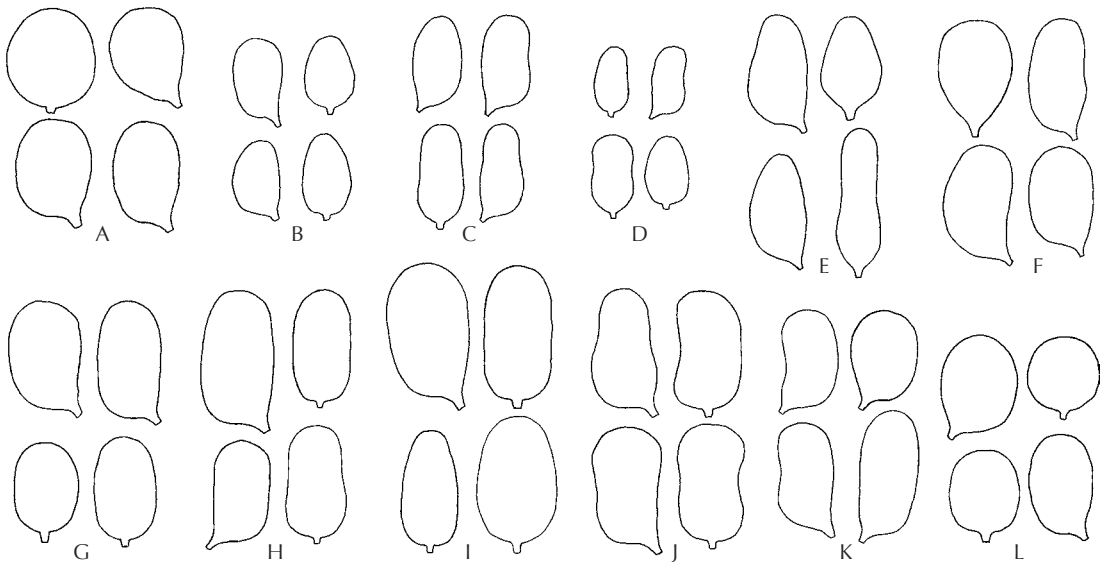
H. insipida (J.E. Lange) M.M. Moser (*Hygrophorus* i. (J.E. Lange) S. Lundell, *Hygrocybe subminutula* Murrill s. auct. Eur.)

- 17. Sp (7-)8-10(-13) x (4-)4.5-5.5(-7); gills pale; cap only slightly translucently striate, up to 1/3 of radius. Cap 5-30 mm, at first hemispherical or low convex, later plane with \pm depressed centre, at first slimy, soon dry and mat, chrome yellow, fading to pale yellow and whitish; gills decurrent and arcuate, with dry edge; stem 5-35 x 1-4 mm, yellow to hyaline whitish, at first slimy, soon drying up and becoming smooth and mat. Sp ellipsoid, oblong or amygdaloid, some slightly constricted in front view and often a few elongated (e.g. 12 x 4 μm) (fig. 201E); gill trama interwoven; gill edge fertile; pileipellis an ixotrichoderm when young and stipitipellis an ixocutis. In fens, grassland, moist dwarf scrub heathland and subalpine *Betula* forests; late summer to autumn; occasional in (bore.-)suba.-arc./alp.; FI (LC), FO, IS, NO (LC), SE (LC). – FE 6:387, FNE 1:65, Jordst 14(3), Svp 12:43, ☉.

H. citrinopallida (A.H. Sm. & Hesler) Kobayasi (*H. vitellina* (Fr.) P. Karst. s. F.H. Møller)

- Sp on av 6-7.5 x 4-5 μm ; gills yellow; cap usually distinctly translucently striate
see *H. xanthochroa* key B 11

18. Cap felty, finely scaly 19
 - Cap smooth or radially fibrillose 26
19. Stem fibrillose, 5-13 mm broad. Cap 25-100 mm, at first broadly conical, later expanded to low convex, when large often lobed, coarsely radially fibrillose, finely scaly at centre, dry, at first scarlet red, more orange or orange yellow when old, not translucently striate; gills free or adnexed, whitish to pale yellow to orange; stem 20-150 mm long, dry and coarsely fibrillose, red to orange yellow, paler between fibres, flesh yellowish, sometimes slowly turning grey in stem base. Sp 8-10 x 5-6.5 μm , ellipsoid, ovoid, pyriform, a few sometimes constricted (fig. 201F); gill trama regular, with 200-700 μm long, fusiform cells, ends often protruding from gill edge as pseudocystidia. In species rich, seminatural grassland, occasionally in scrubs; late summer to autumn; rare in hemib.-bore., very rare in temp.; DK (EN), FI (EN, V: Karjaa, Mustio, EH: Somero, Häntälä), NO (VU), SE (VU). – FNE 1:149, M&J 7, Phil 75h, Svp 15:41, Ves 173.
H. intermedia (Pass.) Fayod (*Hygrophorus i.* Pass.)
- Stem smooth, < 5 mm broad 20
20. Gills decurrent 21
 - Gills adnate, occasional with a decurrent tooth 23
21. Cap scales/felt concolorous or yellow when slightly dried out. Cap 3-40 mm, at first low convex, later plane and with \pm depressed centre and/or with irregularly upturned margin, finely scaly to felty, dry, red, orange or rarely yellow; gills decurrent, pale yellowish white to yellow or even reddish; stem 12-60 x 1.5-5 mm, usually cylindrical, smooth and with silky sheen, dry, concolorous with cap. Sp (7.5-)-9-10.5(-11.5) x (5-)-5.5-7(-9) μm , ellipsoid, oblong or slightly phaseoliform (fig. 201G); gill trama subregular; pileipellis a trichoderm. In seminatural grassland and in damp forests, especially of *Alnus*, but also *Picea*; summer to late autumn; common in temp.-suba.; DK (NT), FI (LC), FO, NO (LC), SE (LC). – B&K 3:90, FE 6:555, FNE 1:111, M&J 10, Ves 168.
H. cantharellus (Schwein.: Fr.) Murrill (*Hygrophorus c.* (Schwein.: Fr.) Fr., *Hygrocybe lepida* Arnolds)
- Cap scales/felt dark grey to black 22
22. Cap and stem orange or orange yellow; cap scales/felt blackish, occasionally forming a black covering on entire cap; in dry habitats. Cap 8-30 mm, at first low convex, later plane with depressed centre, finely scaly to felty, dry; gills decurrent, pale yellow; stem 15-30 x 2-4 mm, usually cylindrical, smooth, dry. Sp (8-)-9.5-11.5(-12.5) x (4.5-)-5.5-7(-8) μm , ellipsoid, oblong to slightly phaseoliform (fig. 201H); gill trama subregular; pileipellis a trichoderm, at least at centre, terminal cells with dark brownish intracellular pigment. In acid grassland, pastures, heathland, fens and arctic dwarf scrubs; summer to autumn; occasional in bore.-arc./alp., but common in IS, rare in temp.-hemib.; DK (EN), FI (LC), FO, IS, NO (NT), SE (VU). – FE 6:587, FNE 1:113, Svp 22:29, ☉.
H. turunda (Fr.: Fr.) P. Karst. (*Hygrophorus t.* (Fr.: Fr.) Fr.)
- Cap and stem orange red to red; dark cap scales often confined to the centre of cap; in moist habitats. Cap 6-20 mm, at first low convex, later plane with depressed centre, finely scaly to felty, dry; gills decurrent, whitish or pale yellow; stem 10-70 x 1.5-4 mm. Sp (8-)-9.5-11.5(-13) x (5-)-5.5-6.5(-8) μm , ellipsoid, oblong to slightly phaseoliform (fig. 201I); gill trama subregular; pileipellis a trichoderm, at least at centre, terminal cells with dark brownish intracellular pigment. In bogs and humid *Pinus* forests, usually among *Sphagnum*, or on dried out oligotrophic lake shores, rarely also in humid grassland; summer to autumn; common in FI, elsewhere occasional in hemib.-suba., rare in temp.; DK (VU), FI (LC), IS, NO (LC), SE (LC). – FNE 1:115, GBW 3:60, Ves 168.
H. coccineocrenata (P.D. Orton) M.M. Moser (*Hygrophorus c.* P. D. Orton)
23. Sp (7-)-9-12(-14.5) x (4-)-5-6.5(-8.5) μm . Cap 5-50 mm, low convex, then plane, often with



Spores: A: *Hygrocybe vitellina*, B: *H. laeta* var. *flava*, C: *H. glutinipes* var. *glutinipes*, D: *H. insipida*, E: *H. citrinopallida*, F: *H. intermedia*, G: *H. cantharellus*, H: *H. turunda*, I: *H. coccineocrenata*, J: *H. substrangulata*, K: *H. helobia*, L: *H. calciphila*.

slightly depressed centre, finely scaly, at least at centre, dry, orange or orange red, rarely scarlet, usually with concolorous scales, becoming yellow when drying, but sometimes greyish; gills adnate, occasionally with a decurrent tooth, whitish to pale yellow or pale orange; stem 10-40 x 2-4 mm, dry and smooth, concolorous with cap; frb from arctic habitats are small and stout. Sp ellipsoid-oblong to ovoid-oblong, sometimes broadly ellipsoid and many often constricted (fig. 201J); gill trama subregular; pileipellis a trichoderm, at least at centre, sometimes with intracellular brownish content in terminal cells. In temp.-bore. in acid/oligotrophic habitats as fens in fixed dunes and heathland, moist grassland and lake shores, in suba. and arc./alp. in dwarf scrub heathland and fens; summer to autumn; occasional in bore.-arc./alp., rare in temp.-hemib.; DK (VU), FI (DD), IS, NO (LC), SE. – FNE 1:107, Svp 22:28, ☉.

H. substrangulata (P.D. Orton) P.D. Orton & Watling var. *substrangulata* (*Hygrophorus* s. P.D. Orton, *Hygrocybe coccineocrenata* (P.D. Orton) M.M. Moser f. *ambigua* Kühner, *H. biminata* Kühner)

var. *rhodophylla* (Kühner) Boertm. differs in being bright red to blood red, particularly the gills; in arc./alp., Greenland and the Alps, but not yet recorded from the Nordic area. – FNE 1:109.

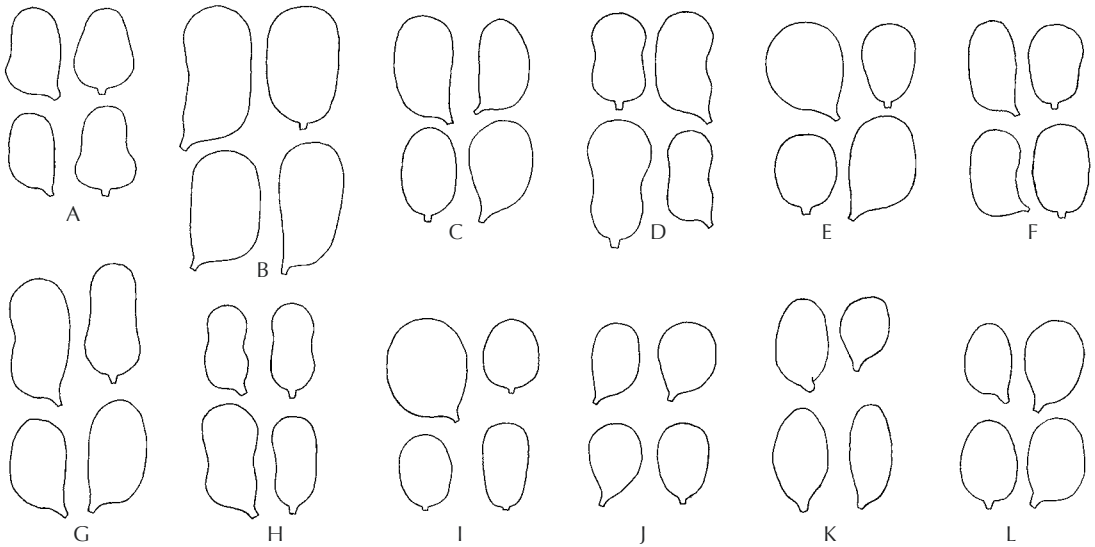
Note: some authors separate small arctic/alpine forms with narrower hairs on stem (3.5-5.5 μm against 6.5-11.5 μm) as *H. biminata* Kühner.

- Sp usually 7-10 μm long 24
- 24. Gill trama cells 150-500 μm long, with tapering ends; smell like garlic, at least after some time in a closed container. Cap 8-25 mm, low convex to plane, often with slightly depressed centre, covered with concolorous often erect and pointed scaly, dry, scarlet red discolouring to dull orange; gills adnate, occasional slightly emarginate or decurrent with a tooth, orange red to pale yellow; stem 10-40 mm x 2-3 mm, dry, smooth, concolorous with cap or paler; flesh fragile. Sp 8-10 x 5-6(-7) μm , rather variable in shape, broadly ellipsoid, ellipsoid, oblong, obovoid, sometimes concave on one side (fig. 201K); gill trama regular; pileipellis a trichoderm. In seminatural grassland, parks and pastures, often in moist areas, heathland

and deciduous forests; summer to autumn; common in hemib.-bore., occasional in temp. and suba.; DK (NT), FI (LC), FO, NO (LC), SE (LC). – B&K 3:87, FE 6:571, FNE 1:135, Svp 13:6, Ves 169.

H. helobia (Arnolds) Bon (*Hygrophorus h.* Arnolds, *Hygrocybe miniatoalba* (Pat.) F.H. Møller s. F.H. Møller)

- Gill trama cells 20-150 μm long, cylindrical; smell indistinct 25
- 25. Sp subglobose to broadly ellipsoid, not constricted (fig. 201L). Cap 3-35 mm, at first hemispherical to convex, later plane, often with depressed centre, scarlet to orange red, often with yellow margin, scales or tomentum concolorous, soon becoming yellow when drying; gills broadly adnate, occasionally decurrent with a tooth, at first often whitish, later yellow to orange; stem 20-40 x 1.5-4 mm, dry and smooth, yellow to orange. Sp 7.5-9 x 5-6(-7) μm ; gill edge occasionally with protruding hairs. In calcareous grassland, up to 540 m alt.; late summer to autumn; rare in temp.-suba.; DK (EN), NO (VU), SE (NT). – FE 6:551, FNE 1:105, GBW 3:56, Svp 22:28.
H. calciphila Arnolds
- Sp ellipsoid, many widened towards base or constricted in front view (fig. 203A). Cap 6-50 mm, at first hemispherical or convex, latter plane and often with depressed centre, covered with fine scales or tufts, at the centre often more felty or tomentose, in older frb often smooth towards the margin, dry, orange red to scarlet red, with concolorous scales, rarely greyish at centre, becoming yellow when dry; gills adnate, occasional with a decurrent tooth, yellow to reddish with paler edge; stem 20-50 x 2-5 mm, cylindrical to plane with longitudinally groove, concolorous with cap or paler, dry, smooth. Sp (6-)7-9(-10) x (4-)4.5-5.5(-6.5) μm ; gill trama subregular; gill edge usually with protruding hairs, 5-40 x 2-4 μm ; pileipellis a trichoderm. Mostly in acid grassland and heathland, coniferous and deciduous forests, often along tracks, but also on black soil in swamps; summer to autumn; very common in temp., common in hemib.-arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – FNE 1:103, M&J 9, R&H 257, Svp 13:6, Ves 169, ☉.
H. miniata (Fr.: Fr.) P. Kumm. var. *miniata* (*Hygrophorus m.* (Fr.: Fr.) Fr., *Hygrocybe m.* (Fr.: Fr.) P. Kumm. var. *microspora* Kühner, *H. strangulata* (P.D. Orton) Svrček, *H. moseri* Bon) var. *mollis* (Berk. & Broome) Arnolds differs in having yellow cap and stem; DK.
- 26. Gills free or adnexed 27
- Gills adnate or decurrent 31
- 27. Stem fibrillose 28
- Stem smooth 29
- 28. Cap dark brown. Cap 25-80 mm, broadly conical, lobed, later expanded with \pm acute umbo, often with splitting margin, rimose, with paler flesh visible between fibres in old frb; gills free or adnexed, yellow, occasionally orange; stem 35-90 x 3-12 mm, fibrillose, yellow, when older more orange, occasionally with brown fibres. Sp 9-12 x 5-7 μm , ellipsoid to oblong (fig. 203B); gill trama regular, of ≥ 1000 μm long, fusiform cells. In seminatural dry grassland, usually after warm summers; summer to autumn; rare in temp.-southern bore., very rare in suba., in IS not since 1935; DK (NT), FI (CR, V: Iniö, EH: Nokia), FO, IS (Ve), NO (EN), SE (VU). – Däh 165, FNE 1:151, M&J 14, Svp 21:43, Ves 165.
H. spadicea (Scop.) P. Karst. var. *spadicea* (*Hygrophorus s.* (Scop.) Fr.) var. *albifolia* (Hesler & A.H. Sm.) Boertm. differs in having white gills and stem; DK.
- Cap yellow or orange see *H. acutoconica* 6
- 29. Cap and often stem bright to deep scarlet; smell sweetish like honey, particularly in drying frb. Cap 20-70 mm, at first \pm conical to hemispherical, later broadly conical, bell-shaped to plane with an umbo, smooth and mat, dry; gills adnexed, yellow, orange or reddish with paler margin; stem 25-100 x 5-15 mm, dry, smooth, usually with more yellow base, but occasionally entirely yellow, often irregularly twisted and enlarged and with a broad central



Spores: A: *Hygrocybe miniata* var. *miniata*, B: *H. spadicea*, C: *H. splendidissima*, D: *H. quieta*, E: *H. citrinovirens*, F: *H. reidii*, G: *H. phaeococcinea*, H: *H. constrictospora*, I: *H. calyptriformis*, J: *H. pratensis* var. *pratensis*, K: *H. hygrocyboides*, L: *H. laeta* var. *laeta*.

cavity; flesh in stem yellow or orange, rather fragile. Sp (6.5-)7.5-9(-10) x (4-)4.5-5.5(-6) μm , ellipsoid, ovoid to ellipsoid-oblong (fig. 203C); gill trama subregular, with \pm inflated elements up to 100 μm long. In seminatural, high diversity grassland and lawns; late autumn; rare in temp.-bore.; DK (EN), FO, NO (NT), SE (NT). – FE 6:539, FNE 1:95, N&S 501, Svp 11:2, Ves 173.

H. splendidissima (P.D. Orton) M.M. Moser (*Hygrophorus* s. P.D. Orton)

- Cap and stem yellow or orange; smell like *Lactarius quietus*, herbaceous or insignificant 30
30. Gills yellow to orange, usually more deeply coloured than rest of frb; cap convex, bell-shaped to plane. Cap 10-80 mm, usually dry, although young and fresh frb may be slightly greasy, lemon chrome, dirty yellow to orange, becoming greyish green when faded and eroded; gills adnexed, occasionally adnate or emarginate, often broad; stem 30-90 x 2-8 mm, often irregularly compressed and grooved, dry and smooth, concolorous with cap, usually with orange top, hollow and fragile; smell faint like *Lactarius quietus* or pentatomid bugs, best recorded immediately after picking and from a closed container. Sp (7-)7.5-9(-11) x 4-5 (-6) μm ellipsoid or oblong, usually > 75 % of them constricted (fig. 203D); gill trama subregular with \pm inflated cells up to 150(-250) μm long. In seminatural, high diversity grassland and deciduous scrubs and forests; late summer to autumn; occasional, but locally common in hemib.-suba., in FI north to PK, rare in temp.; DK (EN), FI (LC), FO, IS, NO (NT), SE (VU). – B&K 3:95, FE 6:531, FNE 1:99, Jordst 12(3), Svp 13:3.

H. quieta (Kühner) Singer (*Hygrophorus* q. Kühner, *Hygrocybe obrussea* (Fr.: Fr.) Wünsche s. Arnolds)

Note: small, robust forms with dirty orange cap and stem and bright orange gills could be a separate taxon.



- Gills whitish to greenish yellow; cap \pm conical. Cap 25-90 mm, conical when young, later plane with acute umbo, often irregularly lobed with splitting margin, radially fibrillose, occasionally somewhat scaly at centre, dry, lemon yellow, greenish yellow or orange yellow, sometimes with brownish fibres; gills free or adnexed, with coarsely serrate margin; stem

50-130 x 7-20 mm, at first smooth, later more fibrillose, dry and mat, pale yellow to greenish yellow, often flushed with orange or brownish, very brittle; smell sometimes herbaceous and pleasant. Sp 6.5-8.5(-10) x (4.5)5-6(-7.5) μm , broadly ellipsoid, ellipsoid to subglobose, occasionally slightly constricted (fig. 203E); gill trama regular, with fusiform cells, 250-600 x 12-30 μm , some of which are seen as pseudocystidia. In seminatural, species rich grassland, often on calcareous ground; autumn; very rare in temp.-southern bore.; DK (EN), FI (EN), FO, NO (EN), SE (VU). – FE 6:459, FNE 1:139, Jordst 12(2), Sienop 113, Svp 15:42.

H. citrinovirens (J.E. Lange) Jul. Schäff. (*H. brevispora* F.H. Møller, *H. cystidiata* Arnolds)

31. Gill trama interwoven 32
 - Gill trama subregular 33
32. Cap dull orange to brownish orange see key B 5
 - Cap \pm yellow see 17
33. Frb yellow to orange; smell faint, after some time in a box like *Lactarius quietus*
 see *H. quieta* 30
 - Frb orange, orange red or red; smell sweetish and honey-like or indistinct 34
34. With distinct bitter taste or sweetish and honey-like smell 35
 - With insignificant taste and smell 36
35. Smell sweetish and honey-like, particularly from slightly dried frb; taste insignificant. Cap 10-50 mm, low convex to plane often with slightly depressed centre when old, smooth, dry, orange to orange red, drying out to buff, not or only short translucently striate; gills adnate to \pm decurrent, paler than cap; stem 20-50 x 2-5 mm, dry and smooth, concolorous with cap or golden yellow. Sp (6-)6.5-8.5(-10) x 4-5(-7.5) μm , ellipsoid, ovoid, a few occasionally slightly constricted in front view (fig. 203F); gill trama subregular. In seminatural grassland, fixed dunes, lawns and deciduous scrubs, including subalpine *Betula* forests; summer to autumn; common in temp.-suba.; DK (NT), FI (LC), FO, IS (Nm, Na), NO (LC), SE (LC). – FNE 1:93, Phil 77f, R&H 256, Svp 15:42, Ves 175.
H. reidii Kühner (*H. marchii* (Bres.) F.H. Møller s. F.H. Møller)
 - Smell insignificant; taste bitter see *H. mucronella* 9
36. Cap with a \pm prominent black covering; gills usually deep orange or bright red and often with salmon hue. Cap 3-25(-50) mm, convex to plane, occasionally with depressed centre, dry, mat and smooth, usually dark red to scarlet with a narrow yellow margin, rarely entirely yellow; gills adnate or \pm decurrent, often visible below cap margin; stem 10-50 x 1-3(-5) mm, concolorous with cap (except black coating) or paler, dry, mat and smooth, very fragile. Sp (6-)7.5-10(-12.5) x (4-)4.5-5.5(-7.5) μm , shape variable, ellipsoid to oblong, sometimes constricted or phaseoliform (fig. 203G); gill trama subregular, of chains of cylindrical cells, in fresh frb often with brownish intracellular contents; gill edge with scattered sterile hairs, up to 70 x 2.5 μm . In seminatural grassland, fixed dunes, parks and dried out oligotrophic lake shores; late summer to autumn; occasional in temp.-bore.; DK (NT), FI (LC), NO (NT), SE (NT). – FE 6:527, FNE 1:97, Svp 15:39.
H. phaeococcinea (Arnolds) Bon (*Hygrophorus p.* Arnolds)
 - Cap without black covering; gills whitish to pale yellow or pale orange. Cap 4-35 mm, hemispherical to plane, sometimes with depressed centre, dry, scarlet to orange; stem 25-50 x 1.5-2 mm, dry and smooth, yellow or orange. Sp (6-)7-9(-11) x (3-)3.5-4.5(-5) μm , oblong to cylindrical, many (more than 75%) constricted (fig. 203H); gill trama subregular, pileipellis a cutis, in young frb with a thin cover of gelatinised hyphae. In coastal grassland and fixed dunes often near *Salix repens* and often on calcareous ground; late summer to autumn; very rare or possibly overlooked in temp.-suba., occasional in IS; DK (EN), FI (VU), IS, SE (NT). – FNE 1:101, Pers 9: pl. 20 (as *Hygrophorus strangulatus*).
H. constrictospora Arnolds (*H. parvula* (Peck) Murrill s. Hallgrímsson)

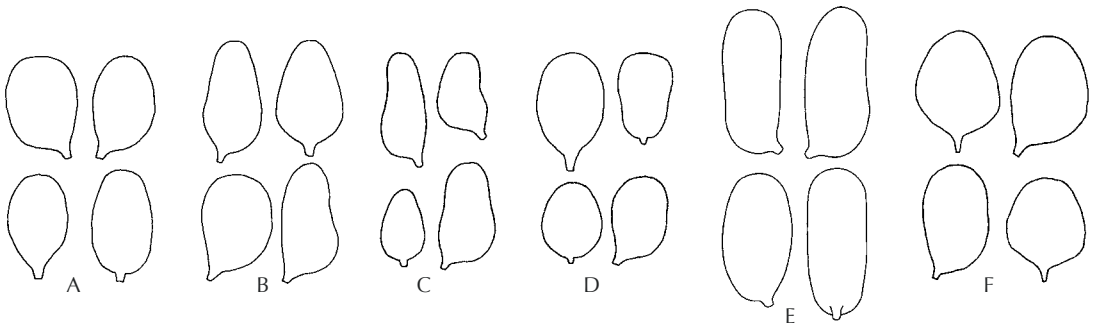
Key B: Frb green, blue, lilac, brick red, dull orange, brownish orange or pink

1. Cap and stem dry, or occasionally somewhat moist 2
- Cap and/or stem distinctly slimy 6
2. Cap conical to plane with an umbo; gills adnexed or free 3
- Cap plane to almost funnel-shaped; gills decurrent 4
3. Frb blackening when handled and old; stem \pm fibrillose see *H. conica* key A 2
- Frb not blackening when handled or with age; stem smooth. Cap 25-70 mm, at first narrowly conical, irregularly lobed, later expanding with splitting margin and acute umbo, slightly greasy to dry, pale lilac, rose, flesh pink, discolouring to brownish pink or fading to whitish; gills white, free to adnexed, splitting lengthwise; stem 30-120 x 5-15 mm, cylindrical, dry, white or pale rose. Sp 6-9 x 4-7 μm , broadly ellipsoid to ellipsoid-oblong (fig. 203I); gill trama regular, with $\geq 1000 \mu\text{m}$ long cells. In seminatural, high diversity grassland; autumn; very rare in temp.-hemib.; DK (CR), FO, NO (CR). – B&K 3:80, Däh 166, FNE 1:137, Phil 74b, Ves 166, .
- H. calyptriformis* (Berk. & Broome) Fayod ('*calyptraeformis*', *Hygrophorus c.* Berk. & Broome)
Note: frb with white cap and stem are referred to *f. nivea* (Cooke) Bon.
4. Frb greyish, getting a distinct pink hue when old and drying see *H. roseascens* key C 22
- Frb with yellow and lilac colours 5
5. Cap not hygrophanous, 30-120 mm, at first hemispherical, low convex or broadly conical, later plane, often with a broad umbo and upturned margin when old, dry and mat, dull orange, brownish orange, apricot or buff; gills deeply decurrent, paler than cap, buff or cream; stem 30-150 x 4-20 μm , often tapering downwards, finely aeriferous fibrillose, dry and mat, usually paler than cap and dull orange, buff to cream; flesh at centre of cap thick. Sp (5-)5.5-6.5(-7.5) x (3.5-)4-5(-5.5) μm , Q = 1.1-1.8, Qav = 1.2-1.4, ellipsoid to subglobose (fig. 203J); gill trama interwoven; pileipellis a cutis with some trichoderm-like elements. Mostly in seminatural grassland, pastures, lawns, fixed dunes, but also in deciduous woods and scrubs; summer to late autumn; common in temp.-arc./alp., in FI less common in northern parts; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:76, Däh 146, FNE 1:41, Phil 72a, Ves 162, .
- H. pratensis* (Pers.: Fr.) Murrill var. *pratensis* (*Hygrophorus p.* (Pers.: Fr.) Fr., *Camarophyllus p.* (Pers.: Fr.) P. Kumm., *Cuphophyllus p.* (Pers.: Fr.) Bon)
- Cap hygrophanous, 10-33 mm, low convex to bell-shaped, later plane and often with distinct umbo, dry and smooth, orange with a brownish flush or orange brown, translucently striate halfway to centre; gills decurrent, buff to cream with reddish brown flush, paler with age; stem 30-75 x 2-4.5 mm, dry and covered with aeriferous fibrils, buff to cream, with reddish or orange tinge. Sp (6-)7-9(-10.5) x (3.5-)4.5-5.5(-6.5) μm , Q = 1.3-2.2, Qav = 1.6-1.7, ellipsoid to oblong (fig. 203K); gill trama interwoven, in places subregular; pileipellis a cutis. In grassland; rare in suba.-arc./alp.; SE.
H. hygrocyboides (Kühner) Arnolds (*Camarophyllus h.* Kühner, *Cuphophyllus h.* (Kühner) Bon)
6. Gills decurrent, with a slimy, hyaline edge. Cap 10-50 mm, low convex, later plane with slightly depressed centre, slimy, pale brownish orange, dull orange, at first occasionally olive greyish, often with paler margin, translucently striate; gills pale greyish, occasionally with lilac or olive hue; stem 15-60 x 2-4 mm, concolorous with cap and often with greyish top; flesh rather tough; smell unpleasant, like burnt rubber. Sp (5-)6-7(-8.5) x (3.5-)4-4.5(-5) μm , ellipsoid, ovoid or oblong (fig. 203L); gill edge sterile and covered with gelatinised and densely packed cheilocystidia; subhymenium gelatinized (unique in the genus); pileipellis an ixotrichoderm; gill trama subregular; basidia often with medallion clamps. Mostly in acid seminatural grassland, heathland and fixed dunes; summer to autumn; very common

in temp.-hemib., common in bore., occasional in arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:89, FNE 1:85, M&J 2, Svp 11:6, Ves 170.

H. laeta (Pers.: Fr.) P. Kumm. var. *laeta* (*Hygrophorus l.* (Pers.: Fr.) Fr., *Gliophorus l.* (Pers.: Fr.) Kovalenko)

- Gills adnate or emarginate, edge not slimy 7
- 7. Frb green or greenish, at least at stem top. Cap 5-60 mm, hemispherical, bell-shaped to almost plane, distinctly slimy, at first usually with bright green to olive green colours, but occasionally without green and then ochre yellow, bright yellow or even bluish or brownish, hygrophanous and drying to pale pinkish, ± translucently striate; gills ventricose and usually slightly emarginate, concolorous with cap or paler; stem 20-60 x 2-8 mm, distinctly slimy, concolorous with cap, but in some forms entirely whitish, pale bluish or with a faint lilac hue. Sp 7-9.5 x 5-6 μm, ellipsoid to ovoid (fig. 207A); basidia often with medallion clamps; gill trama subregular with cells up to 150 μm long. In seminatural grassland, fixed dunes, lawns, deciduous forests, scrubs, etc.; summer to late autumn; common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:98, FE 6:614, 615, FNE 1:81, Svp 11:4, 43:30, Ves 171, ☉.
- H. psittacina* (Schaeff.: Fr.) P. Kumm. var. *psittacina* (*Hygrophorus p.* Schaeff.: Fr., *Gliophorus p.* (Schaeff.: Fr) Herink)
- Frb without green 8
- 8. Frb pink, brick or brownish red 9
- Frb brown and/or blue or lilac 10
- 9. Frb pink; gills and stem paler than cap. In other characters like the main variety. In seminatural grassland; autumn. UK. – Cke 937 (905) A (as *Hygrophorus sciophanus*).
- H. psittacina* (Schaeff.: Fr.) P. Kumm. var. *sciophanoides* (Rea) Boertm. (*H. sciophanoides* (Rea) P.D. Orton & Watling)
- Frb with darker colours. Cap rust to brownish red, often with paler margin; gills pale orange to brick red, sometimes with olive or salmon hue; stem concolorous with cap or paler, occasionally with greyish or olive top; in other characters like the main variety. In seminatural grassland; summer to autumn; rare in temp.-bore.; DK, NO (NE), SE (NA). – Däh 152, FE 6:610, FNE 1:83, GBW 3:72, Ves 171.
- H. psittacina* (Schaeff.: Fr.) P. Kumm. var. *perplexa* (A.H. Sm. & Hesler) Boertm. (*Hygrophorus p.* A.H. Sm. & Hesler, *Gliophorus p.* (A.H. Sm. & Hesler) Kovalenko, *Hygrocybe sciophana* (Fr.) P. Karst.)
- 10. Cap chestnut brown with lilac hue see *H. psittacina* 7
- Cap bluish or lilac 11
- 11. Cap bluish; stem often whitish; in lowland pastures see *H. psittacina* 7
- Cap lilac, yellow or a mixture of these; stem ± lilac; in arc./alp. fens and grassland 12
- 12. Cap translucently striate less than half the radius; sp 8-10(-12) x 5-7 μm. Cap 5-25 mm, low convex with incurved margin, later plane with ± depressed centre, often with crenate margin, at first distinctly slimy, soon drying and becoming mat, at first bright yellow to brownish orange, later pale yellow, buff, lilac or a mixture of these colours, weathered frb opaque greyish to white; gills decurrent, occasionally broadly adnate, yellow to lilac; stem 10-40 x 1-3 mm, at first slimy, lilac or occasionally partly yellow. Sp ellipsoid, oblong, ovoid or amygdaloid (fig. 207B); gill trama interwoven. In bogs and fens, moist dwarf scrub heathland and grassland; late summer to autumn; occasional in northern bore.-arc./alp.; FI (LC), FO, NO (LC), SE (LC). – FE 6:394, FNE 1:69, M&J 16, P,R&V 75, Seiniop 116, ☉.
- H. lilacina* (P. Karst.) M.M. Moser (*Agaricus l.* C. Laest. nom. illeg., *Omphalia l.* P. Karst., *Hygrophorus l.* (P. Karst.) M. Lange, *Gliophorus l.* (P. Karst.) Kovalenko)
- Cap translucently striate more than half the radius and with a translucent central eye; sp



Spores: A: *Hygrocybe psittacina* var. *psittacina*, B: *H. lilacina*, C: *H. xanthochroa*, D: *H. irrigata*, E: *H. olivaceonigra*, F: *H. ingrata*.

(4.5-)5-7.5(-8) x 3-5(-5.5) μm . Cap 5-25 mm, at first low convex, soon umbilicate, with in-curved margin, later plane with depressed centre, at first slimy, soon drying and becoming mat, pale yellow, yellow, orange yellow, brownish yellow to violaceous grey, often a mixture of these, becoming whitish when drying out; gills decurrent, pale violaceous grey to pale yellow, with dry edge; stem 10-60 x 1.3-2 mm, at first viscid, dry and mat when old, pale yellow to hyaline whitish, sometimes with violaceous grey areas, particularly at the top. Sp ellipsoid to amygdaloid, often slightly constricted (fig. 207C); gill trama interwoven. In fens, dwarf scrub heathland and grassland; late summer to autumn; occasional in suba.-arc./alp.; FI (LC), FO, IS, NO (LC). – FNE 1:67.

H. xanthochroa (P.D. Orton) M.M. Moser (*Hygrophorus* x. P.D. Orton)

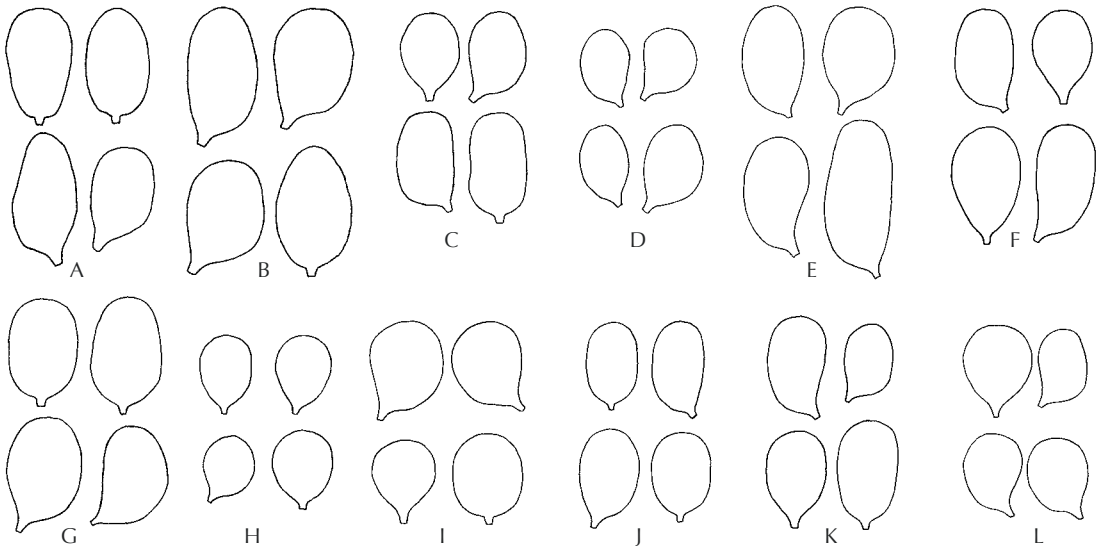
Key C: Frb white, grey, brown or black

1. Gills free, adnexed or adnate, occasionally with a decurrent tooth 2
 - Gills decurrent 12
2. Cap and stem distinctly slimy 3
 - Cap and stem not slimy, but may be somewhat sticky or moist 4
3. Cap dark brown, occasional with lilac; stem white see *H. psittacina* key B 6
 - Cap and stem grey brown, grey, steel grey or even almost white. Cap 10-50 mm, broadly bell-shaped, hemispherical to \pm plane when old, viscid, \pm translucently striate near margin; gills adnate to short decurrent, whitish or pale grey; stem 30-100 x 3-5 mm, viscid. Sp (5-)6.5-8(-9) x (3.5-)4.5-5(-6) μm , ellipsoid, broadly ellipsoid or ovoid, occasionally a few slightly constricted (fig. 207D); gill trama subregular with \pm inflated cells, up to 140 μm long; pileipellis an ixotrichoderm; basidia often with medallion clamps. In seminatural grassland and fixed dunes, more rarely in rich coniferous and deciduous forests; summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:102, Däh 150, FNE 1:89, Phil 73e, Ves 170, .
- H. irrigata* (Pers.: Fr.) Bon (*Hygrophorus* i. (Pers.: Fr.) Fr., *H. unguinosa* (Fr.: Fr.) P. Karst.)
4. Gills free to adnexed; smell indistinct 5
 - Gills adnexed, emarginate to adnate; smell often distinctly nitrous, farinaceous or unpleasant like *Tricholoma album* 7
5. Frb blackening with age and when handled. Cap 30-50 mm, \pm conical, greenish white, olive-green, with more brownish centre; gills free or adnexed, pale greenish white to greenish grey; stem 40-100 x 3-6 mm, whitish to greyish white, somewhat striate-fibrillose. Sp 9-14.5 x 4.5-5.5 μm , cylindrical to oblong (fig. 207E); cheilocystidia clavate or fusiform 30-50 x 13-20

μm . In grassland and fixed dunes. UK. – FE 6:415.

H. olivaceonigra (P.D. Orton) M.M. Moser (*Hygrophorus o.* P.D. Orton)

- Frb not blackening 6
- 6. Cap dark brown; stem and gills yellow or white see *H. spadicea* key A 28
- Cap, stem and gills white see *H. calyptriformis* key B 3
- 7. Smell distinctly nitrous 8
- Smell absent or different 9
- 8. Cap smooth, but often irregularly uneven or cracked, buff or yellowish brown, often with whitish margin, when old chestnut brown to dark brown; flesh slowly reddening when bruised. Cap 20-60 mm, \pm convex, rarely with depressed centre, dry; gills adnate or emarginate, at first cream, gradually more brown with age, occasionally with dark edge; stem 30-110 x 5-20 mm, in large frb often irregularly twisted and compressed, dry, smooth, at first cream, becoming brown with age, hollow; smell nitrous, particularly when cut, but rather faint compared to *H. nitrata*. Sp (6-)7-9(-10) x (4-)5-6.5(-7) μm , broadly ellipsoid to ellipsoid, often a few subglobose present as well and these often in front view with angular base (fig. 207F); gill trama subregular, with \pm inflated elements, up to 215 μm long. In seminatural grassland; summer to autumn; rare in temp.-bore.; DK (EN), FI (EN, U: Helsinki, Pornaisten-niemi), FO, NO (NT), SE (VU). – FE 6:647, FNE 1:77, M&J 17, Svp 2:60, Ves 164.
H. ingrata J.P. Jensen & F.H. Møller
- Cap at first smooth, but becoming finely scaly with age, grey brown; flesh not reddening. Cap 20-70 mm, convex to plane, dry; gills adnate or emarginate, pale greyish or buff with paler margin; stem 20-60 x 3-6 mm, smooth and dry, buff or greyish brown often with paler top and base; smell distinctly nitrous. Sp (7-)8-9(-10) x (4-)4.5-5.5(-6) μm , ellipsoid, oblong to broadly ellipsoid (fig. 209A); gill trama subregular with \pm inflated cells, up to 260 μm long. In seminatural grassland and deciduous scrubs, at roadsides in forests and in fixed dunes; summer to autumn; occasional in temp.-suba.; DK (NT), FI (LC), FO, IS, NO (LC), SE (LC). – FNE 1:75, M&J 17, R&H 251, Svp 2:61, Ves 164, \odot .
H. nitrata (Pers.) Wünsche (*Hygrophorus n.* (Pers.) Fr., *Hygrocybe murinacea* (Bull.: Fr.) P. Kumm. s. auct.)
- 9. Smell farinaceous; sp cylindrical, amyloid see *Porpoloma metapodium* p. 412
- Smell absent or unpleasant like *Tricholoma album*; sp ellipsoid, non-amyloid 10
- 10. Frb dark; flesh reddening. Cap 20-90 mm, at first hemispherical to bell-shaped, later more irregularly convex, broadly conical or almost plane, smooth, but when old often cracked and \pm scaly, dry, at first dark grey brown, later dark sepia grey, dark grey to almost blackish; gills adnexed, often very broad and thick, sepia grey, grey brown to dark grey, but usually paler than cap; stem 30-120 x 7-25(-30) mm, irregularly furrowed and compressed in large frb, dry, smooth and fibrillose when old, concolorous with cap and hollow; flesh slightly paler than surface and turning reddish when cut or bruised; smell unpleasant and sometimes slightly nitrous. Sp (7-)7.5-9(-11) x 5-6(-7) μm , ellipsoid, broadly ellipsoid to ellipsoid-oblong (fig. 209B); gill trama subregular, with cells up to 400 μm long, some with brownish contents. In seminatural, high diversity grassland; summer to autumn; rare in temp.-bore.; DK (EN), FI (CR, V: Rymättylä and EH: Nokia), NO (VU), SE (EN). – B&K 3:96, FNE 1:79, Phil 73f, Svp 2:60, Ves 165, \odot .
H. ovina (Bull.: Fr.) Kühner (*Hygrophorus o.* (Bull.: Fr.) Fr., *Hygrocybe nitiosa* (A. Blytt) M.M. Moser)
- Frb whitish, greyish or brown; flesh usually unchanged, but occasionally turning pink 11
- 11. Frb greyish or whitish. Cap 20-80 mm, at first broadly conical to bell-shaped, later \pm plane with small umbo or papilla, smooth, at first slightly sticky, soon dry, sometimes finely fibrillose or even finely scaly at centre, pale greyish white to dark brownish grey, often with



Spores: A: *Hygrocybe nitrata*, B: *H. ovina*, C: *H. fornicata*, D: *H. pratensis* var. *pallida*, E: *H. russocoriacea*, F: *H. virginea*, G: *H. colemanniana*, H: *H. canescens*, I: *H. flavipes*, J: *H. lacmus*, K: *H. cinerella*, L: *H. roseascens*.

darker centre; gills adnexed, adnate to emarginate, thin, medium spaced, white or pale grey; stem 20-70 x 3-20 mm, dry and fibrillose, occasionally finely scaly, particularly at base, white and sometimes with rusty spots or scales near base; flesh, cap margin and gills occasionally turning slowly pink when cut or bruised; smell sometimes unpleasant, resembling *Tricholoma album*. Sp (6-)7-8.5(-9.5) x (4-)4.5-5.5(-6) μm , ellipsoid, broadly ellipsoid or ovoid, a few occasionally oblong or phaseoliform (fig. 209C); gill trama subregular, with cells up to 150 μm long. In seminatural grassland, fixed dunes and deciduous scrubs, mostly on calcareous soil; autumn; occasional in hemib.-suba., in FI rare in hemib.-bore., rare in temp.; DK (EN), FI (VU), FO, IS, NO (NT), SE (LC). – FE 6:643, FNE 1:73, N&S 495, R&H 252, Svp 2:61,64.

H. fornicata (Fr.) Singer var. ***fornicata*** (*Hygrophorus* f. Fr., *Hygrocybe clivalis* (Fr.) P.D. Orton, *H. streptopus* (Fr.) Bon)

var. ***lepidopus*** (Rea) Boertm. & N. Barden differs by appressed red brown scales on the cap; UK.

- Frb brown see *Camarophylloopsis schulzeri* p. 189
- 12. Stem distinctly slimy 13
- Stem dry 14
- 13. Gill edge hyaline and slimy; frb orange brownish see *H. laeta* key B 6
- Gill edge dry; frb yellowish or whitish see key A 36
- 14. Cap white, cream or ivory, occasionally very pale yellowish 15
- Cap grey, greyish brown, pale buff, reddish brown, occasionally only at centre 17
- 15. Cap dry, not hygrophanous; sp (5-)5.5-6.5(-7) x (3.5-)4-4.5(-5) μm . Cap at first dry and pruinose, white or ivory white, often with buff or cream centre, not translucently striate; gills white or ivory white to pale buff; stem \pm fibrillose, concolorous with cap; flesh in cap thick; smell indistinct. Sp ellipsoid, broadly ellipsoid to subglobose (fig. 209D); in other characters like the main variety. In seminatural grassland; autumn; rare in temp.-hemib.; DK, NO, SE. – B&K *Camarophyllus* 1, FE 6:363, FNE 1:43.

H. pratensis (Pers.: Fr.) Murrill var. ***pallida*** (Cooke) Arnolds (*Hygrophorus* p. (Pers.: Fr.) Mur-

rill var. *p.* Cooke, *Hygrocybe berkeleyi* (P.D. Orton) P.D. Orton & Watling, *Cuphophyllus b.* (P.D. Orton) Bon, *Camarophyllus berkeleyanus* Clemençon, *H. ortonii* Bon

- Cap sticky to greasy, hygrophanous; sp > 7 µm long 16
- 16. Smell strong like Russia leather or cedar wood. Cap 5-30 mm, at first low convex, later plane, usually with ± depressed centre, slightly sticky, ivory white, pale buff, occasionally pale cinnamon buff or with yellow tinge, ± translucently striate; gills decurrent, whitish; stem 12-40 × 15-4 mm, smooth, dry, concolorous with cap. Sp (6-)7.5-9(-10) × 4.5-5.5(-6) µm, Qav = 1.6, ellipsoid to ovoid to oblong (fig. 209E); gill trama interwoven. In seminatural grassland, often near the coast, in fixed dunes, pastures and at roadsides; late autumn; occasional in temp.-bore., but rare in FI, rare in suba.; DK (NT), FI (EN), FO, IS (Na, Au), NO (NT), SE (NT). – B&K 3:77, Däh 143, FE 6:375, FNE 1:46, M&J *Camarophyllus* 4.
H. russocoriacea (Berk. & T.K. Mill.) P.D. Orton & Watling (*Hygrophorus r.* Berk. & T.K. Mill., *Cuphophyllus r.* (Berk. & T.K. Mill.) Bon, *Camarophyllus r.* (Berk. & T.K. Mill.) J.E. Lange)
 - Smell insignificant. Cap 10-70 mm, at first hemispherical, low convex or broadly conical, later plane with ± depressed centre and irregularly upturned margin, occasionally with a small umbo, in moist conditions sticky, but soon dry and mat, small frb distinctly translucently striate, white, ivory white or cream, occasionally with ochre or pale brownish tinge, hygrophanous and becoming chalk white when dried out; gills decurrent, white, occasionally more ochre than cap and stem; stem 20-60 × 2-10 mm, dry and smooth, in large frb somewhat fibrillose, concolorous with cap; taste insignificant; infections by microorganisms may cause pink spots, completely dark purplish colouration and / or smell of coconut. Sp (6-)7-8.5(-9) × (4-)4.5-5(-6) µm (fig. 209F); gill trama interwoven; pileipellis an ixocutis. In seminatural grassland, lawns, pastures, deciduous scrubs, fixed dunes, roadsides; late summer to late autumn; very common in temp.-arc. / alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:103, FNE 1:49, R&H 249, Phil 76b, Ves 162, ☉.
H. virginea (Wulfen: Fr.) P.D. Orton & Watling var. *virginea* (*Hygrophorus v.* (Wulfen: Fr.) Fr., *Camarophyllus v.* (Wulfen: Fr.) P. Kumm., *Hygrocybe nivea* (Scop.) Murrill, *Cuphophyllus n.* (Scop.) Bon, *H. subradiata* (Schumach.) P.D. Orton & Watling)

Note: very variable in size and stature, and some subspecific taxa have been described:

 - var. *fuscescens* (Bres.) Arnolds differs in having a ± distinct central brownish spot on the cap. – B&K *Camarophyllus* 3, FE 6:371, FNE 1:51, N&S 496, Svp 44:53.
 - var. *ochraceopallida* (P.D. Orton) Boertm. differs in the cap being uniformly pale café-ou-lait, buff or pinkish buff and the stem being fibrillose and pale greyish covered with white, easily removable layer. In seminatural often lime rich grassland; rare in temp., but probably overlooked; DK, SE.
- 17. Cap reddish brown, dark chestnut brown to dark café-ou-lait brown. Cap 7-50 mm, at first convex to bell-shaped, later plane, often with conspicuous umbo, lubricous in moist conditions, occasionally paler margin and darker striate, hygrophanous; gills decurrent, often strongly intervenose, paler than cap; stem 20-50 × 3-7 mm, dry and fibrillose, whitish and often somewhat shiny and covered with a white, removable coating. Sp (6-)7.5-9(-10) × (4-)5-6(-7) µm, Q = 1.2-1.9, Qav = 1.4-1.5, ellipsoid to broadly ellipsoid (fig. 209G); gill trama interwoven; pileipellis an ixocutis. In seminatural, often lime rich grassland, less often in deciduous scrubs; autumn; rare in temp.-suba.; DK (EN), FI (VU, A, V), IS, NO (VU), SE (NT). – B&K 3:84, FE 6:331, FNE 1:55, N&S 494, Ves 163.
H. colemanniana (A. Bloxam) P.D. Orton & Watling (*Hygrophorus c.* A. Bloxam, *Camarophyllus c.* (A. Bloxam) Ricken, *Cuphophyllus c.* (A. Bloxam) Bon)
 - Cap grey, bluish grey, greyish brown, café-au-lait or buff 18
- 18. Cap pale café-ou-lait, buff or pinkish buff see *H. virginea* var. *ochraceopallida* 16
 - Cap grey, bluish grey or grey brown 19
- 19. Cap dry, not translucently striate or hygrophanous. Cap 20-40 mm, low convex with

incurved margin to plane, \pm broadly umbonate, at first somewhat felty to tomentose, grey to bluish grey, with greyish white areas, when young with a violaceous tinge, occasionally with dark spots; gills decurrent, intervenose, pale grey, violaceous grey, becoming paler with age; stem 25-50 x 3-7 mm, dry and mat, greyish like cap and covered with a whitish layer. Sp (4.5-)5-6 x 4-5 μm , broadly ellipsoid to subglobose (fig. 209H); gill trama interwoven. In seminatural grassland; autumn; very rare in temp.-bore.; NO (EN), SE (EN). – FNE 1:45, N&S 503.

H. canescens (A.H. Sm. & Hesler) P.D. Orton (*Hygrophorus* c. A.H. Sm. & Hesler, *Camarophyllus* c. (A.H. Sm. & Hesler) Singer)

- Cap usually slimy, greasy or sticky, translucently striate and hygrophanous 20
- 20. Expanded cap usually > 20 mm; stem with or without yellow at base 21
- Expanded cap usually < 20 mm; stem without yellow at base 22
- 21. Stem fibrillose, lower quarter or third pale yellow, but not always in small frb; sp mostly subglobose (fig. 209I). Cap 20-50 mm, broadly conical or low convex, later plane to funnel-shaped, occasionally with a low umbo, lubricous in moist conditions, translucently striate, especially in small frb, grey-brown to ash grey, occasionally with violaceous tinge, hygrophanous, discolouring to pale greyish, buff or whitish from centre; gills decurrent, often intervenose at base, grey with paler margin; stem 20-50 x 3-8 mm, cylindrical and tapering downwards, pale greyish, in young frb with fugacious white covering. Sp 6-7.5 x 5-6 μm , Qav = 1.1-1.3; gill trama interwoven, pileipellis an ixocutis at least in young frb. In seminatural grassland; late summer to autumn; occasional in temp.-bore.; DK (EN), FO, IS, NO (NT), SE (NT). – FE 6:335, FNE 1:58, M&J *Camarophyllus* 3, N&S 503, Ves 163.
- H. flavipes* (Britzelm.) Bon (*Hygrophorus* f. Britzelm., *Camarophyllus* f. (Britzelm.) Clémençon, *Cuphophyllus* f. (Britzelm.) Bon, *H. radiata* Arnolds s. Boertmann p.p.)
- Stem smooth, without yellow; sp mostly broadly ellipsoid (fig. 209J). Cap 25-60 mm, low convex, umbonate or broadly conical at first, later \pm plane, sticky and slimy in moist conditions, ash grey, pale mouse grey, bluish grey, translucently striate, hygrophanous, discolouring to pale greyish and subsequently buff from centre; gills decurrent, often intervenose, pale grey, bluish grey or dark grey, often with paler margin; stem 30-70 x 3-6 mm, dry, whitish with \pm grey or violaceous tinge, at base occasionally cream or buff; smell usually like *Cystoderma carcharias*; taste unpleasant, acidulous or rancid, especially in cap cuticle. Sp (6-)7-8(-8.5) x (4-)4.5-6(-6.5) μm , Qav = 1.3-1.5; gill trama interwoven; pileipellis an ixotrichoderm. In seminatural grassland, fens and pastures, often on calcareous soil; summer to autumn; rare in temp.-arc./alp.; DK (EN), FI (NT), NO (NT), SE (VU). – B&K 3:88, FNE 1:57, N&S 502, R&H 250, Svp 2:64, ☉.
- H. lacmus* (Schumach.) P.D. Orton & Watling (*Cuphophyllus* l. (Schumach.) Bon, *H. cinerea* (Fr.) P.D. Orton & Watling, *H. subviolacea* (Peck) P.D. Orton & Watling)
- 22. In suba.-arc./alp. habitats; sp ellipsoid to ovoid, occasionally broadly ellipsoid or elongated, some slightly constricted (fig. 209K). Cap 5-30 mm, low convex, with somewhat involute margin, later plane with \pm depressed centre, only indistinctly striate, when old somewhat scaly, dry, dark brown, grey brown, dark grey, often paler outwards, hygrophanous and fading to pale grey or even whitish, occasionally with a lilac tinge; gills \pm decurrent, pale grey to grey brown with paler margin and sometimes with lilac tinge; stem 5-30 x 1-4 mm, dry and slightly fibrillose, almost white to pale grey or cinnamon buff, often with a white, removable covering. Sp (6-)6.5-8(-9) x (4-)4.5-5.5(-6) μm , Qav = 1.4-1.6; gill trama interwoven to subregular; pileipellis a cutis. In fens, bogs and moist heathland; summer to autumn; occasional in middle bore.-arc./alp., but very rare in IS; FI (DD), IS (Na), NO (LC), SE (LC). – FE 6:327, FNE 1:63, M&J *Camarophyllus* 2.
- H. cinerella* (Kühner) Arnolds (*Camarophyllus* c. Kühner, *Cuphophyllus* c. (Kühner) Bon)
- In temp.-hemib. habitats; sp subglobose to broadly ellipsoid (fig. 209L). Cap 5-20 mm, low convex to plane, at centre finely scaly to tomentose, dry, indistinctly translucently striate,

grey, grey brown, drying out pale grey with pink tinge; gills \pm decurrent, pale grey to almost white; stem 10-30 x 1-2 mm, slightly fibrous, silvery white. Sp 5-7.5(-8.5) x 4-6(-7.5) μm , Qav = 1.2; gill trama interwoven; pileipellis a trichoderm, at least at centre. In deciduous scrubs and probably also seminatural grassland; summer to autumn; very rare in temp.-hemib.; DK (CR), NO, SE.

H. roseascens E. Ludw. & J.G. Svensson (*H. radiata* Arnolds s. Boertmann p.p.)

Hygrophoropsis (J. Schröt.) Maire HENNING KNUDSEN & ANDY TAYLOR

Frb clitocyboid with orange, cream or pink gills. Cap 20-70 mm, plane to funnel-shaped, often irregular, with incurved margin, somewhat tomentose, orange, reddish, brownish, pinkish to yellowish. Gills strongly decurrent, dichotomously branched, thick or thin, narrow, loosening from cap. Flesh whitish, soft and slightly elastic-tough. Sp deposit white.

Sp almost cylindrical to ellipsoid or broadly ellipsoid, hyaline, thick- or thin-walled, dextrinoid or without iodine reactions. Basidia clavate, 4-spored. Cystidia absent. Pileipellis a cutis or a weakly defined trichoderm, with cylindrical hyphae and somewhat swollen terminal cells.

Saprotrophic; on the ground and on decayed, mostly coniferous wood or on sedges and grasses, causing a brown rot.

Four species in the Nordic countries.

Lit.: Kuyper 1995, Ludwig 2001, Orton 1960, Reid 1972.



Spores: B: *Hygrophoropsis aurantiaca*, C: *H. pallida*.

1. Smell strongly sweetish, resembling *Hebeloma sacchariolenis*; gills narrow and thin, dichotomously forked, whitish with a flush of cap colour; sp without iodine reactions. Cap 10-30 mm, irregularly funnel-shaped, flesh-coloured or brick with a buff tinge resembling that of *Hydnum repandum*, margin irregularly sinuose-wavy; stem 15-40 x 2-5 mm; flesh whitish, in stem base slightly yellowish. Sp 3.5-4.5 x 2.5-3 μm , ellipsoid to broadly ellipsoid, thin-walled. Saprotrophic in coniferous forests, often in *Pinus* heaths on calcareous soil, in small groups; rare and scattered in hemib.-bore., only known from a few places in NO, in FI and SE widely distributed in bore., with a northern distribution; FI (NT), NO (VU), SE (VU). – Däh 107, GBW 3:276, K&R 287, M&H 3:294, R&H 235, 📍.
H. olida (Quél.) Métrod (*H. morganii* (Peck) Bigel.)
- Smell indistinct; gills of normal width, thick, orange or white, dichotomously forked; sp dextrinoid 2
2. Cap 30-80 mm, typically orange, from pale orange to deep reddish orange, or orange yellow, dry, tomentose, margin incurved; flesh orange, soft and slightly tough; gills concolorous with cap or deeper orange, more rarely pale orange to pale cream (= f. *albida* (Gill.)), when dried orange to orange brown, smooth or venose, edge rounded; stem concolorous with cap, often slightly eccentric and curved at base. Sp 5-7 x 3.5-4.5 μm , ellipsoid (fig. 153B); pileipellis with almost cylindrical terminal cells, c. 10 μm broad. In coniferous and mixed forests, on litter, decayed stumps, sawdust, around ant-hills, etc., rarely outside forests; very common in temp.-bore., rare in western parts of NO, north to KiL.; DK (LC), FI, FO, NO (LC), SE (LC). – B&K 3:61, Däh 106, Phil 66, R&H 235, Ves 180, 📍.
H. aurantiaca (Wulfen: Fr.) Maire
- Cap either darker and brownish with orange gills, or paler with whitish gills 3
3. Cap orange brown to dark brown. Cap 30-100 mm, tomentose, flat, becoming depressed when old, margin incurved; gills orange with a salmon tinge, dark orange to orange, strongly decurrent, dichotomously forked; stem 20-50 x 5-15 mm, robust, concolorous with cap. Sp 5-6.5(-7) x 3-4 μm , cylindrical or ellipsoid, thick-walled, strongly dextrinoid; pileipellis with some inflated, terminal cells up to 20 μm broad. Saprotrophic on stumps and trunks of coni-

fers, often subfasciculate; in FI occasional in hemib.-southern bore., possibly also in middle bore., rare in temp.; DK (DD), FI. – FRIC 6.

H. rufa (D.A. Reid) Knudsen (*H. aurantiaca* (Wulfen: Fr.) Maire var. *rufa* D.A. Reid)

- Cap pale whitish to cream, ochre or buff. Cap 15-50 mm, flat then depressed to funnel-shaped, tomentose, margin incurved, sinuose-wavy; stem 15-50 x 4-10 mm, concolorous with cap or paler, often with dark brown base; gills whitish to cream also when dried, dichotomously forked, sometimes very thick and irregular, smooth or venose, strongly decurrent; flesh whitish, soft. Sp 6-9(-10) x 4-5 μm , ellipsoid (fig. 153C), thick-walled, strongly dextrinoid. Saprotrophic, on dried out, but temporarily wet meadows and coastal meadows with sedges and grasses, on extensively used hay-fields, also in acid, moist clearings or along paths with sedges in coniferous forests; rare, but in certain years locally in numbers, in temp.-bore.; DK (LC), FI (DD), NO (LC), SE (LC). – Däh 108, FAD 196B (as *Cantharellus aurantiacus* forma *pallidus*), R&H 236.

H. pallida (Peck) Kreisel (*Hygrophorus p.* Peck, *Cantharellus aurantiacus* Wulfen: Fr. var. *lacteus* Fr.: Fr., *Cantharellus lacteus* (Fr.: Fr.) Quél., *Clitocybe a.* (Wulfen: Fr.) Maire var. *lactea* (Fr.: Fr.) Rea, *Hygrophoropsis a.* (Wulfen: Fr.) Maire var. *lactea* (Fr.: Fr.) Corner, *Cantharellus a.* (Wulfen: Fr.) Maire var. *pallidus* Cooke, *Hygrophoropsis a.* (Wulfen: Fr.) Maire var. *pallida* (Cooke) Heykoop & Esteve-Raventós, *H. aurantiaca* (Wulfen: Fr.) Maire var. *macrospora* D.A. Reid, *H. macrospora* (D.A. Reid) Kuyper, *H. fuscusquamula* P.D. Orton ('*fuscusquamulosa*').

Note: the pale *Hygrophoropsis* species are still insufficiently known and some authors separate more than one species here.

Hypholoma (Fr.) P. Kumm.

JAN VESTERHOLT & ERIK RALD

Nematoloma (Fr.) P. Karst.

Frb mycenoid to collybioid with dull brown to black sp deposit. Cap 10-150 mm, smooth, dry to viscid, mostly with yellow, orange or reddish colours, hygrophanous or not hygrophanous. Gills adnate to emarginate, often ± yellowish, becoming brown to black, often with a violet tinge. Stem mostly slender. Veil distinct in some species, in other species fugacious or absent. Smell indistinct, less often aromatic. Taste mild or slightly to strongly bitter. Sp deposit dark snuff brown, purplish brown or purplish black.

Sp ellipsoid, ovoid, amygdaloid or fusiform, thick-walled, with a germ pore, smooth, yellowish brown to brown, without iodine reactions. Cheilocystidia as clavate to lageniform or utriform leptocystidia, in some species also as chrysocystidia. Pleurocystidia present as chrysocystidia, mostly clavate, often mucronate. Pileipellis a cutis or an ixocutis. Clamps present.

Saprotrophic, on wood, humus, herbaceous litter, mosses, incl. *Sphagnum*, etc.

14 species in the Nordic countries, 15 species in the key.

Lit.: Ludwig 2001, Noordeloos in Bas et al. 1999, Watling & Gregory 1987.

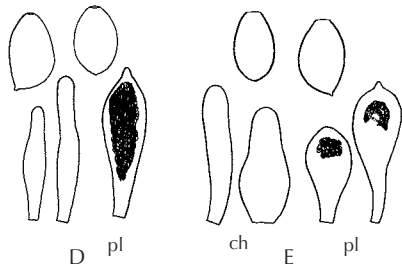


Fig. 831. Spores, cheilocystidia and pleurochrysocystidia: D: *Hypholoma radicosum*, E: *H. fasciculare*.

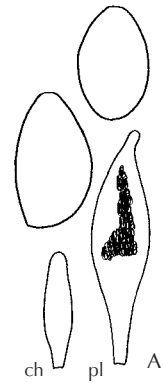


Fig. 837. Spores, cheilocystidia and pleurocystidia: A: *Hypholoma elongatum*.

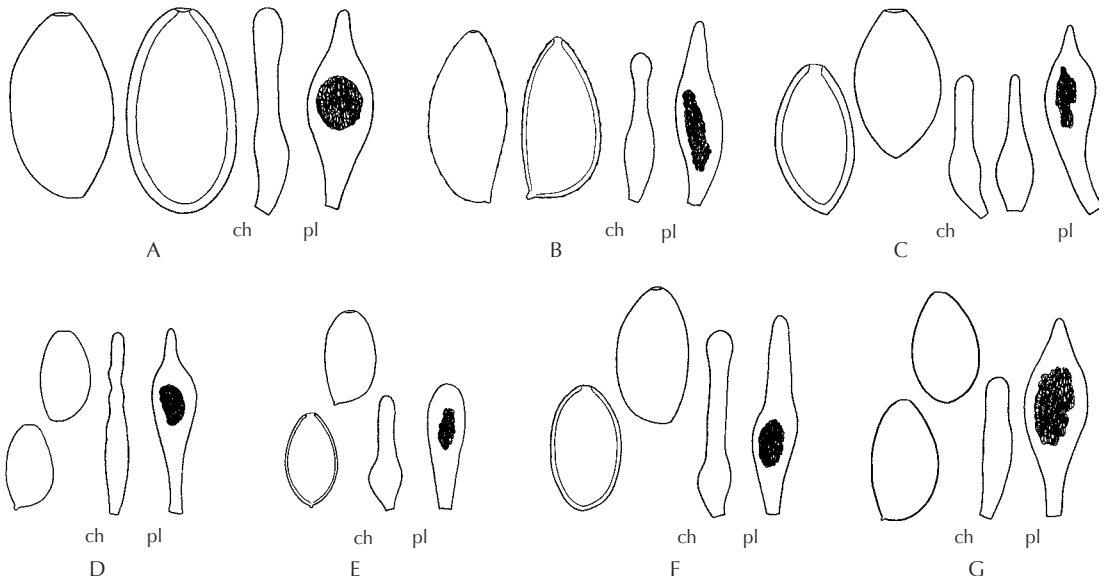






Fig. 835. Spores, cheilocystidia and pleurochrysocystidia: A: *Hypholoma myosotis*, B: *H. udum*, C: *H. ericaeum*, D: *H. polytrichi*, E: *H. subericaeum*, F: *H. ericaeoides*, G: *H. laeticolor*.

1. On wood, sometimes on buried wood or wood chips; taste mild or bitter; veil distinct in young frb 2
 - On humus or herbaceous litter or among mosses; taste mild; veil absent or fugacious 6
2. Stem rooting up to 100 mm; frb solitary or few together. Cap 25-40 mm, bell-shaped to convex, later expanded with or without an umbo, orange to sordid yellow with paler margin, not hygrophanous, when young with fugacious white veil; gills medium spaced, clay buff to fawn with an olive tinge; stem 50-80 x 4-8 mm, white in top, sordid yellow towards base; smell aromatic; taste very bitter. Sp 5.5-7 x 3-4 μm , ellipsoid to ovoid (fig. 831D); leptocystidia \pm cylindrical; chrysocystidia only present as pleurocystidia, clavate-mucronate. On roots and stumps of conifers, rarely of deciduous trees; late summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:415, Däh 609, FAD 145B, Lud 35.1, R&H 448, .
- H. radicosum* J.E. Lange
 - Stem not or only indistinctly rooting; frb mostly caespitose 3
3. Stem with a white fibrillose covering, soon breaking up into transverse, reflective belts. Cap 10-40 mm, hemispherical to convex, greasy to dry, yellowish brown to orange brown, not or only slightly hygrophanous; gills medium spaced, olive grey, becoming purplish brown; stem 40-100 x 2-5 mm, cylindrical, reddish brown in lower part under the fibrillose covering. Sp 7-9 x 4-5 μm , ellipsoid; leptocystidia mostly lageniform to utriform; chrysocystidia only present as pleurocystidia, clavate-mucronate. On woody debris under conifers, mostly solitary, but often in large groups; mostly in spring, but also summer to autumn; common in temp.-bore.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 4:412, Lud 35.3, Phil 230d, R&H 448, Ves 312, .
- H. marginatum* (Pers.: Fr.) J. Schröt. (*H. dispersum* (Fr.) Quél.)
 - Stem without a white fibrillose covering breaking up into transverse, reflective belts 4
4. Gills tinged greenish yellow for a long time; taste bitter. Cap 10-60 mm, convex to expanded, smooth, dry, at first orange to orange brown, later sulphur yellow with orange brown centre, not hygrophanous; gills crowded, finally purplish brown to purplish black; stem 30-80 x 2-8 mm, cylindrical, fibrillose, sulphur yellow, more yellowish brown towards the base; veil fugacious, often persistent near cap margin. Sp 6-8 x 4-4.5 μm , ellipsoid (fig. 831E); leptocystidia mostly cylindrical to lageniform or utriform; chrysocystidia both present as cheilo- and pleurocystidia, clavate, sometimes mucronate. On deciduous, less often coniferous wood, mostly caespitose; all year; very common in temp.-southern bore., rare in middle bore., very rare in suba.; DK (LC), FI (LC), FO, IS (Ve: Reykjavík), NO (LC), SE (LC). – B&K 4:411, Lud 35.5, Phil 231f-g, R&H 449, Ves 313, . – Poisonous.
- H. fasciculare* (Huds.: Fr.) P. Kumm. var. *fasciculare*
 var. *subviride* (Berk. & M.A. Curtis) Krieglst. (var. *pusilla* J.E. Lange) differs in having constantly smaller frb with up to 10(-15) mm cap and 1-2(-3) mm thick stem. DK.
 - Gills without greenish yellow tinges; taste mild to slightly bitter 5
5. Cap reddish to brick at centre, whitish to pale yellowish at margin, not hygrophanous; gills becoming violet or purplish brown; on deciduous wood. Cap 20-100 mm, hemispherical to convex, later expanded, smooth, dry; gills crowded; stem 50-150 x 5-15 mm, cylindrical, fibrillose, cream to pale yellowish in upper part, orange brown to reddish brown downwards; veil fugacious, often persistent near cap margin; taste slightly bitter. Sp 6-8 x 3-4.5 μm , ellipsoid; leptocystidia \pm cylindrical; chrysocystidia both present as cheilo- and pleurocystidia, clavate-mucronate. In small to large groups on stumps and roots; all year; very common in temp., common in hemib.-bore., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:416, Lud 35.4, Phil 232a, R&H 447, Ves 312, .
- H. lateritium* (Schaeff.: Fr.) P. Kumm. (*H. sublateritium* (Fr.) Quél.)
 - Cap honey yellow with ochre or reddish yellow centre, hygrophanous; gills becoming grey-

ish violet or smoke grey; on *Picea* or *Pinus*. Cap 15-70 mm, hemispherical to convex or plane, smooth, dry; gills crowded; stem 50-100 x 3-10 mm, cylindrical, fibrillose, cream to cream yellow in upper part, yellowish brown towards base; veil fugacious, often persistent near cap margin; taste mild. Sp 7-9 x 4-5 μm , ellipsoid to ovoid; leptocystidia mostly lageniform to utriform; chrysocystidia both present as cheilo- and pleurocystidia, clavate-mucronate. Mostly fasciculate on stumps and roots; spring-autumn, but mainly in late autumn; very common in temp.-bore., rare in suba.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:408, Lud 35.2, R&H 446, Sieniop 265, Ves 313, ☉.

H. capnoides (Fr.: Fr.) P. Kumm.

- | | | |
|-----|--|----|
| 6. | Cap viscid when moist, shiny when dry; gills brown without purplish tinge | 7 |
| - | Cap greasy when moist; gills at maturity with or without a violet or purplish tinge | 8 |
| 7. | Cap 20-50 mm, not hygrophanous. Cap olive brown, olive green, olive yellow or greyish brown, when young with white scales near the margin; gills medium spaced, pale, becoming greyish brown, finally snuff brown; stem 80-110 x 2-8 mm, fibrillose-striate, whitish. Sp 14.5-17 x 7.5-9.5 μm , ovoid to amygdaloid (fig. 835A); leptocystidia clavate to cylindrical-capitate; chrysocystidia numerous, mainly present as pleurocystidia, clavate-mucronate. In <i>Sphagnum</i> or on naked soil in bogs and swamps, in moist acid grassland and in woodland; summer to autumn; common in hemib.-arc./alp., occasional in temp.; DK (LC), FI (LC), FO, IS, NO (LC, incl. SvB), SE (LC). – B&K 4:413, FAD 126C, GBW 4:361, Phil 233d, R&H 450, ☉. | |
| | <i>H. myosotis</i> (Fr.: Fr.) M. Lange (<i>Pholiota m.</i> (Fr.: Fr.) Singer, <i>Hemipholiota m.</i> (Fr.: Fr.) Bon) | |
| - | Cap 15-30 mm, hygrophanous. Cap dark brown, drying ochre, more reddish brown at centre, when young with white scales near the margin; gills greyish brown to brown; stem 40-60 x 2.5-5 mm, fibrillose-striate, whitish, darker brown towards base. Sp 15.5-18(-21) x 8-9.5 μm ; leptocystidia lageniform; pleurocystidia sparse. In <i>Sphagnum</i> and on naked soil in snow beds; distribution unknown as it is often included in <i>H. myosotis</i> ; NO (NE). | |
| | <i>H. eximium</i> (C. Laest.) Rald (<i>H. lapponicum</i> (Fr.) M.M. Moser) | |
| 8. | Sp on av > 12.5 μm long; cap without yellow tinges | 9 |
| - | Sp on av < 12.5 μm long; cap with yellow tinges, at least near the margin | 10 |
| 9. | Sp 12-19 x 6-9 μm , minutely verruculose, with a small germ pore (fig. 835B). Cap 10-25(-50) mm, hygrophanous, olive brown to sordid reddish brown or bright brick red, striate only when old; gills medium spaced, at maturity with a purplish tinge; stem 30-100 x 1-3(-5) mm, dark reddish brown with a yellowish top; sp deposit with a purplish tinge. Sp ellipsoid to fusiform, slightly concave in side view near base; leptocystidia mostly lageniform to utriform; pleurocystidia clavate-mucronate. On peaty soil, rarely in <i>Sphagnum</i> ; summer to autumn; common in hemib.-arc./alp., occasional in temp.; DK (LC), FI (LC), IS, NO (NE), SE (LC). – B&K 4:417, GBW 4:365, Jordst 10(1), Lud 35.9, Phil 230e, ☉. | |
| | <i>H. udum</i> (Pers.: Fr.) Kühner | |
| - | Sp 12-15 x 6.5-9 μm , smooth, with a large germ pore (fig. 835C). Cap 15-40 mm, convex, greasy, reddish brown to chestnut brown, hygrophanous, not translucently striate; gills medium spaced to crowded, at first brownish and slightly mottled, finally black with a purplish tinge; stem 80-120 x 2-4 mm, cylindrical, uniformly pale yellowish brown. Sp dark brown in KOH; leptocystidia \pm clavate to lageniform; chrysocystidia both present as cheilo- and pleurocystidia, clavate-mucronate. In wet fields and moist heathland; late summer to autumn; rare, but locally occasional in temp.-arc./alp.; DK (EN), FI (ES: Loppi), NO (NE), SE (LC). – C&D 1293, Lud 35.8. | |
| | <i>H. ericaeum</i> (Pers.: Fr.) Kühner | |
| 10. | Sp on av < 9 μm long | 11 |
| - | Sp on av > 9 μm long | 12 |

11. Stem 1-3 mm broad; gill edge yellow from numerous chrysocystidia. Cap 5-20 mm, convex or slightly umbonate, not hygrophanous, yellow with a reddish yellow centre, not striate; gills medium spaced, yellow when young, becoming olivaceous brown; stem 40-100 x 1-3 mm, yellow at the top, reddish brown towards base. Sp 7-9 x 4-5 μm , ellipsoid (fig. 835D); leptocystidia \pm cylindrical; pleurocystidia clavate-mucronate. Among *Polytrichum* and other mosses, also on bare soil in coniferous and deciduous forests; summer to autumn; occasional but locally common in hemib.-suba., very rare in temp.; DK (DD), FI (LC), IS, NO (LC), SE (LC). – B&K 4:414, GBW 4:362, Lud 35.12, R&H 449.

H. polytrichi (Fr.) Ricken

- Stem 2-5 mm broad; gills edge not yellow, without chrysocystidia. Cap 10-40 mm, convex, sometimes umbonate, hygrophanous, olive yellow or honey brown, drying yellowish ochre with brownish centre, often with a persistent, contrasting marginal belt; gills medium spaced, pale greyish yellow when young, becoming greyish yellow or purplish brown; stem 30-100 x 2-5 mm, cylindrical, slightly striate, whitish yellow, downwards brownish. Sp 7-9 x 4-5 μm , ellipsoid to ovoid (fig. 835E); leptocystidia cylindrical to lageniform; pleurocystidia clavate, rarely mucronate. In wet fields, including salt marshes, forest swamps, etc.; summer to autumn; occasional, but locally common in temp.-hemib., rare in bore.; DK (LC), FI (LC), NO (NE), SE (LC). – GBW 4:365, Jordst 10(3), Lud 35.10.


H. subericaeum (Fr.) Kühner

12. Gills with a purplish tinge when mature; sp thick-walled with a distinct germ pore. Cap 15-40 mm, convex or umbonate, hygrophanous, olive yellow to straw, drying reddish yellow with a sulphur-yellow margin; gills pale sulphur yellow to olive yellow when young, becoming purplish brown with a sulphur-yellow edge; stem 40-80 x 3-5 mm, cylindrical, fibrillose-striate, whitish, downwards brownish. Sp 9-12 x 6-7 μm , ellipsoid to amygdaloid (fig. 835F); leptocystidia lageniform; chrysocystidia only present as pleurocystidia, lageniform to fusiform. In swamps in forests and grassland on sandy or peaty soil; summer to autumn; rare in temp.-arc./alp.; DK (EN), FI (NT), IS, NO (NE), SE (LC). – B&K 4:410, C&D 1294, GBW 4:356, Jordst 10(3), Lud 35.6.

H. ericaeoides P.D. Orton

- Gills without purplish tinge; sp rather thin-walled with a small germ pore 13
13. Sp on av < 6.5 μm broad (fig. 835G); gills without a distinct yellow tinge when young; chrysocystidia absent from gill edge. Cap 10-30 mm, hemispherical to conical or bell-shaped, hygrophanous; gills medium spaced, very pale grey, turning grey brown; stem 25-45 x 1.5-2.5 mm, cylindrical, pale yellow to ochre orange, turning reddish brown from the base. Sp 10-12 x 5.5-6.5(-7) μm , ellipsoid to amygdaloid; leptocystidia cylindrical to lageniform; chrysocystidia clavate-mucronate. In damp and mossy grassland and open areas in conifer plantations on peaty soil; summer to autumn; rare in temp.-suba.; DK (DD, EJyl: Torup Plt.), FO, NO (NE, Akh: Oslo). – FF 3f.

H. laeticolor (F.H. Møller) P.D. Orton

- Sp on av > 6.5 μm broad; gills with a distinct yellow tinge when young; chrysocystidia present on gill edge 14
14. Sp ellipsoid in side view (fig. 837A). Cap 10-25 mm, convex to expanded, smooth, slightly greasy, translucently striate near the margin, pale yellow to olive yellow, hygrophanous, drying cream; gills medium spaced, pale yellow when young; stem 30-150 x 1-3 mm, cylindrical, whitish and pruinose at top, yellowish to yellowish brown towards base. Sp 9-12 x 6-7 μm , ellipsoid; cheilocystidia \pm lageniform; leptocystidia both present as cheilo- and pleurocystidia, clavate-mucronate. Mostly in *Sphagnum*, but also among other mosses, less often in damp meadows on peaty soil; summer to autumn; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 4:409, Lud 35.7, Phil 232b, R&H 449, Ves 314, .
- H. elongatum* (Pers.) Ricken (*H. elongatipes* (Peck) A.H. Sm.)
- Sp amygdaloid in side view. Cap 10-30 mm, convex to expanded, sometimes umbonate,

hygrophanous, translucently striate pale yellow to saffron or ochraceous, sometimes tinged sienna at centre, yellowish olivaceous at margin when moist; gills medium spaced, lemon yellow, then tinged brownish olivaceous, becoming violaceous grey; stem 30-65 x 1-4 mm, cylindrical, fibrillose-striate, upper part yellow and flocculose, downwards reddish brown. Sp 9-11.5 x 6-8 μm ; leptocystidia \pm lageniform; chrysocystidia both present as cheilo- and pleurocystidia, clavate-mucronate to fusiform. On clayey soil and on humus under *Juniperus*, etc.; DE, UK.

H. xanthocephalum P.D. Orton

Hypsizygus Singer

KUULO KALAMEES

One species in the Nordic countries; see description below.

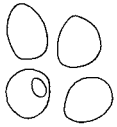
Lit.: Bon 1999, Gulden in Hansen & Knudsen 1992, Horak 2005, Kalamees 2004, Redhead 1984b.

Frb tricholomatoid to ± pleurotoid, whitish to pale greyish brown, thick-fleshed. Cap 60-300 mm, convex to plane, with incurved pubescent margin when young, smooth, dry to slightly sticky, often with hygrophanous brownish spots. Gills adnexed to slightly decurrent, broad, crowded. Stem 60-130 x 20-35 mm, solid, dry, tough, densely cottony-tomentose-fibrillose all over. Smell slightly farinaceous or nearly indistinct. Taste mild. Sp deposit white to pale cream.

Sp 3.5-6.5 x 3-5 μm, broadly ellipsoid to subglobose, smooth (fig. 497F), without iodine reactions, cyanophilous. Basidia up to 35 μm long, weakly and not constantly siderophilous. Cystidia absent. Pileipellis a cutis. Pigments predominantly intracellular. Clamps present.

Parasitic or saprotrophic on wood of *Betula*, less often *Populus*, in temp. on *Ulmus*, on living trees or on standing or fallen trunks, often in holes from large branches, at base of trees, sometimes fasciculate, in parks, deciduous and mixed forests, groves; producing a white rot; spring to autumn; occasional, but locally common in hemib.-suba., rare in temp.; DK (EN, Sj), FI (LC), NO (LC), SE (LC). – GBW 3:277, M&H 3:234, Phil 264a, R&H 298, Sieniop 286, 📍.

H. ulmarius (Bull.: Fr.) Redhead (*Lyophyllum u.* (Bull.: Fr.) Kühner, *Hypsizygus tessulatus* (Bull.: Fr.) Singer, *H. circinatus* (Fr.) Singer s. auct.)



Spores.

Infundibulicybe Harmaja

JAN VESTERHOLT

Clitocybe (Fr.) Staude sect. *Infundibuliformes* (Fr.) QuéL.

Frb clitocyboid, not hygrophanous. Cap 15-240(-400) mm, depressed to funnel-shaped, velvety to finely scaly, white to pale buff to buff, pinkish buff, yellowish, yellowish brown, orange brown, reddish brown or greyish brown. Gills decurrent to deeply decurrent. Smell faint, ± cyanic or sweet-aromatic. Sp deposit whitish.

Sp ± dacryoid, smooth, hyaline, without iodine reactions. Basidia 4-spored. Cheilocystidia absent. Pileipellis a trichoderm. Clamps present.

Saprotrophic on soil or litter in forests, grassland and alpine habitats.

10 species in the Nordic countries, 11 species in the key.

The genus used to be a part of *Clitocybe*, but molecular results have shown that they are not closely related.

Lit.: Cléménçon 1984, Gminder & Kriegelsteiner in Kriegelsteiner 2001, Harmaja 1969, 2003, Kuyper in Bas et al. 1995.




Spores: A: *Infundibulicybe catinus*, B: *I. lapponica*, C: *I. geotropa*, D: *I. squamulosa*, E: *I. costata*, F: *I. bresadolana*, G: *I. gibba*.

1. Cap white to pale cream. Cap 40-110 mm, convex with depressed centre, later funnel-shaped, sometimes with an indistinct umbo, appressed fibrillose-tomentose, soon becoming smooth, not hygrophanous; gills decurrent, thin and medium broad, crowded, whitish; stem 20-50 x 5-13 mm, cylindrical to clavate, whitish; smell faintly cyanic; sp deposit white. Sp 5.5-8 x 4.5-6 μm, dacryoid (fig. 311A). On soil in coniferous and deciduous forests and *Dryas* heathland, often on calcareous soil; summer to early autumn; occasional in temp.-arc. / alp.; DK (NA, EJyl: Løvenholm), FI (LC), NO (LC), SE (LC). – B&K 3:153, Sieniop 127.
I. catinus (Fr.) Harmaja (*Clitocybe c.* (Fr.) QuéL.)
 - Cap pale buff to buff, pinkish buff, yellowish, yellowish brown, orange brown, reddish brown or greyish brown 2
2. Frb thick-fleshed; stem top mostly > 10 mm broad 3
 - Frb not very thick-fleshed; stem top mostly < 10 mm broad 6
3. Cap 90-240(-400) mm; gills with few lactifers. Cap becoming depressed to funnel-shaped, smooth to slightly scaly; gills decurrent, crowded, forked near the stem; stem 40-110 x 12-38 mm. Sp 6.5-9.5 x 4.5-6 μm, ellipsoid to dacryoid. In deciduous forests and rich *Picea* forests, calciphilous; summer to early autumn; occasional in suba., rare in bore.; FI (DD, Ks), NO (NE), SE (LC).
I. gigas (Harmaja) Harmaja (*Clitocybe g.* Harmaja, *C. maxima* (Gaertn. & G. Mey.: Fr.) P. Kumm. s. auct. p.p.)
 - Cap up to 150 mm broad; gills with few or numerous lactifers 4
4. Sp narrowly dacryoid (fig. 311B), Qav > 1.4. Cap 60-120 mm, low convex to plane or slightly depressed, finely scaly or areolate, brown, not hygrophanous; gills decurrent, medium

spaced to crowded, pale; stem 40-60 x 10-15 mm, cylindrical to ± clavate, concolorous with cap; sp deposit white. Sp 6-11 x 4-6 μm. In *Betula* forests and above the forest line, often on calcareous soil; summer; occasional in suba.-arc./alp.; FI (DD, InL: Utsjoki), NO (LC), SE (LC).
I. lapponica (Harmaja) Harmaja (*Clitocybe l.* Harmaja)

- Sp broadly dacryoid, Qav < 1.4 5
- 5. Stem 60-150 x 13-30 mm; on rich soil or leaf litter in deciduous and mixed forests. Cap 35-150 mm, at first plane with a decurved margin, later funnel-shaped, mostly with a prominent umbo, thick-fleshed, cream, smooth, turning pale buff with age or when handled, not hygrophanous; gills decurrent, medium spaced, cream; stem cylindrical to ± clavate, smooth to fibrillose, cream with a buff tinge; smell strong, sweet and aromatic. Sp 7.5-9.5 x 6-7 μm, broadly dacryoid (fig. 311C). From summer, but especially in late autumn; common in temp.-hemib., rare in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 275, Däh 191, Phil 91f, R&H 270, Ves 182, ☉.
I. geotropa (Bull.) Harmaja (*Clitocybe g.* (Bull.) Quél.)
- Stem 40-70 x 6-25 mm; in northern bore.-suba. on calcareous soil. Cap 50-120 mm, low convex to plane, later depressed, with inrolled margin when young, brown, not hygrophanous; gills decurrent, medium spaced, pale buff; stem cylindrical or slightly widened at base, almost smooth, slightly paler than cap, but darkening with age; smell strong and sweet. Sp 7-9 x 5-7 μm, dacryoid. Very rare; NO (NE).
- I. montana*** (Harmaja) Harmaja (*Clitocybe m.* Harmaja)
- 6. Smell farinaceous; sp 7-10.5 x 5-6 μm see *Clitocybe sinopica* p. 401
- Smell not farinaceous; sp ≤ 5 μm broad 7
- 7. Cap ± finely scaly at centre, elsewhere tomentose. Cap 15-50 mm, at first convex with a depressed centre, later funnel-shaped, orange brown to greyish brown, not hygrophanous; gills decurrent, medium spaced, white to pale buff; stem 20-60 x 3-7 mm, cylindrical to clavate, orange brown to greyish brown; smell cyanic; sp deposit white. Sp 7-9.5 x 4-5 μm, dacryoid (fig. 311D). In deciduous and coniferous forests and pastures, often at roadsides and in clearings; summer to autumn; common in hemib.-bore, occasional in temp. and suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – C&D 280, FAD 35B, Ves 189.
I. squamulosa (Pers.: Fr.) Harmaja (*Clitocybe s.* (Pers.: Fr.) P. Kumm., *C. sinopicoides* Peck)
- Cap tomentose to smooth 8
- 8. Cap in exsiccates turning chestnut brown with 5 % KOH 9
- Cap in exsiccates ± unchanged with 5 % KOH 10
- 9. Cap pinkish ochraceous, at margin often with radiating ribs; on litter in deciduous and coniferous forests on neutral to calcareous soil. Cap 25-65 mm, slightly depressed to funnel-shaped, tomentose, pinkish buff, not hygrophanous; gills decurrent, medium spaced, isabella to pinkish cream; stem 35-65 x 4-10 mm, cylindrical to ± clavate, fibrillose, ± concolorous with cap; smell cyanic; sp deposit white. Sp 6-8 x 3.5-4.5 μm, dacryoid (fig. 311E). Summer to autumn; occasional in temp.-bore.; DK (LC), NO (LC), SE (LC). – FAD 35E (as *Clitocybe trullaeformis*), GBW 3:162, M&J 19.
I. costata (Kühner & Romagn.) Harmaja (*Clitocybe c.* Kühner & Romagn., *C. squamulosoides* P.D. Orton s. auct.)
- Cap orange brown to reddish brown, without radiating ribs at margin; in open calcareous areas in alvars, etc. Cap 20-50 mm, slightly depressed to funnel-shaped, felty, becoming smooth, not hygrophanous; gills decurrent, medium spaced to crowded, cream; stem 15-45 x 3-10 mm, cylindrical, fibrillose, orange brown to reddish brown; smell faintly cyanic. Sp 5.5-8 x 3-4 μm, dacryoid (fig. 311F). Summer to early autumn; rare in hemib.-arc./alp.; FI (DD), IS, NO (NT), SE (LC). – B&K 3:150, Bres 169 (as *Clitocybe flaccida*), C&D 279, R&H 272.
I. bresadolana (Singer) Harmaja ('*bresadoliana*', *Clitocybe b.* Singer, *C. b.* Singer var. *dryadum* Bon, *Infundibulicybe d.* (Bon) Harmaja)

10. Cap pale buff to incarnate buff. Cap 30-80 mm, convex with depressed centre, later funnel-shaped, often with a small umbo, thin-fleshed, smooth to slightly tomentose, not hygrophanous; gills decurrent, crowded, whitish; stem 20-50 x 3-13 mm, cylindrical or slightly widened towards base, whitish; smell faintly cyanic; sp deposit white. Sp 5.5-8 x 3.5-5 μm , dacryoid (fig. 311G). On soil or litter in deciduous and coniferous forests; summer to autumn; very common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:163, C&D 277, Phil 90a, R&H 270, Ves 188, .
- I. gibba* (Pers.: Fr.) Harmaja (*Clitocybe g.* (Pers.: Fr.) P. Kumm., *C. infundibuliformis* (Schaeff.) Quél. s. auct.)
- Cap yellowish, becoming yellowish brown. Cap 50-80 mm, convex with depressed to umbilicate centre, later funnel-shaped, thin-fleshed, smooth, often shiny, not hygrophanous; gills decurrent, crowded, whitish; stem 20-70 x 5-10 mm, cylindrical or slightly widened towards base, whitish, becoming yellowish; smell faint; sp deposit white. Sp 6-7 x 4-5 μm , dacryoid. In deciduous forests, especially with *Fagus*; autumn; *LT, PL*. – Bres 168 (as *Clitocybe splendens*).
- I. splendoides* (H.E. Bigelow) Vesterh., see p. 913 (*Clitocybe* s. H.E. Bigelow, *C. splendens* (Fr.) Gillet s. Bresadola)

Inocybe (Fr.) Fr.

STIG JACOBSSON

Frb mycenoid, collybioid or tricholomatoid, mostly whitish, grey, brown or yellowish, in several species also with red, greenish or violaceous tinges. Cap 10-120 mm, fibrillose to rimose, often breaking up in scales, a few distinctly recurved scaly, dry or exceptionally subviscid. Gills adnexed to broadly adnate, initially whitish, pale grey, brownish or with a yellowish or olivaceous tinge, finally becoming snuff brown. Stem equal or with a bulbous base, in most species pruinose to a varying extent. Cortinate veil often present, sometimes leaving an annular zone or fibrillose patches on the stem, sometimes visible on the cap surface or as a margin on the basal bulb; the cuticle and veil often mingle and form a velipellis. Smell distinct in several species, variable but in many species described as spermatic. Taste indistinct or sometimes faintly bitter. Sp deposit snuff brown.

Sp angular-nodulose, amygdaloid, ovoid or phaseoliform, rarely with an indistinct germ pore, smooth, brown or brownish. Cheilocystidia present, in most species of subgen. *Inocybe* with characteristic, thick-walled pleuro- and cheilocystidia, generally with crystals at apex (metuloids); in addition these species often have thin-walled, ± globose or pyriform paracystidia on the gill edge. Pileipellis a rather undifferentiated cutis to a trichoderm. Clamps present.

Ectomycorrhizal, on soil, most frequent on rich soil, many species calciphilous, common also in arc./alp. habitats and in coastal dunes.


154 species in the key. Fruiting time in most species prolonged, it may occur anytime from early summer to autumn when conditions are favourable. Several species are poisonous, containing a rather large amount of muscarin.

Lit.: Bon 1997a, 1997b, 1998, Kuyper 1986a, Kühner 1988, Stangl 1989, Stridvall et al. 1989, Vauras 1992.

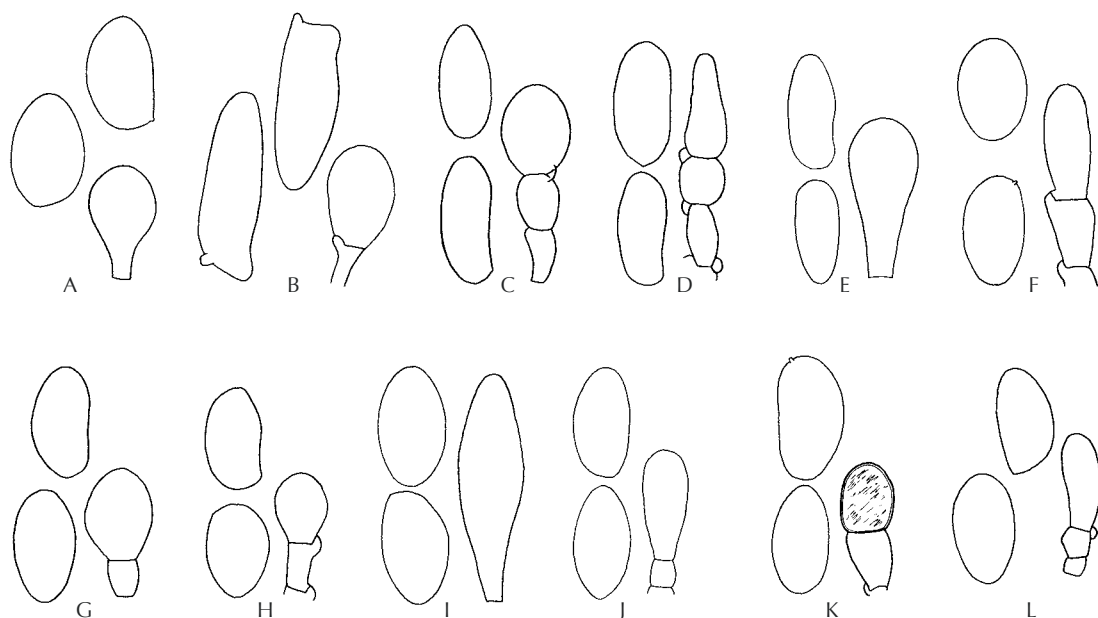
Main key

1. Pleurocystidia absent; sp with an obtuse apex, ± ovoid to phaseoliform, not amygdaloid or nodulose-angular 2
 - Pleurocystidia almost always present, with few exceptions thick-walled with crystals at apex (metuloids); sp variously shaped, but normally ± amygdaloid or nodulose-angular subgen. *Inocybe* 3
2. Cap tomentose to scaly, not or very indistinctly radially fibrillose; stem often shorter than cap diam.; cheilocystidia originating from hymenophoral trama, often septate Key A subgen. *Mallocybe* p. 869
 - Cap radially fibrillose to rimose or ± scaly; stem usually longer than cap diam.; cheilocystidia hymenial, simple, cylindrical, clavate to pyriform, densely packed making the gill edge look distinctly white in mature specimens Key B subgen. *Inosperma* p. 872
3. Sp ± nodulose to angular or spiny 4
 - Sp not nodulose-angular or spiny 7
4. With cortina; stem not pruinose or only pruinose in the upper third, sometimes bulbous, but bulb not marginate Key C sect. *Inocybe* p. 877
 - Cortina absent; stem pruinose all over or at least descending to the middle part, with or without a marginate bulb 5
5. Sp spiny Key D sect. *Calosporae* p. 882
 - Sp angular-nodulose 6
6. Stem equal or with a small, non-marginate bulb; hymenial cystidia with a rounded base (figs 883C-I) Key E sect. *Petiginosae* p. 882
 - Stem with a bulb at the base, generally marginate; hymenial cystidia not with a rounded base Key F sect. *Marginatae* p. 884
7. Cortina generally absent; stem pruinose throughout or at least descending to the middle, sometimes with a bulbous base Key G sect. *Splendentes* p. 889
 - With cortina; stem not pruinose in lower half, without a bulbous base 8
8. Smell strong, sweetish or unpleasant; flesh often reddening Key H sect. *Lactiferae* p. 895
 - Smell different or absent, not very strong; flesh not reddening 9
9. Stem pruinose in the upper part Key I sect. *Tardae* p. 896
 - Stem not pruinose or only in a narrow zone at the top, mostly less than one tenth of the stem length Key J sect. *Fibrillosae* p. 902

Key A: Subgen. *Mallocybe* Kuyper

1. Stem with ± erect, floccose scales below a distinct ring. Cap 30-60 mm, convex with incurved margin, soon plane, ochraceous yellow with brownish scales; stem 40-70 × 5-12 mm, coloured and scaly as the cap; veil abundant, long persistent as floccules at cap margin and forming a fibrillose ring on the stem. Sp 9-12 × 5.5-7 µm, ellipsoid-ovoid (fig. 871A); cheilocystidia 15-30 × 10-16 µm, clavate. With *Picea* and *Pinus* on calcareous soil; summer to autumn; occasional, but locally abundant in hemib.-bore., very rare in temp.; DK (EN, Lol: Møns Klint), FI (LC), NO (NT), SE (LC). – B&K 5:61, Bon 235, Däh 639, R&H 469, Stangl 1.2,  *I. terrigena* (Fr.) Kühner
- Stem not distinctly scaly, without or with an indistinct and generally evanescent ring 2

2. Sp projectile-shaped, similar to that of certain *Lepiota* species, 15-19 x 5-6 μm (fig. 871B). Cap 20-25 mm, convex, coarsely tomentose, saturated dark brown, paler when dry; gills rather dark brown; stem 20-30 x 3-6 mm, pale brown; smell sourish. Cheilocystidia 25-70 x 12-15 μm . In open, sandy places with sparse vegetation, but not recorded from coastal dunes; summer to autumn; very rare in bore.; FI (CR, EK: Virolahti). – Stangl 1.3.
I. stenospora Stangl & Bresinsky
- Sp not projectile-shaped, < 15 μm long 3
3. Cheilocystidia forming chains of cells with an inflated end-cell (fig. 871C); in arc./alp. with *Salix herbacea*. Cap 10-30 mm, often slightly umbonate, flocculose, ochraceous brown; gills pale beige to olivaceous brown; stem 30-35 x 2-5 mm, pale ochraceous brown; veil as a thin and evanescent cortina. Sp 9.5-11.5 x 5-5.5 μm , subcylindrical; cheilocystidia 15-25 x 10-15 μm . Late summer; rare in arc./alp.; FO, SE. – FND 34-36:318.
I. arthrocytistis Kühner
- Cheilocystidia rarely forming distinct chains; habitat sometimes different 4
4. Sp cylindrical-phaseoliform, like in *I. lacera*, $Q > 2$ (figs 871D-E) 5
- Sp ovoid-phaseoliform (figs 871F-L), $Q < 2$ 6
5. Veil abundant, forming a ring-zone on the stem. Cap 20-70 mm, initially convex with an involute margin, tomentose, at centre with age somewhat scaly, olive to yellowish brown; gills yellowish brown with an olivaceous tinge; stem 20-60 x 5-12 mm, fibrillose, concolorous with cap. Sp 9-12(-15) x 4.5-6(-7.5) μm , cylindrical-phaseoliform (fig. 871D); cheilocystidia 35-50 x 10-15 μm , clavate-fusiform. In coastal dunes with *Pinus*; summer to autumn; rare in temp.-hemib.; DK (DD, EJy: Skagen), NO (NE). – A&R 3, Bon 235, C&D 1009, Heim 7.3-5, M&H 4:37.
I. heimii Bon
- Veil very thin and evanescent. Cap 10-25 mm, convex to plane, finely scaly, yellowish brown; gills brownish; stem 15-30 x 2-5 mm. Sp 9-12 x 4-5 μm , cylindrical-phaseoliform, $Q > 2$ (fig. 871E); cheilocystidia 25-50 x 6-15 μm , clavate-subglobose, sometimes with brownish walls. At roadsides and other sandy places in forests, usually with *Salix*; summer to autumn; occasional in hemib.-arc./alp.; FI (LC), IS (Su: Knarrarós), NO (NE, Troms: Kåfjord, Svå), SE (LC). – A&R 2:3, Heim 5.1, RdM 40:361.
I. malenconii R. Heim
6. Flesh in stem base bright yellow. Cap 12-28 mm, convex-plane, fibrillose or felty, ochraceous to reddish brown; gills beige to pale brown; stem 20-30 x 2-5 mm, floccose, concolorous with cap with a bright yellow base; veil yellow; smell earthy, similar to that of *I. cervicolor*. Sp 8.5-12 x 5-6.5 μm , ellipsoid-phaseoliform (fig. 871F); cheilocystidia 20-40 x 8-15 μm . With dwarf *Salix*; late summer; occasional in arc./alp.; NO (NE), SE.
I. fulvipes Kühner
- Flesh in stem base whitish to brownish 7
7. Cap and stem with a silvery white veil when young 8
- Veil not silvery white 9
8. Cap 30-70 mm. Cap initially almost bell-shaped, but soon plane, for a long time with involute margin, yellowish brown beneath the rather persistent veil; stem 35-50 x 7-10 mm, ochraceous beneath the veil. Sp 8-12 x 5.5-7 μm , ellipsoid-phaseoliform (fig. 871G); cheilocystidia 15-30 x 8-15 μm , clavate, \pm septate. In coniferous forests, especially with *Picea*, but also in subalpine or alpine habitats, there probably with *Salix*, *Betula* or *Dryas*, on calcareous soil; late summer; occasional in bore.-arc./alp., rare in hemib.; FI (LC), NO (LC), SE (LC). – B&K 5:35, Cet 2306, M&J 3, Sieniop 237, Stangl 2.1.
I. leucoblema Kühner



Spores and cheilocystidia: A: *Inocybe terrigena*, B: *I. stenospora*, C: *I. arthrocystis*, D: *I. heimii*, E: *I. malenconii*, F: *I. fulvipes*, G: *I. leucoblema*, H: *I. leucoloma*, I: *I. gymnocarpa*, J: *I. agardhii*, K: *I. fuscomarginata*, L: *I. dulcamara*.

- Cap 10-30 mm. Cap convex with an involute margin, fibrillose, pale ochraceous brown; stem 15-30 x 2-5 mm, brownish beneath the veil. Sp 8-10 x 5-6 μm , ovoid (fig. 871H); cheilocystidia 15-28 x 10-15 μm , clavate, with a few septa. With dwarf *Salix* or *Dryas* on calcareous soil; late summer; rare in arc./alp.; NO (incl. Sv), SE.

I. leucoloma Kühner

9. Veil absent. Cap 25-60 mm, bell-shaped or conical, then convex with an obtuse umbo, tomentose-fibrillose, ochraceous brown; gills ochraceous when young; stem 25-50 x 4-10 mm, equal, slightly fibrillose towards the base, ochraceous brown. Sp 9.5-13 x 6-7.5 μm , subellipsoid-slightly phaseoliform (fig. 871I); cheilocystidia 25-50 x 10-25 μm , clavate. In coniferous forests on calcareous soil; summer to autumn; rare in hemib.-bore.; NO (STr: Oppdal), SE (NE). – BCat 924, B&K 5:25, Stangl 2.3.

I. gymnocarpa Kühner

- Veil present 10
10. Veil abundant, often forming a fibrillose and rather persistent ring on the stem. Cap 20-80 mm, convex to plane, fibrillose-tomentose, not distinctly scaly, yellowish ochre, but darkening to ochraceous brown with age; gills pale ochraceous buff, finally snuff brown with a white edge; stem 20-60 x 3-12 mm, concolorous with cap or paler. Sp 8-11 x 5-6.5 μm , ellipsoid to phaseoliform (fig. 871J); cheilocystidia 15-30 x 10-18 μm , generally clavate. With *Salix*, i.e. at roadsides with *S. caprea*, in dunes with *S. repens*, sometimes in fens, calciphilous, often in small fascicles; summer to autumn; occasional in temp.-suba., in FI north to OP; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Bon 235, FAD 122D, M&J 2, R&H 470, Ves 321, ☉.

I. agardhii (N. Lund) P.D. Orton

Note: difficult to delimitate from forms of *I. dulcamara* with a thick partial veil.

- Veil generally not forming a fibrillose ring 11

11. Cheilocystidia globose or broadly clavate with a thick, ± brownish wall, often visible as a strikingly dark gill edge. Cap 10-30 mm, convex, fibrillose-finely scaly, cigar brown; stem 20-50 x 3-6 mm, paler than the cap; veil evanescent, but sometimes forming a thin ring-zone. Sp 9-13 x 5.5-7.5 µm, ovoid-subphaseoliform (fig. 871K); basidia partly 2-spored; cheilocystidia 20-50 x 14-30 µm, broadly clavate. With deciduous and coniferous trees, often at roadsides, on calcareous soil; summer to autumn; rare in bore.-arc./alp.; NO (NE, incl. Svb), SE (LC). – B&K 5:20, FND 34-36:320, M&J 3, Stangl 2.4.

I. fuscomarginata Kühner

- Cheilocystidia cylindrical to clavate, thin-walled, hyaline; gill edge not strikingly dark. Cap 10-40 mm, convex with an incurved margin, with a low, obtuse umbo or not, woolly-to-mentose, sometimes scaly, ochraceous brown; gills brownish; stem 20-60 x 2-8 mm, equal, ochraceous, fibrillose; veil sometimes forming a thin and evanescent ring. Sp 8-11 x 5-6.5 µm, larger in forms with 2-spored basidia, ovoid-ellipsoid, but rather variable in shape (fig. 871L); cheilocystidia 30-50 x 10-20 µm. Generally with *Salix*, sometimes in coniferous forests, often at roadsides and in other sandy places, calciphilous; summer to autumn; very common in arc./alp., common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – Bon 235, Däh 641, FAD 114C, Stangl 1.1, Ves 321.

I. dulcamara (Alb. & Schwein.) P. Kumm.

Note: *I. dulcamara* is very variable and certainly a complex including several taxa, very difficult to delimit. Numerous taxa are described from the Alps, but their possible occurrence in Scandinavian mountains is not yet well investigated.

Key B: Subgen. *Inosperma* Kühner

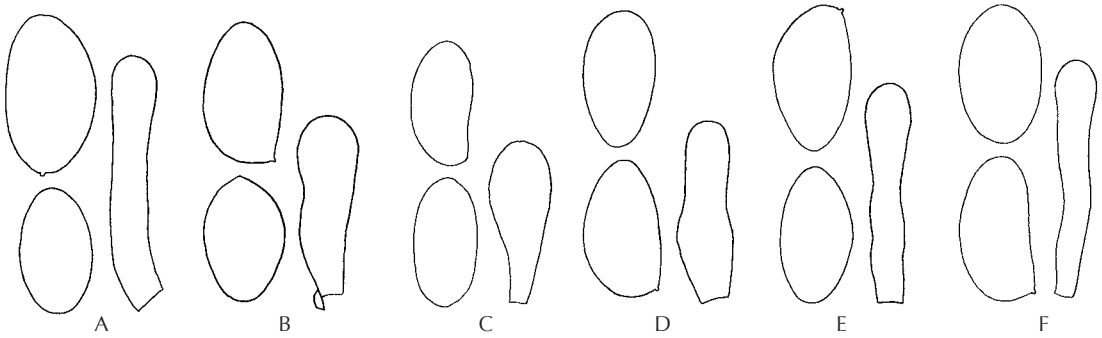
1. Cap finely scaly to recurved scaly, not rimose; basidia slender, $Q > 4$ sect. *Cervicolores* Singer 2
 - Cap fibrillose to rimose; basidia less slender, $Q < 3.5$ sect. *Rimosae* (Fr.) Sacc. 8
2. Flesh ± reddening 3
 - Flesh not reddening 5
3. Smell strong and sweetish, pleasant. Cap 20-60 mm, bell-shaped, then low convex, not or only indistinctly umbonate, ochraceous brown to buff with a pinkish tinge, with slightly darker, appressed scales; gills greyish brown with a flocculose, white edge; stem 30-80 x 3-9 mm, equal, flocculose at the top, downwards fibrillose, ± red brown especially in the lower half. Sp 11-16 x 6.5-9 µm, ellipsoid (fig. 873A); cheilocystidia 40-60 x 10-18 µm, cylindrical to slenderly clavate. On calcareous soil in deciduous forests, especially with *Fagus* and *Quercus*, sometimes with *Picea* or in luxuriant subalpine *Betula* forests and heathland; summer to autumn; occasional in temp.-hemib., rare in bore.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Bon 235, Phil 220a, R&H 473, Stangl 3.1, Ves 320, ☉.

I. bongardii (Weinm.) Quél. var. *bongardii*

 - Smell earthy, *Pelargonium*-like or fishy 4
4. With smell like *Pelargonium*, often mixed with a faint, sweetish component, later more fishy. Stem initially whitish, staining reddish brown with age. In other characters like the main variety. With deciduous and coniferous trees, rarely in heathland, on calcareous soil; summer to autumn; rare in bore.-suba., very rare in hemib.; FI, IS (Au: Hólmaháls), NO (Vestf: Sandefjord). – A&R 9, BCat 827, Bres 732, FND 34-36:324, M&J 10.

I. bongardii (Weinm.) Quél. var. *pisciodora* (Donadini & Rioussset) Kuyper (*I. grata* (Weinm.) Gillet)

 - Smell strong, earthy, sometimes mixed with a sweetish component. Cap 8-40 mm, conical to convex, then plane, not or indistinctly umbonate, with dark brown scales on an ochraceous-brownish background; gills yellowish to sordid brown with a flocculose, white edge;




Spores and cheilocystidia: A: *Inocybe bongardii*, B: *I. cervicolor*, C: *I. calamistrata*, D: *I. subhirsuta*, E: *I. geraniodora*, F: *I. erubescens*.

stem 30-100 x 2-6 mm, flocculose-fibrillose, brownish with a reddish tinge with age. Sp 11-15 x 6.5-8.5 μm , ellipsoid (fig. 873B); cheilocystidia 35-60 x 10-15 μm . Mostly in fertile *Picea* forests, sometimes in deciduous forests on calcareous soil; summer to autumn; occasional in temp.-suba., in FI north to Ks; DK (LC), FI (LC), NO (LC), SE (LC). – A&R 7, Däh 648, FAD 114F (as *hirsuta*), Stangl 4.1.

I. cervicolor (Pers.) Quél.

- | | | |
|----|----------------------------|---|
| 5. | Stem base bluish green | 6 |
| - | Stem base not bluish green | 7 |

6. Sp 10-13.5 x 5-6(-6.5) μm , Q = 1.8-2.3, subcylindrical-phaseoliform (fig. 873C); smell acidulous or fishy, sometimes with a sweetish component. Cap 20-40 mm, bell-shaped to convex, not or only indistinctly umbonate, with \pm recurved scales, greyish brown, darkest at centre; gills cinnamon to brown with a fimbriate, white edge; stem 30-80 x 2-6 mm, indistinctly recurved scaly and brownish above the green base; smell acidulous or fishy, sometimes with a sweetish component. Cheilocystidia 30-55 x 8-12 μm , cylindrical or narrowly clavate. In forests, on rich naked soil in damp habitats, along paths, in gravel, etc.; summer to autumn; occasional in hemib.-arc./alp., in FI with northern distribution, rare in temp.; DK (vu), FI (LC), FO, IS, NO (LC, incl. Sv), SE (LC). – A&R 8, Bon 235, FAD 114D, Phil 221g, Stangl 3.1, .

I. calamistrata (Fr.: Fr.) Gillet

- Sp 9-13 x 5.5-8 μm , Q = 1.4-2, ellipsoid-ovoid to subphaseoliform (fig. 873D); smell like *Pelargonium*. Cap 10-30 mm, less recurved scaly than in *I. calamistrata*, dark brown; gills brown with a white edge; stem 20-40 x 3-5 mm, fibrillose, gradually darker towards base. Cheilocystidia 30-55 x 10-15 μm , narrowly clavate. With *Salix* on calcareous soil; late summer; common in arc./alp.; FI, NO, SE.

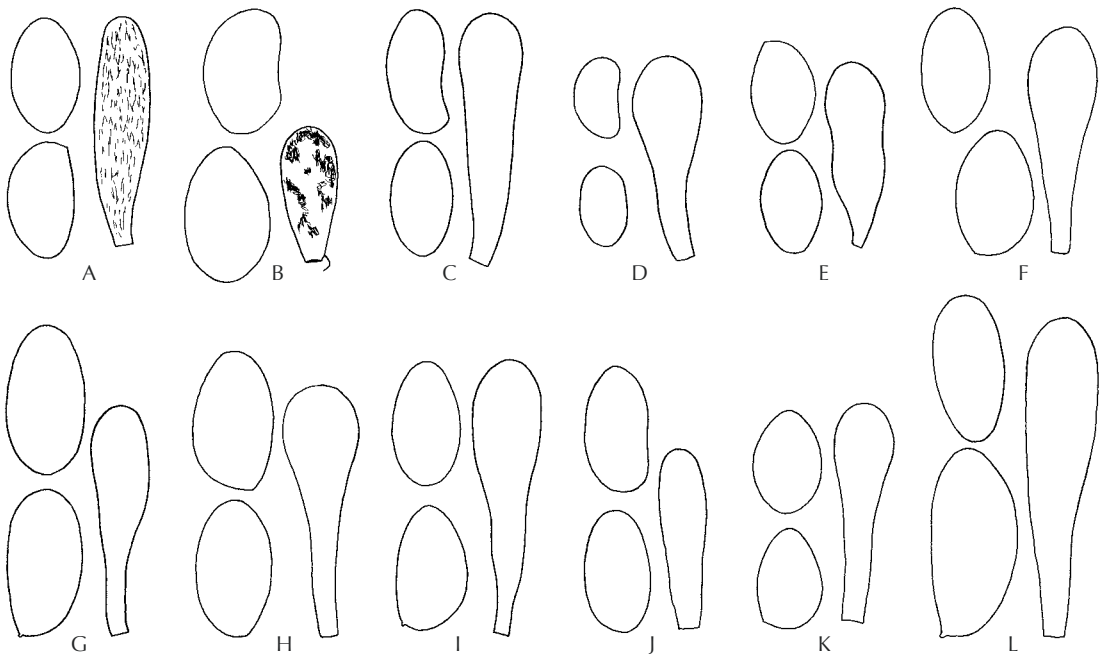
I. subhirsuta Kühner

7. Smell strong like *Pelargonium*; cheilocystidia hyaline. Cap c. 10 mm, conical to convex, not umbonate, recurved scaly at centre, coarsely fibrillose towards margin, dark brown; gills ochraceous brown with a white edge; stem 20-40 x 2-3 mm, equal, white flocculose at the top, downwards finely scaly and very dark brown. Sp 12-14 x 6-7 μm , some slightly phaseoliform (fig. 873E); cheilocystidia 40-50 x 9-14 μm . With dwarf *Salix* species in arc./alp.; late summer; occasional; IS, SE. – B&K 5:23, Fav 55:6.3.

I. geraniodora J. Favre

- Smell not like *Pelargonium*; cheilocystidia with internal drops of brown pigment (fig. 875B) see *I. dulcamaroides* 10

8. Frb ± reddening 9
 - Frb not reddening 10
9. Frb whitish, but slowly turning brick red with age or from damage. Cap 40-100 mm, obtusely conical or bell-shaped, then low convex with an umbo; gills initially pale buff, then greyish brown, often with reddish spots; stem 40-70 × 8-15 mm, almost equal or clavate; taste and smell disagreeable, reminding of perfumed soap. Sp 10-14 × 5.5-7.5 μm, ellipsoid to subphaseoliform (fig. 873F); cheilocystidia 40-60 × 8-15 μm, cylindrical to narrowly clavate. On calcareous soil in deciduous forests and parks, especially with *Fagus*, *Quercus*, *Tilia* and *Carpinus*, exceptionally with *Betula* or conifers; summer; occasional in temp.-hemib., rare in bore., very rare in FI (V, U); DK (LC), FI (VU), NO (NT), SE (LC). – FAD 115E, Phil 219e, R&H 470, Sienop 233, Ves 325, ☉.
I. erubescens A. Blytt (*I. patouillardii* Bres.)
- Frb red brown with a ± vinaceous tinge. Cap 30-80 mm, at first bell-shaped or convex, finally plane with a low umbo, fibrillose-rimose, sometimes breaking up in scales; gills pale yellowish brown, with age discolouring red brown, with a fimbriate, white edge; stem 30-100 × 4-12 mm, initially white, but staining vinaceous or dark red brown from base upwards; smell reminding of beet root. Sp 9-13 × 5.5-7 μm, ellipsoid-subphaseoliform (fig. 875A); cheilocystidia 25-70 × 8-16 μm, cylindrical. On nutrient-rich, preferably calcareous soil in deciduous forests and parks, often with *Quercus* and *Tilia*; summer to autumn; occasional in temp., rare in hemib., very rare in FI; DK (LC), FI (DD, V: Lohja), NO (NT), SE (LC). – B&K 5:1, Bon 237, R&H 471, Stangl 4.2, Ves 323, ☉.
I. adaequata (Britzelm.) Sacc. (*I. jurana* (Pat.) Sacc., *I. rhodiola* Bres.)
10. Cheilocystidia with internal drops of brown pigment. Cap 10-25 mm, bell-shaped to convex with a low umbo, flocculose from a thick universal veil, ochraceous brown, reminding of *I. dulcamara*; gills greyish; stem 40-50 × 2-5 mm, with a subbulbous base, pale ochraceous; smell absent. Sp 11-14 × 7-8.5 μm, ellipsoid (fig. 875B); cheilocystidia 25-50 × 11-20 μm, broadly clavate-utriform. With dwarf *Salix*; late summer; rare in arc./alp.; SE.
I. dulcamaroides Kühner
- Cheilocystidia not containing drops of brown pigment 11
11. Cheilocystidia broadly clavate to pyriform; sp often phaseoliform 12
 - Cheilocystidia cylindrical to slenderly clavate; sp mostly not phaseoliform 14
12. Cap chestnut- to ochraceous brown, 20-80 mm, when young often acutely conical with incurved margin, then low convex and usually with an umbo, outwards radially rimulose, often with white, conspicuous velar patches at the centre, which disappear with age and in moist weather; gills pale greyish brown; stem 30-100 × 3-9 mm, initially whitish, but with age becoming brown, especially in the median part. Sp 8-12 × 5-6.5 μm, ± phaseoliform (fig. 875C); cheilocystidia 30-60 × 10-24 μm, clavate. Generally in deciduous forests with *Fagus*, *Quercus*, etc., often on disturbed soil, but sometimes also under *Picea* on nutrient-rich soil; summer to autumn; very common in temp., common in hemib.-bore., occasional in suba., rare in arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – Phil 219f, R&H 472, Sienop 237, Stangl 5.4, Ves 322.
I. maculata Boud.
- Cap predominantly yellow 13
13. Smell like honey; sp 7-9 × 4-5 μm, phaseoliform (fig. 875D). Cap 20-50 mm, at first obtusely conical with incurved margin, then plane with an obtuse umbo, smooth at centre, outwards radially fibrillose, with or without a whitish velipellis, straw to ochraceous yellow; gills greyish to ochraceous without an olivaceous tinge; stem 25-80 × 3-8 mm, whitish to pale yellow, bulbous; cheilocystidia 25-45 × 12-20 μm, pyriform. In deciduous and mixed forests; summer to autumn; occasional, but locally common in temp.-hemib., rare in bore.; DK (LC), NO (NE), SE (LC). – Bon 235, Phil 218a, R&H 471, Stangl 5.1, Ves 323.
I. cookei Bres.



Spores and cheilocystidia: A: *Inocybe adaequata*, B: *I. dulcamaroides*, C: *I. maculata*, D: *I. cookei*, E: *I. quietiodor*, F: *I. perlata*, G: *I. arenicola*, H: *I. rimosa*, I: *I. obsoleta*, J: *I. flavella*, K: *I. squamata*, L: *I. mimica*.

- Smell recalling *Lactarius quietus*; sp 8-11 x 5.5-6.5 μm , not or only indistinctly phaseoliform (fig. 875E). Cap 10-40 mm, obtusely conical with a slightly incurved margin, then plane with a low umbo, ochraceous yellow, smooth around centre, outwards radially fibrillose; gills yellowish brown; stem 30-50 x 5-8 mm, with a bulbous base, white, but becoming yellowish with age. Cheilocystidia 30-60 x 10-20 μm , clavate-pyriform. On calcareous soil under *Quercus* and *Fagus*; summer to autumn; very rare in temp.-hemib., but may be overlooked being macroscopically similar to *I. cookei*; DK (EN, Lol), SE (Vg, ÖI). – B&K 5:49, Cet 1823, Stangl 5.2.

I. quietiodor Bon

14. Frb not or only insignificantly yellow. Cap 35-100 mm, at first bell-shaped or conical with incurved margin, dark greyish brown, then rimose with reddish brown fibres on pale background outwards, when young with distinct veil remnants; stem 80-120 x 8-13 mm, flocculose at the top, at first pale, but becoming brownish with age; smell weakly spermatic. Sp 10-13 x 6-8 μm , generally ellipsoid (fig. 875F); cheilocystidia 35-65 x 10-20 μm . With deciduous trees in parks, etc., calciphilous; summer to autumn; occasional in temp.-bore., in FI north to EH; DK (LC), FI (LC), NO, SE. – A&R 15, Cet 527, M&J 8, FAD 115F.

I. perlata (Cooke) Sacc.

Note: closely related to *I. rimosa* and by certain mycologists considered to be only a form of it. Molecular studies have shown that it is different.

- Frb with \pm yellow shades, yellowish green or yellowish brown 15

 15. In dune sand. Cap 25-70 mm, bell-shaped with incurved margin, then low convex with a broad umbo, initially white because of a thick velipellis, finely fibrillose, not rimulose, straw yellow to pale ochraceous, at centre persistently white with adhering sand grains; gills initially white; stem 30-75 x 5-13 mm, solid, often rather deeply buried in sand; smell

indistinct. Sp 12-16.5 × 6-8.5 μm, ellipsoid-subphaseoliform or subcylindrical (fig. 875G); cheilocystidia 40-80 × 10-20 μm, cylindrical. With *Salix repens*, probably also *Pinus* and other trees; summer to autumn; NL. – Cet 1826, C&D 1017, Heim 9.3.

I. arenicola (R. Heim) Bon


- Not in dune sand 16
- 16. Gills with a distinct olivaceous yellow tinge. Cap 25-80 mm, at first obtusely conical or bell-shaped, then low convex, generally with an obtuse or subacute umbo, outwards strongly fibrillose-rimose with age, yellowish or ochraceous brown, but rather variable; stem 30-100 × 3-10 mm, flocculose at the top, whitish or staining slightly brownish yellow; smell spermat-ic. Sp 9-15 × 6-8 μm, generally ellipsoid (fig. 875H); cheilocystidia 30-70 × 10-22 μm, broadly cylindrical to clavate. In forests, preferably deciduous, parks, open land, alpine heathland, etc.; summer to autumn; very common in temp., common in hemib.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – Bon 235, Däh 644, Phil 219g, R&H 473, Ves 322.
I. rimosa (Bull.: Fr.) P. Kumm. (*I. fastigiata* (Schaeff.: Fr.) Quél.)
Note: *I. rimosa* is here interpreted in a wide sense. Several closely related species, varieties and forms have been described, especially from arctic/alpine areas. Their taxonomical status are still unclear and must be evaluated with molecular methods.
- Gills greyish without distinct yellow tinges 17
- 17. Cap with a distinct white velipellis. Cap 25-60 mm, obtusely conical or bell-shaped, then low convex with or without an umbo, fibrillose to rimose, beneath the velipellis ± yellowish brown; stem 30-100 × 3-10 mm, whitish to slightly yellowish brown; smell absent. Sp 9-15 × 6-8 μm, generally ellipsoid (fig. 875I); cheilocystidia 30-70 × 10-20 μm, broadly cylindrical to clavate. In deciduous forests and parks, preferably on calcareous soil; summer to autumn; occasional in temp.-suba.; FI, NO (NE, Hord: Lindås), SE (LC). – A&R 12:2.
I. obsoleta Romagn.
Note: some authors include it in *I. rimosa* as a form, but molecular studies have shown it is different.
- Cap without white velipellis 18
- 18. Cap not scaly. Cap 25-50 mm, obtusely conical to low convex with or without an umbo, at centre silky-smooth and pale ochraceous, towards margin fibrillose and more yellow; gills greyish yellow; stem 35-80 × 3-5 mm; smell indistinct. Sp 9-13 × 5-6 μm, ellipsoid-phaseoli-form (fig. 875J); cheilocystidia 30-65 × 8-16 μm, cylindrical. With deciduous trees and bushes, mainly *Salix*, often in humid habitats; summer to autumn; common in temp.-bore.; DK (VU), FI (LC), NO (NE), SE (LC). – C&D 1016, Sieniop 234, Stangl 7.3.
I. flavella P. Karst.
- Cap ± scaly 19
- 19. Sp 8-11 × 5-7 μm (fig. 875K). Cap 20-50 mm, obtusely conical to low convex, with or without a low umbo, around centre with appressed scales, sometimes without, outwards fibrillose, at centre brown, towards margin ochraceous yellow; gills pale yellow; stem 30-65 × 4-10 mm, pale yellowish, solid; smell faintly acidulous or absent. Sp ellipsoid; cheilocystidia 35-60 × 10-18 μm, slenderly clavate. With deciduous trees on calcareous soil, often *Populus*; summer to autumn; rare in temp.-hemib.; DK (LC), NO (Oslo: Hovedöya), SE (LC). – A&R 13, FAD 115D, M&J 7, Stangl 7.2.
I. squamata J.E. Lange
- Sp 12-15 × 6-7 μm (fig. 875L). Cap 50-65 mm, conical to low convex with an umbo, recalls *I. rimosa*, but generally with small, brown scales, brownish yellow to yellowish green; gills with a faint olivaceous tinge; stem 35-75 × 8-10 mm, initially whitish, then reddish brown; smell faint. Sp generally ellipsoid; cheilocystidia 45-60 × 15-20 μm, slenderly clavate. With deciduous trees on calcareous soils; autumn; rare in hemib., possibly overlooked in temp.; NO (NE, Østf: Fredrikstad), SE. – FND 2:5.
I. mimica Massee

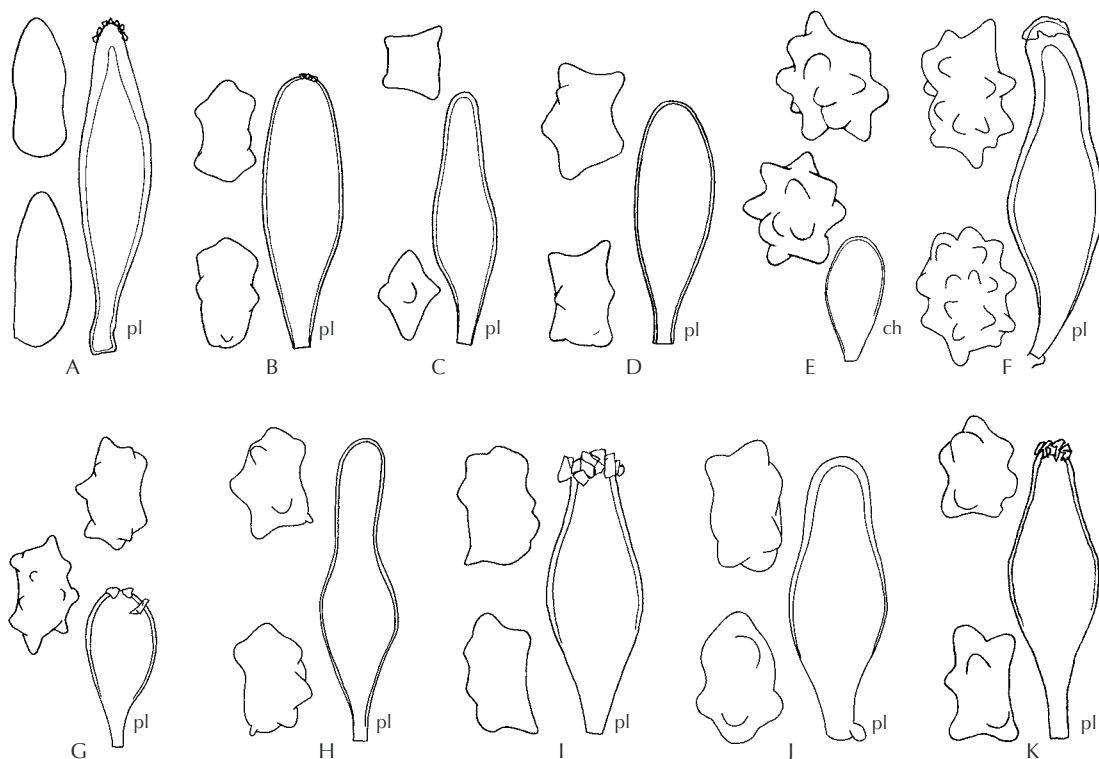
Key C: Subgen. *Inocybe* sect. *Inocybe* (sect. *Cortinatae* Kühner & Boursier)

1. Sp cylindrical, exceptionally almost amygdaloid 2
 - Sp nodulose-angular 3
2. Cap hygrophanous. Cap 10-40 mm when moist dull grey brown, when dry pale grey. Sp 12-17 x 5.5-7.5 μm , cylindrical, often looking somewhat darker than in var. *lacera*; hymenial cystidia cylindrical. In other characters like the main variety. In coastal dunes with *Salix repens* etc, recorded also inland and in alpine environments, e.g. on river banks and in sand pits; summer to autumn; rare in temp.-arc./alp., locally common in NO; DK (DD), FI (LC), IS (Au, Su), NO (NT), SE. – Sieniop 235, Svp 33:41.
I. lacera (Fr.: Fr.) P. Kumm. var. *maritima* (Fr.) Bon (*I. impexa* Lasch)
- Cap not hygrophanous. Cap 10-40 mm, at first obtusely conical or hemispherical with an incurved margin, then convex to plane, coarsely fibrillose, but frequently breaking up, dark brown when young and fresh, but paler and with an ochraceous tinge with age and in dry weather; gills at first pale, then ochraceous brown; stem 25-80 x 1-6 mm, equal, fibrillose, grey brown, darkest towards the base. Sp 10-15 x 4-6 μm , cylindrical (fig. 879A); pleurocystidia 35-75 x 12-22 μm , lageniform, sometimes with an acute apex, walls up to 2 μm thick, colourless. On sandy and nutrient-poor soil, often on forest roads, etc., both with coniferous trees and broadleaved such as *Betula*, *Salix*, etc.; late spring-autumn; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – Bon 239, FAD 111D, Phil 222c, R&H 477, Ves 320.
I. lacera (Fr.: Fr.) P. Kumm. var. *lacera*
 Note: spores and cystidia are rather variable and several further varieties have been described, i.e. var. *helobia* Kuyper with pleurocystidia with \pm yellow wall (recorded from DK, FI and NO), var. *regularis* Kuyper with almost amygdaloid sp, var. *heterosperma* Grund & D.E. Stuntz with very variable spores and var. *rhacodes* (J. Favre) Kuyper with cheilocystidia at least partly catenate with brown-incrusted elements. The taxonomical value of these varieties is disputed.
3. Cap golden yellow. Cap 15-30 mm, obtusely conical to plane with or without a low umbo, fibrillose to finely scaly, at centre darker and with a brown tinge; gills beige; stem 15-30 x 2-6 mm, initially white, then yellowish. Sp 8.5-10.5 x 5-6.5 μm , irregularly and often only slightly nodulose (fig. 879B); hymenial cystidia 45-65 x 18-25 μm , \pm clavate, walls about 1 μm thick, mostly without crystals. In coniferous forests on peaty soil, also arctic/alpine habitats with *Salix*; summer to autumn; rare in hemib.-arc./alp.; FI (DD), SE (LC). – Stangl 28.3, SZP 82:149.
I. aurea Huijsman
- Cap predominantly greyish brown 4
4. Cap \pm scaly, often recurved scaly 5
 - Cap fibrillose to rimose 11
5. Gills distinctly yellow when young. Cap 10-30 mm, obtusely conical-plane, dark greyish brown, scales often erect at centre and blackish when moist; stem 25-70 x 2-5 mm, with greyish brown fibrils and floccules, at base with a yellow tomentum. Sp 6-7 x 5-6 μm , with few nodules, often looking almost quadrangular (fig. 879C); hymenial cystidia 50-70 x 12-18 μm , fusiform-lageniform, with or without crystals. In humid coniferous forests, often in *Sphagnum*; summer to autumn; occasional in hemib.-bore., but locally common in southwestern SE; FI (LC), NO (LC), SE (LC). – FRIC 7:56a, Jordst 7(1), M&J 22.
I. relicina (Fr.) Quél.
- Gills white to pale grey when young 6
6. Sp angular rather than nodulose see 23
 - Sp distinctly nodulose 7
7. Cap woolly-fibrillose or finely scaly, at least at centre; stem fibrillose without scales. Cap 30-60 mm, hemispherical, then plane with or without an obtuse umbo, dark brown; gills

long whitish; stem 5-10 mm thick, equal, greyish brown. Sp 8-11 x 5-7 μm , with rather few nodules (fig. 879D); hymenial cystidia 50-85 x 13-25 μm , thin-walled, generally without crystals. In coniferous forests, often with *Pinus*, on poor, acid soil, often in young plantations; summer to autumn; common hemib.-suba., occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:93, Cet 525, Jordst 10(2), Stangl 29.4, Ves 327.

I. subcarpta Kühner & Boursier (*I. boltonii* R. Heim)

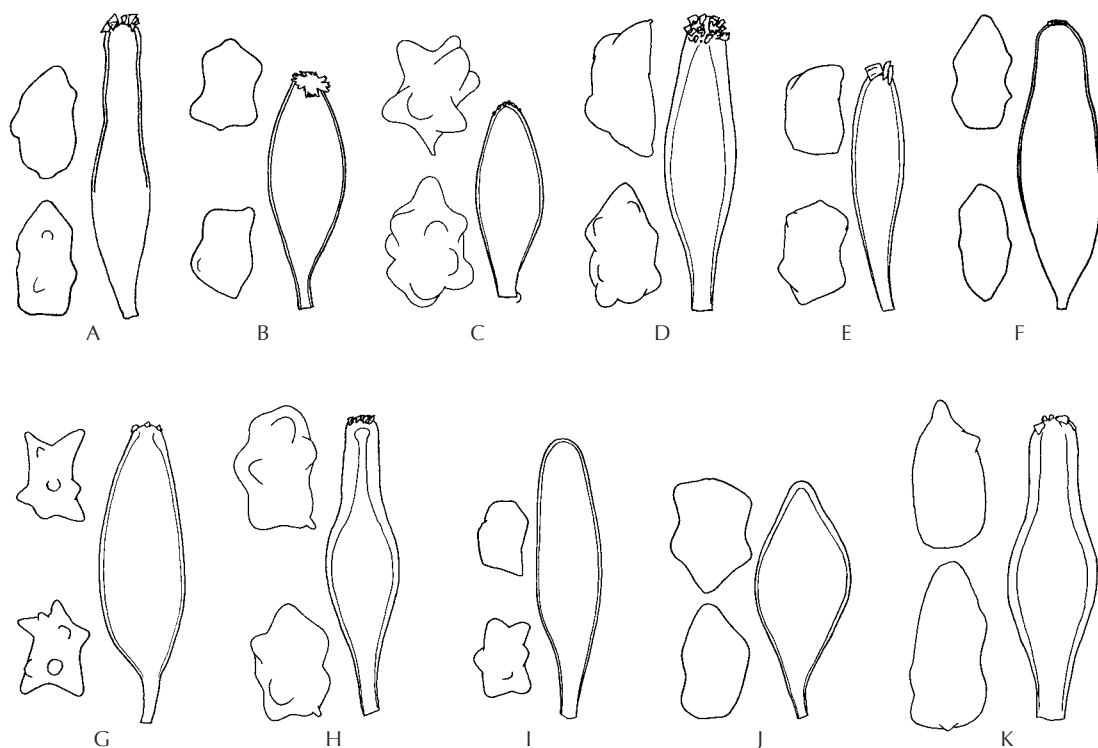
- Cap and stem scaly 8
- 8. Pleurocystidia absent. Cap 10-35 mm, convex-plane, dark brown; gills initially pale brownish; stem 20-40 x 3-5 mm, brown, but paler than the cap, \pm scaly; smell indistinct. Sp 9-12 x 7-9 μm , with several small nodules (fig. 879E); cheilocystidia 30-50 x 12-16 μm , abundant, shape variable, thin-walled, without crystals. In coniferous and deciduous forests on poor soil, rarely on rotten coniferous wood; summer to autumn; occasional, but locally common in temp.-suba.; DK (DD), FI (LC), NO (LC), SE (LC). – B&K 5:81, Bres 755, FAD 118C (as *lanuginosa*), M&J 28, Stangl 29.3.
I. leptophylla G.F. Atk. (*I. casimiri* Velen.)
- Pleurocystidia present 9
- 9. Sp 9-12.5 x 6-9 μm (fig. 879F); in *Sphagnum* fens. Cap 10-55 mm, at first obtusely conical or bell-shaped, then plane without or with a low umbo, densely covered with fibrillose scales, brown to greyish brown; gills at first whitish, then olive brown; stem 15-30 x 3-5 mm, equal, finely scaly to fibrillose, concolorous with the cap. Sp with several \pm acute nodules; hymenial cystidia 50-110 x 15-23 μm , lageniform to almost utriform, somewhat thick-walled, often without crystals. With *Pinus* or other conifers; summer to autumn; occasion in hemib.-bore.; FI (LC), NO (STr: Trondheim), SE.
- I. teraturgus* M.M. Moser
- Sp 7.5-11 x 5.5-8 μm ; in forests, rarely in *Sphagnum* 10
- 10. Pleurocystidia clavate-pyriform, 30-50 x 13-25 μm (fig. 879G), walls up to 1.5 μm thick, often with crystals. Cap 10-40 mm, obtusely conical to convex, then plane with a low umbo, brown to dark brown; gills pale brownish; stem 30-65 x 3-7 mm, equal, fibrillose-finely scaly, brownish; smell weakly spermatic. Sp 8-11 x 6-8 μm , nodules fewer, but more prominent than in *I. leptophylla* and *I. teraturgus*. In coniferous and deciduous forests on poor soil, sometimes on rotten wood; summer to autumn; common in temp.-bore., rare in arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:80, FND 34-36:422, Stangl 30.2, .
- I. lanuginosa* (Bull.: Fr.) P. Kumm. (*I. ovatocystis* Boursier & Kühner)
- Pleurocystidia cylindrical-lageniform, 50-80 x 15-25(-30) μm , walls up to 1 μm thick, mostly without crystals (fig. 879H). Cap 15-40 mm, hemispherical to plane with a low umbo, erect scaly at least at centre, dark brown, but may be paler when growing in open environments; gills initially whitish or pale greyish brown; stem 20-65 x 3-6 mm, brownish flocculose. Sp 7.5-10.5 x 5.5-8 μm , with prominent nodules. In coniferous or sometimes deciduous forests, sometimes on rotten coniferous wood or in *Sphagnum*; summer to autumn; common in hemib.-bore., occasional in temp.; DK (LC), FI (LC), NO, SE. – B&K 5:79, Phil 222d, Stangl 30.1.
I. stellatospora (Peck) Masee (*I. lanuginosa* (Bull.: Fr.) P. Kumm. var. *longicystis* G.F. Atk.)
- 11. Stem base \pm bulbous 12
- Stem base not bulbous 17
- 12. In arc./alp. with dwarf *Salix* or *Dryas*. Cap 15-30 mm, obtusely conical, then plane with an umbo, smooth and brownish at centre, outwards fibrillose to rimose and paler, ochraceous yellow at margin; gills ochraceous brown; stem 20-30 x 2-5 mm, with a slightly bulbous base, pruinose at the top, pale brownish. Sp 9-12 x 5-7 μm , angular-nodulose (fig. 879I); hymenial cystidia 40-80 x 10-25 μm , lageniform. In snow-beds; late summer; rare; NO (NE Oppl: Vågå). – Fav 55:8.7, FND 34-36:406.
I. taxocystis (J. Favre) Singer (*I. decipientoides* Peck var. *taxocystis* J. Favre)



Spores, pleurocystidia and cheilocystidia: A: *Inocybe lacera*, B: *I. aurea*, C: *I. relicina*, D: *I. subcarpta*, E: *I. leptophylla*, F: *I. teraturgus*, G: *I. lanuginosa*, H: *I. stellatospora*, I: *I. taxocystis*, J: *I. rivularis*, K: *I. striata*.

- Not with dwarf *Salix* or *Dryas* 13
- 13. Stem pure white or only somewhat brown with age, naked; cap ochraceous or reddish brown, often with a yellowish umbo. Cap 30-70 mm, initially conical, at last plane, usually with an umbo, smooth at centre, outwards finely fibrillose; stem 40-100 x 4-12 mm, with a rounded, not marginate bulb. Sp 9-12 x 6-8.5 μ m, with obtuse nodules (fig. 879J); hymenial cystidia 50-80 x 14-25 μ m, broadly utriform, walls up to 2 μ m thick. In moist habitats with *Salix*, *Betula*, etc.; summer to autumn; common in suba., occasional in bore., with a northern distribution in FI; FI (LC), IS, NO (NE), SE (LC). – Bol Bres 45:26, 27, M&J 41, Sieniop 238.
I. rivularis Jacobsson & Vauras
- Stem brownish, \pm floccose; cap brown, without a yellowish umbo 14
- 14. Cap with a very prominent, acute umbo 15
- Cap with an obtuse umbo 16
- 15. In forests, especially with *Picea*. Cap 20-40 mm, at first conical, then convex to plane, finely fibrillose-rimulose, greyish brown; gills initially whitish; stem 40-70 x 3-6 mm, greyish brown, base widened, but not distinctly bulbous. Sp 8-11 x 6-7 μ m, with rather prominent nodules like in *I. napipes* (fig. 879K); hymenial cystidia 45-70 x 14-22 μ m, walls up to 2 μ m thick, generally with crystals. Summer to autumn; common in hemib.-bore., occasional in temp.; DK (DD), FI (LC), NO, SE (LC). – Bres 759, Däh 672, FND 34-36:405, Jordst 10(2), Stangl 28.4.
I. striata Bres. (*I. acuta* Boud. s. auct. p.p.)

- In fens and other moist habitats with e.g. *Salix*, sometimes in *Sphagnum*. Cap 10-20 mm, conical-convex, fibrillose-rimulose, dark brown; stem brownish, sometimes with a vinaceous tinge, at base with a rounded, whitish bulb. Sp 8.5-11.5 x 5-7.5 μm , moderately nodulose (fig. 881A); hymenial cystidia 50-75 x 15-22 μm , walls up to 2 μm thick. Summer to autumn; occasional in temp.-arc./alp.; DK (DD), FI (LC), NO, SE (LC). – FAD 117D (as *umboninota*), Heim 30:3.
I. acuta Boud. (*I. acutella* Bon)
- 16. Sp 7-9 x 5-7 μm , nodules not prominent (fig. 881B). Cap 10-40 mm, initially conical, finally plane with an umbo, fibrillose-rimulose, greyish brown, often rather dark; stem 30-50 x 3-5 mm, \pm brown, base with a rounded, whitish bulb, \pm flocculose; smell indistinct. Hymenial cystidia 45-65 x 12-20 μm , walls up to 1.5 μm thick, generally with crystals. In deciduous and coniferous forests and parks, with *Quercus*, *Corylus*, *Fagus* and *Picea*, sometimes under other deciduous trees; summer to autumn; common in temp.-bore.; DK (LC), NO (LC), SE (LC). – Bon 243, Däh 674, FAD 118G, Phil 224c, Stangl 27.2.
I. assimilata Britzelm. (*I. umbrina* Bres.)
- Sp 8-11 x 6-8 μm , with prominent nodules (fig. 881C). Cap 30-50 mm, conical to convex with a distinct umbo, fibrillose-rimulose, brown, dark at centre, paler towards margin; gills initially pale greyish; stem 40-75 x 4-7 mm, with a prominent, often flattened bulb, brownish, especially towards base; smell spermatic. Hymenial cystidia 40-65 x 15-25 μm , walls up to 1 μm thick, hyaline. On acid soil, especially in coniferous forests, but also on poor soil in deciduous forests and in open, subalpine habitats; summer to autumn; common in temp.-suba., rare in IS; DK (LC), FI (LC), NO (LC), IS, SE (LC). – B&K 5:84, FAD 116A, Phil 224b, Stangl 27.1, Ves 328.
I. napipes J.E. Lange
- 17. In arc./alp. with dwarf *Salix* 18
- Not in arc./alp. 20
- 18. Sp at least partly almost quadrangular see *I. soluta* 23
- Sp not (almost) quadrangular 19
- 19. Sp 10-14 x 5-6.5 μm , oblong, Q = 2-2.3, distinctly, but irregularly angular (fig. 881D). Cap 10-30 mm, at first \pm conical with incurved margin, fibrillose, dark greyish brown; gills initially whitish, then greyish; stem 20-40 x 3-5 mm, equal, pale brown, sometimes with a reddish tinge; hymenial cystidia 50-75 x 11-20 μm , lageniform, walls up to 2 μm thick. In snow-beds with *Salix*; late summer; occasional in arc./alp.; NO (NE, incl. Sv), SE. – AAF 3:47, B&K 5:76, Fav 55:8.6, FND 34-36:415-416.
I. giacomii J. Favre (*I. borealis* M. Lange)
- Sp 7-10 x 4-6 μm , angular like in an *Entoloma* (fig. 881E). Cap 5-10 mm, convex, fibrillose-finely scaly, somewhat rimulose near the margin, dark brown; gills brownish; stem 10-15 x 2-3 mm, ochraceous to reddish brown, not pruinose. Hymenial cystidia 40-70 x 10-16 μm , cylindrical, walls up to 1 μm thick, rarely 2 μm . With dwarf *Salix* in snow-beds, perhaps also with *Dryas*; late summer; occasional in arc./alp.; NO (NE), SE.
I. alpigenes (E. Horak) Bon
- 20. Cap strongly rimose, like in *I. rimosa*; sp 11-13 x 5-6.5 μm , weakly angular (fig. 881F). Cap 25-50 mm, when young with an acute umbo, at centre dark brown, towards margin paler; gills pale grey when young; stem 40-80 x 4-9 mm, initially pinkish brown, finally reddish brown. Hymenial cystidia 50-75 x 14-25 μm , thin-walled, almost without crystals. With *Salix* and *Pinus*; late summer; very rare in hemib.; NO (NE, Østf: Fredrikstad).
I. undulatospora Kuyper
- Cap not rimose; sp smaller and nodulose or angular 21
- 21. Sp with large and distinct nodules, often star-shaped (fig. 881G) like in *Entoloma conferen-*



Spores and pleurocystidia: A: *Inocybe acuta*, B: *I. assimilata*, C: *I. napipes*, D: *I. giacomii*, E: *I. alpigenes*, F: *I. undulatospora*, G: *I. pseudoasterospora* var. *microsperma*, H: *I. putilla*, I: *I. soluta*, J: *I. curvipes*, K: *I. rennyi*.

dum. Cap 10-30 mm, conical to plane, generally with an acute umbo, smooth or with age rimulose to somewhat scaly, at centre rather dark brown, paler towards margin; stem 35-50 x 2-5 mm, equal or only slightly widened towards the base, whitish to pale greyish brown. Sp 6.5-10 x 5-7.5 μm ; hymenial cystidia 50-80 x 16-23 μm , walls up to 2 μm thick, with crystals. With deciduous trees and *Picea* on rather, nutrient-rich and often moist soil; summer to autumn; occasional in temp.-hemib., rare in bore.; DK (DD), FI (DD), NO (NE), SE (NE). – FND 34-36:417-418.

I. pseudoasterospora Kühner & Boursier var. *microsperma* Kuyper & P.-J. Keizer

- Sp with small nodules or angular, not star-shaped 22
- 22. Sp with several small nodules, 8-10 x 6-8 μm (fig. 881H). Cap 10-30 mm, obtusely conical-plane, smooth at centre, outwards fibrillose-rimulose, initially brown or greyish brown, paler with age; stem 20-45 x 2-5 mm, pale, slightly pinkish. Hymenial cystidia 50-70 x 14-20 μm , walls about 2 μm thick, with crystals. On soil in deciduous forests and parks with *Quercus* and *Tilia*; summer to autumn; occasional in temp.-hemib., very rare in southern bore.; FI (NT), NO (NE, Vestf: Tønsberg), SE. – A&R 92:3, Bres 764.

I. putilla Bres.


- Sp angular rather than nodulose 23
- 23. Sp 6-8 x 5-6.5 μm , at least some almost quadrangular (fig. 881I), rather pale. Cap 20-60 mm, conical-plane with an umbo, fibrillose-flocculose, sometimes breaking up in scales, greyish brown; gills pale beige; stem 30-60 x 3-8 mm, rather dark brown. Hymenial cystidia 45-65 x 10-20 μm , subfusiform, walls up to 1 μm thick, with or without crystals. Most frequent on sandy, acid and poor soil, mostly in coniferous forests, also with *Betula* and *Salix* in moun-

tains; summer to autumn; occasional but locally common in temp.-arc./alp.; DK (LC), FI (LC), FO, NO (NE), SE (LC). – Stangl 28.1.

I. soluta Velen. (*I. brevispora* Huijsman)

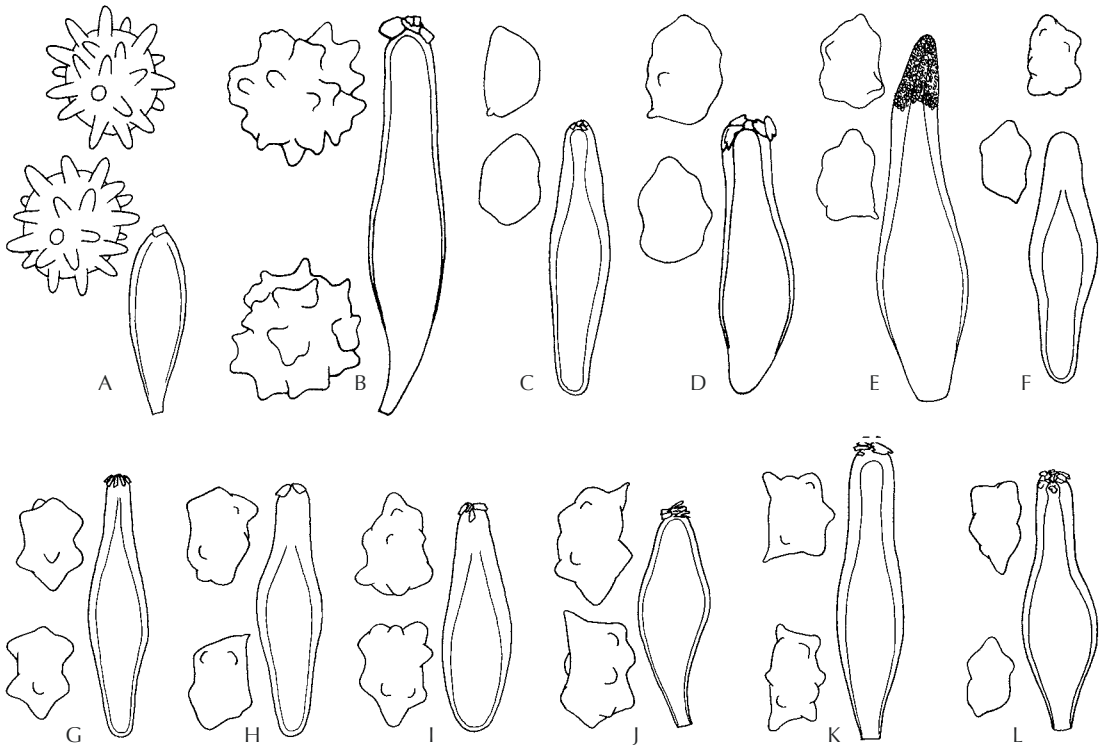
- Sp > 8 μm long, more elongate and irregular 24
- 24. Hymenial cystidia \pm lageniform with a short, subacute apex (fig. 881J). Cap 10-40 mm, bell-shaped to convex with a low or indistinct umbo, at first fibrillose, with age often finely scaly, when young pale ochraceous brown with a darker centre, with age more reddish brown; gills greyish; stem 30-80 \times 3-7 mm, initially whitish, but soon becoming grey brown from the base. Sp 8.5-12 \times 5.5-7 μm , irregularly angular; hymenial cystidia 35-65 \times 15-25 μm , walls 1-1.5 μm thick. With deciduous trees, often in lawns in gardens and parks; summer to autumn; very common in temp., common in hemib., occasional in bore., rare in suba.; DK (LC), FI (LC), IS, NO (NE), SE (LC). – Bon 243, FAD 117A, FND 34-36:413, Stangl 29.1, Ves 332. *I. curvipes* P. Karst. (*I. globocystis* Velen., *I. lanuginella* (J. Schröt.) Konrad & Maubl. s. auct.)
- Hymenial cystidia lageniform (fig. 881K). Cap 10-25 mm, conical to convex with an umbo, fibrillose or sometimes finely scaly, dark reddish brown or brown; gills brownish; stem 20-45 \times 2-5 mm, fibrillose to floccose, not pruinose, grey brown, but paler at top. Sp 8-15(-20) \times 5-7 μm , very variable and irregular in size and shape, but generally strongly elongate; hymenial cystidia 40-80 \times 15-25 μm , walls about 2 μm thick. In coniferous forests on poor soil and in mossy heathland; summer to autumn; rare in hemib.-suba.; IS (Su: Stóra-Dímon) NO (LC), SE (NA). – A&R 97:2, FND 34-36:419. *I. rennyi* Berk. & Broome

Key D: Subgen. *Inocybe* sect. *Calosporae* J.E. Lange

1. Sp with numerous pointed spines (fig. 883A); hymenial cystidia 35-55 \times 10-15 μm . Cap 10-25 mm, bell-shaped to plane with or without an umbo, often with small fibrillose scales, dark brown, often with a reddish tinge; gills ochraceous brown; stem 20-50 \times 1-3 mm, equal, dark brown, pruinose all over. Sp 11-14 \times 9.5-12.5 μm including the spines. With deciduous trees, often on damp soil, rarely with conifers; summer to autumn; occasional in temp.-hemib.; rare in bore.-suba.; DK (LC), FI (LC), IS (Au, Ve), NO (LC), SE (LC). – B&K 5:72, Bres 754:1, C&D 1075, FAD 115C, Stangl 31.1, . *I. calospora* Quéf.
- Sp warty with small protuberances at apex of the warts (fig. 883B); hymenial cystidia 65-95 \times 13-23 μm . Cap 5-20 mm, hemispherical to convex with an obtuse umbo, fibrillose-finely scaly, dark brown, with whitish scales; gills initially pale brown; stem 20-55 \times 1-2 mm, equal, reddish brown with white fibrils, paler towards base, pruinose to below the middle. Sp 12-14 \times 10-12 μm incl. warts. In moist, herb-rich forests on alluvial soil; late summer; very rare in bore.; FI (CR, PS: Kuopio). – Kar 28:83. *I. multicornata* A.H. Sm.

Key E: Subgen. *Inocybe* sect. *Petiginosae* Heim

1. Sp almost amygdaloid with an only slightly flexuose outline (fig. 883C). Cap 10-30 \times 2-3 mm, conical to plane with an umbo, fibrillose, dark red brown, but paler with age and when dry; gills pale greyish brown; stem 20-40 \times 2-3 mm, \pm cylindrical or bulbous, pinkish brown. Sp 7.5-8 \times 4-5 μm ; hymenial cystidia 50-80 \times 14-17 μm , lageniform-fusiform, thick-walled, not or only slightly yellow. With *Picea* or deciduous trees in moist habitats; summer to autumn; rare in hemib.-bore.; FI (DD), SE (NE). *I. ambigua* Romagn.
- Sp not amygdaloid, distinctly nodulose 2
2. Sp with rather obtuse nodules 3
- Sp with rather acute nodules or angular 4



Spores and pleurocystidia: A: *Inocybe calospora*, B: *I. multicornata*, C: *I. ambigua*, D: *I. argenteolutea*, E: *I. castanea*, F: *I. petiginosa*, G: *I. nematoloma*, H: *I. egenula*, I: *I. jacobi*, J: *I. fibrosa*, K: *I. fibrosoides*, L: *I. paludinella*.


3. Cap greyish yellow with a distinct velipellis. Cap 10-25 mm, hemispherical to broadly conical, later low convex with or without an umbo, fibrillose, later breaking up in scales, at centre silvery yellow grey, towards margin yellow brown; gills initially yellow, pruinose all over. Sp 7.5-9 × 5-6 μm , with obtuse nodules (fig. 883D); hymenial cystidia 50-80 × 15-25 μm , numerous, walls up to 3 μm thick. On open, dry soil in subalpine *Betula* forests or with *Betula* and *Salix* above the timberline; late summer; rare in suba.-arc./alp., but maybe overlooked; FI (LC), NO (NE, Oppl: Vågå), SE. – Kar 37:42, Sieniop 232.

***I. argenteolutea* Vauras**


- Cap reddish to ochraceous brown, without a distinct velipellis. Cap 10-30 mm, obtusely conical or bell-shaped, finely tomentose, at centre often breaking up in scales; gills yellowish; stem 20-35 × 2-4 mm, slightly pinkish brown, frequently not or only sparsely pruinose below the middle. Sp 7-9 × 4.5-6.5 μm , with obtuse nodules (fig. 883E); hymenial cystidia 50-80 × 12-25 μm , lageniform, walls up to 3 μm thick, pale yellow or hyaline in KOH. Mostly in *Picea* forests, but also in subalpine *Betula* forests, along roadsides, etc.; summer to autumn; common in hemib.-suba., rare in temp.; DK (EN, EJyl: Rold, Bjergeskoven), FI (LC), NO (NE), SE (LC). – FND 34-36:423-424, Stangl 31.2, ZM 51:261.

***I. castanea* Peck (*I. sapinea* Velen.)**

4. Gills distinctly yellow when young 5
 - Gills whitish to pale ochraceous grey when young 6

5. Cap densely covered with fibrillose, whitish hairs or scales. Cap 5-20 mm, convex with a low, obtuse umbo, reddish brown under the covering, often zonate; stem 10-30 x 1-3 mm, reddish brown. Sp 6-8 x 4.5-5.5 μm (fig. 883F); hymenial cystidia 40-70 x 10-16 μm , narrowly lageniform, walls 2-2.5 μm thick, yellow in KOH. In deciduous forests, often on acid soil, especially with *Fagus* and *Quercus*; summer to autumn; very common in temp., common in hemib., in FI rare in hemib., rare in bore.; DK (LC), FI (VU), NO (LC), SE (LC). – B&K 5:87, Bon 242, FAD 118A, Phil 225e, Stangl 31.3, .

I. petiginosa (Fr.: Fr.) Gillet

- Cap not covered with whitish scales. Cap 5-25 mm, convex with an obtuse umbo, finely fibrillose, at centre warm yellowish brown, towards margin yellow and naked; stem 10-65 x 1-3 mm, sometimes even longer when growing in deep moss. Sp 7.5-9 x 4.5-6.5 μm (fig. 883G); hymenial cystidia 45-65 x 14-20 μm , walls up to 2.5 μm thick, yellow. In humid habitats in coniferous or mixed forests, often in *Sphagnum*; summer to autumn; common in bore., but occasional in NO, in FI with northern distribution; FI, NO (NT), SE (LC). – Jordst 10(2), .
- I. nematoloma* Joss.

6. On naked soil with *Salix* and *Dryas* in mountains. Cap 5-20 mm, convex, smooth at centre, fibrillose or towards margin finely scaly, yellowish brown; gills initially whitish beige, soon ochraceous brown; stem 10-20 x 3-5 mm, with a tapering base, pale brownish with a pink tinge, paler towards the base. Sp 7.5-9(-10) x 5.5-7 μm , angular-nodulose (fig. 883H); hymenial cystidia 50-80 x 10-20 μm , lageniform, walls up to 2.5 μm thick, yellow with KOH. Late summer; occasional in suba.-arc. / alp.; NO (NE), SE. – A&R 95:1, B&K 5:74, Fav 55:8.10.

I. egenula J. Favre

- On sandy soil at roadsides and in old gravel pits, etc. with young *Pinus* and *Betula* in lowlands. Cap 10-20 mm, obtusely conical or bell-shaped, then plane with an umbo, slightly scaly with age, orange brown, dark at centre, towards margin paler and with an ochraceous tinge; gills pale greyish brown; stem 30-40 x 2-3 mm, greyish brown, pruinose over entire length. Sp 7.5-10 x 5-7 μm , nodulose (fig. 883I); hymenial cystidia 40-60 x 12-16 μm , lageniform, walls up to 2.5 μm thick, yellow. Summer to autumn; occasional or overlooked in temp.-bore.; DK (DD), FI (LC), IS (Au: Hallormsstadir), NO (NE), SE (LC). – B&K 5:78, Bol Bres 43:19, FND 34-36:424, M&J 28, Stangl 31.4.

I. jacobii Kühner

Key F: Subgen. *Inocybe* sect. *Marginatae* Kühner

- | | | |
|----|---|---|
| 1. | Cap white to pale yellow | 2 |
| - | Cap \pm yellow or brown | 5 |
| 2. | Cap usually 40-120 mm | 3 |
| - | Cap usually not exceeding 30 mm | 4 |
| 3. | Cap 50-120 mm; stem base \pm inflated, but generally without a marginate bulb. Cap initially bell-shaped, soon flattened with a low, obtuse umbo, finely fibrillose, initially white and reminding of a <i>Tricholoma</i> , with age somewhat brownish; gills initially pale greyish; stem 50-100 x 8-20 mm. Sp 8-10 x 5.5-7 μm , nodulose (fig. 883J); hymenial cystidia lageniform, 45-70 x 15-25 μm , walls 1.5-2 μm thick. In humid <i>Picea</i> forests on calcareous soil; summer to autumn; very rare in hemib.; SE (EN, Vg). – Bon 243, Bres 765, FND 34-36:427-428, Jordst 18(3):40, Stangl 32.1. | |

I. fibrosa (Sowerby) Gillet

- Cap 40-80 mm; stem with a large, marginate bulb. Cap bell-shaped to plane with a prominent umbo, straw or pale ochraceous yellow; gills pale greyish with a beige tinge; stem 50-90 x 8-12 mm, white, but staining wax-coloured with age. Sp 8.5-11 x 6-8 μm , nodulose (fig. 883K); hymenial cystidia 40-65 x 15-20 μm , lageniform, walls about 2 μm thick. With

Fagus on calcareous soil; summer to autumn, very rare in temp.; SE (EN, SK). – C&D 1082, Stangl 36.1.

I. fibrosoides Kühner

4. With *Salix* and *Alnus*, mostly in humid habitats. Cap 10-25 mm, obtusely conical-plane with an umbo, finely fibrillose, whitish to straw-coloured; gills initially whitish or pale citrine; stem 25-40 x 3-6 mm, pruinose all over, with a small bulb. Sp 8-10 x 5-6.5 μ m, nodulose (fig. 883L); hymenial cystidia 35-50 x 10-14 μ m, fusiform-lageniform, walls up to 5 μ m thick. Late summer to autumn; occasional in temp.-suba.; DK (LC), FI (LC), IS, NO (NE), SE (LC). – A&R 89, FAD 118B (as *trechispora*), FND 34-36:429, M&J 33, Stangl 31.6.

I. paludinella (Peck) Sacc.

- In *Picea* forests on nutrient-rich soil. Cap 15-30 mm, obtusely conical to plane with an obtuse umbo, finely fibrillose, initially pure white, reminding of *I. geophylla*, with age somewhat greyish; gills cream or somewhat greyish; stem 30-50 x 3-6 mm, whitish or somewhat wax-coloured, pruinose all over, with a small bulb. Sp 7-10 x 5.5-7 μ m, nodulose (fig. 887A); hymenial cystidia 35-50 x 10-14 μ m, clavate-fusiform, walls about 3.5 μ m thick. Summer to autumn; occasional in hemib.-bore.; FI (LC), NO (NE), SE (LC). – A&R 88, Bres 734.2, C&D 1077, Sieniop 239, Stangl 31.5.

I. umbratica Quél.

5. Frb reddening on cap margin, stem base and in the flesh. Cap 20-50 mm, at first almost bell-shaped, then plane with an umbo, tomentose-finely scaly, ochraceous brown with a tinge of orange; stem wax-coloured; smell pleasant. Sp 7-10 x 5-7 μ m, moderately nodulose (fig. 887B); hymenial cystidia 40-75 x 10-17 μ m, fusiform, walls up to 3 μ m thick, \pm yellow. In deciduous forests on calcareous soil; summer; very rare in temp.-hemib.; NO (NE), SE (SK). – A&R 75, C&D 1080, FND 34-36:431, M&J 25:1, Stangl 32.2.

I. bresadolae Masee

- Not reddening 6
6. Stem with a pink or reddish brown tinge, at least with age 7
- Stem white, ochraceous or sometimes with a brown tinge 14
7. Cap with abundant white veil floccules, reminding of *I. maculata*. Cap 20-40 mm, when young conical, then with an acute or obtuse umbo, finely fibrillose, chestnut brown, often with adhering earth; gills ochraceous brown; stem 15-30 x 3-6 mm, pruinose to the middle, at first whitish, then reddish brown; smell spermatic. Sp 9-13 x 6-8 μ m, angular to distinctly nodulose (fig. 887C); hymenial cystidia 50-80 x 15-25 μ m, fusiform-clavate, walls up to 4 μ m thick. With *Dryas* and dwarf *Salix*; late summer; occasional in arc./alp.; NO (Oppl, Finnm), SE. – Fav 55:8.5, FND 32:48, 34-36:432.

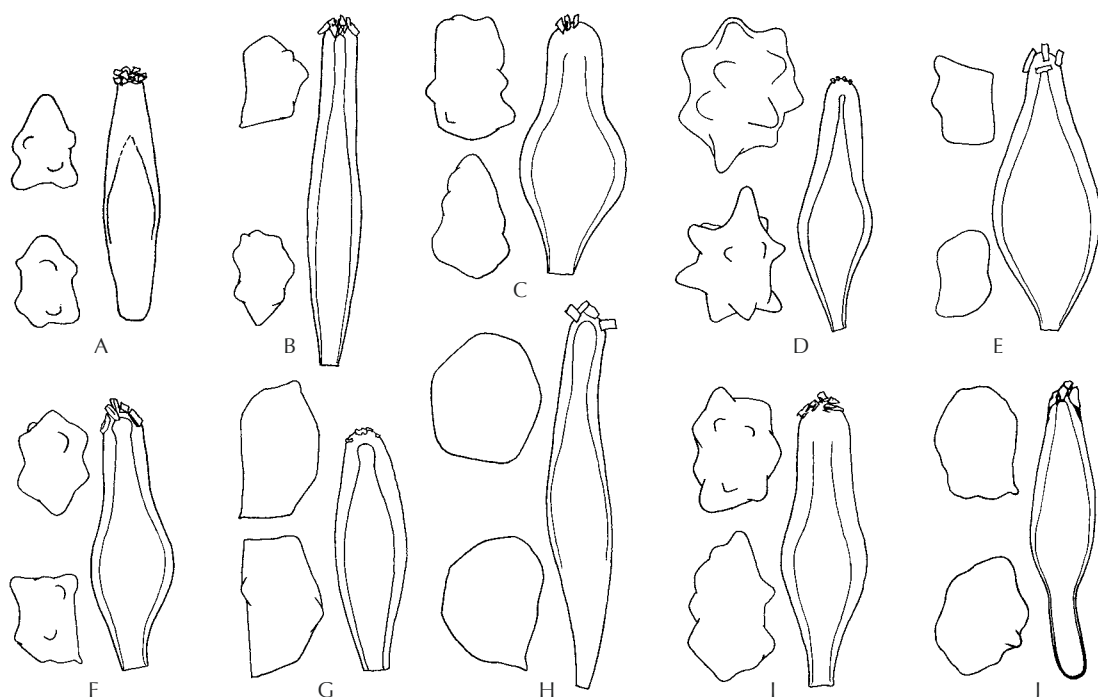
I. favrei Bon (*I. decipiens* Bres. var. *mundula* J. Favre)

- Cap without white veil floccules 8
8. Sp with regular and acute nodules, looking almost star-shaped (fig. 887D). Cap 25-60 mm, obtusely conical-plane with an umbo, distinctly rimose, dark reddish brown or umber; stem 20-80 x 3-8 mm, reddish brown with a large and distinctly marginate bulb. Sp 9-12 x 7-10 μ m; hymenial cystidia 45-75 x 10-25 μ m, lageniform, walls up to 2.5 μ m thick. In deciduous forests and parks, e.g. with *Fagus*, *Quercus* and *Corylus* on richer soil; summer to autumn; common in temp., occasional in hemib.-bore., in FI rare in hemib. (A, V); DK (LC), FI (NT), NO (LC), SE (LC). – Bon 243, Bres 766, FAD 117G, Stangl 37.2, Ves 328.

I. asterospora Quél.

- Sp with more irregular and obtuse nodules, not almost star-shaped 9
9. Sp on av < 10 μ m long 10
- Sp on av > 10 μ m long 11

10. Cap 20-60 mm, incarnate-vinaceous with cream-coloured centre, but covered with a silvery grey and rather persistent velipellis. Cap obtusely conical, then convex with or without a broad umbo, fibrillose-rimulose; gills initially greyish beige; stem 30-70 x 4-8 mm, pinkish brown upwards. Sp 7.5-10 x 5-6.5 μm , with obscure nodules (fig. 887E); hymenial cystidia 50-80 x 16-32 μm , lageniform, walls up to 4 μm thick. On rich, often sandy soil in coniferous and deciduous forests and mossy lawns, with *Betula* or *Pinus* and in alpine heathland with dwarf *Salix*; summer to autumn; occasional in temp.-arc. / alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 5:77, FAD 116D, M&J 26, Phil 224a, Stangl 35.2.
I. grammata Quél. & Le Bret.
- Cap 10-30 mm, chestnut brown, mostly with visible white veil remnants at centre. Cap obtusely conical to plane with a distinct umbo, smooth at centre, outwards finely fibrillose; gills initially pale grey beige, stem 25-50 x 2-5 mm, with a distinct bulb, with a reddish brown tinge; smell spermatic. Sp 8-11 x 6-8 μm , with prominent nodules (fig. 887F); hymenial cystidia 40-80 x 13-23 μm , lageniform, walls up to 3.5 μm thick. With deciduous trees in forests and parks on calcareous soil; summer to autumn; rare in temp.-hemib.; DK (DD, Lol), NO (NE, AA:Arendal, Oppl.: Lunner), SE (LC). – A&R 85:1, B&K 5:71, Stangl 36.3, 36.4.
I. calida Velen. (*I. brunneorufa* Stangl & Veselský, incl. *I. glabrodisca* P.D. Orton)
11. In sand dunes with *Salix*. Cap 40-70 mm, initially obtusely conical, when expanded obtusely umbonate, smooth at centre, soon radially fibrillose, slightly rimose towards margin, pale ochraceous, with age reddish brown, at least at centre; gills initially pale clay buff; stem 35-80 x 4-10 mm, whitish but staining dirty pinkish or brownish, entirely pruinose; smell spermatic. Sp 10-14 x 6-8 μm , angular (fig. 887G); hymenial cystidia 45-90 x 15-25 μm , lageniform-fusiform, walls up to 4 μm thick. Summer to autumn; rare in temp.-suba.; DK (LC), IS Au), NO (NT), SE (LC). – B&K 5:73, C&D 1081, Cet 1851, Stangl 32.3.
I. dunensis P.D. Orton (*I. heimiana* Bon)
- Not in sand dunes 12
12. Gills distinctly yellow; in arc. / alp. Cap 10-20 mm, bell-shaped or obtusely conical, radially fibrillose to rimose, reddish brown with an ochraceous tinge; stem 10-20 x 1-3 mm, bulbous, but not always marginate, distinctly red brown; flesh with a citrine tinge. Sp 10-12.5 x 7.5-9 μm , angular (fig. 887H); hymenial cystidia 60-85 x 14-20 μm , fusiform, walls up to 4 μm thick. With dwarf *Salix* or *Dryas* on calcareous soil; rare; NO (LC, Svb), SE. – Fav 55:8.3, FND 34-36:445-446.
I. concinnula J. Favre
- Gills not yellow; in temp.-bore. 13
13. Cap robust and fleshy, 30-70 mm; sp with several obtuse nodules (fig. 887I). Cap convex-plane with a low umbo, finely fibrillose to rimulose, greyish or ochraceous brown, generally dark brown at centre in contrast to the paler outer part; stem 40-80 x 7-12 mm, with a large, but frequently not distinctly marginate bulb, strongly fibrous, usually with a \pm pink tinge in the upper part; gills clay-coloured, later grey brown with an olive tinge. Sp 9-14 x 6-9 μm ; hymenial cystidia 40-75 x 14-28 μm , fusiform, walls up to 3.5 μm thick. With coniferous or deciduous trees, preferably on sandy and calcareous soil; late summer to autumn; occasional in hemib.-bore., rare in FI; FI (LC), SE (NE). – Bres 763, Jordst 10(2), M&J 26, Stangl 38.2.
I. oblectabilis (Britzelm.) Sacc.
- Cap slender, 10-35 mm; sp with few small nodules (fig. 887J). Cap at first hemispherical, later conical-convex with or without an umbo, smooth at centre, outwards felty-fibrillose, later rimose, when young with a whitish velipellis at centre, towards margin brown grey to greyish yellow brown; stem 15-45 x 2-5 mm, \pm reddish, bulb not distinctly marginate; smell spermatic. Sp 9-11.5 x 6-8 μm ; hymenial cystidia 50-80 x 13-25 μm , lageniform-clavate, walls up to 4 μm thick, yellowish. In mixed forests with *Pinus*, *Picea* and *Betula* on calcareous soil; summer to autumn; rare in hemib.; FI (EN, V: Parainen, Lohja). – Kar 37:46.
I. pargasensis Vauras



Spores and pleurocystidia: A: *Inocybe umbratica*, B: *I. bresadolae*, C: *I. favrei*, D: *I. asterospora*, E: *I. grammata*, F: *I. calida*, G: *I. dunensis*, H: *I. concinnula*, I: *I. oblectabilis*, J: *I. pargasensis*.

14. Cap speckled from small, appressed brownish scales on a pale yellow background. Cap 30-50 mm, obtusely conical-plane with a low umbo; stem 30-50 x 4-10 mm, pale yellowish; gills for long greyish beige. Sp 8-10 x 6-8 μm , with several small nodules (fig. 889A); hymenial cystidia 50-90 x 16-30 μm , lageniform, walls up to 3 μm thick. In deciduous forests, rarely under conifers, on nutrient-rich and calcareous soil; summer to autumn; rare in temp.-bore.; DK (VU), FI (DD), SE (NE). – A&R 81, C&D 1084, FAD 198C, M&J 33, Stangl 35.1.

I. margaritispora (Berk.) Sacc.

- Cap finely fibrillose-rimose, sometimes breaking up in large scales 15
15. Sp on av < 10 μm long (fig. 889B). Cap 15-35 mm, convex with a pronounced umbo, finely fibrillose, pale ochraceous yellow to brownish yellow, darkest at centre; gills generally with a distinct grey tinge when young, then brown; stem 30-60 x 3-6 mm, at first whitish, then with an ochraceous tinge, pruinose all over; smell weakly spermatic. Sp 7-10 x 5-7 μm , distinctly nodulose; hymenial cystidia 35-55 x 14-20 μm , lageniform-subutriform, walls up to 3 μm thick. In coniferous and deciduous forests, parks and gardens; summer to autumn; very common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:83, Stangl 34.3, Ves 329.
- I. mixtilis* (Britzelm.) Sacc.
- Sp on av > 10 μm long 16
16. Sp only weakly and indistinctly nodulose or angular (figs 889C-D) 17
- Sp distinctly and often very prominently nodulose (figs 889E-I) 18

17. Cap 10-30 mm; in arc./alp. Cap umbonate, coarsely fibrillose to finely scaly, ochraceous brown; gills pale with an olive tinge; stem 20-30 x 3-6 mm, with an indistinctly marginate bulb, pale greyish brown. Sp 10-12 x 7-9.5 μm (fig. 889C); hymenial cystidia 50-100 x 15-30 μm , lageniform, walls up to 2 μm thick, yellow in KOH. With *Dryas* or dwarf *Salix* on calcar-

eous soil; late summer; rare; FI (DD, EnL: Kilpisjärvi), NO (LC, Hord: Ulvik). – B&K 5:85, C&D 1088, Fav 55:8.14, Stangl 30.3.

I. oreina J. Favre

- Cap 20-70 mm; in temp.-hemib. Cap obtusely conical to plane with a low and obtuse umbo, fibrillose-floccose, breaking up in small brownish scales on a greyish yellow background; gills grey beige; stem 40-50 x 10-12 mm, pale, but staining ochraceous with age, pruinose down to the middle; smell somewhat spermatic. Sp 10-15 x 6-9 μm , angular to indistinctly nodulose (fig. 889D); hymenial cystidia 45-70 x 15-25 μm , lageniform, walls 1.5-3 μm thick. In sandy habitats with various deciduous and coniferous trees, probably only on calcareous soil; summer to autumn; rare; SE (NA). – A&R 93, Bon 243, Bres 757, Stangl 33.4.

I. decipiens Bres.

- 18. Cap predominantly brown; sp with rather low and obtuse nodules 19
- Cap predominantly yellow to yellowish brown; sp with very distinct nodules 20
- 19. Velipellis absent or very indistinct. Cap 15-45 mm, at first bell-shaped or obtusely conical, when expanded with an obtuse umbo, woolly-fibrillose, then rimulose, yellow-brown to brown with a red tinge; gills pale grey; stem 30-80 x 2.5-7 mm, inflated at base, but without a marginate bulb, pale but darkening with age. Sp 10-12.5 x 7.5-9.5 μm , obtusely nodulose (fig. 889E); hymenial cystidia 60-100 x 16-27 μm , fusiform with a cylindrical neck, walls up to 5 μm thick. In eutrophic fens or other humid habitats with *Salix* and *Betula*; summer to autumn; occasional in bore.-arc./alp., rare in FI; FI (VU), NO (NE, Vestf: Hof, SvB), SE.

I. hirculus Vauras

- With persistent whitish veil remnants at centre. Cap 30-70 mm, obtusely conical, soon plane with a broad umbo, fibrillose-rimulose, initially chestnut brown, with age paler ochraceous brown towards margin; gills pale beige; stem 50-70 x 5-10 mm, with a large bulb, whitish, then pale ochraceous brown, pruinose in the upper part. Sp 10-14 x 7-9.5 μm , with several obtuse nodules (fig. 889F); hymenial cystidia 60-90 x 15-25 μm , fusiform, walls up to 3 μm thick, often yellow. In coniferous forests and alpine heathland on calcareous soil; summer to autumn; occasional in bore.-arc./alp., rare in FI; FI (DD, EnL: Kilpisjärvi), NO (LC), SE (NA). – A&R 84, FND 34-36:452-453, Stangl 37.1.

I. pseudohiulca Kühner

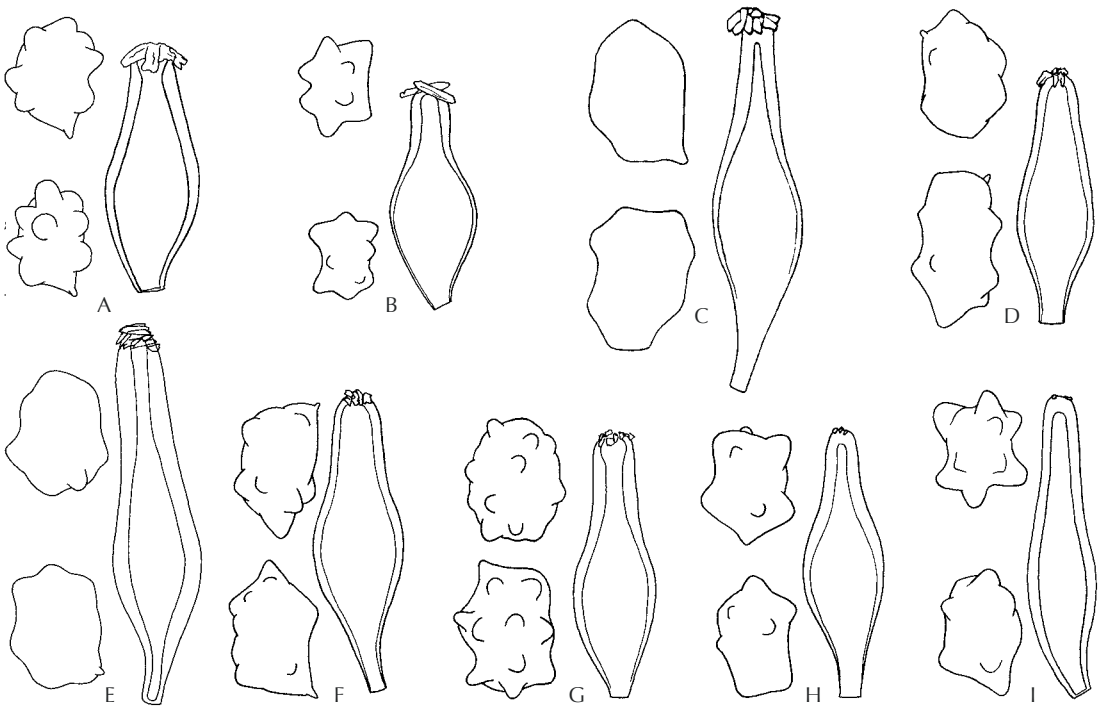
- 20. Sp with several blunt nodules (fig. 889G). Cap 10-20(-30) mm. Cap conical-convex with an umbo, radially fibrillose, yellowish brown; gills greyish; stem 20-50 x 2-4 mm, with a small bulb, wax-coloured. Sp 10-11.5 x 7.5-9 μm ; hymenial cystidia 50-75 x 15-20 μm , lageniform, walls up to 4 μm thick. With *Salix* and *Alnus*, possibly also *Betula* in humid habitats; summer to autumn; rare in temp.-arc./alp.; DK (LC), FI (DD, OP: Kiiminki), IS, NO, SE (LC). – C&D 1087, FAD 115B (as *xantomelas*), M&J 34, RdM 40:140, Stangl 33.5.

I. salicis Kühner

- Sp with prominent, subacute nodules (figs 889H-I) 21
- 21. Cap fibrillose to somewhat rimulose; in arc./alp. Cap 15-40 mm, conical to plane with a prominent, mostly acute umbo, pale yellowish brown; gills pale beige without a grey tinge; stem 20-40 x 3-6 mm, pruinose down to the middle part or almost all over, initially white, but becoming beige or brownish with age. Sp 9-12 x 6-9 μm , with prominent, subacute nodules (fig. 889H); hymenial cystidia 65-110 x 12-25 μm , fusiform, walls up to 4 μm thick. With dwarf *Salix* and *Dryas*; late summer, probably common; IS, NO (incl. SvB), SE. – FND 32:48, 34-36:437-438.

I. salicis-herbaceae Kühner (*I. rufofusca* (J. Favre) Bon)

- Cap when mature often rimose; mostly in deciduous forests, sometimes under conifers, also alpine heathland. Cap 20-50 mm, obtusely conical, then convex with an umbo, fibrillose-rimulose, at centre often brownish; gills initially cream with a \pm grey tinge; stem 30-75 x 3-6 mm, whitish to pale ochraceous, staining \pm greyish brown when dry. Sp 9-12 x 7-10 μm ,



Spores and pleurocystidia: A: *Inocybe margaritipora*, B: *I. mixtilis*, C: *I. oreina*, D: *I. decipiens*, E: *I. hirculus*, F: *I. pseudohiulca*, G: *I. salicis*, H: *I. salicis-herbaceae*, I: *I. praetervisa*.

with prominent, subacute nodules (fig. 889I); hymenial cystidia 50-80 x 12-20 μm , fusiform-sublageniform, walls up to 2.5 μm thick, yellowish in KOH. Both on calcareous and acid soil; summer to autumn; common in hemib.-suba., occasional in temp. and arc./alp.; DK (NT), FI (LC), FO, IS, NO (LC, incl. SvB), SE (LC). – Bon 243, Bres 760, Phil 222f, Stangl 34.1, Svp 36:28, ☉.

I. praetervisa Quél. (incl. *I. xanthomelas* Boursier & Kühner)

Note: specimens from alpine heathland may be difficult to distinguish from similar species.

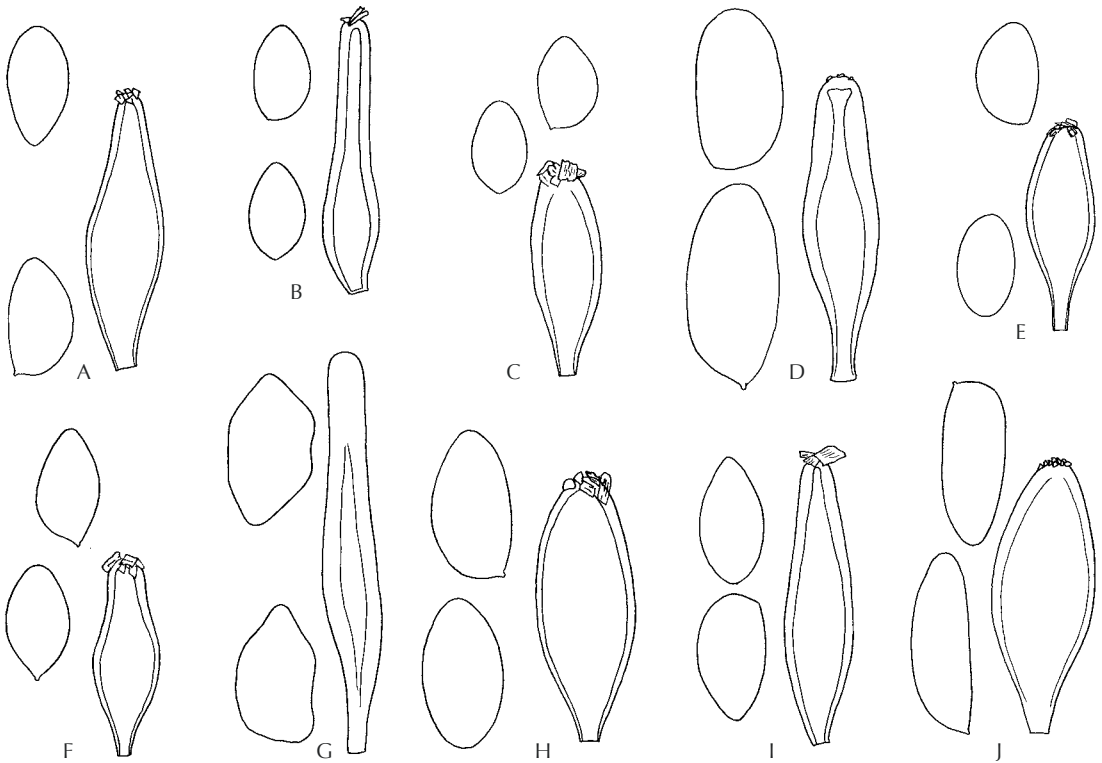
Key G: Subgen. *Inocybe* sect. *Splendentes* Singer

1. Sp narrow, almost cylindrical (fig. 897I) see *I. sambucina* key I 3
 - Sp amygdaloid-ovoid 2
2. Frb at first pure white, but strongly reddening with age and when handled. Cap 20-50 mm, hemispherical or obtusely conical, then almost plane with or without an umbo, fibrillose; gills initially whitish; stem 15-70 x 3-6 mm, with a marginate bulb, pruinose all over. Sp 9-12 x 6-7 μm , amygdaloid (fig. 891A); hymenial cystidia 45-70 x 12-24 μm , fusiform-subutri-form, walls up to 1.5 μm thick. In deciduous forests and parks on calcareous soil, especially with *Quercus*, *Tilia* and *Corylus*; summer to autumn; rare in temp.-bore.; DK (LC), FI (CR, OP: Kiiminki), NO (vu), SE (NT). – Bon 237, Däh 650, Phil 218a, Stangl 20.4, Ves 329, ☉.
I. godeyi Gillet
 - Frb not pure white and not reddening 3
3. Cap whitish to pale ochraceous brown. Cap 20-60 mm, obtusely conical-convex, at first finely fibrillose, with age often becoming finely scaly; gills greyish-yellowish; stem 25-100 x

2-8 mm, equal or sometimes with a clavate to subbulbous base, densely pruinose in upper half, whitish or somewhat pink in the upper part. Sp 7.5-10 x 4.5-5.5 μm , amygdaloid (fig. 891B); hymenial cystidia 50-90 x 12-18 μm , slenderly fusiform to subcylindrical, walls up to 3 μm thick, pale to bright yellow. With various deciduous trees and conifers, especially on moist, clayey soil; autumn; common in temp.-southern bore., occasional in middle-northern bore.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – Bon 241, FAD 112F, Phil 222a, Stangl 19.1, Ves 325, ☉.

I. sindonia (Fr.) P. Karst. (*I. kuehneri* Stangl & Veselský)

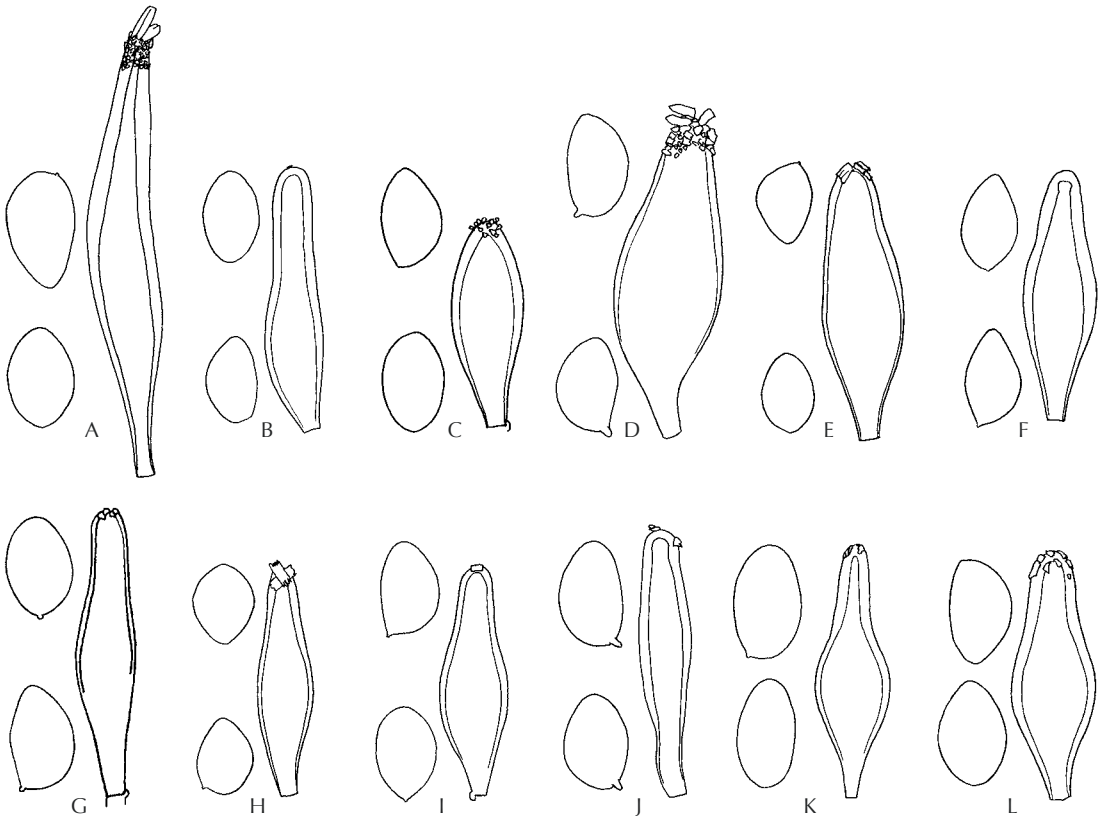
- Cap yellow or strongly coloured 4
- 4. Stem distinctly darkening in the lower half 5
- Stem not or only exceptionally darkening in the lower half 8
- 5. Stem blackening with an olivaceous tinge. Cap 10-30 mm, obtusely conical-convex with or without an umbo, coarsely fibrillose to finely scaly, at centre often breaking up in small scales, dark brown, towards margin ochraceous brown; gills yellowish-greyish; stem 20-50 x 2-6 mm, equal to subbulbous, at first white; smell spermatic. Sp 7-9.5 x 4.5-5.5 μm , amygdaloid (fig. 891C); hymenial cystidia 40-60 x 12-20 μm , \pm clavate, walls up to 2.5 μm thick. In deciduous forests on calcareous soil, generally with *Quercus*, *Tilia* or *Corylus*; summer to autumn; very rare in temp.-hemib.; DK (EN), NO (VU, AA: Kragerø and Evje og Hornnes), SE (LC). – B&K 5:60, C&D 1067, FRIC 6:45a, M&J 1, Stangl 21.2.
- I. tenebrosa* Quéf. (*I. atripes* G.F. Atk.)
- Stem darkening, but without an olivaceous tinge 6
- 6. Sp 12-18 x 7-9 μm , ellipsoid-ovoid (fig. 891D). Cap 10-40 mm, convex to plane without a distinct umbo, coarsely tomentose to scaly, when young with an arachnoid greyish velipellis, rather dark brown, sometimes reddish brown; gills initially cream or yellowish-greyish; stem 25-75 x 2-10 mm, clavate or bulbous, entirely pruinose, turning dark brown from base upwards; smell absent. Hymenial cystidia 45-80 x 14-26 μm , lageniform-fusiform, walls up to 5 μm thick. With deciduous trees on sandy calcareous soil, especially *Populus* and *Salix*, also in sand dunes; summer to autumn; rare in temp.-suba.; DK (LC), FI (DD, V, U), NO (Østf: Halden), SE (LC). – DocM 46:8, FRIC 19:147, M&J 42, Stangl 21.1, Svp 33:41.
- I. vulpinella* Bruylants (*I. ovalispora* Kauffman s. Kühner)
- Sp < 12 μm long 7
- 7. Sp mostly with an obtuse apex (fig. 891E); hymenial cystidia clavate, but sometimes tending to be subutriform. Cap 10-30 mm, slightly conical to convex, but not or only indistinctly umbonate, fibrillose to \pm recurved scaly, dark brown, but sometimes with an ochraceous tinge towards margin; gills whitish to pale grey when young; stem 20-40 x 3-5 mm, equal to slightly bulbous, initially pale, but soon staining greyish brown. Sp 7.5-10 x 5-6 μm , subamygdaloid; hymenial cystidia 40-65 x 14-20 μm , walls up to 2 μm thick, slightly yellow. With both deciduous and coniferous trees, often at sandy roadsides, etc., preferably on calcareous soil; summer to autumn; occasional in hemib.-suba.; FI (LC), NO (NE), SE (LC). – Stangl 24.3.
- I. tjallingiorum* Kuyper
- Sp with a conical apex; hymenial cystidia fusiform to utriform (fig. 893L) see *I. splendens* 24
- 8. Smell like bitter almonds. Cap 20-40 mm, convex to plane, not or only indistinctly umbonate, fibrillose-scaly, ochraceous yellow, sometimes with a slightly brown tinge; stem 20-60 x 3-5 mm, equal, wax-coloured, often slightly pink at the top. Sp 9-12 x 4-7 μm , amygdaloid (fig. 891F); basidia 4- or 2-spored, sometimes in the same frb; hymenial cystidia 35-60 x 10-20 μm , subfusiform to subutriform, sometimes clavate, walls up to 2.5 μm thick. With *Fagus*, *Quercus*, *Corylus* or other deciduous trees on nutrient-rich, often calcareous soil; late summer to autumn; common in temp., occasional in hemib., rare in bore.-suba., in FI rare in hemib.; DK (LC), FI (DD), IS, NO (LC), SE (LC). – Bres 734.1, Phil 222e, R&H 475, Stangl 25.1, Ves 331, ☉.
- I. hirtella* Bres.



Spores and pleurocystidia: A: *Inocybe godeyi*, B: *I. sindonia*, C: *I. tenebrosa*, D: *I. vulpinella*, E: *I. tjallingiorum*, F: *I. hirtella*, G: *I. diabolica*, H: *I. serotina*, I: *I. inodora*, J: *I. pruinosa*.

- Smell indistinct or different 9
- 9. Sp in part weakly angular, often with an apical papilla (fig. 891G). Cap 5-25 mm, bell-shaped, when expanded with a broad umbo, smooth at centre, outwards becoming rimose or scaly, yellowish brown to orange brown; gills initially pale grey; stem 10-30 x 2-4 mm, somewhat bulbous, pale brownish; smell absent. Sp 10-14 x 7-8 μm ; hymenial cystidia 60-100 x 12-25 μm , lageniform, often with a very long neck, walls up to 5 μm thick, \pm yellow. With *Salix* and *Betula* on moist, calcareous soil; summer to autumn; rare but locally occasional in suba.-arc./alp.; FI (EN), NO (NE), SE (LC).
I. diabolica Vauras
- Sp without an angular outline or an apical papilla 10
- 10. Sp on av > 11 μm long; cap with white velipellis at centre 11
- Sp on av < 11 μm long; cap with or without white velipellis 13
- 11. Smell strong, disagreeable. Cap 20-50 mm, obtusely conical, then plane with or without a low, broad umbo, smooth at centre, fibrillose to rimulose outwards, almost white around the centre from velipellis, but often covered with grains of sand, \pm ochraceous brown towards the margin; stem 35-65 x 5-10 mm, equal or bulbous, solid, hairy-pruinose down to the median part, whitish, when old ochraceous, at least in the lower part. Sp 12-16 x 6.5-8.5 μm , subamygdaloid (fig. 891H); hymenial cystidia 45-70 x 17-35 μm , clavate to balloon-shaped, walls up to 3 μm thick. In coastal dunes under deciduous and coniferous trees, also with *Salix repens*; autumn; rare in temp.-hemib.; DK (DD, EJyl: Skagen), NO (EN, VA: Lista).
- C&D 1053, FAD 111J, M&J 18, Svp 33:41.
I. serotina Peck (*I. devoniensis* P.D. Orton, *I. psammophila* Bon)

- Smell weak or absent 12
- 12. Sp subamygdaloid with an indistinctly conical apex, sometimes with a suprahilar depression (fig. 891I). Cap 20-60 mm, bell-shaped to plane with a large, broad umbo, smooth at centre, outwards fibrillose, pale ochraceous to brownish with a white velipellis at centre; stem 25-70 x 3-10 mm, often with a basal bulb, whitish to pale ochraceous brown, pruinose all over but sparsely below middle; smell absent. Sp 10.5-13.5 x 5.5-7 μm ; hymenial cystidia 50-80 x 15-30 μm , fusiform-utriform, walls up to 3.5 μm thick. In sand dunes, etc. with deciduous trees and *Pinus*, also alpine with dwarf *Salix* and *Dryas*; summer to autumn; occasional in temp.-arc. / alp.; DK (DD, WJyl: Henne Strand), FI (LC), FO, NO (NE, Nordl, Finnm), SE (LC). – A&R 65, B&K 5:31, FND 3:7, 34-36:367, Stangl 20.2.
I. inodora Velen. (*I. albidodisca* Kühner, *I. canescens* J. Favre)
- Sp subcylindrical, sometimes slightly irregular (fig. 891J). Cap 20-40 mm, obtusely conical, when expanded with or without a low broad umbo, smooth at centre, outwards fibrillose, yellowish brown, but when young covered with a white, often persisting velipellis; stem 20-45 x 3-6 mm, equal or subbulbous, indistinctly pruinose; smell indistinct. Sp 11-16 x 5-6.5 μm ; hymenial cystidia 45-75 x 14-30 μm , clavate to fusiform, walls up to 5 μm thick. With coniferous and deciduous trees in dry, sandy places; summer to autumn; very rare in temp.-hemib.; DK (DD, EJyl: Rubjerg Knude), NO (VA). – A&R 71:1, Heim 17.
I. pruinosa R. Heim
- 13. Hymenial cystidia slender with a very long neck (fig. 893A). Cap 15-20 mm, bell-shaped to convex with an incurved margin when young, then plane with or without an umbo, woolly-felty, then becoming recurved scaly at centre, ochraceous yellow to yellowish, umbo with a brownish tinge; gills pale yellow brown; stem 40-50 x 2-3 mm, at base somewhat inflated, white, pruinose all over; smell spermatic. Sp 8-12 x 5-6.5 μm , amygdaloid; hymenial cystidia 50-100 x 12-20 μm , walls up to 3 μm thick. In deciduous forests, sometimes also with conifers on rich soil; summer to autumn; occasional in temp.-suba.; DK (LC), FI (LC), NO (NE), SE (LC). – Bres 730, M&J 36, RdM 40:137, Stangl 26.1.
I. muricellata Bres.
- Hymenial cystidia of variable shape, but not slender with a long neck 14
- 14. Smell like *Pelargonium*. Cap 15-40 mm, conical to convex with an incurved margin, when expanded with or without an umbo, smooth at centre, outwards silky-fibrillose or innately scaly, ochraceous yellow to brown; gills initially whitish to cream; stem 25-65 x 3-8 mm, often with a marginate bulb, pruinose all over. Sp 6.5-10 x 4-6 μm , amygdaloid (fig. 893B); hymenial cystidia 40-70 x 12-22 μm , subutriform to lageniform, walls up to 2 μm thick. With deciduous and coniferous trees on calcareous soil; summer to autumn; rare in temp.-hemib.; DK (NT), SE (Öl). – B&K 5:42, M&J 13.
I. pelargonium Kühner
- Smell not like *Pelargonium* 15
- 15. Hymenial cystidia clavate or often almost subglobose (fig. 893C). Cap 10-40(-60) mm, obtusely conical to convex with incurved margin, finally often plane, with or without an umbo, almost smooth at centre, outwards finely scaly or somewhat breaking up in scales, ochraceous to pale brownish yellow, when young frequently \pm covered with white velipellis; gills initially greyish-yellowish; stem 20-60 x 2-5 mm, often somewhat bulbous, pruinose downwards, at least down to the median part. Sp 7.5-10 x 4.5-6 μm , amygdaloid; pleurocystidia 35-65 x 14-25 μm , walls up to 3 μm thick. On dry, often sandy soils with *Pinus* and *Picea*, at roadsides, especially in calcareous areas; summer to autumn; occasional, but locally common in temp.-bore.; DK (LC), FI (LC), FO, NO (NE), SE (LC). – Jordst 13(1), M&J 42, Stangl 25.4, Ves 330.
I. ochroalba Bruylants
- Hymenial cystidia subutriform to lageniform 16



Spores and pleurocystidia: A: *Inocybe muricellata*, B: *I. pelargonium*, C: *I. ochroalba*, D: *I. amblyspora*, E: *I. albomarginata*, F: *I. pseudoreducta*, G: *I. furfurea*, H: *I. stangliana*, I: *I. angulatosquamulosa*, J: *I. langei*, K: *I. leiocephala*, L: *I. splendens* var. *phaeoleuca*.

16. Stem with a distinct marginate bulb 17
 - Stem equal or with an indistinct, not marginate bulb 19
17. Cap almost smooth. Cap 30-60 mm, bell-shaped to almost plane with an umbo, chestnut brown with a greyish tinge due to the velipellis; stem 30-60 x 4-10 mm, with a conspicuous marginate basal bulb, reddish-brownish. Sp 7.5-9.5 x 4.5-5.5 μ m, ovoid to subamygdaloid with obtuse apex (fig. 893D); hymenial cystidia 50-70 x 12-18 μ m, subfusiform, walls up to 1.5 μ m thick. With deciduous trees on calcareous soil; summer to autumn; rare in hemib.-bore.; FI (LC). – A&R 50:2, FND 34-36:391, M&J 30, Stangl 24.4.
I. amblyspora Kühner
 - Cap radially rimulose to rimose 18
18. Cap rimose and reminding of a small *I. asterospora*; sp 6.5-8 x 4-5 μ m, ovoid to subamygdaloid with obtuse apex (fig. 893E). Cap 20-30 mm, low convex to plane, with or without a low umbo, rather dark brown or reddish brown at centre; gills yellowish-brownish; stem 30-45 x 3-4 mm, initially white, then brownish pink. Hymenial cystidia 45-65 x 15-20 μ m, subtrifurcate, walls up to 1.5 μ m thick, hyaline. With *Quercus* and *Fagus*, probably also other deciduous trees in forests or parks, favoured by calcareous soil; summer to autumn; occasional in temp.-hemib.; DK (DD), NO (NE, Østf.: Sarpsborg), SE (LC). – A&R 47:2, C&D 1062, Stangl 23.2.
I. albomarginata Velen. (*I. ovalispora* Kauffman)

- Cap radially rimulose; sp 8-10 x 4-5.5 μm , amygdaloid with a conical apex (fig. 893F). Cap 20-55 mm, conical to plane with an obtuse umbo, smooth around the centre, brown; stem with a brownish-pinkish tinge. Hymenial cystidia 50-70 x 14-23 μm , lageniform-subfusiform, walls up to 2.5 μm thick, almost hyaline. In deciduous forests on calcareous soil; summer; rare in hemib.; SE (NA). – B&K 5:46, Stangl 23.1.
I. pseudoreducta Stangl & Glowinski
- 19. Cap breaking up in concentric scales. Cap 10-30 mm, conical-convex to almost plane without an umbo, with straight margin, dark brown at centre, outwards paler brown; stem 25-50 x 1-3 mm, red brown, equal to slightly inflated at base, pruinose to the median part. Sp 8-9.5 x 4-5.5 μm , ovoid to subamygdaloid (fig. 893G); hymenial cystidia 45-70 x 10-17 μm cylindrical to subfusiform, walls up to 1 μm thick. With deciduous trees on calcareous soil; summer to autumn; very rare in temp.; DK (EN, EJyl: Rold, Bjergeskoven). – A&R 36, M&J 30, RdM 48:226, Stangl 23.3.
I. furfurea Kühner
 - Cap not breaking up concentrically 20
- 20. Sp < 8.5 μm long 21
 - Sp > 9 μm long 23
- 21. Sp Q = 1.2-1.5 (fig. 893H). Cap 20-30 mm, low convex with rather conspicuous umbo, radially fibrillose to slightly rimulose, hazel brown; gills lemon yellow; stem 20-30 x 2-4 mm, dirty yellowish; smell faintly fruit-like. Sp 6-7 x 4.5-5 μm , ovoid; hymenial cystidia 50-55 x 15-18 μm , broadly fusiform to subclavate, walls up to 2 μm thick. With deciduous trees; summer to autumn; rare in temp.-hemib. DK (DD, EJyl: Løvenholm), NO (NE, Østf.: Fredrikstad), SE.
I. stangliana Kuyper
 - Sp Q = 1.5-1.8 (figs 893I-J) 22
- 22. Stem reddish to pink at the top, downwards white. Cap 20-30 mm, conical-convex, finally plane with or without an umbo, appressed finely scaly, brown to yellowish brown; gills initially grey; stem 25-35 x 6 mm, slightly and not marginate bulbous. Sp 7.5-8.5 x 4.5-5 μm , ovoid (fig. 893I); pleurocystidia 50-80 x 12-18 μm , yellowish, abundant. With *Betula*, calciphilous; summer to autumn; rare in hemib.-bore.; FI (LC), SE (LC). – FND 34-36:392.
I. angulatosquamulosa Stangl
 - Stem white to pale ochraceous throughout. Cap 20-40(-50) mm, convex, when expanded not or only slightly umbonate, fibrillose or with age breaking up in scales, brownish yellow, sometimes orange yellow at centre; gills initially distinctly grey; stem 15-30 x 3-6 mm, bulbous or not, whitish, densely pruinose on the upper half, below middle only sparsely so or naked. Sp 6.5-8.5 x 4-5 μm , ovoid to subamygdaloid with an almost obtuse apex (fig. 893J); hymenial cystidia 40-70 x 12-18 μm , walls up to 2.5 μm thick, often somewhat yellow, abundant. With *Quercus*, *Tilia* or other deciduous trees on rich soil, often in parks and gardens; summer to autumn; common in temp., occasional in hemib., rare in bore., in FI north to EH; DK (LC), FI (LC), NO (NE), SE (LC). – C&D 1054, Heim 16.3, RdM 48:223, Stangl 26.4.
I. langei R. Heim
- 23. Velipellis absent; stem entirely reddish. Cap 15-40 mm, conical-convex to plane, usually umbonate, smooth at centre, finely fibrillose towards margin, exceptionally rimulose, dark reddish brown; stem 15-50 x 4-7 mm, equal, entirely pruinose. Sp 9-11 x 5.5-6.5 μm , ovoid to subamygdaloid (fig. 893K); hymenial cystidia 45-75 x 12-20 μm , broadly fusiform to subtriform, walls up to 3 μm thick. With deciduous and coniferous trees on nutrient-rich soil, also with *Salix* in dunes and in arc./alp.; summer to autumn; common in hemib.-arc./alp., occasional in temp.; DK (DD), FI (LC), IS (Au, Na), NO (LC), SE (LC). – AA 3:49, A&R 47:1, B&K 5:34, M&J 37, Stangl 21.3.
I. leioccephala D.E. Stuntz (incl. *I. subbrunnea* Kühner)
 - Velipellis persistent or indistinct and fugacious; stem white to pale ochraceous 24

24. Frb slender; cap 20-50 mm; stem 20-60 x 2-7 mm; velipellis indistinct and fugacious. Cap obtusely conical or almost bell-shaped with a strongly incurved margin when young, soon plane with or without an umbo, fibrillose-rimulose, dark brown, when young with a greyish, thin and fugacious velipellis at centre; stem equal or indistinctly bulbous, exceptionally discolouring to dark brown in the lower half. Sp 9-12 x 5.5-6.5 μm , amygdaloid (fig. 893L); hymenial cystidia 50-75 x 12-22 μm , fusiform with rather long neck, walls up to 2 μm thick, hyaline or somewhat yellow. In deciduous forests on calcareous soil; summer to autumn; rare in temp.-suba.; DK, NO, SE (LC). – Bon 241, C&D 1066, M&J 14, Stangl 21.4.
I. splendens R. Heim var. *phaeoleuca* (Kühner) Kuyper
- Frb robust; cap 30-70 mm; stem 20-95 x 4-13 mm; often with a rather persistent velipellis. Cap obtusely conical or almost bell-shaped with a strongly incurved margin when young, then plane with a low and broad umbo, ochraceous brown, often with a yellow tinge. In other characters like var. *phaeoleuca*. With deciduous trees on calcareous soil; summer to autumn; rare in temp.-bore.; DK (LC), NO (NT). – C&D 1061, Heim 16.1, M&J 29, Stangl 22.
I. splendens R. Heim var. *splendens*

Key H: Subgen. *Inocybe* sect. *Lactiferae* Heim

1. Smell of horse stable or of sea mussels 2
- Smell sweetish, like Peru balsam 3
2. Flesh reddening; smell reminding of horse stable or urine at stem base. Cap 20-60 mm, conical with incurved margin when young, then convex to plane with a straight margin, with or without an umbo, pale grey brown with a greenish tinge; gills initially pale brown; stem 20-80 x 3-8 mm, with age greyish green towards base. Sp 8-12 x 5-7 μm , amygdaloid (fig. 897A); hymenial cystidia 55-85 x 14-20 μm , sublageniform, walls up to 2 μm thick. In deciduous forests and parks with *Fagus* and *Quercus* on stiff calcareous clay; autumn; rare in temp.; DK (NT), SE (LC, Sk). – A&R 25, B&K 5:27, Bon 237, FAD 112B, Stangl 9.1.
I. haemacta (Berk. & Cooke) Sacc.
- Flesh not reddening; smell like sea mussels. Cap 4-20 mm, fibrillose-scaly, yellowish to buff brown, dull; gills initially greyish; stem 20-40 x 2-4 mm, whitish at top, downwards concolorous with cap. Sp 8.5-10 x 5.5-6.5 μm , amygdaloid (fig. 897B); hymenial cystidia 28-57 x 17-27 μm , thin-walled. With deciduous trees on calcareous soil; summer to autumn; very rare in hemib.; FI (EN, V: Parainen and Lohja). – Kar 27:18.
I. mytiliodora Stangl & Vauras
3. In arc./alp. habitats 4
- In lowlands 5
4. Cap with distinct white scales; sp 7.5-9.5 x 5.5-6 μm (fig. 897C); flesh not reddening. Cap 10-35 mm, almost bell-shaped to convex, finely fibrillose, ochraceous beige; gills pale ochraceous; stem 25-50 x 4-7 mm, pruinose at the top, pale beige. Sp amygdaloid; hymenial cystidia 40-60 x 10-18 μm , fusiform. With *Dryas* and *Salix*; late summer; rare in suba.-arc./alp.; FO, NO (Svb), SE. – FND 32:46.
I. moelleri Eyssart. & A. Delannoy (*I. corydalina* Quél. var. *montana* F.H. Møller)
- Cap without white scales; sp 9-12 x 5.5-7.5 μm ; flesh slightly reddening. Cap 10-30 mm, bell-shaped to convex, soon breaking up in scales, ochraceous to reddish brown; stem reddish brown, at least towards base. Sp amygdaloid; hymenial cystidia 35-50 x 10-15(-20) μm , clavate-fusiform, walls up to 2 μm thick. With dwarf *Salix* or *Dryas*, on calcareous soil; late summer; occasional in arc./alp.; NO, SE.
I. fraudans (Britzelm.) Sacc. var. *chamaesalicis* Bon
5. Flesh not or only weakly reddening 6
- Flesh distinctly reddening, often strongly 7

6. Cap centre greyish green. Cap 30-80 mm, at first bell-shaped or obtusely conical with incurved margin, later low convex with a broad umbo, finely fibrillose to subtomentose, sometimes finely scaly, pale greyish or brownish greyish; gills pale yellowish brown; stem 30-90 x 5-12 mm, whitish, but in the lower part \pm darkening to greyish brown or with a green tinge. Sp 7.5-9.5 x 5-6 μm , amygdaloid (fig. 897D); hymenial cystidia 40-65 x 10-20 μm , cylindrical-clavate to subfusiform, walls up to 2 μm thick. Generally in deciduous forests e.g. with *Quercus*, *Fagus*, *Tilia* and *Corylus*, sometimes also with *Picea*, on calcareous soil; late summer to autumn; occasional in temp.-hemib., rare in bore.; DK (LC), NO (VU, AA: Arendal, Akh: Asker), SE (LC). – A&R 24, B&K 5:13, Bon 237, M&J 35, Stangl 8.2.


I. corydalina Quél.

- Cap centre dark brown. Cap 30-50 mm, at first convex with involute margin, later almost plane with or without an umbo, when young uniformly dark brown, soon breaking up in scales exposing the whitish background, especially at centre; gills pale brownish; stem at first whitish, later darkening. Sp 7.5-9.5 x 5-6 μm , amygdaloid (fig. 897E); hymenial cystidia 40-65 x 10-25 μm , cylindrical-clavate to subfusiform, walls up to 2 μm thick. With *Quercus* or *Fagus* on calcareous soil; late summer to autumn; rare in temp.-hemib. DK (LC), SE (NA). – Bres 726.2, C&D 1027, FAD 111G, Stangl 9.3.

I. erinaceomorpha Stangl & Veselský (*I. corydalina* Quél. var. *erinaceomorpha* (Stangl & Veselský) Kuyper, *I. scabra* (Fr.) P. Kumm. s. auct.)

7. Cap without white velipellis. Cap 20-50 mm, initially bell-shaped or obtusely conical with incurved margin, then convex with an umbo, fibrillose to finely scaly, dark vinaceous brown at centre, paler towards margin; gills pale grey; stem 30-50 x 3-10 mm, white at top, towards the base vinaceous red. Sp 7-11 x 5-7 μm , amygdaloid (fig. 897F); hymenial cystidia 40-60 x 12-16 μm , walls about 1 μm thick. In humid *Picea* forests on calcareous soil, in NO with *Dryas*, in central Europe also reported from deciduous forests; late summer to autumn; very rare in hemib.-suba.; NO (NE, M&R: Fræna), SE (VU, Vg, Jmt). – B&K 5:62, Bol Bres 27:27, FRIC 7:56c, Stangl 8.1.

I. tricolor Kühner

- Cap with a prominent white velipellis 8
8. Cap 30-55 mm. Cap bell-shaped with an involute or incurved margin when young, then convex to plane with or without an umbo, initially almost white because of a thick, silky velipellis, persisting at centre but with age gradually cracking and disappearing outwards, exposing the ochraceous brown background; gills grey brown; stem 40-80 x 4-10 mm, pale; reddening in damages, later brown. Sp 8-12 x 5.5-7.5 μm , amygdaloid (fig. 897G); hymenial cystidia 40-70 x 14-24 μm , walls up to 2.5 μm thick. In coniferous or mixed forests, also in subalpine *Betula* forests on calcareous soil; summer to autumn; occasional, but locally common in temp.-suba., rare in FI; DK (LC), FI (NT), NO (LC), SE (LC). – B&K 5:18, Bon 237, Bres 729, M&J 12, .
- I. fraudans* (Britzelm.) Sacc. var. *fraudans* (*I. pyriodora* (Pers.: Fr.) P. Kumm. s. auct. p.p.)

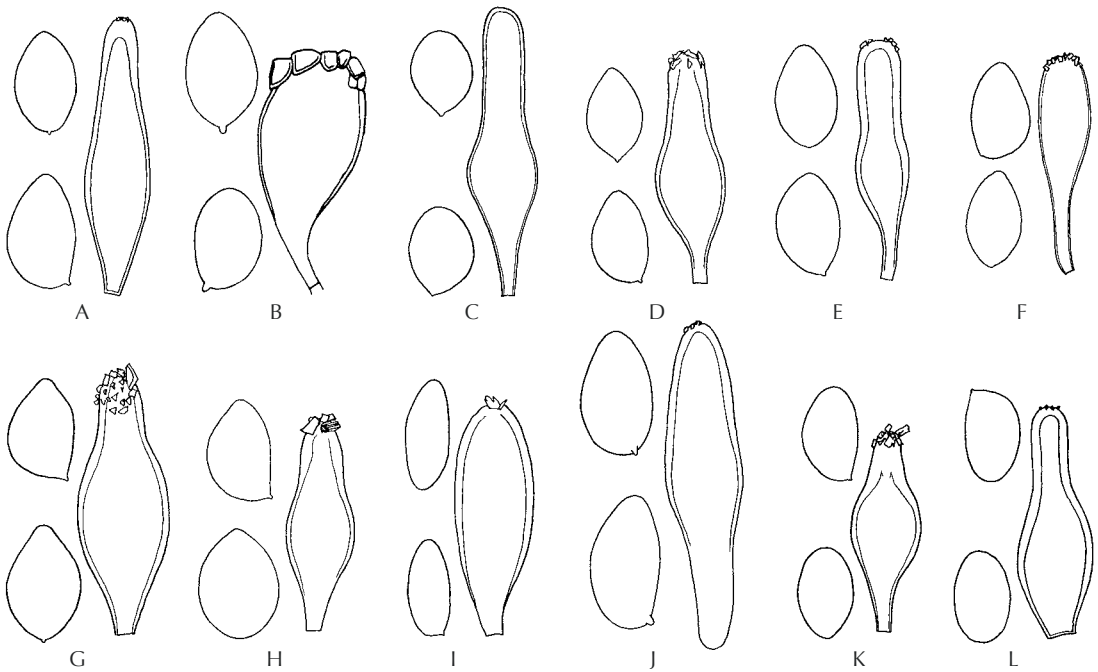
- Cap up to 100 mm. Cap bell-shaped with an involute or incurved margin when young, then convex to plane with an obtuse umbo, rather smooth, whitish-ochraceous; gills greyish brown; stem 60-100 x 6-15 mm; strongly reddening in damages; smell strong. Sp 8-12 x 5.5-7.5 μm , amygdaloid (fig. 897H); hymenial cystidia 40-70 x 14-24 μm , walls up to 2.5 μm thick. With deciduous trees on calcareous soil; summer to autumn; rare in temp.-hemib.; DK (DD), SE (NA). – Bon 237, Bres 728, FAD 110C, Phil 220b (as *fraudans*), Ves 333.

I. incarnata Bres. (*I. pyriodora* (Pers.: Fr.) P. Kumm. s. auct. p.p.)

Note: often considered to be a luxuriant form of *I. fraudans*, but molecular studies have shown that it is different.

Key I: Subgen. *Inocybe* sect. *Tardae* Bon

1. Cap white to pale ochraceous, alutaceous or violaceous 2
 - Cap yellow, ochraceous brown to brown 7



Spores and pleurocystidia: A: *Inocybe haemacta*, B: *I. mytiliodora*, C: *I. moelleri*, D: *I. corydalina*, E: *I. erinaceomorpha*, F: *I. tricolor*, G: *I. fraudans* var. *fraudans*, H: *I. incarnata*, I: *I. sambucina*, J: *I. queletii*, K: *I. whitei*, L: *I. geophylla*.

2. Frb rather robust and fleshy; stem 5-12 mm broad; cap 25-50 mm 3
 - Frb slender; stem 2-8 mm broad; cap 10-40 mm 4

3. Sp 7-10 x 3.5-5 μm , cylindrical, often slightly irregular (fig. 897I). Cap 30-80 mm, obtusely conical to convex, then plane with or without an umbo, finely fibrillose, whitish to pale ochraceous; gills pale isabella; stem 35-75 x 5-12 mm, pruinose to the median part. Sp Q = 2-2.3, pale; hymenial cystidia 45-70 x 12-23 μm , broadly fusiform to clavate, walls up to 2.5 μm thick, crystals sometimes absent. On nutrient-poor, acid and sandy soil in coniferous forests with *Pinus*, often along paths; summer to autumn; occasional in hemib.-bore., very rare in temp.; DK (EN), FI (LC), NO (LC), SE (LC). – Bol Bres 43:21, Bres 750, Däh 656, M&J 11, Stangl 10.1.

I. sambucina (Fr.: Fr.) Quél.

- Sp 8.5-13 x 5.5-7 μm , ovoid to subamygdaloid (fig. 897J). Cap 30-70 mm, obtusely conical or bell-shaped, finally plane, usually without an umbo, smooth at centre, outwards fibrillose, ochraceous to pale alutaceous, but whitish when young from a thick velipellis; gills initially whitish; stem 30-60 x 5-7 mm, pruinose at the top, whitish, straw-coloured with age. Hymenial cystidia 50-75 x 14-20 μm , fusiform to lageniform, walls up to 3 μm thick. In coniferous forests, especially with *Abies* on calcareous soil; early summer and autumn; rare in hemib.-bore.; FI (DD, V: Lohja, U: Hanko), NO (NE, Østf: Fredrikstad). – Däh 667, Stangl 20.1.

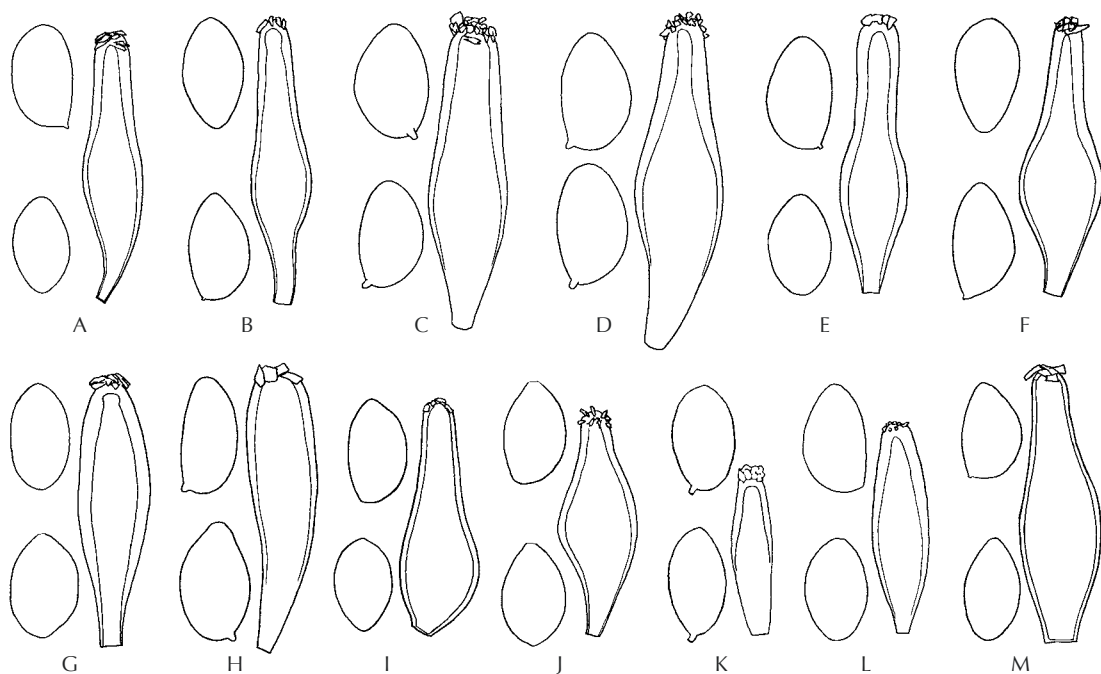
I. queletii Konrad

4. Frb with age staining red in patches, especially on the stem. Cap 10-40 mm, initially \pm conical with incurved margin, then low convex with a distinct, often acute umbo, silky-fibrillose, whitish; gills initially whitish or pale clay-coloured; stem 30-80 x 2-8 mm, equal, white; smell spermatic. Sp 8-9.5 x 4.5-5.5 μm , ellipsoid-ovoid (fig. 897K); hymenial cystidia 40-65 x 12-22 μm , broadly lageniform to subutriform, walls up to 2.5 μm thick. Mostly in deciduous

forests, also on nutrient-rich and moist soil in *Picea* forests; summer to autumn; common in temp., occasional in hemib.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – Bon 237, FAD 112H, R&H 475, Stangl 11/3, Ves 324, ☉.

I. whitei (Berk. & Broome) Sacc. (*I. pudica* Kühner, *I. armeniaca* Huijsman, *I. geophylla* (Fr.: Fr.) P. Kumm. var. *lateritia* (Berk. & Broome) W.G. Sm.)

- Frb not staining red 5
- 5. Sp amygdaloid; hymenial cystidia slenderly fusiform; cap often becoming scaly see *I. sindonia* key G 3
- Sp ellipsoid-ovoid; hymenial cystidia subutriform-lageniform; cap silky smooth 6
- 6. Cap white, but may become ochraceous or brownish with age, especially at centre. Cap 10-35 mm, at first bell-shaped or conical, finally almost plane with a low, obtuse umbo or distinct papilla, silky smooth to finely fibrillose and shiny; gills rather crowded, pale greyish brown; stem 15-50 x 2-5 mm, whitish; smell spermatic. Sp 7.5-10.5 x 4.5-6.5 μm , ellipsoid-ovoid (fig. 897L); hymenial cystidia 45-70 x 10-20 μm , lageniform-subutriform, walls up to 2.5 μm thick. In deciduous and coniferous forests and parks, on nutrient-rich soil, often in lawns or at roadsides; summer to autumn; very common in temp.-hemib., common in bore., occasional in suba., rare in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC, incl. SvB), SE (LC). – B&K 5:21, Bon 241, Däh 654, Phil 221d, R&H 474.
- I. geophylla* (Fr.: Fr.) P. Kumm.
- Cap \pm violaceous, but umbo often yellowish, rarely entirely yellowish. Cap 10-35 mm, bell-shaped to \pm conical, then convex with an umbo or acute papilla, silky smooth; gills at first violaceous, but soon greyish brown; stem 20-40 x 2-5 mm, violaceous when young. Sp 7.5-10.5 x 4.5-6.5 μm , ovoid (fig. 899A); hymenial cystidia 40-70 x 10-22 μm , lageniform-subutriform, walls up to 2.5 μm thick. In deciduous or sometimes coniferous forests on calcareous soil; summer to autumn; common in temp.-suba., often abundant in calcareous areas, but absent on acid soil; DK (LC), FI (LC), NO, SE. – B&K 5:22, Bon 241, Däh 655, Phil 221e, R&H 474, ☉.
- I. lilacina* (Peck) Kauffman (*I. geophylla* (Fr.: Fr.) P. Kumm. var. *lilacina* (Peck) Gillet)
- 7. Stem violaceous to greyish violaceous in the upper third. Cap 10-35 mm, obtusely conical, then plane, often with an umbo, smooth at centre, towards margin fibrillose or rimulose, dark brown at centre, but paler towards margin; gills at first with a violaceous tinge; stem 20-50 x 3-6 mm, whitish downwards. Sp 8-11 x 4.5-6 μm , subamygdaloid (fig. 899B); hymenial cystidia 45-75 x 12-22 μm , lageniform, walls up to 2 μm thick, mostly hyaline. With deciduous trees in forests and parks on better soil; summer to autumn; occasional in temp.-hemib.; DK (LC), FI (DD, EH: Tammela), NO (NE), SE (LC). – B&K 5:47, C&D 1035, FAD 112A, Stangl 39.1.
- I. pusio* P. Karst.
- Stem not violaceous 8
- 8. Stem slowly becoming blue green from base upwards, otherwise white. Cap 10-40 mm, conical to low convex, fibrillose, sordid buff to ochraceous brown; gills pale grey brown; stem 25-50 x 3-7 mm. Sp 8-10 x 4-5.5 μm , amygdaloid (fig. 899C); hymenial cystidia 40-70 x 13-24 μm , broadly fusiform-subutriform. On sandy soil, in dunes etc. on calcareous soil with deciduous trees, e.g. *Populus* and *Salix*; summer to autumn; very rare in hemib.; FI (RE, V: Lohja). – C&D 1030.
- I. aeruginascens* Babos (*I. pseudohaemacta* Bon & Courtec.)
- Note: contains psilocybin.
- Stem not becoming blue green 9
- 9. Stem a with pink tinge, especially in the upper part 10
- Stem without a pink tinge 12



Spores and pleurocystidia: A: *Inocybe lilacina*, B: *I. pusio*, C: *I. aeruginascens*, D: *I. involuta*, E: *I. tarda*, F: *I. nitidiuscula*, G: *I. luteipes*, H: *I. rupestris*, I: *I. posterula*, J: *I. subporospora*, K: *I. cryptocystis*, L: *I. auricoma*, M: *I. fuscidula*.

10. Cap with involute margin. Cap 20-40 mm, ± conical to convex, almost smooth at centre and rimulose towards margin, brownish with pale centre; stem 30-50 × 4-7 mm, whitish with a pink top. Sp 10-12.5 × 6-7.5 μm, amygdaloid (fig. 899D); hymenial cystidia 60-80 × 15-25(-30) μm, lageniform-subutriform. In coniferous forests on rich soil; very rare in temp.; NO (NE, Østf: Fredrikstad, Vestf: Larvik).

I. involuta Kuyper

- Cap not with involute margin

11

11. With broadleaved trees in parks and deciduous forests on sandy soil; hymenial cystidia distinctly yellow in KOH. Cap 20-50 mm, obtusely conical to plane, fibrillose, yellowish to chestnut brown; gills initially whitish; stem 30-50 × 3-7 mm, with a pinkish brown tinge in the upper part. Sp 8-11 × 5-6 μm, amygdaloid (fig. 899E); hymenial cystidia 55-75 × 14-20 μm, walls up to 2.5 μm thick. Autumn; rare or overlooked in temp.-hemib.; SE. – Bon 241, C&D 1048, ZP 37: pl. 5.

I. tarda Kühner s. Stangl

Note: distribution and frequency poorly known as many authors have included it in *I. nitidiuscula*.

- With coniferous trees, especially *Picea*, on calcareous soil, often in humid habitats, rarely with deciduous trees; hymenial cystidia hyaline or weakly yellow in KOH. Cap 10-40 mm, obtusely conical to almost plane with age, mostly umbonate, fibrillose, not rimose, chestnut brown; gills initially whitish; stem 25-70 × 2-5 mm. Sp 9-12 × 5-6.5 μm, amygdaloid (fig. 899F); hymenial cystidia 50-85 × 12-22 μm, fusiform-lageniform, walls up to 2.5 μm thick. Summer to autumn; common in temp.-suba., in FI not found in suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – Bon 241, Cet 975, Däh 663, Stangl 14.2, Ves 332.

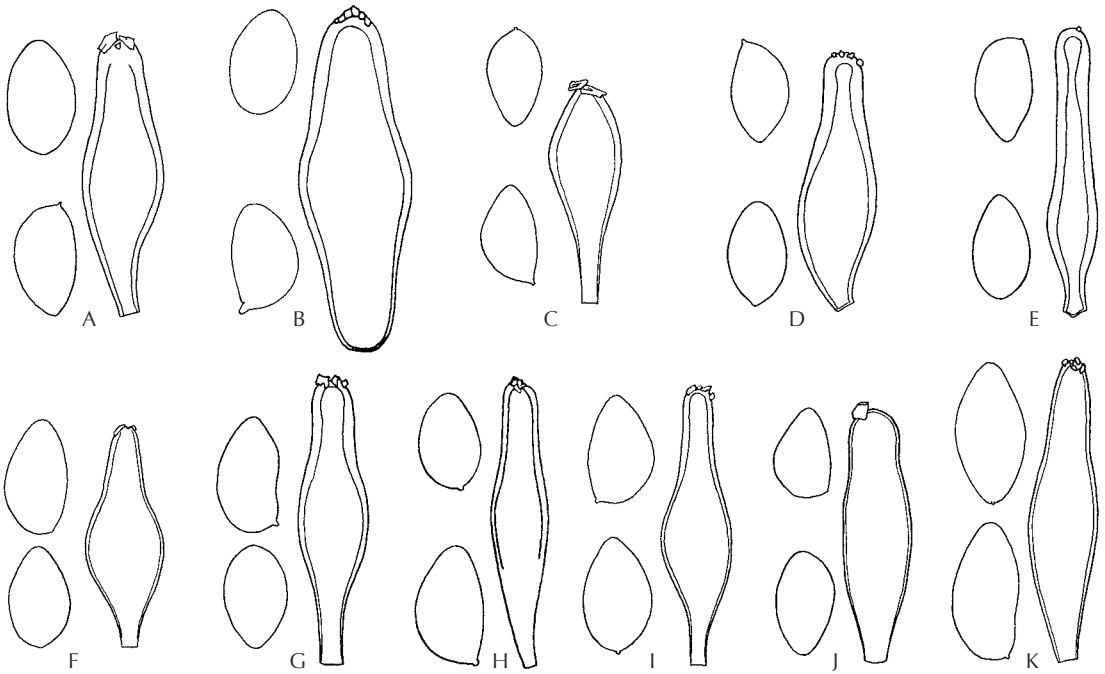
I. nitidiuscula (Britzelm.) Sacc. (*I. friesii* R. Heim)

12. In arc./alp. habitats; cap \leq 20 mm 13
 - Not in arc./alp. habitats; cap mostly $>$ 20 mm 14
13. Stem bright ochraceous yellow to yellowish brown. Cap 10-20 mm, convex without an umbo, coarsely fibrillose, at margin rimulose, dark greyish brown; stem 20-40 x 3-5 mm, pruinose at the top. Sp 8.5-9.5 x 6-6.5 μ m, ellipsoid, sometimes with an indistinct germ-pore (fig. 899G); hymenial cystidia 70-80 x 12-17 μ m, walls up to 3 μ m thick, yellow, numerous. Associated with *Dryas* or *Salix* on calcareous soil; late summer; rare in arc./alp.; NO (NE, Hord: Ulvik), SE (LC). – Fav 55:8.13.
I. luteipes J. Favre
 - Stem brown, but paler than the cap. Cap 10-15 mm, obtusely conical or bell-shaped with a large umbo, minutely scaly, chestnut brown; gills grey brown; stem 10-20 x 2-3 mm. Sp 9-11 x 5-6 μ m, amygdaloid (fig. 899H); hymenial cystidia 45-65 x 10-16 μ m, cylindrical or \pm flexuose, walls up to 3 μ m thick, yellow. On calcareous soil with dwarf *Salix* and *Dryas*; late summer; rare in arc./alp.; FI (DD, EnL: Kilpisjärvi).
I. rupestris J. Favre
14. Cap silky smooth like in *I. geophylla*. Cap 30-50 mm, at first obtusely conical with incurved margin, then almost plane with or without an umbo, yellow to orange brown at centre, gradually paler towards the almost white margin; gills pale yellowish grey; stem 20-75 x 3-8 mm, white, densely pruinose at the top, sometimes appearing sticky. Sp 7.5-9 x 4.5-6 μ m, ovoid-ellipsoid (fig. 899I); hymenial cystidia 45-60 x 12-20 μ m, lageniform, walls up to 2.5 μ m thick. In coniferous or mixed forests, often with *Pinus* on calcareous soil; summer to autumn; occasional, but locally abundant in temp.-bore.; DK (DD), FI (LC), NO (NE), SE (LC). – B&K 5:45, Däh 665, Jordst 10(2), Stangl 19.2.
I. posterula (Britzelm.) Sacc. (*I. xanthodisca* Kühner)
 - Cap not silky smooth 15
15. Sp with a small germ-pore (immersion, fig. 899J). Cap 9-36 mm, convex to plane, fibrillose-tomentose, later breaking up to become finely scaly, dark red brown or brown; stem red brown, but at first covered with white fibrils, pruinose in the upper part. Sp 8.5-10 x 5.5-6 μ m, ovoid to subamygdaloid with obtuse apex; hymenial cystidia 45-60 x 14-20 μ m, broadly fusiform to subutriform, walls up to 2 μ m thick. Generally with conifers or *Salix* in sandy habitats, e.g. in sand dunes, at roadsides, etc.; autumn; rare in temp.-southern bore., rare in middle-northern bore.; DK (DD), NO (NE, Øst: Fredrikstad, Troms: Tromsø), SE (LC).
I. subporospora Kuyper
 - Sp without germ-pore 16
16. Cap 10-30 mm, ochraceous yellow 17
 - Cap 10-60 mm, not predominantly yellow 18
17. Hymenial cystidia 25-45 x 8-14 μ m, walls up to 1.5 μ m thick (fig. 899K). Cap 15-30 mm, \pm conical to convex, generally without an umbo, radially fibrillose, but not rimulose; gills with a slight greyish tinge; stem 20-40 x 3-5 mm, often with bulbous base, whitish to pale yellow with age. Sp 7.5-9 x 4-5.5 μ m, amygdaloid. With deciduous trees, exceptionally with *Picea* on nutrient-rich soil; summer; rare in temp.-hemib., very rare in southern bore.; DK (EN, EJyl: Kolding, Lisbjerg Skov), FI (VU), NO (Østf.: Fredrikstad), SE (LC). – M&J 38, Stangl 19.3.
I. cryptocystis D.E. Stuntz (*I. mystica* Stangl & Glowinski)
 - Hymenial cystidia 40-60 x 12-20 μ m, walls up to 3 μ m thick (fig. 899L). Cap 10-25 mm, initially conical, subtomentose to finely scaly, pale cream to yellow; stem 15-40 x 2-3 mm, at first white, then ochraceous. Sp 8-9.5 x 4.5-5.5 μ m, amygdaloid. With deciduous trees on nutrient-rich soil in parks, etc.; rare in temp.-suba.; DK (EN), FI (DD, A: Finström), NO (NE), SE (LC). – A&R 58:2, C&D 1060, FAD 113B, M&J 15, Stangl 10/3.
I. auricoma (Batsch) J.E. Lange

18. Cap distinctly rimulose 19
 - Cap tomentose to finely scaly 21
19. Basidia 2-spored. Sp 10-14 x 5-6.5 μm , amygdaloid with conical apex. In other characters like the main variety. With *Quercus*, *Fagus* or other deciduous trees on nutrient-rich soil; summer to autumn; occasional in temp.-hemib., very rare in FI; DK, FI (DD, V: Turku), SE. – Bres 735, FND 34-36:388.
I. fuscidula Velen. var. *bisporigera* Kuyper
 - Basidia 4-spored 20
20. Cap ochraceous to greyish brown without a reddish tinge, dark brown at centre, dull. Cap 15-45 mm, \pm conical to plane with an umbo, radially fibrillose to rimose; gills for long remaining whitish; stem 25-70 x 3-7 mm, initially white, then slightly yellowish or greyish. Sp 8-10.5 x 5-6 μm , subamygdaloid, often with a rather obtuse apex (fig. 899M); hymenial cystidia 45-80 x 12-20 μm , fusiform, walls up to 2 μm thick, mostly hyaline. In deciduous forests and parks, also in coniferous forests on not too poor soil; summer to autumn; very common in temp., common in hemib.-suba., but occasional in FI; DK (LC), FI (LC), FO, NO (NE), SE (LC). – Bon 241, Däh 664, FAD 113A, Stangl 17.1, Ves 333.
I. fuscidula Velen. var. *fuscidula* (*I. descissa* (Fr.) Quél. var. *brunneoatra* R. Heim, *I. virgatula* Kühner)
 - Cap chestnut brown at centre, outwards slightly paler, shiny. Cap 15-60 mm, conical to plane with an umbo, radially fibrillose-rimose; gills initially with an ochraceous tinge; stem 30-65 x 3-8 mm, initially white, but then pale yellow or brownish. Sp 8.5-11 x 5-6 μm , subamygdaloid (fig. 903A); hymenial cystidia 50-70 x 14-22 μm , fusiform, walls up to 2 μm thick, mostly hyaline. With deciduous or coniferous trees; summer to autumn; rare in temp.-middle bore.; DK (DD), FI (LC), NO (NE, Østf: Sarpsborg), SE (NE). – Stangl 14.1.
I. pseudodistricta Stangl & Veselský
21. Hymenial cystidia extremely thick-walled, in neck up to 5 μm thick, with a rounded base (fig. 903B). Cap 10-35 mm, tomentose, with age finely scaly, pale to brownish yellow at centre, brown towards margin; stem 10-50 x 3-5 mm, young pale yellowish, staining brown with age; smell spermatic. Sp 8.5-10 x 5.5-6 μm , amygdaloid; hymenial cystidia 40-80 x 15-30 μm . In mixed forests with *Pinus* and *Picea*, often on sandy soil, calciphilous; late summer to autumn; rare in bore.; FI (NT), NO (NE, Busk: Kongsberg). – Kar 27:19.
I. urceolicystis Stangl & Vauras
 - Hymenial cystidia with less than 2.5 μm thick walls, not with rounded base 22
22. Hymenial cystidia clavate (fig. 903C). Cap 15-40 mm, at first obtusely conical with incurved margin, then low convex with an umbo, tomentose, at first pale ochraceous brown, soon breaking up into dark patches on a pale background; stem 25-40 x 3-5 mm, at first pale, but darkening to greyish brown. Sp 7-10 x 4.5-5 μm , amygdaloid; hymenial cystidia 35-50 x 14-20 μm , walls up to 2.5 μm thick. In deciduous forests (*Quercus*) on calcareous soil; summer to autumn; rare in temp.-hemib.; SE (LC). – Stangl 12.5.
I. brunneotomentosa Huijsman
 - Hymenial cystidia lageniform to subfusiform (fig. 903D). Cap 10-60 mm, obtusely conical with incurved margin when young, soon plane with or without an umbo, fibrillose-finely scaly, not rimulose, often becoming recurved scaly with age, pale brown or ochraceous brown; gills initially whitish or pale ochraceous, rarely lemon yellow to saffran yellow; stem 15-75 x 2-8 mm, white, then staining pale brownish. Sp 8-11 x 4.5-6 μm , amygdaloid; hymenial cystidia 50-80 x 12-20 μm , walls up to 2.5 μm thick, often slightly yellow. With deciduous and coniferous trees in forests and parks, at roadsides, etc.; summer to autumn; very common in temp., common in hemib.-suba., occasional in arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – Däh 666, FAD 111C, 112D, 113D, Phil 223gh, Stangl 18.1, Ves 330.
I. flocculosa (Berk.) Sacc. (*I. gausapata* Kühner, *I. deglubens* (Fr.) Gillet s. J.E. Lange)

Key J: Subgen. *Inocybe* sect. *Fibrillosae* Heim

1. Sp cylindrical (fig. 879A) see *I. lacera* key C 2
 - Sp ± amygdaloid 2
2. Stem with a violaceous or pinkish-violaceous tinge 3
 - Stem without a violaceous tinge 7
3. Stem with scattered dark scales of veil 4
 - Stem without dark scales 5
4. Frb slender; cap 10-30 mm; stem 20-50 x 2-4 mm. Cap initially convex with incurved margin, then plane and not or only indistinctly umbonate, flocculose, breaking up in scales, at least at the centre, grey brown; gills greyish yellow to greyish brown, when young with weak violaceous tinge; stem generally lilac, mainly at the top, but this tinge may be very faint or sometimes completely absent; smell indistinct. Sp 8-11 x 5-6 µm, amygdaloid (fig. 903E); hymenial cystidia 60-95 x 12-20(-25) µm, walls about 2 µm thick, yellow in KOH; gill edge with numerous clavate, rather thick-walled and brownish parahymenial cystidia. In deciduous and coniferous forests on nutrient-rich soil; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – Bon 239, FAD 111H, Phil 221h, R&H 477, Ves 326.
I. cincinnata (Fr.: Fr.) Quél. var. *cincinnata* (*I. phaeocomis* (Pers.) Kuyper var. *phaeocomis*)
 - Frb more robust; cap 20-50 mm; stem 25-70 x 3-9 mm. In other characters like the main variety. In deciduous or sometimes coniferous forests, preferably on calcareous soil; summer to autumn; occasional in temp.-hemib.; DK, FI (LC), NO (Østf.: Fredrikstad), SE. – Cet 973, FAD 111A (as *obscura*), Stangl 13/1.
I. cincinnata (Fr.: Fr.) Quél. var. *major* (S. Petersen) Kuyper (*I. obscura* (Pers.) Gillet, *I. phaeocomis* (Pers.) Kuyper var. *major* (S. Petersen) Kuyper)
5. Cap pale alutaceous with a whitish margin, almost smooth. Cap 13-20 mm, obtusely conical when young, becoming low convex with a prominent umbo; gills initially with a faint lilac tinge; stem 30-45 x 2-3 mm, white-fibrillose, whitish over the greater part, but pinkish lilac near the top. Sp 8.5-11 x 5.5-6 µm, subamygdaloid (fig. 903F); hymenial cystidia 40-70 x 12-18 µm, fusiform-utriform, walls about 1 µm thick. In deciduous forests with *Corylus*; summer to autumn; rare in temp., but may be overlooked being similar to a small *I. geophylla*. DK (vu), NO (Østf: Sarpsborg). – Svp 20:97.
I. huijsmanii Kuyper
 - Cap brownish and soon distinctly scaly 6
6. Cap greyish brown; stem violaceous for the greater part. Cap 10-35 mm, obtusely conical to plane, not or indistinctly umbonate, at first coarsely fibrillose, later finely to recurved scaly, brown or greyish brown at centre, pale grey towards margin; gills pale grey brown; stem 15-60 x 2-6 mm, with whitish fibrils, not pruinose. Sp 8-11 x 5-6 µm, ovoid to subamygdaloid (fig. 903G); hymenial cystidia 50-75 x 12-18 µm, sublageniform to utriform, walls about 2 µm thick. In deciduous forests, usually with *Fagus* or *Corylus*, on calcareous soil; summer to autumn, occasional in temp., rare in hemib.; DK (LC), NO (vu), SE (LC). – Bon 239, FAD 111F, Phil 221c, R&H 476, Ves 326.
I. griseoilacina J.E. Lange
 - Cap reddish brown; stem generally violaceous in upper part only, sometimes faintly or not violaceous. Cap 10-40 mm, convex to almost plane with or without a low umbo, when young almost smooth, then woolly-scaly to minutely appressed scaly; gills pale isabella, sometimes with a pale violaceous tinge; stem 20-45 x 2-5 mm, at top pruinose over a narrow zone, downwards smooth or white fibrillose. Sp 8-11 x 5-6 µm, amygdaloid (fig. 903H); hymenial cystidia 50-80 x 13-20 µm, lageniform-subcylindrical, walls about 2 µm thick. In deciduous and coniferous forests on calcareous, sandy soil; spring to autumn; rare or overlooked in temp.-hemib., very rare in suba.; DK (LC), FO, NO (NE, Østf.: Fredrikstad), SE.



Spores and pleurocystidia: A: *Inocybe pseudodestructa*, B: *I. urceolicystis*, C: *I. brunneotomentosa*, D: *I. flocculosa*, E: *I. cincinnata* var. *cincinnata*, F: *I. huijsmanii*, G: *I. griseolilacina*, H: *I. amethystina*, I: *I. hystrix*, J: *I. squarrosa*, K: *I. griseoscabrosa*.

– BCat 1021, B&K 5:3, Stangl 12.6.

I. amethystina Kuyper

- | | | |
|----|---|----------------------------|
| 7. | Cap with ± erect scales | 8 |
| - | Cap without erect scales | 11 |
| 8. | Hymenial cystidia predominantly cylindrical with yellow walls | see <i>I. cincinnata</i> 4 |
| - | Hymenial cystidia predominantly lageniform or utriform, walls normally not yellow | 9 |

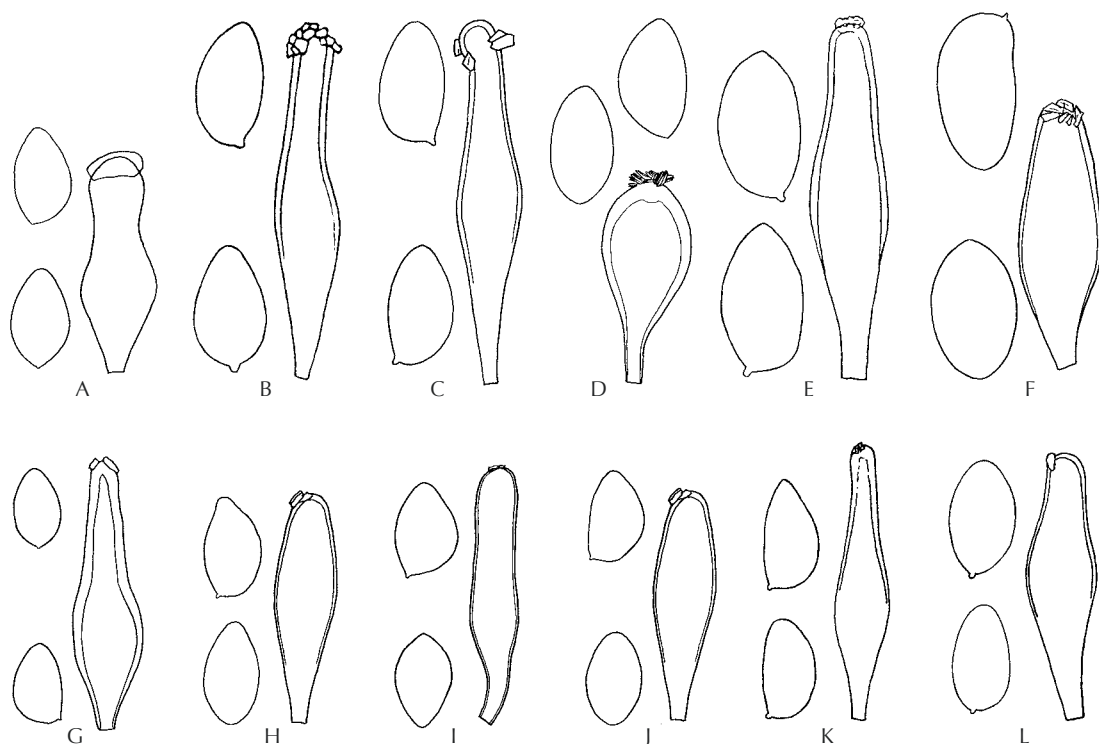
9. Cap without arachnoid velipellis. Cap 15-40 mm, convex to plane, with or without an umbo, with brown scales on a pale brownish background, scales erect and pointed, especially around centre; gills initially whitish; stem 20-60 × 3-5 mm, recurved scaly and brown like the cap. Sp 8-12 × 5-7 μm, amygdaloid (fig. 903I); hymenial cystidia 60-90 × 10-22 μm, lageniform, walls up to 2 μm thick. In deciduous forests with *Quercus*, *Fagus* and *Corylus* on better soil, also in grass-herb *Picea* forests; summer to autumn; occasional in hemib., rare in FI and temp.; DK (VU), FI (NT), NO (LC), SE (LC). – B&K 5:29, Bon 239, M&J 1, Phil 222b, Stangl 7.4, ☉.

I. hystrix (Fr.) P. Karst.

- | | | |
|---|--|----|
| - | Cap initially covered with a whitish, arachnoid velipellis | 10 |
|---|--|----|
10. Cap yellowish brown. Cap 5-20 mm, convex, then plane without an umbo, recurved scaly with a whitish, arachnoid pileipellis; gills brownish; stem 15-45 × 1-3 mm, with similar colour and covering as the cap. Sp 8-10 × 4.5-5.5 μm, amygdaloid (fig. 903J); hymenial cystidia 45-75 × 14-22 μm, utriform, walls about 0.5 μm thick. With *Salix* and *Alnus* in marshy habitats, at brooksides, in moist depressions, etc.; summer to autumn; rare, but locally occasional in temp.-arc./alp.; DK (DD, EJyl: Randers), FI (LC), NO (NE, Troms: Storfjord), SE (LC). – Bon 239, C&D 1033, FND 34-36:357, Stangl 10.2.

I. squarrosa Rea

- Cap pale isabella with a yellow tinge at centre. Cap 10-30 mm, convex to low convex without an umbo, recurved scaly with a whitish, arachnoid velipellis; gills greyish isabella; stem 40-60 x 3-4 mm, brownish, but conspicuously white fibrillose or white scaly, not pruinose. Sp 10-12 x 5.5-6.5 μm , amygdaloid (fig. 903K); hymenial cystidia 50-80 x 15-18 μm , walls about 1 μm thick, hyaline. On nutrient-rich soil with *Picea* or deciduous trees; summer to autumn; rare in bore.-suba.; SE (LC).
I. griseoscabrosa (Peck) Earle
- 11. Hymenial cystidia with simple walls (fig. 905A). Cap 10-40 mm, obtusely conical to almost plane, indistinctly umbonate, fibrillose-scaly, brown with an ochraceous or beige tinge; gills yellowish-brownish with a fimbriate, whitish edge; stem 20-50 x 2-5 mm, equal, whitish to ochraceous, sometimes slightly pink at the top, not pruinose. Sp 8-10 x 4.5-6 μm , amygdaloid; hymenial cystidia 40-65 x 12-18 μm , subutriform, not crystalliferous, but sometimes with resinous exudates. In humid, calcareous habitats with *Picea*, *Betula*, etc.; summer to autumn; rare in bore.-arc./alp., very rare in hemib., but possibly overlooked; FI (LC), NO (NE, Hord: Bergen), SE (LC). – Däh 671, Fav 60:2.8 (as *hygrophila*), M&J 43, RdM 42:313, Sieniop 236.
I. leptocystis G.F. Atk. (*I. hygrophila* J. Favre)
Note: *I. hygrophila* J. Favre var. *pseudohygrophila* described provisorily by Delannoy & Eyssartier occurs on calcareous soil with *Dryas* or dwarf *Salix*; late summer; rare in Arc./alp.; NO (Svb), SE. – FND 32:47.
- Hymenial cystidia \pm thick-walled with double walls (figs 905B-L) 12
- 12. In arc./alp. habitats 13
- Not in arc./alp. habitats 15
- 13. Stem yellow upwards. Cap 10-20 mm, convex-plane, weakly umbonate, rimose, yellowish brown; gills at first yellow; stem 15-30 x 2-3 mm. Sp 10-12 x 5.5-7 μm , amygdaloid (fig. 905B); hymenial cystidia 60-90 x 10-20 μm , slenderly fusiform, walls up to 3 μm thick, yellow. With dwarf *Salix* or *Dryas*; late summer; rare in arc./alp.; NO (NE). – FND 34-36:379, Fav 55:7.1.
I. hypotheja Kühner (*I. lutescens* Velen. s. Kühner 1955, *I. lucifuga* (Fr.: Fr.) P. Kumm. var. *lutescens* (Velen.) J. Favre s. Favre)
- Stem base whitish to ochraceous brown, not yellow 14
- 14. Sp 9-11.5(-13) x 5-6.5 μm (fig. 905C). Cap up to 24 mm, convex, indistinctly umbonate, fibrillose, uniformly ochraceous brown; gills at first whitish; stem 20-32 x 3-5 mm, weakly pruinose at extreme top. Sp subamygdaloid; hymenial cystidia 60-84 x 12-15 μm , walls up to 2 μm thick. With *Dryas*; late summer; rare in arc./alp.; NO (NE, ST: Melhus). – BCat 770, Fav 55:7.3, RdM 40:349.
I. monochroa J. Favre
- Sp 10.5-13 x 6-7 μm (fig. 905F) see *I. abjecta* 17
- 15. Cap margin initially strongly involute and appendiculate-dentate from a thick veil. Cap 15-40 mm, initially bell-shaped, then convex with a broad umbo, silky-smooth when young, later fibrillose to finely scaly, when young whitish to pale yellowish buff, with age ochraceous brown; gills whitish to pale grey brown; stem 20-80 x 2-8 mm, at first whitish, staining ochraceous brown; smell when young spermatic, with age disagreeable like rotten meat. Sp 9-11 x 5-6 μm , amygdaloid (fig. 905D); hymenial cystidia 35-65 x 12-22 μm , clavate to almost pyriform, walls up to 2 μm thick. In coniferous forests on rich soil, sometimes with deciduous trees; summer to autumn; rare in temp.-suba.; FI (NT), SE (LC). – A&R 62:1, B&K 5:4, FRIC 7:56b, Jordst 13(1), Stangl 10.4.
I. appendiculata Kühner
- Cap margin not appendiculate-dentate, usually incurved, sometimes involute 16
- 16. Sp on av > 11 μm long 17
- Sp on av < 11 μm long 18



Spores and pleurocystidia: A: *Inocybe leptocystis*, B: *I. hypothēja*, C: *I. monochroa*, D: *I. appendiculata*, E: *I. exilis*, F: *I. abjecta*, G: *I. microspora*, H: *I. phaeodisca*, I: *I. obscuroidia*, J: *I. melanopus*, K: *I. subnudipes*, L: *I. albovelutipes*.

17. Sp 12-14.5 x 6.5-8.5 μm (fig. 905E). Cap 4-14 mm, convex, not or indistinctly umbonate, rather coarsely fibrillose, when young with a white arachnoid velipellis, dark brown with a reddish tinge; gills reddish brown with white, flocculose edge; stem 15-45 x 1-3 mm, yellowish brown to reddish brown, dark at the base. Hymenial cystidia 50-70 x 15-22 μm , fusiform to subutriform, walls up to 2 μm thick, yellow in KOH. With deciduous trees and *Salix repens* in sandy places; autumn; very rare in temp.; DK (DD). – Svp 36:29.

I. exilis (Kuyper) Jacobsson & E. Larss., see p. 913 (*I. rufuloides* Bon var. *exilis* Kuyper)

- Sp 10.5-13 x 6-7 μm (fig. 905F). Cap 10-25 mm, at first obtusely conical, then plane with a low umbo, finely fibrillose-finely scaly, brown, dark at the centre, paler outwards when dry and with age, when young with a thin greyish velipellis; stem 30-45 x 2-4 mm, slightly pruinose at top, pale brownish; smell slightly spermatic. Sp subamygdaloid; hymenial cystidia 50-80 x 13-20 μm , walls about 1 μm thick. With coniferous trees and in alpine zone with *Salix* and *Dryas*; summer to autumn; rare in hemib.-arc. / alp.; FI (CR, EH: Tammela, PS: Kuopio), IS, NO (NE), SE (LC). – Stangl 14.4.

I. abjecta P. Karst.

18. Sp 6.5-8 x 4-5 μm (fig. 905G). Cap 10-30 mm, convex, finally plane, only indistinctly umbonate, fibrillose to rimulose, sometimes minutely scaly at the centre, ochraceous brown; gills ochraceous brown; stem 20-40 x 2-4 mm, pruinose in a few mm broad zone at top, pale yellowish to brownish, sometimes with a pink tinge; smell spermatic. Sp subamygdaloid; hymenial cystidia 40-65 x 10-16 μm , subfusiform, walls up to 2 μm thick. In deciduous and mixed forests; summer to autumn; common in temp.-hemib., occasional in bore.; DK (LC), FI

(LC), NO (NE), SE (LC). – Bon 238, BSMF 121:133, FAD 113C, M&J 35, Stangl 16.2.

I. microspora J.E. Lange (*I. glabripes* Ricken s. Kuyper)

- Sp > 8 μm long 19
- 19. Cap dark brown, at least at centre 20
- Cap rather pale, yellowish to greyish 21
- 20. Cap centre brown, contrasting the pale buff outer half; hymenial cystidia lageniform-subfusiform, walls up to 2 μm thick. Cap 10-35 mm, bell-shaped to low convex, usually with an umbo, at centre silky smooth, outwards fibrillose-rimulose; stem 25-55 x 3-5 mm, pinkish buff and not pruinose at top, downwards whitish. Sp 8-11 x 4.5-5.5 μm , amygdaloid (fig. 905H); hymenial cystidia 50-75 x 15-25 μm , hyaline. With deciduous trees or in humid *Picea* forests; summer to autumn; rare in temp.-bore., with southern distribution in FI; DK (LC), FI (DD), NO (NE), SE (LC). – A&R 72, Bon 239, Bres 743, Stangl 15.1, Svp 36:29.
I. phaeodisca Kühner (incl. var. *geophylloides* Kühner)
- Cap more uniformly brown; hymenial cystidia mostly with cylindrical and often somewhat flexuose necks, walls up to 1.5 μm thick. Cap 10-35 mm, convex to plane with an umbo, fibrillose, dark brown or with age paler with an ochraceous tinge; stem 25-110 x 2-5 mm, equal, brownish, often with a reddish tinge in the upper part. Sp 8-11 x 4.5-6.5 μm , amygdaloid (fig. 905I); hymenial cystidia 50-85 x 10-20 μm . Mostly with coniferous trees on calcareous soil, sometimes with deciduous trees; summer to autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (DD), NO (NE, Busk: Hole), SE (LC). – A&R 71:2 (as *leptocystis*), B&K 5:40, Fav 55.7, Stangl 16.3.
I. obscuroidia (J. Favre) Grund & D.E. Stuntz (*I. tenuicystidiata* E. Horak & Stangl)
- 21. Stem soon staining greyish brown, especially in the lower part. Cap 30-60 mm, convex, then plane with a low, broad umbo, tomentose to finely scaly, pale ochraceous or pale brownish yellow; gills grey brown, stem 30-60 x 4-10 mm. Sp 8-10 x 4.5-6 μm , subamygdaloid (fig. 905J); hymenial cystidia 45-65 x 10-22 μm , broadly cylindrical with an obtuse apex, often subcapitate, walls 0.5-1 μm thick, crystals few or absent. Mostly with *Pinus*, sometimes with deciduous trees, on calcareous soil; summer to autumn; occasional in temp.-arc. / alp.; DK (LC), FI (LC), NO, SE (LC). – M&J 43, RdM 42:312, Stangl 12.3, Svp 20:97, 30:24, Ves 327.
I. melanopus D.E. Stuntz (*I. submaculipes* J. Favre, *I. terrifera* Kühner, *I. mammifera* M.M. Moser)
- Stem not staining greyish brown 22
- 22. Hymenial cystidia lageniform (fig. 905K), walls up to 2.5 μm thick. Cap 20-40(-50) mm, convex to plane with an obtuse umbo, fibrillose-floccose, often breaking up with age, at first with involute margin, yellowish grey, but umbo often brownish; gills clay-coloured; stem 25-50 x 2-5 mm, white to pale yellow brown, only at top slightly pruinose. Sp 7.5-9.5 x 4.5-5.5 μm , amygdaloid; hymenial cystidia 50-70 x 10-14 μm , abundant, yellow in KOH. Preferably on calcareous soil along forest roads, frequently with conifers, especially *Pinus*; summer to autumn; occasional in hemib.-bore., very rare in suba.; FI (LC), IS (Su: Knarrarós), SE (LC).
I. subnudipes Kühner
- Hymenial cystidia almost clavate to subutriform (fig. 905L), walls 0.5-1 μm thick. Cap 30-50 mm, convex to almost plane with a low broad umbo, woolly-tomentose, pale yellowish buff, when old ochraceous brown; gills grey brown; stem 40-50 x 5-9 mm, whitish when young, then pale yellow brown, sometimes with a pinkish tinge near the top. Sp 8-10 x 4.5-6 μm , amygdaloid; hymenial cystidia 40-70 x 10-20 μm . With deciduous and coniferous trees on sandy soil; summer to autumn; very rare in hemib.-bore.; NO (NE). – Stangl 20.3.
I. albovelutipes Stangl

Kuehneromyces Singer & A.H. Sm.

STIG JACOBSSON

Pholiota subgen. *Kuehneromyces* (Singer & A.H. Sm.) Kühner

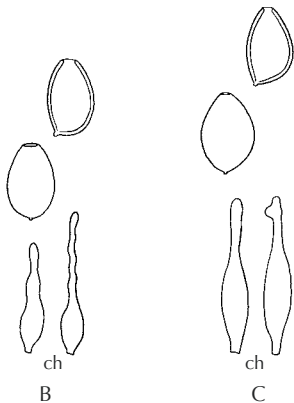
Frb fasciculate, brown. Cap 10-60 mm, glabrous, only slightly viscid or dry, distinctly hygrophanous, ± translucently striate when moist. Gills adnexed to slightly decurrent, ± crowded. Stem with or without a ring. Smell pleasant or weak. Taste mild. Sp deposit cinnamon brown.

Sp smooth, with a broad germ pore, truncate. Cheilocystidia fusiform-lageniform, thin-walled, hyaline. Pleurocystidia absent. Pileipellis an ixocutis with partly gelatinous hyphae. Clamps present.

Saprotrophic on wood, ± fasciculate.

Two species in the Nordic countries.

Lit.: Holec 2001, Jacobsson 1990, Noordeloos in Bas et al. 1999.



Spores and cheilocystidia: B: *Kuehneromyces mutabilis*, C: *K. lignicola*.

1. Stem scaly below the distinct and persistent ring. Cap 20-60 mm, rather fleshy, obtusely bell-shaped, for long time with incurved margin, yellowish brown but at the centre soon fading to pale yellow; gills pale, becoming rusty; stem whitish, but soon staining dark brown from the base upwards; stem 40-100 × 3-12 mm. Sp 6-7.5 × 3.5-4.5 μm, ovoid to subamygdaloid, with a broad germ pore (fig. 837B); cystidia fusiform-lageniform, thin-walled, abundant. On many kinds of deciduous wood, rarely on *Picea*; late spring to late autumn; very common in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – C&D 1229, Lud 65.33, Phil 227f, R&H 462, Ves 318, ⊙.

K. mutabilis (Schaeff.: Fr.) Singer & A.H. Sm. (*Pholiota m.* (Schaeff.: Fr.) P. Kumm.)

- Stem not scaly, without a ring, but with an evanescent ring-zone. Cap 10-40 mm, rather thin-fleshed, at first uniformly cinnamon or yellowish brown, soon entirely fading to pale yellow; gills crowded and narrow, yellowish becoming rusty; stem 25-60 × 1-5 mm, staining dark greyish brown, base white tomentose. Sp 6-7.5 × 3.5-4.5 μm, ovoid, with a broad germ pore (fig. 837C); cystidia fusiform-lageniform, often subcapitate or irregularly nodulose at apex. Caespitose on old logs and stumps of conifers, mostly *Picea*, also on bark heaps, one record from NO on *Populus tremula*; late spring to early autumn; common in bore., occasional in hemib.; FI (LC), NO (LC), SE (LC). – B&K 4:430, Lud 65.34, M&J 2.

K. lignicola (Peck) Redhead (*Pholiota l.* (Peck) Jacobsson, *K. vernalis* (Peck) Singer & A.H. Sm., *K. myriadophyllus* (P.D. Orton) Pegler & T.W.K. Young)

Laccaria Berk. & Broome

JAN VESTERHOLT

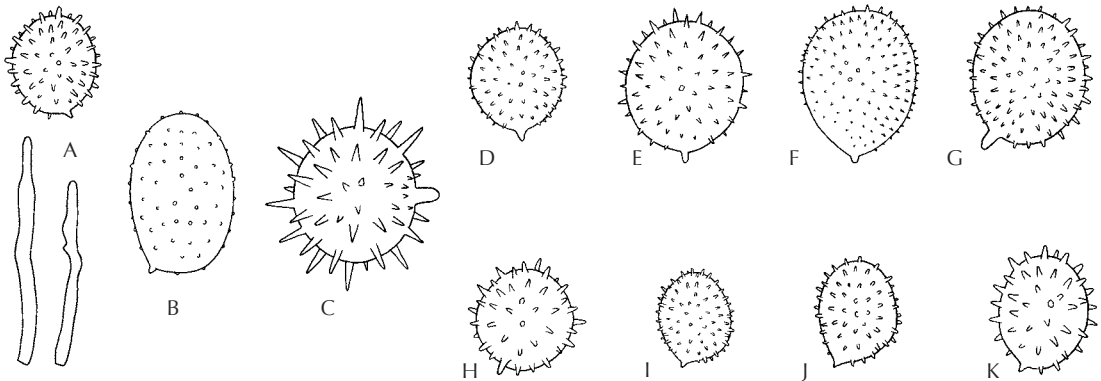
Frb with central stem, collybioid to omphalinoid, with orange brown, reddish brown, purplish brown or violet colours. Cap smooth to finely scaly, dry, less often slightly viscid, hygrophanous, strongly fading when dry. Gills adnate to short decurrent, rather thick, medium spaced to distant. Stem cylindrical to clavate, ± fibrillose. Veil absent. Flesh ± concolorous with surface. Smell insignificant. Taste mild. Sp deposit white to very pale lilac.

Sp globose to ellipsoid or oblong, spiny, thick-walled, hyaline, without iodine reactions. Basidia 2- or 4-spored. Cheilocystidia present or absent. Pleurocystidia absent. Pileipellis a cutis. Clamps present.

Generally mycorrhizal with trees and shrubs and present in nearly all biotopes where mycorrhizal partners occur. Some species may live saprotrophically for a certain period. Some species commonly form mycorrhiza with seedlings and are thereby important in forestry.

11 species in the Nordic countries.

Lit.: Contu 2003, Ludwig 2001, Mueller 1992, Mueller & Vellinga 1986, Sivertsen 1993, Vellinga in Bas et al. 1995.



Spores and cheilocystidia: A: *Laccaria amethystina*, B: *L. maritima*, C: *L. tortilis*, D: *L. fraterna*, E: *L. pumila*, F: *L. altaica*, G: *L. montana*, H: *L. laccata*, I: *L. bicolor*, J: *L. purpureobadia*, K: *L. proxima*.

1. Frb deep violet; gill edge sterile from cheilocystidia 30-70 × 3-6(-10) μm (fig. 659A). Cap 10-40 mm, convex to expanded, tomentose to finely scaly, translucently striate in outer part or almost to centre, hygrophanous, drying pale violet; gills adnate to short decurrent, distant; stem 30-80 × 3-7 mm, cylindrical to clavate, fibrillose to coarsely fibrillose. Sp 7.5-10.5 × 7.5-10 μm, globose to subglobose, Q_{av} = 1-1.1, with up to 1.5 μm high spines; basidia 4-spored. In deciduous forests, often with *Fagus*, but also in coniferous forests; summer to autumn; very common in temp.-hemib., rare, but locally occasional in bore., in FI north to southern bore.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:228, Lud 36.2, Phil 103f, R&H 265, Ves 218, ⊙.

L. amethystina Cooke

- Frb dominantly reddish, brownish red, reddish brown, orange brown or purplish brown; cheilocystidia absent or inconspicuous
2. Sp ellipsoid to oblong, Q_{av} = 1.7-2, with spines < 0.5 μm high (fig. 659B); in sand dunes with *Salix repens*. Cap 20-40 mm, convex to plane, smooth, slightly viscid, brownish red, hygrophanous, slightly translucently striate at margin or not; gills adnate to emarginate, medium spaced to distant, brownish red; stem 20-40 × 4-8 mm, cylindrical, fibrillose, con-

2

colourous with cap. Sp 12-17 x 7-11 μm ; basidia 4-spored. Along coasts and rivers; autumn; rare, but locally occasional in temp.-bore.; DK (LC), FI (LC), IS, NO (VU), SE (NT). – Lud 36.7, Svp 19:9.

L. maritima (Theodor.) Huhtinen

- Sp globose to broadly ellipsoid, $Q_{av} = 1-1.35$, with spines $> 0.5 \mu\text{m}$ high; not restricted to sand dunes 3
- 3. Basidia in majority 2-spored 4
- Basidia in majority 4-spored 7
- 4. Sp with up to 3 μm high spines (fig. 659C). Cap 4-20 mm, low convex to plane or irregular, sometimes umbilicate, radially sulcate and often split, smooth, brownish red, hygrophanous, translucently striate to centre; gills adnate, distant, flesh-pink; stem 4-20 x 0.5-2 mm, cylindrical or widened at top, often tortuous, concolorous with cap. Sp 10.5-15 μm , globose, $Q_{av} = c. 1$. In shady places in damp forests, on rich soil, often with mosses at roadsides, lake shores, in deciduous forests, gardens, etc.; summer to autumn; common in temp.-hemib., occasional in bore., rare in suba.; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – B&K 3:233, GBW 3:286, Lud 36.3, M&J 2, Phil 103g, ☉.

L. tortilis (Bolton) Cooke

- Sp with up to 1.5(-2) μm high spines 5
- 5. Sp 9-11 x 7.5-10.5 μm (fig. 659D). Cap 20-40 mm, convex to expanded or slightly depressed, smooth to fibrillose or tomentose, vividly orange brown, hygrophanous, translucently striate in outer half; gills adnate, medium spaced to distant, paler than cap; stem 35-60 x 2-5 mm, cylindrical, fibrillose, concolorous with cap. Sp subglobose, $Q_{av} = 1.1-1.2$, with up to 1.3 μm high spines. With deciduous trees, especially in *Salix* bogs and in subalpine *Betula* forests; autumn; rare in temp.-suba.; DK (LC), FI (DD), SE (NE, Sk). – BCat 570, Bol Bres 46:26, Lud 36.1.

L. fraterna (Cooke & Masee) Pegler (*L. lateritia* Malençon)

- Sp 10-14.5 x 9-13.5 μm 6
- 6. Sp subglobose to broadly ellipsoid, broadest in median part, with rather distant, up to 1.5(-2) mm high spines (fig. 659E). Cap 7-26 mm, convex to expanded with depressed centre, smooth or finely scaly at centre, orange brown to reddish brown, hygrophanous, translucently striate to centre; gills broadly adnate or emarginate to short decurrent, medium spaced to distant, flesh pink; stem 20-70 mm x 1-3 mm, cylindrical or slightly widened at top and base, fibrillose, \pm concolorous with cap. Sp 10-14 x 9-13 μm , $Q_{av} = 1.1-1.2$. In damp habitats such as banks of creeks and rivers, *Salix* shrubs, etc.; summer; occasional in bore.-arc./alp., in FI with a northern distribution; FI (LC), IS, NO (LC, incl. Svb), SE (LC).

L. pumila Fayod

- Sp slightly narrowed towards base, broadest in upper part, with crowded, up to 0.7 μm high spines (fig. 659F). Cap 5-25 mm, convex to expanded, often with a small umbo, finely tomentose, rose to pinkish brown, hygrophanous, slightly translucently striate at margin; gills adnate to short decurrent, distant, pale pinkish; stem 20-60 x 2-5 mm, cylindrical, concolorous with cap. Sp 10-14.5 x 9-12 μm , $Q_{av} = 1.1-1.2$. At brook sides and on river banks; occasional in arc./alp.; NO (incl. Svb), SE. – B&K 3:227, Bol Bres 46:28 (as *pumila*), Lud 36.4 (as *pumila*).

L. altaica Singer

- 7. Cap smooth to tomentose; stem fibrillose without contrasting fibres 8
- Cap scaly; stem coarsely fibrillose with \pm contrasting fibres 9
- 8. Sp 9-13 x 8-10 μm (fig. 659G); in suba.-arc./alp. in heathland with *Salix*. Cap 6-35 mm, convex to expanded, often umbonate, finally becoming depressed, smooth, becoming tomentose, brick red to orange brown, hygrophanous, translucently striate in outer part; gills adnate to short decurrent, medium spaced to distant, pale pink; stem 15-50 x 2-5 mm,

cylindrical, fibrillose, concolorous with cap. Sp subglobose to broadly ellipsoid, $Q_{av} = 1.1-1.3$, with up to $1 \mu\text{m}$ high spines. Summer to autumn; common; FI (DD), FO, IS (Au), NO (LC, incl. Svb). – Bol Bres 46:45, M&J 1.

L. montana Singer

- Sp $7.5-11.5 \times 7-9.5 \mu\text{m}$ (fig. 659H); in deciduous and coniferous forests, parks, dunes and heathland in temp.-arc./alp. Cap 10-40 mm, convex to expanded or slightly depressed, smooth to tomentose, reddish buff to flesh-coloured, hygrophanous, translucently striate at margin or entirely; gills adnate to short decurrent, distant, concolorous with cap or slightly paler; stem 20-70 \times 2-5 mm, cylindrical, sometimes compressed, concolorous with cap. Sp globose to broadly ellipsoid, $Q_{av} = 1-1.3$, with up to $1.5 \mu\text{m}$ high spines. Summer to autumn; very common; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – B&K 3:232, Lud 36.6, Phil 102a, R&H 266, Ves 218, ☉.

L. laccata (Scop.: Fr.) Berk. & Broome (incl. var. *pallidifolia* (Peck) Peck and var. *moelleri* Singer)

Note: var. *pallidifolia* with sp $Q_{av} = 1-1.1(-1.15)$ is far more common than var. *laccata* with sp $Q_{av} > 1.2$, and Singer's (1967) typification of *L. laccata* with the rare element should be reconsidered.

9. Gills mostly lilac; stem mostly with a violet basal tomentum; sp $Q_{av} < 1.2$ (fig. 659I). Cap 20-70 mm, convex to expanded, becoming finely scaly, orange brown to reddish brown, hygrophanous; gills emarginate, medium spaced; stem 40-100 \times 4-10 mm, cylindrical to clavate, coarsely fibrillose, brownish red. Sp $7-9.5 \times 6-8.5 \mu\text{m}$, subglobose to broadly ellipsoid, $Q_{av} = 1.1-1.25$, with up to $1.5 \mu\text{m}$ high spines; basidia 4-spored. On neutral to acid soil in coniferous forests, often with young trees, less often with deciduous trees and in arc./alp. lichen heathland; late summer to autumn; common in temp.-suba., occasional in arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – GBW 3:281, Lud 36.9, Phil 103d, R&H 266, Ves 219., ☉

L. bicolor (Maire) P.D. Orton

- Gills pinkish or tinged purplish brown; stem base without a violet tomentum; sp $Q_{av} = 1.2-1.35$
10. Frb purplish brown; in damp deciduous forests with *Alnus* and *Betula*. Cap 15-35 mm, convex to expanded or slightly depressed, finely scaly under lens, slightly hygrophanous, translucently striate in outer part; gills adnate or emarginate, medium spaced to distant; stem 30-120 \times 2-5 mm, cylindrical to clavate, coarsely fibrillose. Sp $8.5-10 \times 7-8 \mu\text{m}$, broadly ellipsoid, $Q_{av} = 1.25-1.35$, with up to $1 \mu\text{m}$ high spines (fig. 659J). Autumn; rare in temp.-arc./alp.; DK (DD), FI (DD), NO (LC), SE (LC, Sk). – Bol Bres 46:44, Lud 36.10, Phil 102c, RdM 39:57.

L. purpureobadia D.A. Reid

- Cap brownish red; in oligotrophic deciduous and coniferous forests and in arc./alp. heathland, mostly on sandy or peaty soil. Cap 20-60 mm, convex to bell-shaped, later expanded, sometimes becoming depressed, finely scaly, hygrophanous, sometimes translucently striate at margin; gills narrowly adnate to short decurrent, medium spaced, pinkish; stem 30-120 \times 5-10 mm, cylindrical, coarsely fibrillose, brownish red to reddish brown. Sp $7.5-11 \times 6-9 \mu\text{m}$, broadly ellipsoid, $Q_{av} = 1.2-1.35$, with up to $1.5 \mu\text{m}$ high spines (fig. 659K). Summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – Lud 36.8, M&J 2, R&H 267, Ves 219, ☉.

L. proxima (Boud.) Pat. (*L. proximella* Singer)

Lachnella Fr.

HENNING KNUDSEN

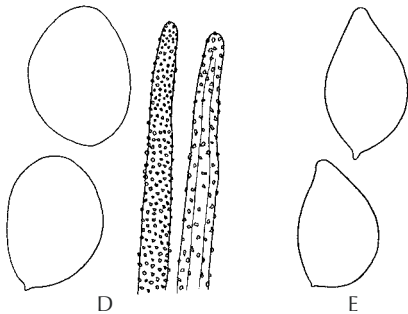
Frb cyphelloid with white, hairy outside. Frb cup- or disc-shaped, sessile or with a very short stem, with hymenial disc, 0.5-2 mm broad, white to greyish, waxy when fresh, tough and persistent when dry, margin inrolled. Outside densely covered with long, white hairs.

Sp in profile ellipsoid with one side flattened, ellipsoid in front view, with distinct apiculus, smooth, cyanophilous. Cystidia present or absent. Clamps present. Hairs thick-walled with a narrow lumen, cylindrical, a large majority with an obtuse apex, but some hairs attenuated and even rarely with a naked and whip-like apex, ± smooth at base, finely and densely incrustated towards apex, 200-250 × 5-7 μm (fig. 247D).

On twigs of deciduous scrubs or dead stems of herbs, more rarely on bark of deciduous trees. All year.

Two species in the Nordic countries.

Lit.: Agerer 1983.



Spores and apical parts of hairs: D: *Lachnella alboviolacea*, E: *L. villosa*.

1. Sp av > 8.5 μm broad (fig. 247D); cystidia absent. Frb disc-shaped, 1-2 mm broad; hymenium greyish with a bluish-violaceous tinge, margin incurved; hairs crowded on the outside, white, sometimes with a brownish base. Sp 10-15 × 7.5-12 μm, av 12.5 × 9.4 μm, Q = 1.3-1.5; basidia 50-75 × 10-16 μm; cystidia absent. Saprotrophic; gregarious and often ± clustered on twigs and thin branches of various dead, deciduous scrubs such as *Caragana*, *Cytisus*, *Deutzia*, *Euonymus*, *Frangula*, *Genista*, *Lonicera*, *Ribes*, *Sambucus*, *Sarothamnus*, *Spiræa*, *Syringa* and *Viburnum*, trees such as *Fraxinus*, *Populus*, *Salix*, *Ulmus*, and on stems of dead herbs such as *Alchemilla*, *Artemisia*, *Filipendula*, *Coronilla* and *Tanacetum*; common but mostly overlooked in temp.-bore., in FO in suba., in NO north to STTr, in SE to Vb; DK (LC), FI (DD), FO, NO (NE), SE (LC). – BCat 571, B&K 2:230, GBW 3:598, ⊙.

L. alboviolascens (Alb. & Schwein.: Fr.) Fr.

- Sp av < 8.5 μm broad (fig. 247E); cystidia present. Frb cup-shaped, < 1 mm broad; hymenium whitish; margin crowded with long white hairs, often inrolled and hiding the hymenium. Sp 9-14 × 7-9 μm, av 13.3 × 8.3 μm, Q = 1.3-2.0, Qav = 1.6; basidia 40-50 × 10-12 μm; cystidia ± lanceolate, slightly longer than basidia. Saprotrophic; gregarious and often ± clustered on stems of dead herbs such as *Arctium*, *Artemisia*, *Astragalus*, *Eupatorium*, *Lupinus*, *Mentha*, *Onobrychis*, *Ononis*, *Trifolium* and *Urtica*, more rarely on twigs of deciduous scrubs like *Sarothamnus*; common in temp.-bore., in FO in suba., in NO north to STTr; DK (LC), FI (DD), FO, IS (Na: Fornhagi Hörgårdal), NO (NE), SE (LC). – ⊙.

L. villosa (Pers.: Fr.) Gillet

Lacrymaria Pat.

HENNING KNUDSEN

Psathyrella subgen. *Lacrymaria* (Pat.) A.H. Sm. & Singer

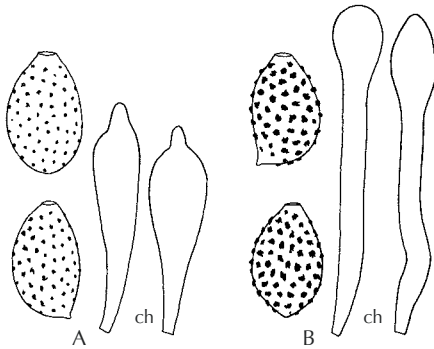
Frb hairy-tomentose with black gills. Cap 15-100 mm, convex to flattened, tomentose, fibrillose to woolly, ochraceous to yellowish brown or orange, with remnants of veil along the margin. Gills adnate to emarginate, mottled dark brown to almost black, when fresh exuding small drops, with white, fimbriate edge. Stem 20-100 x 3-13 mm, cylindrical, robust, pale above the fibrillose veil, concolorous with cap, with fibrillose belts below the veil. Ring absent or rarely present. Taste mild. Smell indistinct. Sp deposit brownish black.

Sp citriform, coarsely verrucose, with prominent germ pore, dark brown. Cheilocystidia capitate or mucronate. Pleurocystidia often subfasciculate, similar in shape to cheilocystidia. Clamps present. Pileipellis a cutis of smooth or slightly incrustated hyphae.

Saprotrophic; gregarious on rich soil in forests or open land, often at disturbed places, sometimes on very rotten wood.

Three species in the Nordic countries.

Lit.: Watling & Gregory 1987.



Spores, cheilocystidia and sclerocystidia: A: *Lacrymaria glareosa*, B: *L. lacrymabunda*.

1. Cystidia capitate-mucronate (fig. 585A); cap 15-50 mm. Cap hemispherical to convex, sometimes umbonate, fibrillose to finely scaly, ochraceous, darker at centre; stem 20-35 x 3-5 mm, cylindrical, fibrillose, buff, tinged ochre below. Sp 9.5-12 x 5-6 μm , citriform, verrucose, with prominent germ pore. On soil in open land, more rarely in forests; mainly in suba. where it probably is occasional, but with few records from FI and NO; rare in temp.-bore.; DK (DD), FI (DD), NO (LC), SE. – FND 2:6, SZP 36:65.

L. glareosa (J. Favre) Watling (*Psathyrella g.* (J. Favre) M.M. Moser)

- Cystidia capitate, but not mucronate (fig. 585B); cap often larger 2

2. Cap thin-fleshed, ochre to yellow brown at centre, paler or brownish at margin; veil of hyaline to yellowish, smooth or slightly incrustated hyphae. Cap 15-60(-100) mm, convex with low broad umbo, then flattened, with innate, woolly, radiating fibrils; stem 20-100 x 5-10 mm, cylindrical, above dirty whitish, below somewhat ochre brown, covered with fibrillose belts. Sp 8-11 x 5.5-6.5 μm , citriform, strongly verrucose, with prominent germ pore (fig. 585B). On rich, moist soil in deciduous forests, often along paths and roads, in gardens and parks, gregarious; summer to autumn; very common in temp.-bore., occasional, but locally common in suba. in IS; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:308, Däh 574, Phil 256b, R&H 434, Ves 296, ⊙.

L. lacrymabunda (Bull.: Fr.) Pat. (*Psathyrella l.* (Bull.: Fr.) M.M. Moser, *L. velutina* (Pers.: Fr.) Konrad & Maubl., *Psathyrella v.* (Pers.: Fr.) Singer)

- Cap relatively fleshy, bright orange at centre or all over; most hyphae in veil strongly yellowish incrustated. Cap 30-100 mm, convex, umbonate or not, becoming flattened, with a thick, woolly layer of radiating fibrils; stem 30-100 x 5-13 mm, concolorous with cap, with fibrillose belts. Sp 8-11 x 5.5-6.5 μm , citriform, strongly verrucose, with prominent germ pore. On rich, moist soil or rotten wood in deciduous forests, often along paths, in gardens and parks, gregarious; autumn; occasional in temp.-hemib., rare in southern bore.; DK (LC), FI (DD), SE (LC). – C&D 783, Holmskjold II 35, Lud 95.1E, Phil 81:176, Ves 296.
L. pyrotricha (Holmskj.: Fr.) Konrad & Maubl. (*Psathyrella p.* (Holmskj.: Fr.) M.M. Moser, *L. ignescens* (Lasch) Lundell)

Lactarius Pers.

ANNEMIEKE VERBEKEN & JAN VESTERHOLT

Fr with normally developed central stem and gills and crumbling texture with milky juice. Cap convex to plane, mostly with depressed centre, in many species becoming funnel-shaped, smooth, velvety or scaly, in some species with bearded margin, dry, greasy, sticky or slimy, in many species with conspicuous concentric zones. Gills adnate to decurrent. Stem mostly cylindrical, dry, viscid or slimy, pitted or smooth. Milk scarce to abundant, mostly white, in some species turning yellow, lilac, pink or greenish grey on exposure, in some species orange or wine red, and hyaline in one species, *L. helvus*. Smell indistinct, fruity, sweetish, spicy, fish-like or like *Pentamogium* bugs. Taste mild to bitter or acrid, the taste of the milk may differ from the taste of the flesh. Sp deposit white to cream or dark pinkish buff.

Sp globose to ellipsoid, ± hyaline, with amyloid ornamentation of low to high warts and ridges, which may be connected to form a zebra-like or reticulate pattern with open or closed meshes, with a differentiated plage, which may be partly amyloid. Macrocytidia with needle-like, guttulate or granular contents, mostly present as pleuro- and cheilocystidia and between the gills. Very thick-walled so-called lamprocystidia (fig. 83B) present in one species from the area, *L. volemus*. Thin-walled paracystidia without specific contents present on gill edge. Lactiferous hyphae present, and their extremities emerge through the hymenium, resembling cystidia, so-called pseudocystidia. Pileipellis an (ixo)cutis, an (ixo)trichoderm, an epithelium, a hyphoepithelium or a paraderm. Clamps absent.

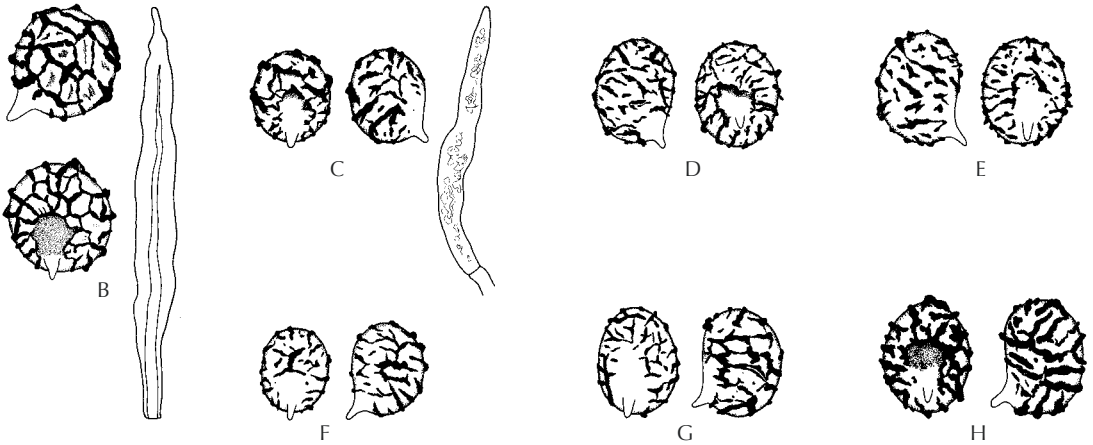
Ectomycorrhizal with trees and shrubs and found in nearly all types of forests, in dunes and in alpine habitats.

92 species in the Nordic countries. *Lactarius* species are often collected for eating, and especially orange and red milked species and *L. volemus* are considered as good. In Finland there is a long tradition of salting and consuming *L. trivialis* and other species with an acrid taste.

Lit.: Basso 1999, Bon 1980, Heilmann-Clausen et al. 1998, Korhonen 1984, Kytövuori 1984, Neuhoff 1956.

Main key

1. Milk orange to brownish red when exuded, rarely bluish or greenish in a zone right underneath the cuticle Key A p. 83
 - Milk watery, whitish or cream when exuded, but often changing colour after exposure 2
2. Milk turning lilac, violet or pink within a few minutes after exposure, at least in contact with the flesh or gills 3
 - Milk unchanged or turning yellow, greenish, greyish or brownish on exposure 4
3. Milk turning lilac or violet in contact with the flesh or gills Key B p. 85
 - Milk turning pink in contact with the flesh or gills Key C p. 88
4. Milk white, turning bright yellow on exposure Key D p. 90
 - Milk white, watery or cream, unchanged or turning greenish, greyish, brownish or pale yellow 5
5. Milk turning brownish, staining the gills and the flesh brown; smell fish-like; pleuromacrocytidia very thick-walled (fig. 83B). Cap 50-170 mm, convex to expanded, sometimes with slightly depressed centre, smooth or slightly wrinkled, sometimes cracked, dry, clay buff to orange brown; gills adnate to short decurrent, crowded, cream to warm buff; stem 50-100 x 15-30 mm, cylindrical, smooth, dry, slightly paler than cap; milk white, abundant, taste mild and pleasant. Sp 9-11 x 8.5-10.5 µm, globose to subglobose, ornamentation up to 0.5 µm high, or ridges forming a ± complete reticulum; lamprocystidia 65-90 x 8-10 µm, lanceolate. In deciduous and coniferous forests; summer to early autumn; rare in temp.-southern bore., in FI north to PS; DK (EN), FI (LC), NO (LC), SE (LC). – FNE 2:247, Korh 184-185, Phil 55e, R&H 575, Ves 440, ☉. – Edible and good.
L. volemus (Fr.: Fr.) Fr.



Spores and pleuromacrocytidia: B: *Lactarius volemus*, C: *L. sanguifluus*, D: *L. semisanguifluus*, E: *L. deterimus*, F: *L. fennoscandicus*, G: *L. deliciosus*, H: *L. quieticolor*.

- Milk not turning brownish; smell different or indistinct; pleuromacrocytidia ± thin-walled 6
- 6. Cap margin distinctly scaly, hairy or bearded, at least in young specimens [Key E p. 92](#)
- Cap margin velvety or smooth 7
- 7. Cap whitish [Key F p. 94](#)
- Cap distinctly coloured 8
- 8. Cap dry; pileipellis without a gelatinized layer; taste mild to acrid [Key I p. 101](#)
- Cap sticky to slimy; pileipellis an ixocutis or ixotrichoderm; taste of milk and flesh usually very acrid, rarely only slightly acrid after a while 9
- 9. Cap orange or yellow, typically zonate [Key G p. 95](#)
- Cap cream, greyish, brownish or reddish, zonate or azonate [Key H p. 97](#)

Key A: Milk orange to brownish red when exuded

1. Milk brownish red when exuded. Cap 40-80 mm, convex to expanded with depressed centre, smooth, viscid, dull ochraceous orange, zonate; gills short decurrent, medium spaced to crowded, pale vinaceous; stem 20-45 x 10-20 mm, cylindrical, smooth, dry, clay buff to pale vinaceous; smell faint; taste mild to slightly bitter. Sp 8-9.5 x 6.5-8 µm, broadly ellipsoid, ornamentation < 0.5 µm high, of warts and ridges forming an incomplete to almost complete reticulum (fig. 83C); pleuromacrocytidia 45-65 x 6-9 µm, ± fusiform. With *Pinus* on calcareous soil, thermophilous; summer to autumn; very rare in hemib.; SE (NT). – B&K 6:62, C&D 1549, Däh 952, FNE 2:147, SMT 28(2):33. – Edible and good.
L. sanguifluus (Paulet) Fr.
- Milk orange when exuded 2
2. Milk orange, but turning vinaceous red in 5-8 minutes; cap often partly or dominantly green, especially in older specimens. Cap 25-70 mm, convex to expanded with depressed centre, smooth, slightly viscid, partly ochraceous orange; gills short decurrent, medium spaced, pale orange; stem 30-50 x 8-16 mm, cylindrical, smooth, dry, clay pink to greenish; smell faint, carrot-like; taste slightly bitter. Sp 7.5-10 x 6-8 µm, broadly ellipsoid, ornamentation up to 0.5 µm high, of warts and ridges forming an incomplete reticulum (fig. 83D); pleuromacrocytidia 50-60 x 10-14 µm, ± clavate. With *Pinus*, mostly in grass on calcareous

soil, thermophilus; summer to autumn; very rare in hemib.; SE (vu). – B&K 6:65, C&D 1555, FE 7:289, 777, FNE 2:149, SMT 28(2):34. – Edible.

L. semisanguifluus R. Heim & Leclair

- Milk remaining orange for more than 10-15 minutes; cap not dominantly green, but green colours may be present, especially in bruised spots 3
- 3. Stem without obvious pits; with *Picea*; sp with isolated warts and short ridges, not reticulate 4
- Stem mostly pitted; with *Pinus*; sp with an incomplete reticulum 5
- 4. Cap typically azonate or with a few zones near the margin, with mainly bright orange colours and green tinges; stem unicoloured bright orange, but often with green tinges; cheilomacrocytidia mostly quite abundant. Cap 25-110 mm, convex to expanded with depressed centre, finally funnel-shaped, smooth, viscid; gills broadly adnate to decurrent, medium spaced to crowded, pale orange; stem 20-50 x 7-15 mm, cylindrical, smooth, dry; milk reddish orange; smell carrot-like; taste mild. Sp 8-11.5 x 6.5-8.5 μm , broadly ellipsoid to ellipsoid, ornamentation up to 0.5 μm high, of warts and ridges, not forming a reticulum (fig. 83E); pleuromacrocytidia 40-50 x 7-8 μm , \pm fusiform. With *Picea*, often in young stands; summer to autumn; very common in temp.-bore., rare, but locally occasional in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – FNE 2:151-153, Korh 107, 108 top, 110-111, Phil 64b, R&H 563, Ves 422, \odot . – Edible.

L. deterrimus Gröger

- Cap conspicuously zonate, with brownish orange, sometimes lilac-grey tinges; stem pallid to dull orange buff, rarely with indistinct pits; cheilomacrocytidia mostly rare. Cap 25-80 mm, convex to expanded with depressed centre, smooth, slightly viscid; gills decurrent, medium spaced, pale orange; stem 40-100 x 10-25 mm, cylindrical, dry; milk orange, turning greenish grey; smell faint or carrot-like; taste mild to bitter. Sp 7-9.5 x 5.5-7 μm , broadly ellipsoid, ornamentation < 0.5 μm high, of warts and ridges forming an incomplete reticulum (fig. 83F); pleuromacrocytidia 50-55 x 7-8 μm , \pm fusiform. With *Picea*; summer to autumn; occasional in bore.-arc./alp.; FI (LC), NO, SE. – FE 7:268, FNE 2:155, Korh 109 top (as *deterimus*), SMT 28(2):35. – Edible.

L. fennoscandicus Verbeke & Vesterh.

- 5. Milk orange, remaining orange or turning red after > 30 minutes; cap bright orange; stem with orange pits; on neutral to calcareous soil; sp ornament not with very thick ridges (fig. 83G). Cap 40-110 mm, convex to expanded with depressed centre, smooth, viscid, zonate; gills short decurrent, medium spaced to crowded, pale orange; stem 30-65 x 15-30 mm, cylindrical, dry, salmon; smell carrot-like; taste mild. Sp 8-10.5 x 6.5-8 μm , broadly ellipsoid to ellipsoid, ornamentation up to 0.5 μm high, forming an almost complete reticulum; pleuromacrocytidia 45-50 x 7-9 μm , \pm fusiform. With *Pinus* on sandy soil; summer to autumn; common in temp.-hemib., occasional in bore.-suba.; DK (LC), FI (LC), NO (LC), SE (LC), \odot . – FNE 2:141, Korh 112-113, Phil 64c, R&H 563, Ves 423. – Edible and good.

L. deliciosus (L.: Fr.) Gray

- Milk orange, turning red in about 20 minutes; cap orange to brownish or bluish, mostly dull coloured; stem without or only with inconspicuous pits; on acid soil; sp ornament with thick ridges (fig. 83H). Cap 25-110 mm, convex to expanded with depressed centre, smooth, soon dry, mostly zonate; gills decurrent, medium spaced, pale orange; stem 20-60 x 10-25 mm, cylindrical, dry, salmon to greyish; smell faint; taste mild or becoming slightly bitter. Sp 8-10.5 x 6.5-8.5 μm , broadly ellipsoid to ellipsoid, ornamentation up to 0.5 μm high, forming an incomplete to almost complete reticulum; pleuromacrocytidia 25-30 x 5-8 μm , \pm fusiform. With *Pinus* on rather acid soil; summer to autumn; common in temp., occasional in hemib.-bore., in FI north to PS; DK (LC), FI (LC), FO, NO (LC), SE (LC). – FNE 2:143,145, Korh 114, Phil 66c, 67d, Svp 27:14, Ves 423, \odot . – Edible.

L. quieticolor Romagn. (*L. hemicyaneus* Romagn.)



Spores: A: *Lactarius dryadophilus*, B: *L. repraesentaneus*, C: *L. salicis-herbaceae*, D: *L. salicis-reticulatae*.

Key B: Milk turning lilac or violet after exposure

- 1. Cap margin hairy 2
 - Cap margin smooth or at most velvety in young frb 3
- 2. Cap whitish to cream or warm buff, with up to 2 mm long hairs at margin; stem 20-40 x 15-25 mm, often curved, finely pitted, especially at base; in arc./alp. on calcareous soil with *Dryas* or *Salix*. Cap 30-100 mm, convex to expanded with depressed centre, viscid; gills adnate, crowded, pale cream; stem smooth, dry, whitish to pale cream; milk white, turning lilac in contact with the flesh; smell fruity, sweetish; taste aromatic to slightly acrid. Sp 9.5-12 x 7-9 μm, broadly ellipsoid to ellipsoid, ornamentation up to 0.3 μm high, of aligned ridges not forming a reticulum (fig. 85A); pleuromacrocystidia 80-120 x 10-15 μm, ± fusiform. Summer to autumn; rare in suba.-arc./alp.; FI (NT), IS (Mi, Na), NO (LC, incl. SvB), SE (LC). – B&K 6:19, C&D 1559, FNE 2:103, Korh 120, R&H 559, ☉.

L. dryadophilus Kühner

- Cap with bright yellow colours, with abundant hairs and scales, almost to centre; stem 40-125 x 12-30 mm, straight, distinctly pitted; mainly in wet forests with *Picea* and *Betula*, but also in arc./alp. with *Betula nana*. Cap 30-160 mm, convex to expanded with depressed centre, viscid to slimy; gills broadly adnate to short decurrent, crowded, cream; stem viscid to slimy, pale chrome to warm buff; milk white, turning lilac in contact with the flesh; smell hyacinth-like; taste hyacinth-like, then bitter. Sp 8.5-10.5 x 7-9 μm, broadly ellipsoid to ellipsoid, ornamentation < 1 μm high, of rounded warts and ridges forming an incomplete reticulum (fig. 85B); pleuromacrocystidia 80-110 x 10-12 μm, ± fusiform. Summer to autumn; common in hemib.-suba., very rare in temp.; DK (vU), FI (LC), IS (Ve: Sauraskógur), NO (LC), SE (LC). – B&K 6:54, Däh 940, FNE 2:105, Korh 120-122, R&H 558.

L. repraesentaneus Britzelm.

- 3. Cap dominantly with yellowish tinges 4
 - Cap dominantly with violet to brownish-greyish tinges, rarely whitish 8
- 4. With dwarf *Salix* or *Betula nana*, mainly in arc./alp.; cap 10-50 mm 5
 - With deciduous trees in temp.-suba.; cap often larger 6
- 5. Cap 10-30 mm, cream to buff yellow, sometimes ochraceous at the centre, hardly with crenulate margin; sp ornamentation almost reticulate. Cap convex to expanded with depressed centre, smooth, viscid to slimy, azonate; gills adnate, medium spaced, pale cream; stem 10-25 x 2-8 mm, cylindrical, smooth, dry, whitish to pale cream; milk white, turning lilac in contact with the flesh; smell indistinct; taste mild to slightly acrid. Sp 8.5-11.5 x 6.5-8.5 μm, broadly ellipsoid to ellipsoid, ornamentation < 0.3 μm high, of warts and ridges (fig. 85C); pleuromacrocystidia 55-80 x 8-11 μm, ± fusiform. With dwarf *Salix*; summer to autumn; occasional in suba.-arc./alp.; FI (LC), IS, NO (LC), SE (LC). – B&K 6:59, C&D 1560, FE 7:244, FNE 2:101, Korh 126.

L. salicis-herbaceae Kühner

- Cap 20-50 mm, pale cream to buff yellow, sometimes with crenulate margin; sp ornamentation not reticulate. Cap convex to expanded with depressed centre, smooth, viscid to slimy, azonate or indistinctly zonate; gills broadly adnate, medium spaced to crowded, cream; stem 20-30 x 5-10 mm, cylindrical, smooth, viscid, pale cream; milk white, turning

lilac in contact with the flesh; smell fruity; taste mild. Sp 9.5-11.5 × 6.5-8.5 μm, subglobose to broadly ellipsoid, ornamentation < 0.3 μm high, of irregular warts and ridges (fig. 85D); pleuromacrocystidia 80-115 × 10-12 μm, ± fusiform. With dwarf *Salix* or *Betula nana*, calciphilous; summer to autumn; occasional in arc./alp., rare in bore.-suba.; FI (NT), NO (LC), SE (LC). – B&K 6:60, FE 7:249, FNE 2:99, Korh 126-127.

L. salicis-reticulatae Kühner

6. On calcareous soil in deciduous forests; cap ± zonate with brownish spots; milk turning brownish violet to dark violet on the flesh; taste acrid. Cap 55-90 mm, convex to expanded with depressed centre, smooth, viscid, yellowish cream to cream yellow; gills broadly adnate, crowded, cream; stem 40-60 × 10-20 mm, cylindrical, smooth, dry, cream; milk white; smell faint, fruity. Sp 8.5-11.5 × 6.5-8.5 μm, broadly ellipsoid to ellipsoid, ornamentation up to 1 μm high, of aligned, mostly acute warts and ridges, not forming a reticulum (fig. 87A); pleuromacrocystidia 40-80 × 7-13 μm, ± fusiform. With *Carpinus*, *Quercus*, *Fagus*, etc.; late summer to autumn; very rare in temp.-hemib., one record from NO (Hord: Bergen) and two in DK (Lol: Ny Kirstinebjerg Storskov, Ejyl: Trelde Østerskov); DK (CR), NO, SE (NT, presumably interpreted in a wide sense). – B&K 6:21, Däh 939, FE 7:233, 775, FNE 2:93, Korh 124.

L. flavidus Boud.

- In *Salix* or *Betula* stands; cap zonate or azonate; milk turning pale violet; taste mild to bitter 7
7. With *Salix* in bogs and forest edges; cap 10-70 mm broad, viscid to sticky when young, later almost dry, straw yellow to pale cream; stem solid. Cap convex to expanded with slightly depressed centre, smooth; gills broadly adnate to decurrent, crowded, cream; stem 10-65 × 5-17 mm, cylindrical to clavate, smooth, viscid, pale straw to pale cream; milk white, turning lilac in contact with the flesh; smell faint, fruity; taste mild, becoming bitter. Sp 6.5-9.5 × 5.5-8 μm, subglobose to ellipsoid, ornamentation up to 0.5 μm high, of ridges forming a ± complete reticulum (fig. 87B); pleuromacrocystidia 40-65 × 6-10 μm, ± fusiform. Summer to autumn; occasional in temp.-arc./alp., but common in FI; DK (LC), FI (LC), NO (LC), SE (LC). – FE 7:225, 817, FNE 2:97, Korh 124, R&H 559, Ves 427, ☉.

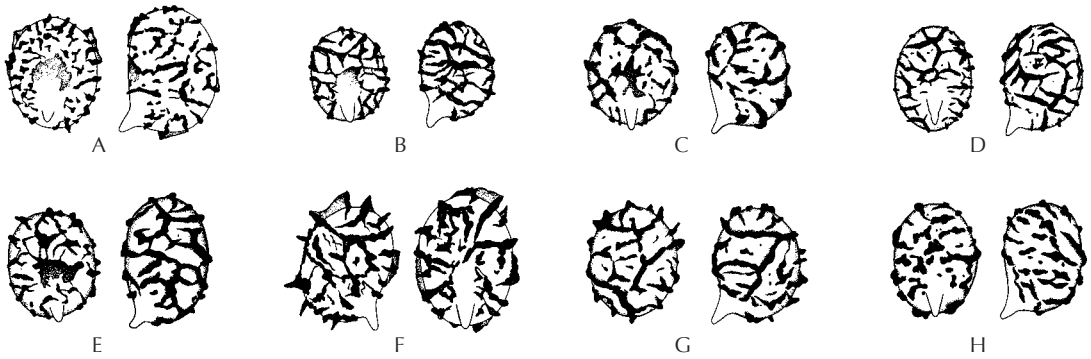
L. aspideus (Fr.: Fr.) Fr.

- In calcareous, ± swampy forests with *Betula*; cap 40-130 mm broad, very viscid and slimy, covered with a thick slime layer, whitish chrome to buff yellow; stem hollow. Cap convex to expanded with depressed centre, becoming funnel-shaped, smooth, ± zonate; gills broadly adnate to short decurrent, crowded, cream; stem 50-120 × 8-25 mm, cylindrical, smooth to finely pitted, slightly viscid, whitish chrome to honey-coloured; milk white, turning lilac in contact with the flesh; smell fruity; taste turning very bitter. Sp 7.5-10 × 6-8 μm, subglobose to ellipsoid, ornamentation up to 0.5 μm high, of warts and ridges forming an incomplete reticulum (fig. 87C); pleuromacrocystidia 60-100 × 10-13 μm, ± fusiform. Late summer to autumn; rare but locally occasional in bore.-suba.; FI (DD), SE. – FNE 2:95, Korh 125.

L. flavopalustris Kytöv. in press (*L. flavidus* Boud. s. auct. p.p.)

8. With dwarf *Salix* in suba.-arc./alp.; cap 10-50 mm broad 9
- In deciduous or coniferous forests in temp.-hemib.; cap often larger 10
9. Cap greyish buff to clay buff; gills pale cream to buff; smell insignificant; taste mild to slightly bitter; sp on av ≤ 9.5 × 7.5 μm, densely reticulate (fig. 87D). Cap 15-35 mm, convex to expanded with depressed centre, smooth, slightly viscid, azonate or indistinctly zonate; gills broadly adnate to short decurrent, medium spaced; stem 25-35 × 3-8 mm, cylindrical, smooth, dry, whitish to cream; milk white, turning lilac in contact with the flesh; smell indistinct; taste turning slightly bitter. Sp 8-10.5 × 6.5-8.5 μm, broadly ellipsoid to ellipsoid, ornamentation up to 0.3 μm high, of rounded warts and ridges; pleuromacrocystidia 60-90 × 8-10 μm, ± subfusiform. With dwarf *Salix*; summer to autumn; occasional or locally common in suba.-arc./alp.; FI (DD), FO, IS, NO (LC, incl. SvB), SE (LC). – Bor 89, FE 7:201, 205, 773, FNE 2:89.

L. pseudovidus Kühner



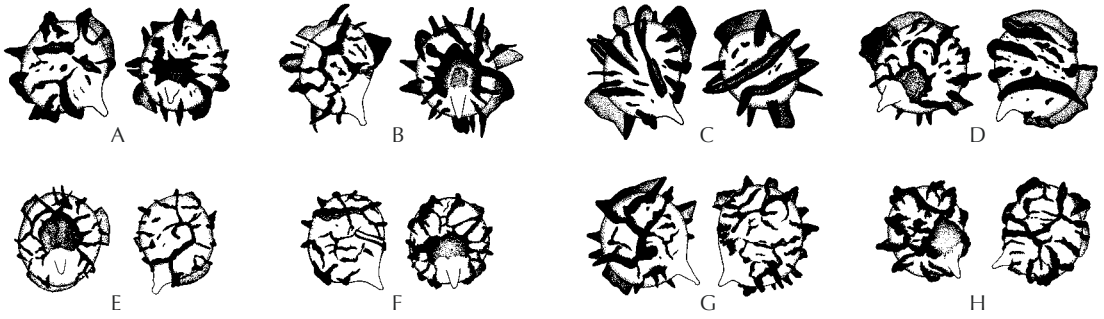
Spores: A: *Lactarius flavidus*, B: *L. aspideus*, C: *L. flavopalustris*, D: *L. pseudouvidus*, E: *L. brunneoviolaceus*, F: *L. violascens*, G: *L. luridus*, H: *L. uvidus*.

- Cap brownish vinaceous, vinaceous grey or dark vinaceous; gills white to pale cream; smell and taste like cedar-oil; sp on av $\geq 9.5 \times 7.5 \mu\text{m}$, incompletely reticulate, with higher and irregular warts (fig. 87E). Cap 20-45 mm, convex to expanded, smooth, viscid, often \pm zonate; gills adnate to decurrent, medium spaced; stem 10-35 x 4-16 mm, cylindrical, smooth, dry, whitish; milk white, turning lilac in contact with the flesh. Sp 9-12 x 6.5-8.5 μm , broadly ellipsoid to ellipsoid, ornamentation up to 0.5(-1) μm high, of warts and ridges; pleuromacrocystidia 40-80 x 8-10 μm , \pm fusiform. With dwarf *Salix*; summer to autumn; occasional in suba.-arc./alp.; FI (DD), FO, IS, NO (NE, incl. Sv), SE. – B&K 6:11, FE 7:204, 205, 773, FNE 2:91, RdM 38:78, Sieniop 37.
L. brunneoviolaceus M.P. Christ. (*L. robertianus* Bon)
- 10. Cap dark brownish violet, with \pm distinct concentric circles of pits and spots near margin, hardly viscid, soon pruinose; flesh turning dark violet to brownish violet; stem not or hardly hollow; sp with acute, up to 1.5 μm high ridges. Cap 40-150 mm, convex to expanded with depressed centre, smooth; gills broadly adnate to decurrent, crowded, cream; stem 30-60 x 12-25 mm, \pm cylindrical, smooth, dry, whitish to greyish buff; milk white; smell faint, fruity; taste mild to slightly bitter. Sp 7.5-11.5 x 6.5-8.5 μm , subglobose to broadly ellipsoid, ornamentation forming an incomplete reticulum (fig. 87F); pleuromacrocystidia 45-80 x 8-13 μm , fusiform. In deciduous forests on calcareous soil with *Quercus*, *Carpinus*, *Betula*, etc.; autumn; rare in hemib.-southern bore., very rare in temp.; DK (EN), FI (NT), NO (LC), SE. – C&D 1564, FE 7:217, 816, FNE 2:87, Jordst 17(2):9.
L. violascens (J. Otto : Fr.) Fr.
- Cap greyish brown to pale brown with pale violet tinge or pinkish grey with lilac and buff tinges, azonate or slightly zonate, slightly sticky or glutinous; flesh not turning brownish violet; stem soon hollow; sp ornamentation up to 1 μm high 11
- 11. Cap greyish brown to pale brown with pale violet tinge, slightly zonate with watery or darker greyish brown to reddish brown spots, hardly viscid; flesh pale violet to greyish violet when bruised; sp with acute warts and ridges forming a rather complete reticulum (fig. 87G); in (dry) deciduous forests with *Quercus*, *Carpinus*, etc. on calcareous soil. Cap 20-75 mm, convex to expanded with depressed centre, smooth; gills adnate to short decurrent, crowded, cream; stem 20-70 x 7-20 mm, cylindrical, smooth, dry, whitish to pale greyish; milk white, turning lilac in contact with the flesh; smell faint, fruity; taste rancid to bitter. Sp 8-11.5 x 6.5-9.5 μm , subglobose to broadly ellipsoid, ornamentation up to 1 μm high; pleuromacrocystidia 60-100 x 9-11 μm , \pm fusiform. Autumn; rare in hemib., very rare in temp.; DK (DD), NO (NT). – B&K 6:37, C&D 1568, FE 7:196, 814, FNE 2:85, SMT 26(1):17.
L. luridus (Pers.: Fr.) Gray

- Cap pinkish grey with lilac and buff tinges, rarely whitish, distinctly viscid, not or hardly zonate; flesh pale violet to lilac when bruised; sp with rounded warts and ridges, forming an incomplete reticulum (fig. 87H); in wet habitats, especially with *Betula*, *Salix* or *Picea*. Cap 30-130 mm, convex to expanded with depressed centre, becoming funnel-shaped, smooth; gills broadly adnate to decurrent, crowded, cream; stem 20-105 x 8-25 mm, ± cylindrical, smooth, slightly viscid, whitish; milk white, turning lilac in contact with the flesh; smell faint, fruity; taste turning bitter to acrid. Sp 8.5-11.5 x 6.5-8.5 μm, broadly ellipsoid to ellipsoid, ornamentation < 1 μm high; pleuromacrocytidia 50-65 x 8-10 μm, fusiform. Late summer to autumn; common in hemib.-suba., rare in temp., occasional in IS; DK (EN), FI (LC), IS, NO (LC), SE (LC). – FNE 2:83, Korh 127-128, Phil 52b, R&H 569, Ves 426, ☉.
L. uvidus (Fr.: Fr.) Fr.

Key C: Milk turning pink in contact with the flesh or gills

1. Milk white, quickly turning pink, also when isolated from the flesh; cap ± viscid; pileipellis covered by a thick slime-layer. Cap 35-80 mm, convex to expanded with depressed centre, smooth, mottled whitish and clay buff; gills adnate to short decurrent, crowded, cream to buff yellow; stem 20-70 x 8-25 mm, ± cylindrical, smooth, dry, whitish; smell chemical; taste becoming acrid. Sp 7-9.5 x 6.5-8.5 μm, subglobose, ornamentation up to 1.5 μm high, of ridges and irregular warts forming an incomplete reticulum (fig. 89A); pleuromacrocytidia absent. With *Fagus* on calcareous soil; summer to autumn; occasional in temp.-hemib.; DK (NT), NO (NT), SE (NT). – B&K 6:2, C&D 1600, FE 7:643, FNE 2:229, Ves 424, ☉.
L. acris (Bolton: Fr.) Gray
 - Milk white, unchanging when isolated from the flesh; cap dry; pileipellis not covered by a thick slime-layer 2
 - 2. Sp with wing-like ridges, up to 2(-3) μm high, forming a zebra-like or reticulate pattern (figs 89B-D); under *Carpinus* or *Fagus* on rich soil 3
 - Sp with ridges to 1(-1.5) μm high, forming a reticulate or spiny pattern (figs 89E-H); with deciduous trees or conifers on rich or poor soil 5
 - 3. Cap dark brown to blackish brown; sp with a reticulate, not zebra-like pattern (fig. 89B). Cap 55-110 mm, convex to expanded with depressed centre, radially rugulose-venose, often with crenulate margin, dry; gills adnate to short decurrent, medium spaced to distant, cream to warm buff; stem 50-85 x 10-25 mm, cylindrical, smooth, dry, clay buff to olive brown; milk white, turning pinkish in contact with the flesh; smell faint; taste mild to slightly bitter. Sp 7.5-10 x 6.5-8.5 μm, subglobose, ornamentation up to 2(-2.5) μm high, of ridges and irregular warts; pleuromacrocytidia absent. With *Fagus* on calcareous soil; summer to autumn; occasional in temp.-hemib.; DK (LC), NO (NT), SE (Sk). – FE 7:679 (as *ruginosus*), FNE 2:235, Mic Due 572, Ves 424, ☉.
L. romagnesii Bon
 - Cap yellowish to greyish brown; sp with a zebra-like pattern (fig. 89C-D), not or weakly reticulate 4
 - 4. Cap café-au-lait, often with paler ochraceous parts, often ± radially wrinkled with age, sometimes to margin, margin not crenulate; gills crowded to very crowded; sp subglobose to ellipsoid, with a few, up to 1 μm broad and up to 2.5(-3) μm high ridges forming a zebra-like pattern (fig. 89C). Cap 40-85 mm, convex to expanded with depressed centre, dry; gills short decurrent, warm buff to pinkish buff; stem 25-70 x 10-15 mm, often tapering downwards, smooth, dry, pale pinkish buff; milk white, turning pinkish in contact with the flesh; smell musty; taste mild. Sp 7-8.5 x 6-8 μm; pleuromacrocytidia absent. With *Fagus* and *Carpinus* on rich or calcareous soil; summer to autumn; common in temp., rare in hemib.; DK (LC), NO (VU), SE (LC). – C&D 1598, FE 7:671, 800, FNE 2:231-233, Phil 61d, Ves 425, ☉.
L. pterosporus Romagn.



Spores: A: *Lactarius acris*, B: *L. romagnesii*, C: *L. pterosporus*, D: *L. ruginosus*, E: *L. azonites* f. *azonites*, F: *L. fuliginosus*, G: *L. lignyotus*, H: *L. picinus*.

- Cap uniformly greyish brown, mostly without ochraceous parts, not wrinkled, margin usually crenulate; gills medium spaced; sp globose to subglobose, with numerous narrow, up to 2 μm high ridges, not forming a zebra-like pattern (fig. 89D). Cap 40-80 mm, convex to expanded with depressed centre, dry; gills adnate, cream to pinkish buff; stem 35-45 x 10-16 mm, cylindrical, smooth, dry, paler than cap; milk white, turning pinkish in contact with the flesh; smell musty; taste acrid. Sp 6.5-9 x 6-8 μm ; pleuromacrocystidia absent. With *Fagus* and *Carpinus* on rich and calcareous soil; summer to autumn; occasional in temp.; DK (LC), SE (NA). – C&D 1599, FNE 2:237, Mic Due 574.

L. ruginosus Romagn.

- 5. With deciduous trees 6
- With conifers 7

- 6. Stem whitish; gills often irregular and anastomosing near the stem; flesh quickly and intensively reddening when cut or bruised; pileipellis a trichopalisade with terminal elements which are often capitate and rarely curved upwards; with *Quercus* on calcareous soil. Cap 45-70 mm, convex to expanded with depressed centre, often irregular, smooth, dry, pale ochraceous to greyish brown, often with paler spots; gills adnate, medium spaced, whitish to pinkish buff; stem 30-50 x 10-15 mm, cylindrical or tapering downwards, smooth, dry; milk white, turning pinkish in contact with the flesh; smell fruity; taste mild. Sp 7.5-9.5 x 7-8.5 μm , globose to subglobose, ornamentation up to 1(-1.5) μm high, of narrow ridges and irregular warts forming a partial reticulum (fig. 89E); pleuromacrocystidia absent. In parks and forests; summer to autumn; rare in temp.-hemib.; DK (VU), FI (LC), NO (VU), SE (LC). – FNE 2:239, 241, Korh 183, Phil 60c, R&H 565, Ves 425.

L. azonites (Bull.) Fr. f. *azonites*

f. *virgineus* (J.E. Lange) Verbeken differs in having a whitish cap; DK, NO (Vestf: Nøtterøy).

– FE 7:651, 800, FNE 2:240.

- Stem pale to dark brown; gills not anastomosing; flesh less intensively reddening when cut or bruised; pileipellis a palisade with a thick layer of rounded cells and fewer terminal elements which are regularly cylindrical; with deciduous or coniferous trees on rich soil. Cap 45-125 mm, convex to expanded with depressed centre, mostly regular, smooth, dry, rather uniformly pale greyish brown, ochraceous to fawn; gills adnate to short decurrent, medium spaced to crowded, cream, then pinkish buff to honey-coloured; stem 40-85 x 10-20 mm, cylindrical, smooth, dry; milk white, turning pinkish in contact with the flesh; smell insignificant; taste mild to slightly acrid. Sp 7.5-9 x 6.5-8.5 μm , globose to subglobose, ornamentation about 1 μm high, of ridges forming a \pm complete reticulum (fig. 89F); pleuromacrocystidia absent. Late summer to autumn; common in hemib.-suba., very rare in temp.; DK (DD), FI (LC), NO (LC), SE (LC). – FE 7:655, 825, 816, FNE 2:245, Korh 182, Phil 60a, R&H 564.

L. fuliginosus (Fr.: Fr.) Fr.

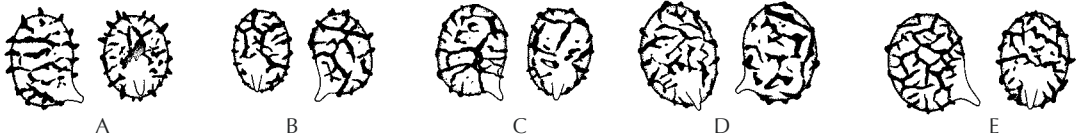
7. Cap with a papilla, very dark brown to almost blackish brown, contrasting with the white and decurrent gills; sp on av > 9 μm long; ornamentation with a clearly spiny aspect, not completely reticulate (fig. 89G). Cap 25-110 mm, convex to expanded with depressed centre, becoming funnel-shaped, smooth to radially wrinkled, dry; gills medium spaced; stem 35-100 x 5-12 mm, cylindrical, smooth or wrinkled, dry, concolorous with cap; milk white, turning pinkish in contact with the flesh; smell agreeable; taste mild and very agreeable. Sp 8.5-10 x 7.5-9 μm , globose to subglobose, ornamentation up to 1.5 μm high; pleuromacro-cystidia absent. In *Picea* forests; late summer to autumn; common in hemib.-southern bore., occasional in middle bore., very rare in temp.; DK (VU), FI (LC), NO (LC), SE (LC). – B&K 6:35, FE 7:659, 799, FNE 2:227, Korh 181-182, R&H 564, ☉.

L. lignyotus Fr.

- Cap without a papilla, paler or gills not decurrent; sp on av < 8.5 μm long, ornamentation reticulate 8
8. Cap dark brown to blackish brown, velvety; gills whitish, remaining so for rather long time; sp with broad ridges with a moniliform aspect, as if formed of rounded warts and small meshes (fig. 89H). Cap 40-90 mm, convex to expanded with slightly depressed centre, smooth, dry; gills broadly adnate to short decurrent, crowded; stem 45-70 x 11-20 mm, cylindrical or broadest at top, smooth, dry, clay buff to greyish brown; milk white, turning pinkish in contact with the flesh; smell dust-like; taste mild, becoming bitter. Sp 6-9 x 5.5-8 μm , globose to broadly ellipsoid, ornamentation up to 1(-1.5) μm high; pleuromacro-cystidia absent. In *Picea* forests; late summer to autumn; occasional in hemib.-bore., very rare in suba.; IS (Ve: Hafnarskógur), NO (LC), SE (LC). – B&K 6:45, C&D 1604, Däh 946, FE 7:667, FNE 2:243.
- L. picinus* Fr.
- Cap pale greyish brown, ochraceous to fawn, not velvety; gills cream, soon turning pinkish buff to honey-coloured; sp with rather narrow ridges and large meshes (fig. 89F) see *L. fuliginosus* 6

Key D: Milk turning bright yellow on exposure

1. Cap margin smooth 2
 - Cap margin velvety, hairy or bearded 3
2. Cap zonate. Cap 25-90 mm, convex to expanded with depressed centre, dry, ochraceous to salmon, zonate; gills broadly adnate to short decurrent, crowded, cream to pale pinkish buff; stem 25-50 x 6-20 mm, cylindrical, smooth, dry, whitish; milk white, turning lemon yellow; smell faint, fruity; taste becoming bitter to acrid. Sp 5.5-9 x 5-7 μm , broadly ellipsoid, ornamentation up to 1 μm high, of aligned warts and ridges connected to form an incomplete reticulum (fig. 91A); pleuromacro-cystidia 45-90 x 7-12 μm , \pm lanceolate. With *Quercus*, often on sandy soil; late summer to autumn; occasional in temp.-hemib.; DK (LC), NO (LC), SE (LC). – FNE 2:123, Korh 172, Phil 66b, R&H 562, Ves 426, ☉.
- L. chrysorrhoeus* Fr.
- Cap azonate see key I p. 101
3. Cap white or whitish; with various deciduous hosts or with *Pinus* 4
 - Cap vividly yellow, buff yellow, pale yellow or tinged olive; with *Picea* 6
4. Cap with long and slimy hairs at margin; sp on av < 5.5 μm broad. Cap 65-150 mm, convex to expanded with a deeply depressed centre, viscid to slimy, white to cream, with watery zones near margin; gills decurrent, crowded, cream, often with a pinkish hue; stem 20-80 x 17-50 mm, cylindrical, smooth or rough, not pitted, dry, whitish; milk white, turning lemon yellow; smell fruity-acidulous; taste adstringent to acrid. Sp 6-8.5 x 4-6 μm , ellipsoid, ornamentation about 0.5 μm high, of aligned warts and ridges connected to form an almost complete reticulum (fig. 91B); pleuromacro-cystidia 40-75 x 7-9 μm , \pm fusiform. Mostly with



Spores: A: *Lactarius chrysoorrhoeus*, B: *L. aquizonatus*, C: *L. citriolens*, D: *L. resimus*, E: *L. leonis*.

Betula, but also with *Pinus*, *Salix* and *Populus*; late summer to autumn; rare, but locally occasional in hemib.-bore., very rare in temp. and suba.; DK (EN), FI (LC), NO (NT), SE (LC). – FE 7:415, FNE 2:119, Korh 97-100, R&H 557, Ves 427.

L. aquizonatus Kytöv.

- Cap margin with dry hairs; sp on av > 5.5 µm broad 5
- 5. Cap conspicuously hairy at margin, somewhat zonate in outer part, whitish chrome to pale cream; in rich, calcareous deciduous forests with *Betula*, *Corylus*, *Quercus*, etc. Cap 60-140 mm, convex to expanded with depressed to umbilicate centre, viscid to slimy; gills broadly adnate to short decurrent, crowded, pale cream to whitish chrome; stem 45-60 x 20-30 mm, cylindrical with a widened base, smooth, not pitted, dry, pale cream, with hairy base; milk white, turning lemon yellow; smell fruity-acidulous; taste aromatic and bitter to acrid. Sp 6.5-9 x 4.5-6.5 µm, broadly ellipsoid to ellipsoid, ornamentation < 1 µm high, of aligned warts and ridges connected to form few meshes, but not a reticulum (fig. 91C); cystidia 45-60 x 8-11 µm, ± cylindrical, mainly found between the gills. Summer to autumn; rare in hemib.-bore., very rare in temp. and suba.; DK (NA, Brnh: Rønne Nordskov 1944), FI (LC), IS (Au, Na), NO (NT), SE (LC). – C&D 1518, FNE 2:121, Korh 95-96, Phil 66a, R&H 557.



L. citriolens Pouzar (*L. cilicioides* (Fr.) Fr. s. auct.)

- Cap pubescent towards margin, azonate, white; with *Betula* or *Pinus*, both in acid and calcareous sites. Cap 100-200 mm, convex to expanded with deeply depressed centre, viscid to slimy; gills decurrent, crowded, pale cream; stem 30-55 x 20-30 mm, cylindrical, smooth or slightly pitted, dry, whitish; milk white, turning lemon yellow; smell faint, fruity; taste becoming bitter to acrid. Sp 7-9.5 x 5.5-7 µm, broadly ellipsoid to ellipsoid, ornamentation < 1 µm high, of aligned warts and ridges connected to form an incomplete reticulum (fig. 91D); pleuromacrocystidia 40-70 x 7-9 µm, cylindrical to fusiform. Late summer to autumn; in FI occasional up to PeP, elsewhere rare in hemib.-bore., very rare in temp.; DK (NA, Brnh: Rønne Nordskov 1947), FI (LC), NO (NT), SE (LC). – B&K 6:55, FE 7:423, FNE 2:117, Korh 96-97, R&H 556.

L. resimus (Fr.: Fr.) Fr.

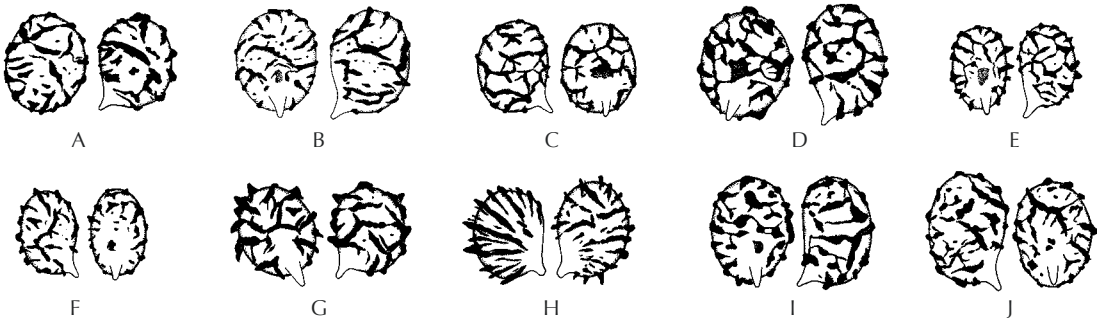
- 6. Stem distinctly pitted in full length; macrocystidia very scarce on the gills, but present between the gills 7
- Stem not pitted or only slightly so at the base; macrocystidia numerous to scarce on the gills 8
- 7. Cap pale chrome to lemon chrome or olivaceous buff, azonate or with indistinct, watery zones; sp reticulate with numerous closed meshes. Cap 50-150 mm, convex to expanded with depressed centre, finally funnel-shaped, pubescent towards margin, viscid; gills broadly adnate to decurrent, crowded, cream to whitish chrome; stem 40-80 x 15-35 mm, cylindrical or tapering downwards, dry, whitish with honey-coloured pits; milk white, turning lemon yellow; smell fruity; taste bitter to spicy. Sp 7-9 x 5.5-7 µm, broadly ellipsoid (fig. 91E), ornamentation up to 0.5 µm high, of aligned warts and ridges connected to form an almost complete reticulum; cystidia 65-100 x 6-12 µm, ± lanceolate, mainly found between the gills. In damp and calcareous *Picea* forests; summer to autumn; rare, but locally occasional in bore.; FI (LC), NO, SE (LC). – B&K 6:33, Bol Bres 41:167, 168, FE 7:435, FNE 2:109, Korh 88.

L. leonis Kytöv.

- Cap yellow to buff yellow, mostly with conspicuous zones; sp ornamentation not reticulate, closed meshes absent or rare. Cap 60-200 mm, convex to expanded with depressed centre, hairy towards margin, viscid; gills adnate to decurrent, crowded, cream to whitish chrome; stem 25-80 x 15-40 mm, cylindrical, dry, whitish with honey-coloured pits; milk white, turning lemon yellow; smell fruity-acidulous; taste bitter to acrid. Sp 7-10 x 5.5-7.5 μm , broadly ellipsoid, ornamentation up to 1 μm high, of aligned warts and ridges connected to form a \pm spirally pattern (fig. 93A). In *Picea* forests on \pm calcareous soil; summer to autumn; common in hemib.-suba., very rare in temp.; DK (EN), FI (LC), NO, SE (LC). – B&K 6:64, FE 7:446, 786, 820, FNE 2:107, Korh 86, R&H 558, .
- 8. Cap straw yellow with an olive tinge; pleuromacrocytidia 7-17 μm broad, mostly numerous. Cap 35-100 mm, convex to expanded with depressed centre, viscid, with appressed triangular scales, azonate; gills adnate to decurrent, medium spaced to crowded, cream to pale chrome; stem 30-60 x 12-20 mm, cylindrical, smooth or indistinctly pitted, dry, pale chrome; milk white, turning lemon yellow; smell fruity; taste becoming acrid. Sp 7.5-10 x 6-8 μm , broadly ellipsoid, ornamentation about 0.5 μm high, of aligned warts and ridges connected to form an incomplete reticulum (fig. 93B); pleuromacrocytidia 35-105 μm long, \pm lanceolate. In damp and \pm calcareous *Picea* forests; summer to autumn; rare in hemib.-bore.; FI (LC), NO, SE (NT). – FE 7:439, FNE 2:111, Korh 85.
L. olivinus Kytöv.
- Cap without olive tinges; pleuromacrocytidia 5-10 μm broad, scattered to rare 9
- 9. Cap 35-70 mm, deeply depressed to umbilicate, at margin with a fringe of hairs when young, without radiating ridges; sp on av < 6.5 μm broad. Cap viscid, often \pm zonate; gills decurrent, medium spaced to crowded, pale cream to whitish chrome; stem 40-65 x 10-18 mm, cylindrical, smooth or slightly pitted near base, dry, whitish chrome; milk white, turning lemon yellow; smell sweetish or fruity; taste bitter. Sp 6.5-9 x 5-6.5 μm , broadly ellipsoid to ellipsoid, ornamentation about 0.5 μm high, of aligned warts and ridges connected to form an almost complete reticulum (fig. 93C); pleuromacrocytidia 45-75 x 8-10 μm , \pm fusiform. In damp and \pm calcareous *Picea* forests; summer to autumn; rare in bore.; FI (LC), NO (NE), SE (LC). – FE 7:419, FNE 2:113, Korh 81.
L. auriolla Kytöv.
- Cap 45-160 mm, shallowly depressed, at margin hairy-scaly, often with radiating ridges; sp on av > 6.5 μm broad. Cap viscid, azonate; gills adnate to short decurrent, crowded, cream to whitish chrome; stem 40-130 x 15-35 mm, cylindrical, smooth, dry, whitish to pale chrome with scattered brownish spots; milk white, turning lemon yellow; smell fruity; taste bitter to acrid. Sp 7.5-10 x 6-7.5 μm , broadly ellipsoid, ornamentation up to 1 μm high, of aligned warts and ridges connected to form an almost complete reticulum (fig. 93D); pleuromacrocytidia 30-90 x 5-9 μm , \pm fusiform. In moist, *Picea* forests, both on acid and calcareous soil; summer to autumn; common in bore.-suba., but less common in NO, rare in hemib.; FI (LC), NO (LC), SE (LC). – B&K 6:74, FE 7:451, FNE 2:115, Korh 82-84, RdM 46:118, .
- L. tuomikoskii* Kytöv.

Key E: Milk white; cap margin distinctly scaly, hairy or bearded when young

1. Cap whitish to cream 2
- Cap clay buff, brick, salmon, dark pink or lilac 3
2. Stem 11-20 mm broad; with *Betula*, mostly in dry places, e.g. in parks, gardens and at road-sides. Cap 35-100 mm, convex to expanded with depressed centre, hairy in outer part, \pm smooth with age, dry, azonate; gills broadly adnate to decurrent, crowded, cream; stem 25-65 mm long, cylindrical, smooth, dry, cream; milk white; smell acidulous-fruity; taste very acrid. Sp 6-8.5 x 4-6 μm , broadly ellipsoid to ellipsoid, ornamentation up to 0.5 μm high, of



Spores: A: *Lactarius scrobiculatus*, B: *L. olivinus*, C: *L. auriolla*, D: *L. tuomikoskii*, E: *L. pubescens*, F: *L. scoticus*, G: *L. mairei*, H: *L. spinosulus*, I: *L. torminosulus*, J: *L. torminosus*.

ridges and warts, connected to form several closed meshes (fig. 93E); pleuromacrocytidia 30-60 x 7-10 μm , fusiform to lanceolate. Late summer to autumn; common in temp.-suba., occasional in arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – FE 7:383, FNE 2:161, Korh 72-73, Phil 50c, Ves 442, ☉.

L. pubescens (Schrad.) Fr.

- Stem 4-10 mm broad; with *Betula* in damp places, such as rich fens, springs and brooks. Cap 15-60 mm, convex to expanded with depressed centre, hairy in outer part, \pm smooth with age, dry, azonate; gills broadly adnate to decurrent, crowded, cream; stem 20-75 mm long, cylindrical, smooth, dry, cream; milk white; smell acidulous-fruity; taste very acrid. Sp 5.5-7.5 x 4.5-5.5 μm , broadly ellipsoid to ellipsoid, ornamentation up to 0.5 μm high, of ridges and warts, connected to form several closed meshes (fig. 93F); pleuromacrocytidia 40-60 x 7-10 μm , fusiform to lanceolate. Summer to autumn; common in FI, elsewhere occasional in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 6:63, FE 7:387, FNE 2:163, Korh 71-72, Ves 443.

L. scoticus Berk. & Broome

3. Cap pale clay buff; with *Quercus* on calcareous soil. Cap 25-120 mm, convex to expanded with depressed centre, bearded in outer part, dry, \pm zonate; gills broadly adnate to short decurrent, crowded, cream; stem 15-40 x 6-15 mm, cylindrical, smooth, dry, cream; milk white; smell fruity; taste becoming acrid. Sp 6-9 x 5-7 μm , broadly ellipsoid, ornamentation up to 1 μm high, of ridges and warts, connected to form few closed meshes (fig. 93G); pleuromacrocytidia 40-95 x 6-12 μm , lanceolate. Autumn; very rare in temp.; DK (CR, after 1980 only in Sj: Sorø Sønderskov), SE (VU). – FE 7:375, FNE 2:165, Jordst 16(1), Phil 51f, R&H 561, ☉.


L. mairei Malençon

- Cap brick to dark pink or lilac; mostly with *Betula* 4



4. Cap finely scaly to strigose hairy in outer part, rather thin-fleshed; sp ornamentation forming a zebra-like pattern (fig. 93H). Cap 20-70 mm, convex to expanded with depressed centre, dry, salmon to brick or lilac, \pm zonate; gills decurrent, medium spaced to crowded, cream to pinkish buff; stem 15-40 x 5-12 mm, cylindrical, smooth, dry, salmon to pale vinaceous; milk white; smell fruity; taste becoming bitter to acrid. Sp 6-8.5 x 5-6.5 μm , broadly ellipsoid, ornamentation about 1 μm high; pleuromacrocytidia 40-100 x 6-10 μm , fusiform. With deciduous trees, mainly *Betula*; summer to autumn; occasional, but locally common in hemib.-suba., very rare in temp.; DK (EN), FI (LC), IS, NO (LC), SE (LC). – FE 7:394, FNE 2:167, Korh 172, Phil 55g, R&H 572, ☉.

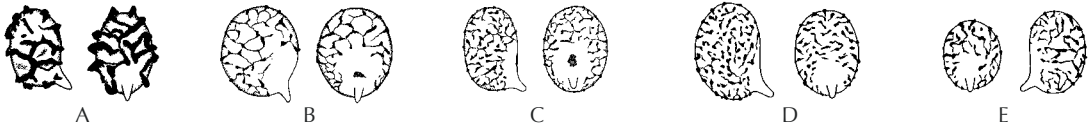
L. spinosulus Quél. & Le Bret.

- Cap hairy in outer part, thick-fleshed; sp ornamentation not forming a zebra-like pattern 5

5. Cap 15-50 mm, hairs at margin up to 5 mm long, disappearing with age. Cap convex to expanded with depressed centre, hairy near margin, dry, flesh pink to brick, \pm zonate; gills adnate to short decurrent, crowded, pale pinkish buff; stem 25-55 x 6-15 mm, cylindrical, smooth, dry, pale salmon to pinkish buff; milk white; smell acidulous-fruity; taste very acrid. Sp 7.5-10 x 5.5-7.5 μm , broadly ellipsoid to ellipsoid, ornamentation about 0.5 μm high, of warts and ridges connected to form some closed meshes (fig. 93I); pleuromacrocytidia 35-75 x 6-10 μm , fusiform to lanceolate. In mountain heaths, but also in lowland in spring places and bogs with *Betula nana*, rarely with *Betula pubescens*; summer to early autumn; common in suba.-arc. / alp.; FI (LC), IS, NO (LC), SE (LC). – Bor 87 (as *Lactarius* sp.), FNE 2:159, Korh 74 bottom (as *torminosus*).
L. torminosulus Knudsen & T. Borgen
- Cap 40-110 mm, hairs at margin up to 10 mm long, persisting. Cap convex to expanded with depressed centre, increasingly hairy towards margin, dry, flesh pink to brick, mostly zonate; gills adnate to decurrent, crowded, pale pinkish buff; stem 35-70 x 10-30 mm, cylindrical, smooth, dry, pale salmon to pinkish buff; milk white; smell acidulous-fruity; taste very acrid. Sp 7.5-9.5 x 5.5-7 μm , broadly ellipsoid to ellipsoid, ornamentation up to 0.5 μm high, of warts and ridges connected to form several closed meshes (fig. 93J); pleuromacrocytidia 50-70 x 6-10 μm , fusiform to lanceolate. With *Betula* in forests, parks, gardens, also in arctic habitats with *Betula nana*, often in damp habitats; summer to autumn; very common in temp.-arc. / alp.; DK (LC), FI (LC), IS, NO (LC, incl. Svb), SE (LC). – FNE 2:157, Korh 74 top, Phil 51e, R&H 562, Ves 442, .
- L. torminosus* (Schaeff.: Fr.) Pers.

Key F: Milk white; cap whitish

1. Gills distinctly pinkish; cap with indistinct pinkish to reddish zones; with *Populus* and with *Salix* in dunes; pileipellis an ixocutis. Cap 80-300 mm, convex to expanded with depressed centre, viscid, often with adhering particles, whitish to pinkish; gills adnate to short decurrent, crowded; stem 25-50 x 15-30 mm, cylindrical, smooth, dry or slightly viscid, whitish; milk white; smell faint, acidulous; taste becoming very acrid. Sp 6-8.5 x 4-6 μm , ellipsoid, ornamentation up to 0.5 μm high, of ridges, connected to form a \pm complete reticulum (fig. 95A); pleuromacrocytidia 30-50 x 5-8 μm , cylindrical to fusiform. Summer to autumn; occasional in temp.-hemib., but rare in FI; DK (LC), FI (LC), NO (VU), SE (NE). – FNE 2:137, Korh 102, Phil 48a, R&H 565, Ves 431, .
- L. controversus* Pers.: Fr.
- Gills white to cream; cap white to cream, azonate; with *Fagus*, *Quercus*, *Betula* or conifers; pileipellis not an ixocutis 2
2. Cap velvety; gills medium spaced to crowded; pileipellis with terminal elements very long and thick-walled 3
- Cap smooth or wrinkled; gills very crowded; pileipellis with terminal elements rather short and thin-walled 4
3. Milk mild when isolated from the burning acrid flesh, unchanged with KOH; sp on av > 9 μm long; terminal elements of pileipellis with regularly thickened walls and a \pm swollen apex. Cap 50-300 mm, convex to expanded with depressed centre, becoming funnel-shaped, velvety, dry, whitish; gills decurrent, medium spaced to crowded, pale cream; stem 25-70 x 20-65 mm, cylindrical or tapering downwards, smooth, dry, whitish; milk white; smell indistinct. Sp 7.5-12 x 6.5-9.5 μm , broadly ellipsoid, ornamentation up to 0.2 μm high, of warts and narrow ridges, connected to form a \pm complete reticulum (fig. 95B); pleuromacrocytidia 50-85 x 6-12 μm , cylindrical to fusiform. In deciduous forests, less often in coniferous forests; late summer to late autumn; very common in temp.-hemib., but rare in FI; DK (LC), FI (NT), NO (LC), SE (LC). – FNE 2:253, Phil 48b, R&H 555, Svp 35:41, Ves 421, .
- L. vellereus* (Fr.: Fr.) Fr.

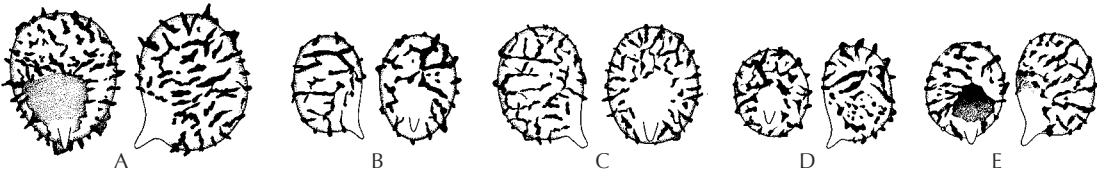


Spores: A: *Lactarius controversus*, B: *L. vellereus*, C: *L. bertillonii*, D: *L. glaucescens*, E: *L. piperatus*.

- Milk and flesh burning acrid; milk turning bright yellow with KOH; sp on av $\leq 9 \mu\text{m}$ long; terminal elements of pileipellis thin-walled towards the non-swollen apex. Cap 50-200 mm, convex to expanded with depressed centre, becoming funnel-shaped, velvety, dry, whitish; gills decurrent, medium spaced to crowded, pale cream; stem 30-80 x 20-60 mm, cylindrical or tapering downwards, smooth, dry, whitish; milk white; smell indistinct. Sp 7-10 x 5-7.5 μm , broadly ellipsoid, ornamentation up to 0.2 μm high, of partly connected narrow ridges, not forming a reticulum (fig. 95C); pleuromacrocytistidia 50-75 x 6-12 μm , clavate to subfusiform. In deciduous forests with *Fagus*, *Quercus* and *Betula*; summer to autumn; occasional, but locally common in hemib.-southern bore., rare in temp.; DK (LC), FI (LC), NO (NE), SE (LC). – FE 7:711, FNE 2:255, Korh 71, Svp 35:71, Ves 421.
L. bertillonii (Z. Schaef.) Bon (*L. vellereus* (Fr.: Fr.) Fr. var. *bertillonii* Z. Schaef.)
- 4. Milk white, drying greenish, turning yellow to orange with KOH; suprapellis 80-120 μm thick, hiding the underlying cellular layer in uperview. Cap 50-150 mm, convex to expanded with depressed centre, smooth or slightly wrinkled, dry, white to cream; gills decurrent, very crowded, very narrow, cream; stem 30-90 x 10-40 mm, cylindrical or tapering downwards, smooth, dry, whitish; smell indistinct; taste very acrid. Sp 6.5-9.5 x 5.5-7 μm , broadly ellipsoid, ornamentation up to 0.2 μm high, of isolated or aligned warts, not suggesting a reticulum (fig. 95D); pleuromacrocytistidia 60-90 x 7-10 μm , cylindrical. In deciduous forests on calcareous soil; summer to early autumn; rare in temp.-hemib.; DK (DD), FI (LC), NO (NE), SE (LC). – B&K 6:25, FE 7:727, 804, Jordst 8(1), FNE 2:251, Korh 68-69.
L. glaucescens Crossl. (*L. pergamenus* (Sw.: Fr.) Fr. s. Blum)
- Milk white, unchanged when drying and with KOH; suprapellis 10-30 μm thick, clearly showing the underlying cellular layer. Cap 40-120 mm, convex to expanded with depressed centre, smooth, dry, whitish; gills decurrent, very crowded, very narrow, cream; stem 40-95 x 12-30 mm, cylindrical or tapering downwards, smooth, dry, whitish; smell indistinct; taste very acrid. Sp 7-10.5 x 5-7.5 μm , broadly ellipsoid, ornamentation up to 0.2 μm high, of aligned warts forming an incomplete reticulum (fig. 95E); pleuromacrocytistidia 50-70 x 8-11 μm , cylindrical to subfusiform. In rich deciduous forests with *Fagus*, etc.; summer to early autumn; occasional in temp.-hemib., rare in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FNE 2:249, Korh 67,70, Phil 49c, R&H 556, Ves 422, ☉.
L. piperatus (L.: Fr.) Pers.

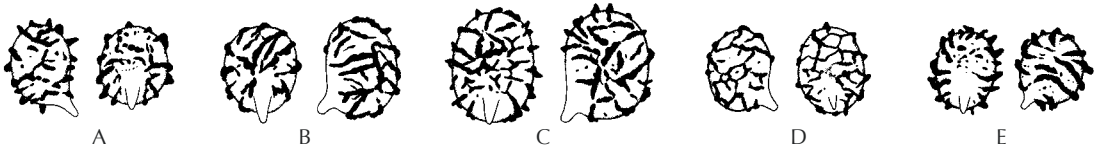
Key G: Milk white; cap sticky to slimy, orange or yellow, typically zonate

1. Basidia 2-spored; sp 9.5-14 x 8-11.5 μm (fig. 96A); gills often forked and anastomosing, especially near the stem; with *Quercus* on rich soil. Cap 35-120 mm, convex to expanded with depressed centre, often irregular, pale ochraceous, orange ochraceous or brownish orange, sometimes \pm zonate; gills adnate to short decurrent, pinkish buff; stem 14-55 x 8-20(-35) mm, cylindrical or tapering downwards, smooth or slightly pitted, dry, whitish to pale pinkish buff; milk white; smell agreeable, fruity, like apples; taste very acrid. Sp broadly ellipsoid, ornamentation up to 1 μm high, of aligned warts and ridges, not forming a reticulum; pleuromacrocytistidia 40-50 x 3-6 μm , fusiform. Summer to autumn; rare in temp.-hemib., only one record from FI (A: Mariehamn, Ytternäs); DK (EN), FI (CR), NO (EN), SE (NT). – FE 7:335, 779, FNE 2:125, Phil 58b, R&H 566 (as *insulsus*), Ves 433, ☉.
L. acerrimus Britzelm.



Spores: A: *Lactarius acerrimus*, B: *L. porninsis*, C: *L. zonarioides*, D: *L. zonarius*, E: *L. evosmus*.

- Basidia 4-spored, rarely mixed with some 2-spored; sp $\leq 10 \mu\text{m}$ long; gills not or slightly forked and anastomosing; with *Quercus* or other hosts 2
- 2. With *Larix*; milk mild; cap with bright, dominantly orange colours. Cap 30-130 mm, convex to expanded with depressed centre, smooth, viscid, zonate in outer part; gills adnate to short decurrent, crowded, pinkish buff; stem 20-90 x 7-25 mm, \pm cylindrical, smooth, dry, cream to pale pinkish buff; milk white; smell fruity; taste mild to bitter. Sp 6.5-9.5 x 5-7.5 μm , broadly ellipsoid to ellipsoid, ornamentation up to 0.5 μm high, of warts and ridges connected to form an incomplete reticulum (fig. 96B); pleuromacrocystidia 40-50 x 5-7 μm , subfusiform. Summer to autumn; very rare in temp.; DK (vu), SE (lc). – B&K 6:47, FE 7:355, FNE 2:135, RdM 46:121, Svp 29:37.
L. porninsis Rolland
- With *Picea*, *Abies* or deciduous trees; milk acrid; cap cream, pale yellowish, ochraceous or yellowish buff to salmon 3
- 3. With *Picea* or *Abies*; sp on av $> 8 \mu\text{m}$ long. Cap 30-130 mm, convex to plane with depressed centre, smooth, viscid to slimy, yellowish buff to salmon with darker zones; gills adnate to short decurrent, crowded, pinkish buff; stem 30-100 x 12-25 mm, cylindrical, smooth, dry, cream; milk white; smell fruity or like liqueur; taste very acrid. Sp 8-10 x 7-8.5 μm , broadly ellipsoid, ornamentation up to about 0.5 μm high, of aligned warts and ridges, not forming a reticulum (fig. 96C); pleuromacrocystidia 35-50 x 4-6 μm , fusiform. In herb rich forests; late summer to autumn; occasional in hemib.-bore.; FI (lc), NO (lc), SE (lc). – FNE 2:133, Korh 100-102, Nit 308, Phil 62c, R&H 566.
L. zonarioides Kühner & Romagn. (*L. bresadolanus* Singer nom. nud.)
- With deciduous trees; sp on av $< 8 \mu\text{m}$ long 4
- 4. Cap usually distinctly zonate all over, yellowish to reddish ochraceous, at margin somewhat velvety when young; smell insignificant or slightly sweet and fruity; flesh reddening after 10-20 min. or slower, later greyish; stem \pm pitted; with *Quercus*; pleuromacrocystidia larger than basidia. Cap 50-100 mm, convex to plane with depressed centre, viscid; gills \pm decurrent, crowded, white to cream; stem 25-55 x 10-25 mm, cylindrical, dry or slightly viscid, white to cream; milk white; taste very acrid. Sp 6.5-9 x 5-7.5 μm , broadly ellipsoid to ellipsoid, ornamentation $< 1 \mu\text{m}$ high, of warts and short ridges not forming a reticulum (fig. 96D); pleuromacrocystidia fusiform. On calcareous soil; late summer to autumn; very rare in temp.; DK (EJyl: Elbæk Skov). – B&K 6:82, FE 7:367, 782, FNE 2:131, Phil 58c, Svp 53:60.
L. zonarius (Bull.) Fr.
- Cap not remarkably zonate or only at margin, pale yellow to ochraceous cream when young, not velvety; smell strongly fruity like apples or *Russula fellea*; cap margin often whitish; flesh not reddening; stem not pitted; with *Salix*, *Populus* or *Quercus*; pleuromacrocystidia 25-35 x 4-6 μm , not larger than basidia. Cap 65-150 mm, convex to plane with depressed centre, viscid; gills \pm decurrent, crowded, white to cream; stem 20-55 x 15-25 mm, cylindrical, dry, white to cream; milk white; taste very acrid. Sp 6-9 x 5-7 μm , broadly ellipsoid to ellipsoid, ornamentation up to 0.5 μm high, of warts and ridges forming a zebra-like pattern (fig. 96E); pleuromacrocystidia fusiform. On calcareous soil, thermophilous; summer to



Spores: A: *Lactarius pallidus*, B: *L. musteus*, C: *L. albocarneus*, D: *L. necator*, E: *L. pyrogalus*.

autumn; rare in temp.-hemib., very rare in southern bore.; DK (NT), FI (NT), NO (NT), SE (LC). – B&K 6:20, FNE 2:127,129, Korh 101 (as *zonarius*), Phil 50b, Ves 433, ☉.

L. evosmus Kühner & Romagn.

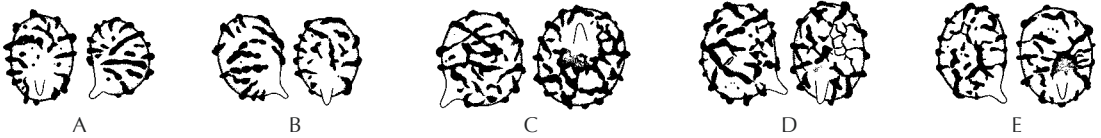
Key H: Milk white; cap sticky to slimy, cream, greyish, brownish or reddish

- 1. Cap whitish, cream or pale pinkish buff at least when young 2
 - Cap olivaceous, ochraceous, greyish, violaceous, buff or brown already when young 4
- 2. In *Fagus* forests, mostly on basic soil. Cap 35-100 mm, convex to expanded with depressed centre, smooth, slimy, cream, becoming pinkish buff, azonate; gills broadly adnate to short decurrent, crowded, cream; stem 35-85 x 10-25 mm, cylindrical, smooth, viscid, cream to pinkish buff; milk white; smell slightly fruity-acidulous; taste mild to slightly acrid. Sp 6.5-8.5 x 5-6.5 μm, broadly ellipsoid, ornamentation about 1 μm high, of warts and ridges connected to form a zebra-like pattern without closed meshes (fig. 97A); pleuromacrocystidia 45-100 x 6-10 μm, ± lanceolate. Summer to autumn; common in temp., rare in hemib.; DK (LC), NO (LC), SE (LC). – B&K 6:44, FNE 2:75, Phil 51d, R&H 568, Ves 432, ☉.
L. pallidus Pers.: Fr. 3
 - With conifers
- 3. In *Pinus* forests on acid soil; taste mild to slightly bitter. Cap 40-95 mm, convex to expanded with depressed centre, smooth, slimy, cream, becoming pale buff, azonate; gills broadly adnate, crowded, cream; stem 30-70 x 11-35 mm, cylindrical, smooth, viscid, cream to pale buff; milk white; smell faint, fruity. Sp 7-9.5 x 5.5-7.5 μm, broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges connected to form a reticulum (fig. 97B); pleuromacrocystidia 55-85 x 8-14 μm, lanceolate. Late summer to autumn; occasional in hemib.-bore., very rare in temp.; DK (VU), FI (LC), NO (LC), SE (NT). – FNE 2:77, Korh 136, Phil 50a, SMT27(3):11, Ves 432.
L. musteus Fr.
 - With *Abies* on rich or calcareous soil; taste soon acrid. Cap 25-60 mm, convex to expanded with depressed centre, smooth, slimy, cream, becoming buff, azonate; gills adnate to decurrent, crowded, cream; stem 30-70 x 8-15 mm, cylindrical, often irregular, smooth, viscid, whitish; milk white; smell faint, fruity. Sp 7-9.5 x 6.5-8 μm, subglobose to broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges forming a zebra-like pattern and some closed meshes (fig. 97C); pleuromacrocystidia 65-100 x 8-10 μm, lanceolate. Autumn; very rare in temp.; DK (EN). – B&K 6:3, C&D 1546, Däh 962-963, FE 7:161, 164, FNE 2:79.
L. albocarneus Britzelm. (*L. glutinopallens* F.H. Møller & J.E. Lange)
- 4. Cap olivaceous, olivaceous grey or ochraceous 5
 - Cap greyish, violaceous, pinkish buff, reddish brown or cinnamon 8
- 5. Cap olivaceous to blackish olivaceous, darkest at centre, bright purple with KOH; with *Picea* or *Betula*. Cap 30-140 mm, convex to expanded with depressed centre, velvety to hairy in outer part, viscid at centre, azonate; gills adnate to short decurrent, crowded, cream; stem 20-65 x 9-25 mm, cylindrical, smooth, slightly viscid, olivaceous; milk white; smell faint; taste very acrid. Sp 6.5-9 x 5-6.5 μm, broadly ellipsoid, ornamentation up to 1 μm high, of

warts and ridges forming a reticulum (fig. 97D); pleuromacrocytidia 40-85 x 7-10 μm , lanceolate. Mainly on sandy or peaty soil; summer to autumn; very common in temp.-hemib., common in bore.-suba., but very rare in IS; DK (LC), FI (LC), IS (Ve: Kópavogur), NO (LC), SE (LC). – FNE 2:43, Korh 136, Phil 57e, R&H 560, Ves 428, ☉.

L. necator (Bull.: Fr.) Pers. (*L. plumbeus* (Bull.: Fr.) Gray, *L. turpis* (Weinm.) Fr.)

- Cap olivaceous grey or ochraceous, not purple with KOH; with *Corylus* or *Fagus* 6
- 6. With *Corylus*; gills cream to pinkish buff, medium spaced to distant. Cap 25-90 mm, convex to expanded with depressed centre, smooth, viscid, greyish to ochraceous, sometimes with darker zones; gills short decurrent; stem 25-65 x 8-20 mm, cylindrical or tapering downwards, smooth, dry, cream to greyish buff; milk white, drying greenish grey; smell faint or fruity; taste very acrid. Sp 5-7.5 x 4.5-6 μm , broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges forming a zebra-like ornamentation (fig. 97E); pleuromacrocytidia 45-105 x 7-10 μm , lanceolate. On rich soil; summer to autumn; common in temp.-hemib., rare in southern-middle bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FNE 2:53, Korh 133, Phil 58a, R&H 571, Ves 431.
L. pyrogalus (Bull.: Fr.) Fr. (*L. hortensis* Velen.)
- With *Fagus*; gills white to cream, crowded 7
- 7. Cap at margin distinctly paler than the rest of the cap, soon becoming dry; gills pale cream to cream, dark greyish brown when bruised; milk very abundant. Cap 40-170 mm, convex to expanded with depressed centre, olivaceous grey to clay buff, often with darker zones; gills short decurrent, crowded; stem 35-70 x 12-25 mm, cylindrical or tapering downwards, smooth, viscid to dry, cream to greyish buff; milk white, drying olivaceous grey; smell faint; taste acrid. Sp 6-8 x 5-6.5 μm , broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges connected to form a partly zebra-like pattern with few closed meshes (fig. 99A); pleuromacrocytidia 45-90 x 6-10 μm , lanceolate. With *Fagus* on rich soil; summer to autumn; occasional in temp., rare in hemib.; DK (LC), NO, SE (LC). – C&D 1543, FNE 2:49, Phil 52a, Svp 34:12, Ves 429.
L. fluens Boud.
- Cap at margin not distinctly paler than the rest of the cap, remaining viscid to slimy; gills whitish to pale cream, pale brownish when bruised; milk moderately abundant. Cap 35-95 mm, convex to plane with depressed centre, olivaceous grey, often with zones of darker dots; gills adnate to short decurrent, crowded; stem 30-70 x 12-30 mm, cylindrical, smooth, viscid, pale olivaceous grey; milk white, drying pale olivaceous grey; smell faint; taste acrid. Sp 5.5-8 x 4.5-6.5 μm , broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges connected to form a partly zebra-like pattern with some closed meshes (fig. 99B); pleuromacrocytidia 30-85 x 6-10 μm , \pm lanceolate. With *Fagus* in forests and parks, on rich and on poor and sandy soil; summer to autumn; very common in temp., occasional in hemib.; DK (LC), FI (DD), NO (LC), SE (LC). – FNE 2:45-47, Korh 137, R&H 567, Svp 34:13, Ves 428, ☉.
L. blennius (Fr.: Fr.) Fr.
- 8. Milk drying greenish grey; stem mostly with a pale zone at the top; with *Betula* 9
- Milk unchanged or drying greyish or ochraceous; stem hardly with a pale zone at the top; with *Betula* or other hosts 10
- 9. Cap dark brown to sepia or greyish brown, often umbonate. Cap 12-55 mm, conical to convex, later plane, smooth, viscid, azonate or indistinctly zonate; gills decurrent, medium spaced to crowded, pinkish buff; stem 25-70 x 4-20 mm, \pm cylindrical, smooth, dry, pinkish buff; milk white, drying greenish grey; smell indistinctly acidulous; taste acrid. Sp 6.5-8.5 x 5.5-7 μm , broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges connected to form a \pm complete reticulum (fig. 99C); pleuromacrocytidia 50-75 x 6-9 μm , lanceolate. With *Betula* in bogs, often in *Sphagnum*; summer to autumn; occasional in temp.-suba.; FI (LC), NO (LC), SE (LC). – FE 7:113, FNE 2:63, Korh 134.
L. pilatii Z. Schaef. (*L. moseri* Harmaja)



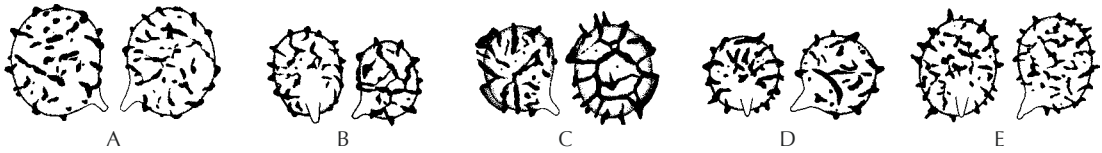
Spores: A: *Lactarius fluens*, B: *L. blennius*, C: *L. pilatii*, D: *L. vietus*, E: *L. nanus*.

- Cap pale grey to vinaceous grey, rarely umbonate. Cap 20-75 mm, convex to plane with depressed centre, smooth, viscid, zonate or azonate; gills decurrent, crowded, cream to pinkish buff; stem 25-65 x 5-18 mm, ± cylindrical, smooth, dry, cream to pale olivaceous grey; milk white, drying greenish grey; smell indistinctly fruity; taste very acrid. Sp 7-9.5 x 5.5-7.5 μm, broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges connected to form an incomplete reticulum (fig. 99D); pleuromacrocystidia 25-55 x 5-9 μm, lanceolate. With *Betula* on nutrient poor soil in bogs or on dry soil; late summer to autumn; very common in temp.-arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – FNE 2:59, Korh 135, Phil 53de, R&H 568, Ves 430, ☉.
L. vietus (Fr.: Fr.) Fr.
- 10. With dwarf *Salix* in arc./alp.; cap 15-35(-50) mm, almost dry. Cap convex to plane or slightly depressed, smooth, clay buff to vinaceous brown, azonate, greyish pruinose when young; gills adnate to short decurrent, medium spaced, pinkish buff; stem 10-25 x 3-10 mm, cylindrical, smooth, dry, pruinose, pale pinkish buff; milk watery white; smell insignificant; taste mild to slightly acrid. Sp 7-9.5 x 5.5-7.5 μm, broadly ellipsoid, ornamentation about 0.5 μm high, of warts and ridges connected to form an incomplete reticulum (fig. 99E); pleuromacrocystidia 45-85 x 6-9 μm, lanceolate. Summer; occasional, but locally common in suba.-arc./alp.; FO, IS, NO (LC, incl. Sv), SE (LC). – B&K 6:41, C&D 1533, FE 7:145, FNE 2:65, FND 11:10, ☉.
L. nanus J. Favre
- In temp.-suba. with other hosts or cap larger and distinctly viscid to slimy 11
- 11. With *Carpinus* in forests and parks. Cap 30-100 mm, convex to plane or slightly depressed, smooth, slightly viscid, greyish with greyish brown zones; gills adnate to short decurrent, crowded, pinkish buff; stem 17-45 x 8-25 mm, ± cylindrical, smooth, dry, pale grey; milk white, drying olivaceous buff; smell fruity; taste becoming bitter to acrid. Sp 5.5-8 x 4.5-6.5 μm, broadly ellipsoid, ornamentation about 1 μm high, of ridges and warts in a zebra-like pattern (fig. 100A); pleuromacrocystidia 35-60 x 5.5-7 μm, cylindrical to narrowly lageniform. Summer to autumn; occasional in temp., very rare in hemib.; DK (LC), NO (NE), SE (LC). – C&D 1540, Däh 966, FNE 2:51, Phil 56a, Ves 429, ☉.
L. circellatus Fr.
- With *Betula*, *Populus*, *Salix* or conifers 12
- 12. Cap cinnamon to brick or reddish brown or pinkish brown to clay pink 13
- Cap without reddish or pinkish tinges 15
- 13. Taste mild or slightly acrid after a while; with *Picea*, *Betula* and *Salix*, often in periodically flooded places. Cap 30-70 mm, convex to plane with depressed centre, smooth, viscid, clay pink to pinkish brown, azonate or with few narrow zones at margin; gills adnate to short decurrent, pinkish buff; stem 35-85 x 10-17 mm, cylindrical, smooth, dry, pinkish buff; milk white. Sp 6.5-8.5 x 5-7 μm, broadly ellipsoid, ornamentation < 1 μm high, of warts and ridges connected to form an incomplete reticulum (fig. 100B); pleuromacrocystidia 40-65 x 6-7 μm, cylindrical to fusiform. Summer to autumn; occasional in bore.-suba., very rare or overlooked in IS; FI (LC), IS, NO (LC), SE (LC). – FNE 2:67.
L. hyuginoides M. Korhonen & T. Ulvinen



Spores: A: *Lactarius circellatus*. B: *L. hyginoides*, C: *L. hyginus*, D: *L. flexuosus* var. *flexuosus*, E: *L. trivialis*.

- Taste becoming very acrid; on dry soil with *Picea*, *Populus*, *Abies*, etc. 14
- 14. Smell like caterpillar of willow borer (*Cossus cossus*) or *Hygrophorus discoxanthus*; gills crowded; with *Picea*, often in disturbed places along paths, etc. Cap 50-85 mm, convex to plane, often with depressed centre, smooth, viscid, cinnamon to brick or reddish brown with paler margin, \pm zonate; gills adnate to short decurrent, cream; stem 35-60 \times 12-25 mm, cylindrical, smooth, dry to greasy, cream to pale pinkish buff; taste very acrid; milk white. Sp 6-8 \times 5-6.5 μ m, broadly ellipsoid, ornamentation up to 1 μ m high, of broad ridges connected to form a \pm complete reticulum (fig. 100C); pleuromacrocytidia 30-65 \times 6.5-10 μ m, \pm fusiform. Late summer to autumn; occasional in hemib.-suba., in FI common, but rare in northern part, very rare in temp.; DK (EN), FI (LC), IS, NO (LC), SE (LC). – B&K 6:29, Däh 993, FNE 2:83, Korh 138-140, Phil 59f.
L. hyginus (Fr.: Fr.) Fr. (*L. curtus* Britzelm.)
- Smell faint; gills medium spaced to distant; with *Populus*, *Abies*, etc. see *L. flexuosus* var. *roseozonatus* 15
- 15. Gills medium spaced to distant; sp on av < 8 μ m long; cap uniformly grey, sometimes zonate near margin. Cap 30-110 mm, convex to plane or with depressed centre, smooth, viscid; gills adnate to short decurrent, cream to pinkish buff; stem 18-60 \times 7-40 mm, cylindrical or tapering downwards, smooth, dry, whitish to pale grey; milk white; smell faint; taste very acrid. Sp 6-8.5 \times 5-7 μ m, broadly ellipsoid, ornamentation up to 1 μ m high, of warts and ridges connected to form an incomplete reticulum (fig. 100D); pleuromacrocytidia 50-90 \times 7.5-11 μ m, \pm fusiform. With *Betula* and *Pinus*, probably also *Populus*; late summer to autumn; occasional and locally common in hemib.-suba., very rare in temp.; DK (NT), FI (LC), NO (LC), SE (LC). – B&K 6:22, C&D 1539, FNE 2:55, Korh 151-154, R&H 570.
L. flexuosus (Pers.: Fr.) Gray var. *flexuosus*
var. *roseozonatus* H. Post (*L. roseozonatus* (H. Post) Britzelm.) differs in having distinct pinkish tinges on the cap. With *Populus*, *Abies*, etc.; autumn; very rare in temp.-bore.; DK (DD), FI (LC). – C&D 1538, FNE 2:57, Korh 154.
- Gills crowded; sp on av > 8 μ m long; cap often strongly zonate or with small dots suggesting zones 16
- 16. Cap azonate or with small dots suggesting zones, grey with purplish or vinaceous tinges; taste becoming moderately acrid. Cap 40-150 mm, convex to plane with depressed centre, becoming funnel-shaped, smooth, viscid to slimy; gills decurrent, crowded, cream to dull cream; stem 30-120 \times 9-20 mm, cylindrical to club- or barrel-shaped, smooth, viscid to dry, cream; milk white; smell weak or fruity. Sp 7.5-10 \times 6-8 μ m, broadly ellipsoid, ornamentation up to 1 μ m high, with warts and ridges suggesting an incomplete reticulum (fig. 100E); pleuromacrocytidia 55-75 \times 7-13 μ m, \pm fusiform. With *Betula* and *Picea*, often in damp habitats; summer to autumn; very common in hemib.-suba., rare, but locally occasional in temp.; DK (NT), FI (LC), NO (LC), SE (LC). – Däh 964, FNE 2:71,73, Korh 156-158, R&H 569, Ves 430, .
L. trivialis (Fr.: Fr.) Fr. (*L. utilis* (Weinm.) Fr.)
- Cap with numerous dark grey to brownish grey zones on a pinkish buff to greyish background; taste mild, but unpleasant. Cap 55-140 mm, convex to plane with depressed centre, sometimes becoming funnel-shaped, smooth, viscid; gills short decurrent, crowded, cream



Spores: A: *Lactarius subcircellatus*, B: *L. helvus*, C: *L. serifluus*, D: *L. rostratus*, E: *L. camphoratus*.

to pinkish buff; stem 40-85 x 15-25 mm, cylindrical, smooth, dry, cream to ochraceous; milk white; smell fruity-acidulous. Sp 8-10.5 x 6.5-8.5 μ m, broadly ellipsoid, ornamentation about 0.5 μ m high, of warts and ridges suggesting an incomplete reticulum (fig. 101A); pleuromacrocytidia 65-110 x 7-13 μ m, \pm fusiform. With *Betula* and *Picea* in damp depressions and mountain heathland; summer to autumn; occasional in middle bore.-arc./alp.; FI (LC), IS, NO (LC), SE (LC). – FE 7:149, FNE 2:69, Korh 155, R&H 570.

L. subcircellatus Kühner

Key I: Milk white or watery; cap velvety or smooth, dry

1. Milk transparent or watery whitish; smell strong, like fenugreek (*Trigonella foenum-graecum*), curry or bugs, sometimes stronger when kept in a closed box or in exsiccata 2
 - Milk white to pale cream, not transparent or watery; smell often different or indistinct 5
2. Cap with age becoming distinctly tomentose or scaly, dry; milk water-like, transparent. Cap (25-)50-130 mm, convex to depressed, pinkish buff to clay pink; gills broadly adnate to decurrent, crowded, cream, later buff; stem 20-100 x 6-22 mm, cylindrical, velvety to smooth, pinkish buff, becoming yellowish brown; smell like fenugreek (*Trigonella foenum-graecum*); taste mild. Sp 6-8.5 x 4.5-6.5 μ m, broadly ellipsoid to ellipsoid, ornamentation 0.5-1 μ m high, of warts and short ridges, connected to form an almost complete reticulum (fig. 101B); pleuromacrocytidia 40-70 x 7-12 μ m, cylindrical to subclavate. With conifers or *Betula* on sandy or peaty soil, often in damp habitats; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – FNE 2:175, Korh 165, Phil 62b, R&H 571, Ves 443, .

L. helvus (Fr.: Fr.) Fr.

 - Cap smooth, dry or greasy; milk at least partly whitish 3
3. Pleuromacrocytidia absent; milk almost transparent and watery. Cap 25-80 mm, convex to plane with depressed centre, smooth, often crenate at margin, orange brown to dark reddish brown or vinaceous brown; gills broadly adnate to short decurrent, medium spaced to crowded, clay pink to clay buff; stem 25-50 x 3-13 mm, cylindrical or tapering downwards, pale vinaceous to fawn or orange brown; smell like fenugreek (*Trigonella foenum-graecum*) or bugs; taste mild. Sp 6.5-8.5 x 5.5-8 μ m, subglobose to broadly ellipsoid, ornamentation about 1 μ m high, of warts and ridges forming a complete reticulum (fig. 101C). In rich deciduous forests, with *Quercus*, possibly also with other hosts; late summer to autumn; occasional in temp., rare in hemib.; DK (LC), FI (VU), NO (LC), SE (LC). – FNE 2:221-225, Korh 187, Phil 63e, R&H 578, Ves 441, .

L. serifluus (DC.: Fr.) Fr. (*L. subumbonatus* Lindgr., *L. cimicarius* (Batsch) Gillet s. auct.)

 - Pleuromacrocytidia present; milk watery whitish 4
4. Cap rugose all over, 10-35 mm; with *Fagus* on clayey soil; pleuromacrocytidia often with very acute apex. Cap convex, later plane with depressed centre, sometimes with a small papilla, dry, orange brown to dark brick; gills adnate to decurrent, crowded, pinkish buff; stem 10-28 x 3-9 mm, cylindrical, sometimes compressed, smooth, ochraceous to brick, turning fawn to orange brown from base; milk watery whitish; smell like bugs; taste sweetish. Sp 6-8 x 5.5-7 μ m, subglobose to broadly ellipsoid, ornamentation up to 1.5 μ m high, of warts

and ridges forming zebra-like pattern and some closed meshes (fig. 101D); pleuromacrocytidia 25-50 x 4-6.5 μm . Summer to autumn; rare in temp.; DK (vu). – C&D 1587, Däh 975, FE 7:595, FNE 2:217-219.

L. rostratus Heilm.-Claus. (*L. cremor* Fr. s. auct.)

- Cap smooth, but sometimes with crenulate margin, usually larger; with deciduous and coniferous hosts on rich or rather poor soil; pleuromacrocytidia fusiform. Cap 20-50 mm, low convex to plane with depressed centre, becoming funnel-shaped, dry, dark brick to fawn; gills broadly adnate to decurrent, medium spaced, clay buff, turning orange brown; stem 25-65 x 4-10 mm, cylindrical, smooth, fawn to brownish vinaceous, turning dark vinaceous brown; milk watery whitish; smell sweet curry-like; taste mild. Sp 6-8.5 x 5-7 μm , subglobose to broadly ellipsoid, ornamentation about 1 μm high, of pointed warts aligned to form lines, but rarely closed meshes (fig. 101E); pleuromacrocytidia 30-45 x 6-10 μm , rare. On soil, or sometimes fruiting on old stumps; summer to autumn; common in temp.-southern bore., rare in middle bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FNE 2:215, Korh 188, Phil 62a, R&H 576, Ves 438, ☉.

L. camphoratus (Bull.: Fr.) Fr.

- | | | |
|----|------------------------------------|---|
| 5. | Smell distinct, like dried coconut | 6 |
| - | Smell not like coconut | 7 |

- 6. Cap pale to dark pinkish buff; stem 3-10 mm broad; with *Betula*, in wet places or in grassy roadsides and lawns. Cap 12-45 mm, low convex to plane, soon becoming depressed, velvety to finely scaly, dry; gills decurrent, crowded, pale pinkish buff; stem 20-70 mm long, cylindrical or tapering downwards, smooth, pale pinkish buff; milk white; smell like dried coconut; taste becoming slightly acrid. Sp 5.5-8.5 x 4.5-7 μm , broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges, connected to form an incomplete reticulum (fig. 103A); pleuromacrocytidia 40-70 x 7-12 μm , \pm cylindrical. Summer to autumn; very common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – FNE 2:171, Korh 168, Phil 59e, R&H 573, Ves 434, ☉.

L. glyciosmus (Fr.: Fr.) Fr.

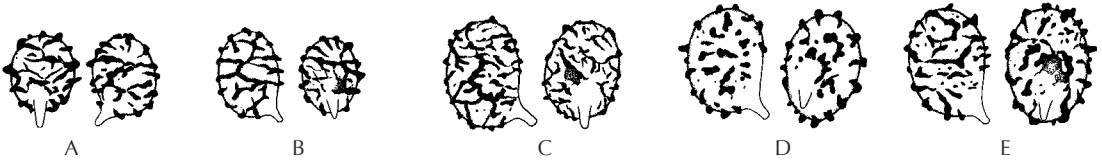
- Cap greyish brown to fuscous; stem 5-15 mm broad; with conifers, especially *Pinus*, or with *Betula* on dry mineral soil. Cap 25-80 mm, low convex to plane, becoming depressed, finely velvety to finely scaly, dry; gills decurrent, crowded, pinkish buff; stem 20-50 mm long, cylindrical to \pm clavate, smooth, greyish buff to greyish brown; milk white; smell like dried coconut; taste becoming slightly bitter to acrid. Sp 6-9 x 5-6.5 μm , broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges forming a \pm complete reticulum (fig. 103B); pleuromacrocytidia 45-75 x 6.5-9.5 μm , cylindrical to clavate. Late summer to autumn; common in hemib.-suba., rare in temp.; DK (vu), FI (LC), IS, NO (LC), SE (LC). – FNE 2:173, Korh 167, Phil 55f, R&H 573, Ves 434.

L. mammosus (Weinm.) Fr. (*L. fuscus* Rolland)

- 7. Cap pinkish to lilac, velvety to finely scaly; with *Alnus*. Cap 15-50 mm, low convex to plane, becoming depressed, dry; gills broadly adnate to decurrent, medium spaced, pinkish buff; stem 15-50 x 3-12 mm, cylindrical, smooth, pinkish buff to salmon, becoming ochraceous orange; milk white; smell fruity or like bugs; taste mild to slightly bitter. Sp 6.5-9 x 5.5-7 μm , broadly ellipsoid, ornamentation about 1 μm high, or warts and ridges connected to form a \pm complete reticulum (fig. 103C); pleuromacrocytidia 60-105 x 7-11 μm , cylindrical. Summer to autumn; common in hemib.-bore, occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 969, FNE 2:169, Korh 169, R&H 572, Ves 435.

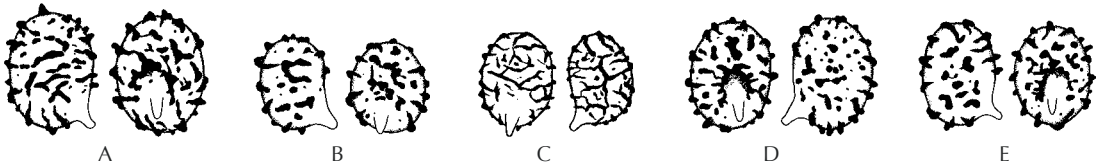
L. lilacinus (Lasch) Fr.

- Cap dominantly orange, reddish, brownish or olivaceous, smooth or concentrically cracked; with *Alnus* or other hosts 8
- 8. With *Alnus*; stem 1.5-5 mm broad 9



Spores: A: *Lactarius glycosmus*, B: *L. mammosus*, C: *L. lilacinus*, D: *L. omphaliformis*, E: *L. obscuratus*.

- With other hosts or stem broader 11
- 9. Cap becoming concentrically cracked and scaly with age, yellowish brown to orange brown, without olivaceous or green tinges. Cap 8-22 mm, plane to depressed, later funnel-shaped, sometimes with a small papilla, translucently striate in outer half; gills short decurrent to decurrent, medium spaced, pinkish buff; stem 13-33 x 1.5-3 mm, cylindrical, smooth, brownish orange, turning reddish brown; milk white; smell insignificant; taste mild. Sp 7-9.5 x 5.5-8 μm , broadly ellipsoid to ellipsoid, ornamentation about 1 μm high, of warts and short ridges aligned to form an incomplete reticulum (fig. 103D); pleuromacrocytidia 35-90 x 6-9 μm , narrowly fusiform. With *Alnus*, in damp places, on bare ground or in deep moss carpets, sometimes in *Sphagnum*; summer to autumn; occasional in temp., rare in hemib.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 6:43, C&D 1606, FE 7:631, FNE 2:213, Korh 202, . *L. omphaliformis* Romagn. (*L. cyathula* (Fr.: Fr.) Fr. s. J.E. Lange)
- Cap hardly cracked or scaly with age, sometimes with \pm olivaceous tinges or an olivaceous green centre 10
- 10. Sp on av < 6.5 μm broad (fig. 103E); cap 10-20(-30) mm, mostly with vivid orange colours, but sometimes olivaceous at centre. Cap convex to plane with depressed centre, sometimes with a small papilla, smooth, translucently striate in outer part with age; gills short decurrent, pinkish buff; stem 10-30 x 2-5 mm, cylindrical, ochraceous orange, turning yellowish brown; milk white; smell insignificant; taste mild. Sp 6.5-9 x 5-7 μm , broadly ellipsoid to ellipsoid, ornamentation up to 1.5 μm high, of warts and short ridges, aligned to form an incomplete reticulum; pleuromacrocytidia 40-100 x 5.5-10 μm , narrowly fusiform. With *Alnus*; late spring to autumn; common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 6:42, FE 7:619, 788, FNE 2:207, 209, Phil 52c, Ves 439. *L. obscuratus* (Lasch) Fr. (*L. obnubilus* (Lasch) Fr.)
- Sp on av > 7 μm broad (fig. 104A); cap 12-45 mm, dull orange brown, often with olivaceous tinges. Cap convex to plane with depressed centre, often with a small papilla, smooth, translucently striate in outer part with age; gills short decurrent, pinkish buff; stem 20-50 x 2-5 mm, cylindrical, ochraceous to dull yellowish brown; milk white; smell faint or fruity; taste mild. Sp 7-11 x 6-8.5 μm , broadly ellipsoid, ornamentation up to 1.5 μm high, of warts and short ridges, aligned to form an incomplete reticulum; pleuromacrocytidia 45-110 x 6.5-12 μm , narrowly fusiform. With *Alnus*; late spring to autumn; common in temp.-hemib., occasional in bore.; DK (LC), FI (LC), NO (LC), SE. – FE 7:615, FNE 2:211, Korh 201 (as *obscuratus*).
- L. cyathuliformis* Bon (*L. obnubilus* (Lasch) Fr. s. auct.)
- 11. Cap typically with zones formed of darker spots, pinkish buff to brick; smell grease-like, like some heteropteran bugs; with *Quercus*. Cap 25-80 mm, convex, later plane to slightly depressed, smooth, dry; gills broadly adnate, medium spaced to crowded, pinkish buff; stem 30-70 x 7-20 mm, cylindrical, smooth, pinkish buff, turning fawn to dark brick from the base; milk pale cream; taste mild, becoming acrid. Sp 6.5-9 x 5.5-7 μm , subglobose to broadly ellipsoid, ornamentation about 1 μm high, of warts and short ridges aligned to form an incomplete reticulum (fig. 104B); pleuromacrocytidia 35-65 x 6.5-10.5 μm , fusiform.



Spores: A: *Lactarius cyathuliformis*, B: *L. quietus*, C: *L. rufus*, D: *L. subdulcis*, E: *L. tabidus*.

Summer to autumn; very common in temp., common in hemib.; DK (LC), FI (LC), NO (LC), SE (LC). – FNE 2:193, Korh 170-171, Phil 56c, 57d, R&H 577, Ves 440, ⊙.

L. quietus (Fr.: Fr.) Fr.

- Cap azonate; with various deciduous and coniferous hosts 12
- 12. Taste of flesh and milk becoming burning acrid. Cap 25-90 mm, low convex to plane or depressed, with a small umbo, becoming funnel-shaped, smooth to rugulose, dry, orange brown to dark brick; gills broadly adnate to decurrent, crowded, cream to pinkish buff; stem 35-100 × 6-20 mm, ± cylindrical, smooth, clay pink, becoming reddish brown except at top and base; milk white; smell faint. Sp 6.5-10 × 5.5-7.5 μm, broadly ellipsoid, ornamentation about 0.5 μm high, of warts and short ridges aligned to form a complete reticulum (fig. 104C); pleuromacrocytidia 30-75 × 6-10 μm, fusiform to subclavate. With conifers, especially *Picea* and *Pinus*, less often with deciduous trees, on acid soil, rarely on rich soil; summer to autumn; very common in temp.-suba., rare in arc./alp. with *Betula nana*; DK (LC), FI (LC), FO, NO (LC), SE (LC). – FNE 2:177, Korh 166, Phil 54c, 55d, R&H 576, Ves 435, ⊙.

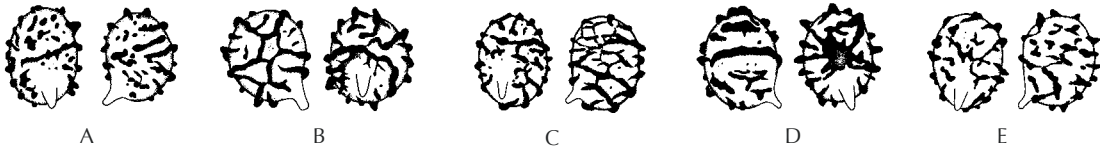
L. rufus (Scop.: Fr.) Fr.

- Taste mild to bitter or slightly acrid 13
- 13. Taste mild and sweet, then turning ± bitter; smell distinct, rubber-like; with *Fagus*, exceptionally with *Corylus*, *Quercus* or *Carpinus*. Cap 20-55 mm, convex to plane or depressed, sometimes becoming funnel-shaped, smooth to rugulose, cinnamon to clay buff; gills broadly adnate to decurrent, medium spaced to crowded, pinkish buff; stem 25-65 × 4-18 mm, cylindrical, smooth, pinkish buff, becoming cinnamon; milk white. Sp 7-9.5 × 5.5-7.5 μm, subglobose to broadly ellipsoid, ornamentation up to 1.5 μm high, of warts and short ridges aligned to form irregular crests, but only a very incomplete reticulum (fig. 104D); pleuromacrocytidia 40-90 × 6-12 μm, fusiform. Summer to autumn; very common in temp., occasional in hemib.; DK (LC), NO (LC), SE (LC). – Däh 986, FNE 2:195, Phil 54b, R&H 577, Ves 436, ⊙.

L. subdulcis (Bull.: Fr.) Gray

- Taste or smell different or with other hosts 14
- 14. Cap wrinkled to rugulose, at least when drying out 15
- Cap smooth, even when old or drying out 16
- 15. Milk turning pale yellow or drying yellowish, immediately turning yellow on a white handkerchief; cap 10-40 mm; stem pinkish brown or pale reddish brown, paler at top. Cap convex, later plane to depressed, smooth, becoming wrinkled when drying out, yellowish brown to orange brown; gills broadly adnate to decurrent, crowded, cream to pinkish buff; stem 20-80 × 3-10 mm, cylindrical, smooth; smell faint; taste mild to slightly acrid. Sp 6-8.5 × 5-7 μm, broadly ellipsoid, ornamentation about 1 μm high, of acute warts connected by fine lines to form a very incomplete reticulum (fig. 104E); pleuromacrocytidia 35-90 × 7.5-11 μm, fusiform. Often with *Betula*, but also with *Quercus*, *Picea*, etc.; late spring to autumn; very common in temp.-suba., but rare in IS; DK (LC), FI (LC), IS, NO (LC), SE (LC). – FNE 2:201, Korh 195-196, Phil 60b, R&H 575, Ves 439, ⊙.

L. tabidus Fr. (*L. theiogalus* (Bull.: Fr.) Gray s. auct.)



Spores: A: *Lactarius rubrocinctus*, B: *L. decipiens*, C: *L. hepaticus*, D: *L. sphagneti*, E: *L. badiosanguineus*.

- Milk unchanging; cap 30-70 mm; stem flesh-coloured to pale reddish brown, soon turning darker to brick, often with an intensely coloured zone at the extreme top. Cap convex to plane, becoming depressed to funnel-shaped, smooth, becoming radially wrinkled when drying out, yellowish brown to orange brown; gills broadly adnate to decurrent, crowded, cream to pinkish buff; stem 20-70 x 8-25 mm, cylindrical, smooth; smell faint; taste mild to slightly acrid. Sp 6.5-9.5 x 5.5-7.5 μm , broadly ellipsoid, ornamentation up to 1 μm high, of warts and short ridges, connected by finer lines to form a very incomplete reticulum (fig. 105A); pleuromacrocytostidia 60-110 x 9-13.5 μm , fusiform. Under *Fagus* on rich, \pm calcareous soil; summer to autumn; occasional in temp.; DK (LC), SE (NT). – B&K 6:57, C&D 1585, Däh 976, FNE 2:203,205, Ves 437.

L. rubrocinctus Fr.

16. Cap pinkish brown to clay pink; smell like *Pelargonium*. Cap 20-60 mm, convex to plane with depressed centre, smooth, dry to slightly viscid; gills adnate to short decurrent, medium spaced to crowded, pale pinkish buff; stem 15-55 x 4-13 mm, cylindrical, smooth, clay pink; milk white, turning yellowish on exposure; taste mild, becoming slightly acrid and unpleasant. Sp 6.5-9 x 5.5-7.5 μm , subglobose to broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges connected in a \pm complete reticulum (fig. 105B); pleuromacrocytostidia 40-90 x 6-9.5 μm , fusiform. With deciduous trees on rich soil, e.g. *Fagus* and *Quercus*; summer to autumn; rare in temp.-hemib.; DK (VU), NO (NE), SE (VU). – B&K 6:16, Däh 993, FE 7:523, 789, FNE 2:191, Phil 61e.

L. decipiens QuéL.

- Cap without pinkish tinges; smell not like *Pelargonium* 17
- 17. Cap very dark when young, dark brick, dark orange brown, reddish brown, sepia or umber, at least at centre; with conifers 18
- Cap orange, orange brown, brick or brownish red; with deciduous trees or conifers 20
- 18. Cap sepia to umber. Cap 15-70 mm, low convex to plane with depressed centre, smooth, dry to slightly greasy; gills decurrent, medium spaced, pale pinkish buff to clay buff; stem 25-70 x 4-12 mm, cylindrical, smooth, fawn to brick; milk white, turning yellowish on exposure; smell faint, of bugs; taste mild, then bitter. Sp 6.5-9.5 x 5.5-7.5 μm , subglobose to broadly ellipsoid, ornamentation up to 1 μm high, of warts and short ridges, aligned to form an almost complete reticulum (fig. 105C); pleuromacrocytostidia 40-80 x 6-10 μm , fusiform. On humus rich soil with *Pinus*, more rarely with *Picea*; late summer to autumn; locally very common and probably increasing in temp., occasional in hemib.-bore.; DK (LC), NO (LC), SE. – B&K 6:28, FNE 2:189, Phil 56b, Svp 15:3, Ves 441,

L. hepaticus Plowr.

- Cap dark brick to dark reddish or orange brown 19
- 19. Cap dark brick to dark reddish or orange brown with paler margin; sp ornamentation very strongly amyloid. Cap 17-50 mm, convex to plane with depressed centre, smooth, dry to slightly greasy; gills emarginate to broadly adnate, medium spaced, pinkish buff; stem 20-70 x 3-8 mm, cylindrical to clavate, clay pink to clay buff; milk white; smell faintly of bugs; taste mild. Sp 6.5-9 x 5-7.5 μm , broadly ellipsoid, ornamentation about 1 μm high, of warts

and ridges aligned to form a reticulum (fig. 105D); pleuromacrocytidia 40-80 × 6-9 μm, fusiform. On wet soil with *Picea*, often with *Sphagnum*; late summer to autumn; common in bore., occasional in hemib., very rare in temp.; DK (NA, Brnh: Almindingen), FI (LC), FO, NO (LC), SE. – B&K 6:67, FE 7:507, FNE 2:187, Korh 199, 200.

L. sphagneti (Fr.) Neuhoff

- Cap ± unicoloured dark brick to dark reddish or orange brown; sp ornamentation amyloid, but not very strongly so. Cap 25-85 mm, convex to plane with depressed centre, smooth, dry to greasy; gills broadly adnate to short decurrent, medium spaced, ochraceous; stem 30-90 × 6-14 mm, cylindrical, ochraceous orange, becoming orange brown; milk white; smell faint, of bugs; taste mild to slightly bitter. Sp 7-9 × 5.5-7.5 μm, broadly ellipsoid, ornamentation about 1 μm high, of elongated warts and ridges, connected to form a zebra-like to subreticulate pattern (fig. 105E); pleuromacrocytidia 40-80 × 6-10 μm, cylindrical to fusiform. With *Picea* and *Abies*, often on calcareous soil, on dry soil and in *Sphagnum*; late summer to autumn; occasional in hemib.-suba., very rare in temp.; DK (NA, EJyl: Rubjerg Klitplt., WJyl: Stråsø Plt.), FI (LC), NO (LC), SE. – B&K 6:7, Däh 989, FNE 2:185, Korh 198, 199, R&H 578.
- L. badiosanguineus* Kühner & Romagn.

- 20. Milk white, also when dry 21
- Milk white but after a while yellowing, drying yellowish 22

- 21. Cap orange brown; with dwarf *Salix* in arc./alp. Cap 25-55 mm, convex to plane with depressed centre, sometimes with a small umbo, smooth, dry, slightly glossy; gills broadly adnate to short decurrent, medium spaced, pinkish buff; stem 20-30 × 5-11 mm, cylindrical to ± clavate, smooth, clay buff to cinnamon; smell faint or like bugs; taste mild to slightly bitter. Sp 7-11 × 5.5-8.5 μm, subglobose to ellipsoid, ornamentation up to 1 μm high, of warts and ridges, aligned to form an incomplete reticulum (fig. 107A); pleuromacrocytidia 50-135 × 6.5-11 μm, ± fusiform. Calciphilous; summer to autumn; rare in arc./alp.; FI (EnL: Kilpisjärvi), NO (LC, SvB, Troms: Kåfjord), SE (PL: Arjeblog). – FNE 2:181.

L. lanceolatus O.K. Mill. & Laursen

- Cap bright orange; in deciduous and coniferous forests, also in sand dunes with *Salix*. Cap 10-50 mm, low convex to plane with depressed centre, smooth, dry, slightly glossy; gills broadly adnate to short decurrent, medium spaced, pinkish buff; stem 25-65 × 5-12 mm, cylindrical to ± clavate, smooth, brownish orange; smell faint or like bugs; taste almost mild. Sp 6.5-9.5 × 5.5-7.5 μm, broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges, aligned to form an incomplete reticulum (fig. 107B); pleuromacrocytidia 45-80 × 6.5-11 μm, fusiform. Mostly on rich, calcareous soil; summer to autumn; common in temp.-southern bore., occasional in middle bore., very rare in northern bore.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – FNE 2:179, Korh 186, Phil 59d, R&H 575, Ves 437, ☉.

L. aurantiacus (Pers.: Fr.) Gray s.l. (*L. mitissimus* (Fr.: Fr.) Fr., *L. aurantiofulvus* Bon)

- 22. Milk quickly turning sulphur yellow; cap ± sticky or glossy; with *Betula* on nutrient rich, damp soil in middle bore.-arc./alp. Cap 20-40 mm, low convex to plane with depressed centre, smooth, vivid orange brown; gills broadly adnate to short decurrent, medium spaced, cream to pinkish buff; stem 25-70 × 6-9 mm, cylindrical, smooth, pale orange brown; smell spicy or like bugs; taste becoming slightly bitter. Sp 6.5-10 × 5.5-7.5 μm, broadly ellipsoid, ornamentation up to 1 μm high, of warts and ridges, joined to form an incomplete reticulum (fig. 107C); pleuromacrocytidia 50-105 × 9-13 μm, lanceolate. Summer to autumn; FI (LC), NO (LC), SE (LC). – Bor 90, FE 7:538, FNE 2:183, Korh 187, Sieniop 43.

L. duplicatus A.H. Sm. (*L. lapponicus* Harmaja)


- Milk unchanged or slowly turning pale yellowish; cap dry or slightly greasy; with deciduous or coniferous hosts in temp.-bore. 23
- 23. Cap 15-60 mm; smell indistinct or slightly like bugs; in humid places with *Alnus*, *Betula* or *Populus*. Cap low convex to expanded with depressed centre, becoming funnel-shaped,



Spores: A: *Lactarius lanceolatus*, B: *L. aurantiacus*, C: *L. duplicatus*, D: *L. lacunarum*, E: *L. fulvissimus*.

smooth, dry, brick to orange brown; gills adnate to decurrent, medium spaced, pinkish buff to ochraceous; stem 15-70 x 3-10 mm, cylindrical, smooth, ochraceous orange, becoming orange brown; milk white, turning yellow; taste mild to slightly acrid. Sp 6-8.5 x 5-6.5 μm , broadly ellipsoid, ornamentation up to 1 μm high, of warts and short ridges connected to form an incomplete reticulum (fig. 107D). Summer to autumn; locally common in hemib.-middle bore., occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 6:32, C&D 1595, FNE 2:199, Korh 196-197, Ves 438.

L. lacunarum Hora

- Cap 40-85 mm; smell strong, like *Lepiota cristata*; on rich, clayey soil with deciduous trees, e.g. *Fagus*, *Quercus*, *Tilia*, *Populus* and *Corylus*, mostly in parks. Cap convex to plane or depressed, \pm smooth, dry or slightly greasy, brownish orange to brownish red, with margin paler and more yellow than centre, discolouring; gills adnate to short decurrent, crowded, pale pinkish buff; stem 30-75 x 5-20 mm, cylindrical to clavate, smooth, pinkish buff to brownish orange; milk unchanging on a white handkerchief; taste mild to bitter. Sp 6-9 x 5.5-7.5 μm , subglobose to broadly ellipsoid, ornamentation about 1 μm , of pointed warts and short ridges, connected to form an incomplete reticulum (fig. 107E); pleuromacrocytidia 40-90 x 5.5-9.5 μm , fusiform. Summer to autumn; occasional in temp., rare in hemib.; DK (LC), FI (LC), NO (NE), SE (LC). – Däh 983, FNE 2:197, Phil 62d, R&H 574, Ves 436, .

L. fulvissimus Romagn. (*L. britannicus* D.A. Reid, *L. ichoratus* (Batsch) Fr. s. auct.)

Note: *L. subsericatus* Bon with milk turning yellow on white handkerchief, darker gills, a more unicoloured, chamois-leather-like cap and sp with more isolated spines may occur in the Nordic countries; DE. – C&D 1578, Däh 977.

Leccinum Gray

HENNING KNUDSEN & ANDY TAYLOR

Krombholzia P. Karst., *Krombholziella* Maire

Frb boletoid with whitish or yellow tubes and scabrous stem. Cap 30-200 mm, convex then applanated, dry and tomentose or sticky to viscid especially when old, pale brown, rust-coloured, brown, greyish brown, blackish brown to almost black, orange, orange brown, yellow or white, margin even, in some species the cuticle is extended to form an appendiculate, 1-2 mm broad rim. Tubes and pores concolorous, whitish or greyish becoming beige or pale brown, in one species yellow, fine, rounded, easily splitting from each other, when mature often > 15 mm long, when fresh bruising yellowish, brownish or pink, adnate or adnexed. Stem 50-270 × 10-50 mm, often long compared to cap diam., cylindrical or clavate, all over scabrous-scaly, with scales concolorous with cap or paler, often paler towards the top. Flesh white, whitish or in one species yellow, in some species unchanging when cut, in others bruising pink, vinaceous, violaceous greyish to dark grey or almost black, turquoise, bluish, greenish or brownish, often after several minutes or longer, sometimes in most of the stem, sometimes only at the base. Taste mild. Smell indistinct. Sp deposit yellowish brown to olivaceous brown.

Sp 11-20 × 3-7 μm, cylindrical to subfusiform (figs 171A-F), hyaline or yellow. Cheilo-, pleuro- and caulocystidia of various shapes present but rarely diagnostic. Pileipellis a cutis of repent, 5-15 μm broad hyphae with transitions to a trichoderm, or epithelioid of short hyphae with the apical cell inflated and up to 30 μm broad hyphae, with parietal brown pigments or hyaline. Basidia 4-spored. Clamps absent.

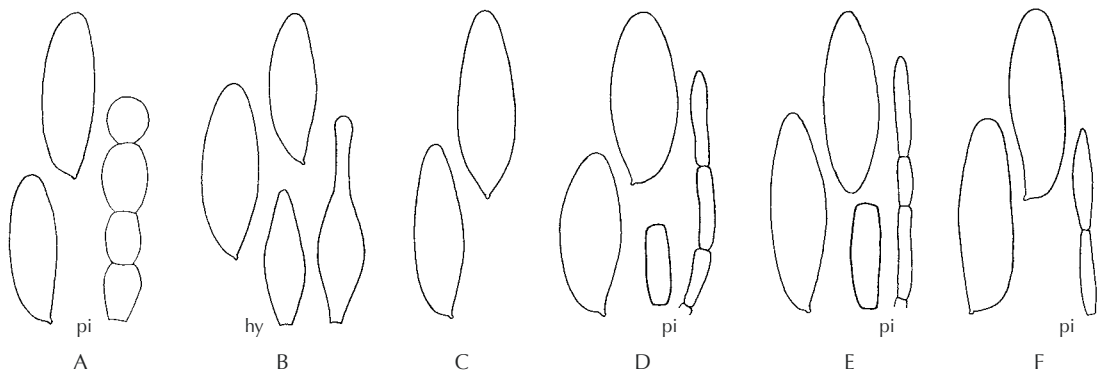
Ectomycorrhizal, especially with *Betula*, but also with *Populus*, *Quercus*, *Carpinus*, *Corylus*, *Fagus*, *Pinus* and *Picea*, often in moist habitats.

14 species in the Nordic countries.

Edible, but some of the orange-capped species cause allergenic reactions in some people and should be avoided or eaten with caution.

The genus has in recent years been the subject of both morphological and molecular research resulting in somewhat different opinions. Here the molecular results have been followed.

Lit.: Den Bakker & Noordeloos 2005, Engel et al. 1983, Lannoy & Estadès 1995, Watling 1970.



Spores, pileipellis elements and hymenial cystidia: A: *Leccinum pseudoscabrum*, B: *L. albstipitatum*, C: *L. versipelle*, D: *L. variicolor*, E: *L. cyaneobasileucum*, F: *L. scabrum*.

1. Tubes and pores lemon yellow. Cap 50-100 mm, convex, becoming tomentose, soon cracking, cinnamon to fulvous with a yellow tinge, then olivaceous; stem 60-120 x 15-25 mm, slender, swollen at base, straw-coloured, usually lemon yellow at top, ornamented with lines of yellow scales; flesh pale lemon yellow, rapidly vinaceous, finally olivaceous black. Sp 12-18 x 5-7 μm , Qav = 2.3-2.4. Mycorrhizal with *Quercus*, especially in dry and warm summers; rare in temp.-hemib.; DK (EN), NO (EN, Rog: Sandnes, Tel: Porsgrunn), SE (EN). – B&K 3:72, Däh 85, L&E 39, Phil 289e, Ves 147, ☉.
L. crocipodium (Letell.) Watling (*Boletus nigrescens* Richon & Roze non Pallas, *B. tessellatus* Gillet non Rostkovius)
 - Tubes and pores white, pale buff, clay buff or pale cinnamon 2
2. Flesh when cut or bruised fairly rapidly darkening to fuscous black to violaceous, sometimes flushing vinaceous first 3
 - Flesh unchanging or only flushing pink to red, may slowly discolour to grey after several hours 8
3. Cap lacking any obvious appendiculate margin. Cap 30-70 mm, convex, with an uneven, hammered appearance, frequently cracking, pale citrine to sepia or snuff brown; tubes and pores small, white, pinkish brown then buff bruising darker; flesh white to straw, slowly changing pink to purple, finally blackening; stem 80-90 x 10-20 mm, often swollen towards base, sulcate striate, whitish to pale grey ochre, rapidly darkening when bruised, covered with pale buff scales at the top and fulvous to snuff brown scales below, scales darkening to brownish black. Sp 15-19 x 5-6 μm , Qav = 2.7-2.9 (fig. 171A); pileipellis with apical cells inflated and up to 30 μm broad. Mycorrhizal with *Carpinus* and *Corylus*; especially in summer or early autumn; occasional in temp.-southern bore., north to 64°; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 96 (as *griseum*), L&E 41, Phil 291g, Ves 150.
L. pseudoscabrum (Kallenb.) Šutara (*L. carpini* (R. Schulz) D.A. Reid, *L. griseum* (Quél.) Singer s. auct.)
 - Cap cuticle exceeding the margin by 1 mm or more, usually as fragmented flaps of tissue 4
4. Cap pale to dark grey brown, rarely with reddish brown tones, with appendiculate margin entire. Cap 60-120 mm, convex; tubes and pores whitish becoming greyish buff, brown when damaged; stem 80-140 x 20-35 mm, swollen towards base, white above, buff towards base, covered with greyish to black or cigar brown scales; flesh whitish, then salmon peach or vinaceous pink, becoming vinaceous grey and finally blotched blackish, mixed with bluish green at the base. Sp 14.5-16 x 4.5-6 μm , Qav = 2.3-2.7. Mycorrhizal with *Populus tremula* and cultivated *Populus* species; autumn; rare in temp.-hemib., in NO also in bore. north to S&F; DK (NT), FI (LC), NO (LC), SE (LC). – B&K 3:70, Mar 72, Phil 288c, Svp 33:60.
L. duriusculum (Schulzer) Singer
 - Cap shades of orange, reddish brown, sienna to ochraceous rarely pale cream, with appendiculate margin as fragmented flaps of tissue 5
5. Stem for a long time with white scales, only becoming reddish brown when old. Cap 80-200 mm, convex, light orange; tubes and pores pale brownish to yellowish white, discolouring brownish when bruised; stem 50-270 x 15-50 mm, cylindrical to subclavate, whitish, often with blue colour in the base; flesh white, when bruised often first vinaceous, then greyish, blackish. Sp 11-17 x 4-5 μm , Qav = 3.1 (fig. 171B). Mycorrhizal with *Populus*; summer to autumn; common in hemib.-bore., occasional in temp.; DK (LC), FI (LC), NO (LC), SE. – Däh 89, Karst 35:55, L&E 34, Phil 288b, Ves 147, ☉.
L. albostipitatum den Bakker & Noordel. (*L. aurantiacum* (Bull.) Gray s. auct. p.p.)
 - Stem scales reddish, reddish brown, brown, grey to black, almost from the start 6

6. Stem with scales initially reddish then darkening to reddish brown or reddish black. Cap 30-150 mm, reddish brown; tubes and pores cream to yellowish pale brown, discolouring brown when damaged; stem 80-150 x 20-50 mm, swollen towards base; flesh initially white, becoming vinaceous grey then sepia to blackish, often turning blue green in base. Sp 12.5-18.5 x 3.5-5 μm , Qav = 3.2-3.6. Mycorrhizal with *Populus*, *Quercus*, *Betula*, rarely with *Salix*, *Tilia* and *Fagus*, in suba. and arc./alp. also with *Arctostaphylos*; summer to autumn; common in temp.-suba., north to 70°; DK (NT), FI (LC), NO, SE (LC). – Däh 88, Karst 35:54, Phil 289d, R&H 229.
L. aurantiacum (Bull.) Gray (*L. quercinum* (Pilát) E.E. Green & Watling, *L. salicola* Watling, *L. populinum* M. Korhonen)
- Stem scales greyish to blackish 7
7. Cap light brownish, yellowish brown to orange, rarely almost white with a pink tinge, 80-180 mm, minutely tomentose to fibrillose scaly. Pores greyish white when young then pale brown, discolouring brownish; stem 70-200 x 15-30 mm, up to 50 mm at base, with grey to blackish scales; flesh white then livid vinaceous, turning bluish green in the stem base, finally violaceous black. Sp 12.5-16 x 4-5 μm , Qav = 3-3.3 (fig. 171C). Mycorrhizal with *Betula*, in arc./alp. with *B. nana*; summer to autumn; very common in hemib.-arc./alp., but rare in IS, common in temp.; DK (LC), FI (LC), IS (Na, Nv), NO (LC), SE (LC). – Däh 90, Karst 35:59, Phil 208, R&H 228, Ves 149, ☉.
- L. versipelle* (Fr.) Snell (*L. percandidum* (Vassilkov) Watling, *L. roseotinctum* Watling, *L. cerinum* M. Korhonen, *L. callitrichum* Redeuilh)
- Note: albino-forms have been described as *L. percandidum* and *L. roseotinctum*.
- Cap reddish brown to purplish chestnut, 30-100 mm, tomentose to fibrillose scaly. Tubes and pores whitish, darker when bruised, becoming vinaceous grey; stem 80-140 x 15-30 mm covered initially with whitish scales that rapidly darken to purplish chestnut or dark red brown, becoming vinaceous grey and finally blotched blackish, mixed with bluish green at the base. Sp 12.5-15 x 3-4 μm , Qav = 3.2-3.4. Mycorrhizal with species of *Pinaceae* and *Arctostaphylos*; summer to autumn; occasional in temp., common in hemib.-bore., north to InL; DK (NT), FI (LC), NO (LC), SE (LC). – L&E 36, SMT 27(3):11, ☉.
- L. vulpinum* Watling
- Note: it is unclear whether *L. piceinum* Pilát & Dermek represents an autonomous species associated with *Picea* or is a synonym of *L. vulpinum*. FI, NO, SE.
8. Cap dark brown to blackish brown with or without light coloured patches; stem scales dark brown to blackish brown 9
- Cap and/or stem scales paler 10
9. Cap dark brown to blackish brown with mouse grey to dark brown areas and lighter olivaceous or yellowish grey patches; stem often intensely green blue at base. Cap 35-120 mm, convex; tubes and pores white or cream, vinaceous to brown when bruised; stem 120-180 x 20-25 mm, white, at top with white to smoke grey scales at the centre, distinctly reticulate with mouse grey to black scales at base; flesh white bruising pink to coral red. Sp 13.5-17.5 x 5-6.5, Qav = 2.6-2.8 (fig. 171D). Mycorrhizal with *Betula*, mostly on moist acid, sandy or peaty soil; autumn; common in temp.-bore., occasional in suba., rare in arc./alp.; DK (LC), FI (LC), IS, NO (LC, incl. Sv), SE (LC). – Däh 97, L&E 13,14,15, Phil 290a, R&H 230, Ves 148, ☉.
- L. varicolor* Watling
- Cap uniformly dark brown to blackish brown; stem not green blue at base. Cap 50-130 mm, convex, subviscid with age; tubes and pores greyish white when young, pores developing brown spots and bruising brownish; stem 90-140 x 20-55 mm, surface and scales dark greyish to blackish, concolorous; flesh white, sometimes discolouring pink when damaged, often browning after several hours, without bluish green coloration at stem base. Sp 14-19 x 5-6 μm , Qav = 2.9-3.2. Mycorrhizal with *Betula*; autumn; occasional in temp.-bore., but distribution still largely unknown; DK. – Däh 98, M&J 2.
- L. melaneum* (Smotl.) Pilát & Dermek

10. Sp Qav \geq 3 11
 - Sp Qav < 3 12
11. Stem with \pm confluent, whitish, then greyish scales, at base usually with blue-green stains. Cap 50-100 mm, convex, greyish brown, pale brown to almost whitish; tubes and pores whitish with a greyish or brown tinge, bruising brown; stem 70-110 x 10-23 mm; flesh whitish, not discolouring pink. Sp 14-19.5 x 4-6.5 μ m, Qav = 3.1-3.5 (fig. 171E). Mycorrhizal with *Betula*; summer to autumn; recently described species, distribution in the area so far unknown; DK (LC), SE. – L&E 18-21, \odot .
L. cyaneobasileucum Lannoy & Estadès (*L. brunneogriseolum* Lannoy & Estadès)
- Stem with greyish to blackish scales that become progressively coarser towards the base, without blue-green stains. Cap 50-150 mm, yellowish brown to dark brown, soon becoming soft, sticky-viscid; tubes and pores white, becoming dirty ochre or pale cinnamon; stem 70-200 x 20-40 mm, white to buff or greyish, rugose; flesh white, unchanging, occasionally becoming slightly pink when bruised. Sp 14-20 x 5-6 μ m, Qav = 3-3.3 (fig. 171F). Mycorrhizal with *Betula* on wet soil in bogs and moist forests as well as on more dry soil in forests, parks and gardens; summer to autumn; very common in temp.-suba., occasional in arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Mar 169, Phil 270e, R&H 231, L&E 4,16 (as *rigidipes*), \odot .
L. scabrum (Bull.: Fr.) Gray (*L. roseofractum* Watling, *L. avellaneum* (J. Blum) Bon, *L. rigidipes* P.D. Orton)
12. Mycorrhizal with *Betula nana* and *B. pubescens* subsp. *czerepanovii* in bore.-arc./alp.; stem without any blue green staining; caulocystidia often clavate, rarely lageniform. Cap 20-70 mm, very pale brown to pale brown, rarely darker brown with lighter areas, finely to coarsely cracking, usually dry; tubes and pores greyish white to pale grey becoming dirty brown; stem 40-80 x 6-15 mm, whitish, covered with whitish scales that become pale brown with age; flesh white, unchanging or becoming slightly pink at stem top. Sp 13.5-17.5 x 4.5-7 μ m, Qav = 2.5-2.7. Common, especially with *Betula nana* in suba.-arc./alp., more rarely with *Betula* in bore., often solitary or few together, summer to autumn; FI (LC), IS, NO (LC, incl. SvB), SE (LC). – AAF 1:9, Bor 39, L&E 2,3,7, M&J 3, R&H 231, \odot .
L. rotundifoliae (Singer) A.H. Sm., Thiers & Watling (*L. scabrum* (Bull.: Fr.) Gray subsp. *tundrae* Kallio)
- Mycorrhizal with *Betula* in temp.-arc./alp.; stem base often with blue green staining; caulocystidia mostly narrowly lageniform to utriform, rarely clavate 13
13. Cap and stem scales very pale, either whitish or pale brownish; caulocystidia narrowly lageniform, up to 13.5 μ m broad. Cap 40-100 mm, convex, whitish to pale brownish, often with an olivaceous tinge; tubes and pores white to buff, brownish when bruised; stem 80-110 x 10-20 mm, whitish, covered in coarse, whitish scales that discolour cinnamon to greyish with age; flesh soft, whitish, often unchanging but also discolouring pink, sometimes with blue green staining at stem base. Sp 17.5-20 x 5.5-6.5 μ m, Qav = 2.6-2.8. Mycorrhizal with *Betula*, on acid, moist soil, most often at the margin of raised bogs among *Sphagnum*; occasional and often solitary or few together; occasional in temp., common in hemib.-suba., rare in arc./alp. with *B. nana*; DK (LC), FI (LC), NO (LC, incl. SvB), SE (LC). – Karst 35:64, L&E 24, R&H 230, Rim 6:35, \odot .
L. niveum (Fr.) Rauschert (*L. holopus* (Rostk.) Watling, *L. nucatum* Lannoy & Estadès)
- Cap light yellowish brown to greyish brown or dark brown; stem scales fine, initially brownish, later greyish to blackish; caulocystidia mostly utriform to lageniform, up to 20 μ m broad. Cap 25-80 mm, convex; tubes and pores yellowish white at first, becoming greyish, bruising brown; stem 45-150 x 10-25 mm, greyish white to brownish; flesh white, grey white, bruising pink in upper stem and cap, often blue green at base, all bruised flesh often discolouring grey after several hours. Sp 13.5-17 x 5-6.5 μ m, Qav = 2.8-2.9. Mycorrhizal with *Betula*; recently described and distribuion not fully known, but probably common and wide-spread; DK (DD), FI (LC), NO, SE (LC). – Karst 35:62, L&E 30.
L. schistophilum Bon (*L. palustre* M. Korhonen)

Lentinellus P. Karst.

HENNING KNUDSEN

Hemicybe P. Karst.

Frb crepidotoid, pleurotoid or clitocyboid with gilled-dentate-spinose hymenophore. Cap 5-120 mm, fan-shaped, dimidiate, conchate, reniform, tongue-shaped or umbilicate, solitary or in dense imbricate clusters, smooth or ribbed, glabrous to pubescent or strongly hirsute or woolly, especially towards the base, cream to brown or dark brown, often with ± incurved margin. Gills adnate to strongly decurrent, thin or thick, narrow to broad, crowded to distant, distinctly serrulate, whitish to pale brown. Stem central or lateral, present, absent or reduced, coarsely and irregularly longitudinally ribbed or grooved, brown. Flesh pale, whitish, fibrous-tough. Smell none or of aniseed. Taste often acrid-burning, more rarely indistinct. Sp deposit white.

Sp 3.5-6 x 3-5 μm , broadly ellipsoid to subglobose, finely spinulose/echinulate or verruculose (often difficult to observe), ornamentation ± amyloid. Pleurocystidia present in most species. Gloeocystidia (apices of oleiferous hyphae protruding into the hymenium) present. Pileocystidia present in some species. Trama monomitic or dimitic, of thin- to thick-walled generative hyphae with numerous clamps, in some species dextrinoid, and thick-walled skeletal hyphae without clamps and with a ± strong amyloid reaction. Oleiferous hyphae becoming blue in sulphovanillin present in all species, especially in the pileipellis.

Saprotrophic on trunks and stumps of deciduous and coniferous trees, twigs and litter or on dead herbaceous stems. Summer to autumn, a few species from late autumn to early spring.

Seven species in the Nordic countries. The variation of many species is considerable and in spite of two recent monographs there are still differing opinions as to the number of species, their separation and the interpretation of some of the classical species.

Lit.: Moreau, Roux, & Mascarell 1999, Moreau, Garcia & Roux 2003, Petersen & Hughes 2004, Pilát 1946, Strid 1992.



Spores: *Lentinellus cochleatus*.

1. Smell strong of aniseed. Cap 20-90 mm, pale brown to red brown, smooth or slightly fibrillose, irregular, umbilicate, fan-shaped or reniform, often densely clustered; gills whitish to pale brown, strongly decurrent, edge even or somewhat serrulate; stem 10-120 x 2-10 mm, central or more often lateral, pale to dark brown, smooth, irregularly longitudinally ribbed or grooved, below often fused with other stems. Sp 4-5 x 3-4 μm , ellipsoid (fig. 83A); pileipellis, stem cortex and gill trama with spheropedunculate, brown chlamydospores, 7-13 x 7-10 μm , with 2 μm thick walls. Fasciculate in 80-150 mm large groups on stumps of deciduous trees like *Fagus*, *Fraxinus*, *Quercus*, *Populus tremula* and *Betula*, rarely on *Picea*; late summer to autumn; occasional in temp., rare in hemib.-bore., in FI to 62°N; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 1002, Phil 268b, R&H 110, Ves 127, 📍.

L. cochleatus (Pers.: Fr.) P. Karst. (*L. cochleatus* (Pers.: Fr.) P. Karst. subsp. *inolens* Konrad & Maubl., *L. inolens* (Konrad & Maubl.) Konrad & Maubl., *L. cochleatus* var. *inolens* (Konrad & Maubl.) Kühner & Romagn.)

Note: *L. inolens* is recognized by some authors by the absence of smell and the absence of chlamydospores in the pileipellis.

- Smell absent or different

2. Frb gathered in a dense cluster, distinctly stipitate and with long decurrent gills
see *L. cochleatus* 1
- Frb solitary or if clustered then stem very short 3
3. On last years stems of *Epilobium angustifolium*; cap 5-11 mm; clamps absent. Cap smooth, pale brown, margin fimbriate or entire; stem 1-5 x 1 mm, lateral or eccentric, paler than cap, sometimes with a woolly base; gills whitish, distant, thick, narrow. Sp 4.5-5.5 x 3.5-4.5 μ m, broadly ovoid, verruculose; pleurocystidia fusiform, 5-7 μ m broad below, protruding up to 20 μ m; hyphal system monomitic, non-amyloid; gloeocystidia prominent, with walls up to 2 μ m, irregular. In open land or clearings in forests with dense stands of *Epilobium* on a moss-covered ground, scattered on lying, last years stems, late autumn and early spring; in the area only known from a few records from DK (DD), but possibly overlooked due to the habitat and the season. – P&H 11a.
L. herbarum (Fr.: Fr.) P.-A. Moreau, Guy Garcia & P. Roux (*Lentinus flabelliformis* Bolton: Fr. var. *herbarum* Fr.: Fr., *Lentinellus tridentinus* (Bres.) Singer f. *h.* (Fr.: Fr.) R.H. Petersen)
- On other substrates; cap larger; clamps present 4
4. Sp 5-6 x 3-4.5 μ m; stem distinct, reduced or absent; frb gregarious to subfasciculate. Cap 10-40 mm, very variable, most often omphalinoïd with even and regular, slightly incurved margin, in forms with reduced stem convex, with regular or lacerate, undulate-wavy margin, striate, ochre, pale brown to greyish brown or red brown, smooth or pubescent towards the centre or basis; gills whitish to pale brown, in stipitate forms decurrent, serrulate to dentate, rather distant; stem in some forms well developed, 10-50 x 1-4 mm, pale greyish to dark brown, longitudinally grooved and irregular, in other forms strongly reduced or practically absent; taste mild, then burning. Sp broadly ellipsoid, verruculose; pleurocystidia fusiform-lanceolate. In small groups on stumps, trunks, twigs and debris of various kinds of coniferous and deciduous wood, most common on *Betula*, *Picea* and *Pinus*, but also on *Salix*, *Alnus*, *Fraxinus* and *Sorbus*; late in the season and in spring; rare, but locally occasional in temp.-suba.; DK (NT), FI (LC [as *omphalodes*]), IS, NO (LC), SE (LC). – FAD 197E, F, M, P&H 6c, R&H 109, R&M 7, 8, 9 (above), 7b, Ves 127, ☉.
L. flabelliformis (Bolton: Fr.) S. Ito (*L. flabelliformis* (Bolton: Fr.) S. Ito var. *micheneri* (Berk. & M.A. Curtis) Moreau & Roux, *L. micheneri* (Berk. & M.A. Curtis) Pegler, *L. omphalodes* (Fr.) P. Karst., *L. flabellinus* Quél.)
Note: a number of biological species are included here. See Petersen & Hughes (2004) for details.
- Sp < 5 μ m long; stem absent or reduced; frb gregarious or densely imbricate 5
5. Cap whitish or cream, smooth, at base stem-like contracted. Cap 20-60 mm, at first white, when old or dried yellowing to yellow brown; gills thin, crowded, white, becoming cream, bruising reddish brown, edge irregularly denticulate; flesh white; smell indistinct when fresh, when dried distinct, of tobacco or dried apples; taste acrid. Sp 3-4 x 2.5-3.5 μ m, broadly ellipsoid, echinulate, amyloid; gloeocystidia 5-6 μ m broad, slightly protruding among the basidia; trama non-amyloid. Saprotrophic, mostly on stumps of *Betula*, rarely on other hosts like *Ulmus*, *Alnus incana* and *Picea*; late summer to autumn; rare in bore., very rare in hemib.; FI (NT), NO (NE), SE (LC). – Jordstj 13(3) cover.
L. auricula (Fr.) E. Ludw. (*Lentinus a.* Fr., *Lentinellus vulpinus* (Sowerby: Fr.) Kühner & Maire f. *auricula* (Fr.) Pilát, *L. pilatii* Herink)
- Cap darker coloured, often \pm brown and velvety-strigose; base contracted or not, stem lateral or absent 6
6. A thin section of the trama is dextrinoid or weakly amyloid; skeletal or skeletalized hyphae weakly amyloid, becoming evenly pale greyish or pale bluish; a dark line (the pileipellis) separating the cap tomentum from the trama is indistinct or absent. Cap 20-70 mm, pleuro-

toid, towards the margin smooth or finely fibrillose-ribbed, very thin-fleshed, convex, but outer part soon turning upwards, smooth at the margin, closer to the base finely tomentose or ± woolly, pale brown; gills very thin and narrow, crowded, whitish, serrulate; stem absent; smell absent, taste moderately strong. Sp 4-5 x 3-4 µm, broadly ellipsoid to subglobose, amyloid, echinulate; hyphal system dimitic, with slightly dextrinoid, thin-walled hyphae, 2.5-3.5 µm broad, with scattered clamps, and very thick-walled skeletal or skeletalized hyphae, 5-10 µm broad, almost without a lumen, slightly irregular-wavy. In dense and often large, imbricate clusters on old trunks and stumps, in the southern part mostly on *Fagus*, in the north on *Populus* and *Ulmus*; late summer to autumn; rare in temp.-bore., but occasional in FI; DK (EN), FI (LC), NO (NT), SE (LC). – BSMF 115:311, R&H 111, Svp 16:61, ☉.

L. vulpinus (Sowerby: Fr.) Kühner & Maire (*L. sublineolatus* R.H. Petersen)

- A thin section of the trama instantly strongly amyloid; skeletal characteristically sinuose-knobby with partly thickened and darker coloured walls appearing almost moliniform, becoming strongly blue, violet or purplish brown in Melzer's reagent; pileipellis often seen as a distinct dark line separating the cap tomentum from the trama 7
7. Cap 30-120 mm, pale buff to reddish brown or dark brown, at first tongue-shaped, then broader, fan-shaped with contracted base often continuing inside the wood, surface smooth or covered with fine white tomentum, often somewhat ribbed towards the margin; gills narrow, serrulate; stem absent; taste mildly unpleasant, not burning (Moreau et al.: very acrid); smell indistinct. Sp 3.5-4.5 x 2.5-3.5 µm, ellipsoid to ovoid, verruculose-echinulate, ornamentation weakly amyloid; hyphal system dimitic; generative hyphae with clamps, 2.5-4 µm broad, thin- to thick-walled, hyaline or slightly dextrinoid; skeletal hyphae thick-walled, long and straight or more often slightly sinuous, distinctly amyloid, with darker knobby thickenings; tomentum of 2.5 µm broad, whitish or slightly brown hyphae with clamps. Often in large imbricate clusters on living or recently dead wood, especially of *Picea*, *Betula* and *Populus*; late summer to autumn; rare in temp.-bore.; FI (LC), NO (LC), SE (LC).
- L. castoreus* (Fr.) Kühner & Maire (*Lentinus angustifolius* Romell)
- Cap 25-70 mm, fan-shaped, contracted towards base, reddish brown to dark brown, when young mostly smooth, but soon for the most part with a pale to dark brown woolly covering, at margin smooth or finely ribbed; gills at first narrow but finally up to 5 mm broad, serrulate; stem absent; taste very strong, after some time burning (by Moreau et al. bitter-mentholate); smell indistinct or slightly sweetish. Sp 3.5-4.5 x 2.5-3.5 µm, ellipsoid, verruculose-echinulate, ornamentation strongly amyloid; hyphal system dimitic; generative hyphae with clamps, 2.5-4 µm broad, thin- to thick-walled, hyaline or slightly dextrinoid; skeletal hyphae thick-walled, long and straight or more often slightly sinuous, distinctly amyloid, with darker knobby thickenings; tomentum of 2.5 µm broad, whitish or slightly brown hyphae with clamps. In small groups or clusters or solitary, on deciduous wood in rich forests, in temp. especially on *Fagus*, further north on *Populus*, *Salix*, *Betula* and *Acer*, rarely on conifers; late summer to autumn; rare in temp.-bore., but occasional in FI; DK (NE), FI (LC), NO (NE), ☉.
- L. ursinus* (Fr.: Fr.) Kühner (*L. lineolatus* R.H. Petersen, *L. castoreus* (Fr.) Kühner & Maire var. *tomentellus* (P. Karst.) Moreau & Roux, *L. castoreus* var. *hispidus* Moreau & Roux, *L. ursinus* f. *robustus* (P. Karst.) R.H. Petersen)

Lentinula Earle

JAN VESTERHOLT

One species in the area; see description below.

Lit.: Bas in Bas et al. 1990, Ludwig 2001, Pegler 1984.

Frb tricholomatoid, tough, scaly. Cap 40-100 mm, convex with inrolled margin, becoming low convex with flattened centre, thick-fleshed, radially fibrillose to scaly, dry, greyish brown to dark brown, especially near margin with greyish white to buff scales of universal veil. Gills emarginate, narrowly adnate to almost free, with ± serrulate edge, crowded to very crowded, white to greyish cream. Stem 30-70 × 8-15 mm, cylindrical, often bent, upper part fibrillose, in middle and lower part with a fibrillose-floccose covering and sometimes a fluffy ring-like zone when young, greyish white to greyish brown. Flesh fairly tough, especially in stem, white. Smell pleasant. Taste slightly spicy, onion-like, more distinct after drying. Sp deposit white.

Sp 5-6.5 × 2.5-3 μm, narrowly ellipsoid, smooth (fig. 303A), hyaline, without iodine reactions. Basidia 4-spored. Cheilocystidia absent or little differentiated; pleurocystia absent. Hyphal system monomitic. Pileipellis a cutis. Clamps present.

Saprotrophic on deciduous wood, mostly on standing trunks, solitary or subfasciculate; all year around; cultivated on large scale, but in Europe very rarely found in nature; *NL*. – Däh 1005, Ger 01:105, Lud 55.1, ⊙. – Edible and widely known as shiitake.

L. edodes (Berk.) Pegler (*Lentinus e.* (Berk.) Singer)



Spores.

Lentinus Fr.: Fr.

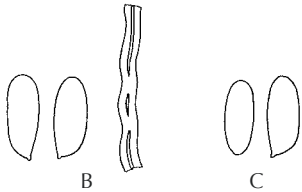
HENNING KNUDSEN

Frb clitocyboid to pleurotoid. Cap 15-80 mm, umbilicate to funnel-shaped, smooth or scaly. Gills decurrent, with dentate-serrate edge, white to yellowish. Stem well developed to almost absent, central to eccentric, smooth or scaly, with or without a fugacious veil. Flesh tough-leathery, whitish. Smell indistinct or of aniseed. Taste not noted. Sp deposit white.

Sp cylindrical-ellipsoid, hyaline, without iodine reactions. Basidia 4-spored. Cheilocystidia present or absent. Clamps present. Hyphal system dimitic; generative hyphae thin-walled, narrow, with clamps; binding hyphae thick-walled, hyaline. Hyphal pegs present, consisting of fascicles of densely aggregated generative hyphae projecting through the hymenophore.

Saprotrophic, making a white rot in trunks and branches of *Salix* and *Populus*.

Lit.: Pegler 1983.



Spores and skeletal hyphae from trama: B: *Lentinus suavissimus*, C: *L. tigrinus*

1. Smell strong, of aniseed. Cap 15-50(-110) mm, umbilicate to funnel-shaped or if stem eccentric then fan-shaped, at first with inrolled margin, smooth, yellow to greyish yellow, hygrophanous striate near margin; gills decurrent, with finely denticulate edge, whitish; stem central or eccentric, short to rudimentary, to 10 mm x 2-4 mm, cylindrical, smooth above, hairy-strigose at base. Sp 7-8 x 3.5-4 μm , cylindrical to ellipsoid (fig. 73B); cheilocystidia absent. On thin branches of *Salix*, often still attached to the bush, solitary or a few scattered on the branches in moist habitats; summer to late autumn, rare in temp.-bore.; DK (VU), FI (NT), NO (LC), SE (LC, Sk). – B&K 3:239, Däh 995, Lud 39.3, M&J Panus 1, ⊙.
L. suavissimus Fr. (*Panus s.* (Fr.) Singer)
- Smell indistinct. Cap 40-80 cm, umbilicate to funnel-shaped, whitish with small, fibrous, adhering fuscous black scales; gills decurrent, with dentate-serrate edge, white to yellowish; stem well developed, 10-60 x 2-6 mm, central to eccentric, smooth or scaly, with a fugacious veil. Sp 6-10 x 2-3 μm , cylindrical to ellipsoid (fig. 73C); cheilocystidia sinuous, nodulose. On trunks and branches of *Populus* and *Salix*, rarely other deciduous wood in moist habitats or on partly submerged wood, often gregarious, summer to autumn; very rare in temp., one record from DK (Sj.: Glænø 1946) and a few from SE; DK (RE), SE (CR, Sk). – B&K 3:240, Däh 999, GBW 3:20, Lud 39.5, MH 3:95, ⊙.
L. tigrinus (Bull.: Fr.) Fr. (*Panus t.* (Bull.: Fr.) Singer)

Lepiota (Pers.: Fr.) Gray

CHRISTIAN LANGE

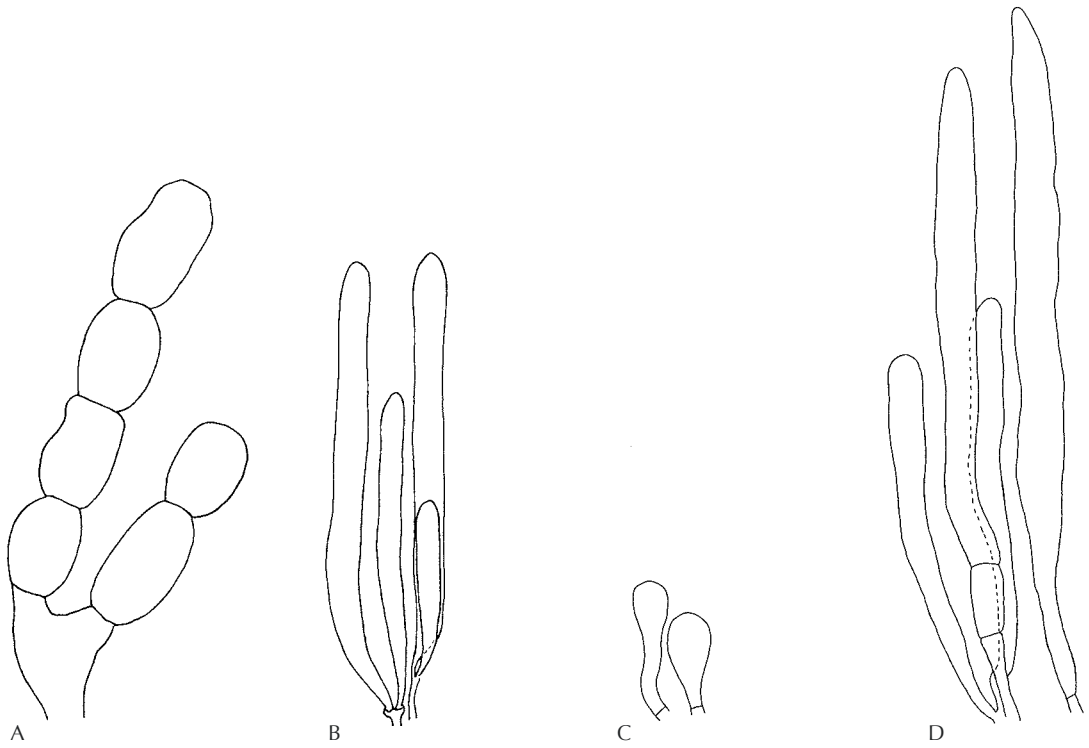
Frb lepiotoid with free gills and ring or ring-zone. Cap 5-100 mm, dry, smooth, radially fibrillose, concentrically scaly, whitish, yellow, orange, brown, pink, brick red, purplish, grey, greenish or black, typically coloured at centre and fading towards margin. Gills free, medium spaced to crowded, white or cream to pinkish, eventually discolouring yellow orange or reddish brown, edge concolorous or coloured. Stem cylindrical or with a clavate base, smooth, silky fibrillose to tomentose, with or without a ring zone or ring, towards base often with girdles of cap colour, often turning reddish-brownish at base. Some species discolouring yellowish, reddish or brownish when handled. Smell neutral, fruity, cedar-like or gas-like and unpleasant. Taste neutral or unpleasant. Sp deposit white to cream.

Sp ellipsoid, ovoid, amygdaloid to broadly fusiform, sometimes spurred, smooth, hyaline, dextrinoid, rarely without iodine reactions, not or rarely pinkish metachromatic. Cheilocystidia present, in a few species absent, cylindrical, clavate, utriform to lageniform. Pleurocystidia absent. Pileipellis a hymeniderm or a trichoderm. Clamps present in almost all species.

Saprotrophic on soil, typically in rich, deciduous or coniferous woodlands, parks and shrubs, sometimes on decaying wood. Many species are frequently found in shrubs on rich, sandy soil along the coastlines of southern Scandinavia. Most species are rarely or very rarely found, but probably overlooked. Several species contain amanitin (*L. brunneoincarnata*, *L. castanea*, *L. lilacea*, *L. pseudolilacea*, *L. subincarnata* and possibly *L. xanthophylla*) and are known as very poisonous, but probably more species are poisonous, and no *Lepiota* should be eaten. None considered edible.

30 species in the Nordic countries, 33 species in the key. *L. rubella* Bres., *L. efibulis* Knudsen, *L. micropholis* (Berk. & Broome) Sacc. and *L. elaiophylla* Vellinga & Huijser, known from greenhouses in the region, are not included.

Lit.: Enderle & Krieglsteiner 1989, Kelderman 1994, Vellinga 2003a, Vellinga in Noordeloos et al. 2001.



Pileipellis elements: A: *Echinoderma echinacea*, B: *Lepiota subalba*, C: *L. cristata*, D: *L. castanea*.

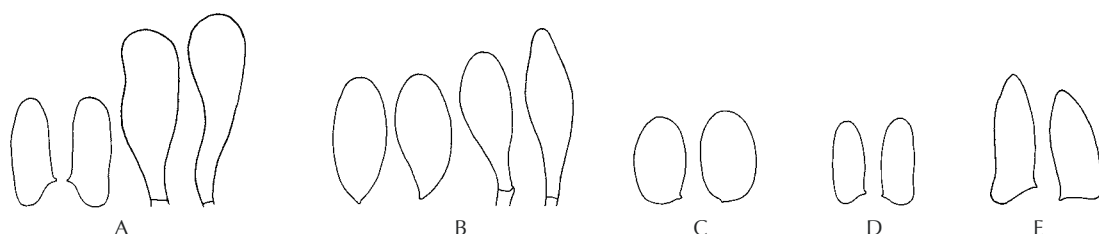
- | | | |
|----|---|---|
| 1. | Cap white or whitish, centre eventually cream to yellowish | 2 |
| - | Cap with distinct colours, at least at centre | 5 |
| 2. | Sp spurred (fig. 541A). Cap 15-35 mm, conical to convex, often with a low umbo, white to dirty white, with a cream to yellowish, felty centre, towards margin more radially fibrillose; gills medium spaced to distant, white, with a floccose edge; stem 20-60 x 2-4 mm, cylindrical, white, fibrillose, cream to pinkish, with a thin, floccose ring zone, below with scattered white, floccose girdles; flesh white, smell unpleasant, taste unpleasant. Sp 7.5-10 x 2.5-3.5 μ m; cheilocystidia 15-40 x 6-10 μ m, cylindrical to narrowly clavate, numerous; pileipellis of cylindrical to fusiform cells, 30-200 x 5-20 μ m (fig. 539B), hyaline, with basal clamps. On rich soil in deciduous woods; summer to autumn; rare, but locally occasional in temp.-hemib., very rare in southern bore.; DK (LC), FI (EN, V: Lohja, EH:Luopioinen), NO (vu), SE (LC).
- Døss 2.1 (as <i>Lepiota</i> sp.), FAD 12B (as <i>albosericea</i>), GBW 4:95, Sieniop 104, Ⓢ. - Poisonous.
<i>L. subalba</i> P.D. Orton | |
| - | Sp fusiform, cylindrical or ellipsoid | 3 |
| 3. | Sp fusiform to cylindrical, 10-20 x 5.5-7 μ m (fig. 541B); stem woolly-tomentose; on sandy, calcareous soil in grassland, often near the coast. Cap 20-60 mm, hemispherical to convex, smooth, silky, shiny, eventually a bit fibrillose around centre, with a low umbo, white with a pale yellowish brown centre, with white, floccose velar remnants along the margin; gills medium spaced, white to cream; stem 20-60 x 2-7 mm, cylindrical, white, above the woolly ring zone cream, silky; flesh white to cream; smell neutral or unpleasant; taste neutral or unpleasant. Sp dextrinoid; cheilocystidia 10-40 x 6-15 μ m, usually clavate, but rather variable; pileipellis of straight, aseptate hyphae, 200-300 x 5-12 μ m, hyaline, with thickened walls. Late summer to autumn; common in temp.-hemib., very rare in bore., in FI north to EH; | |

DK (LC), FI (VU), NO (NT), SE (LC). – B&K 4:213, C&D 669, FAD 11A, GBW 4:67, R&H 414, ☉.
– Poisonous.

L. erminea (Fr.: Fr.) P. Kumm. (*L. alba* (Bres.) Sacc.)

Note: *L. alba* var. *angustispora* Migl. & Bizzi with sp 9-12 x 3-4.5 μm is reported from FI. – Mic Ital 23(3):38.

- Sp ellipsoid, 3-4 x 2-3 μm ; stem smooth to fibrillose; in woods and parks 4
- 4. Cap 8-20 mm; stem without a ring; pileipellis a hymeniderm. Cap conical to plane, with a low umbo, smooth, minutely felty or radially cracking towards margin, white with cream or pinkish tinge at centre; gills white, with age \pm spotted in brown or ochraceous brown; stem 10-25 x 2-3 mm, cylindrical or slightly tapering towards base, fibrillose, whitish-pinkish; flesh white, in stem base brownish; smell unpleasent; taste unknown. Sp 3-4 x 2-3 μm , broadly ellipsoid, without iodine reactions, metachromatic; cheilocystidia 15-30 x 4-10 μm , irregularly clavate; pileipellis cells 15-50 x 8-25 μm . In deciduous woods and parks on rich soil; autumn; very rare in temp.-southern bore.; DK (NA), FI (VU, V: Lohja, ES: Lappeenranta), SE (Sk). – Bol 30:77, Svp 51:53.
L. rufipes Morgan
- Cap 5-8 mm; stem with a thin and fragile ring; pileipellis a trichoderm. Cap convex, radially tomentose, white; gills white, crowded; stem 10-25 x 1-3 mm, cylindrical, white, fibrillose; flesh white; smell and taste unknown. Sp 3-4 x 2-3 μm , broadly ellipsoid, without iodine reactions, not metachromatic; cheilocystidia absent; pileipellis of simple hyphal cells, up to 150-300 x 5-7 μm , hyaline, often with one or few septa with or without clamps. In deciduous forests and shrubs on rich, sand-mixed soil; autumn; very rare in temp.-hemib.; DK (NA, Fyn: Ristinge Klint), FI (DD, V: Lohja), SE. – Bol 30:77, C&L 25b.
L. parvannulata (Lasch) Gillet
- 5. Cap with blue green, greenish, olivaceous or bronze colours 6
- Cap without greenish colours 9
- 6. Only cap centre with olivaceous to greenish brown, small, pointed scales, outwards radially fibrillose and whitish; stem whitish, tomentose; sp ellipsoid (fig. 541C). Cap 20-40 mm, hemispherical to plane with a low umbo; gills medium spaced, white to cream; stem fibrillose, white, below a woolly ring zone with white, woolly girdles, at base with a few scales of cap colour; flesh white; smell unpleasent; taste unpleasent. Sp 6-8 x 3.5-5 μm ; cheilocystidia 15-30 x 4-8 μm , cylindrical, narrowly clavate to fusiform, numerous; pileipellis a mixture of long cylindrical elements, 60-350 x 5-10 μm , and shorter, clavate elements, 20-50 x 8-15 μm , with yellowish-greyish parietal pigment. In deciduous forests on rich soil; autumn; very rare in temp.-hemib.; DK (NA, Lol: Vintersbølle Skov 1928), SE (VU, ÖI). – BCat 730, C&D 682, C&L 30, Mic Ital 23(3):39, Svp 51:51.
L. forquignonii QuéI.
- Entire cap blue-green, greenish or bronze-coloured, with age often discolouring orange, smooth to radially fibrillose, with small tufted scales at centre; stem with scale girdles of cap colour; sp with truncate base 7
- 7. Cap olive, grey olive, bronze to light brown, minutely fibrillose. Cap 10-30 mm, hemispherical to plane with a low umbo, towards margin radially cracking into small scales, exposing the cream to light brown flesh; gills white, medium spaced to crowded; stem 20-50 x 2-4 mm, cylindrical or slightly clavate, white fibrillose on a brownish beige background, with girdles of scales of cap colour in lower half; flesh whitish beige; smell faint or unpleasent; taste neutral. Sp 6-8 x 3.5-4.5 μm , broadly cylindrical with a rounded truncate, slightly spurred base (fig. 541D); cheilocystidia 15-30 x 5-10 μm , cylindrical to narrowly clavate; pileipellis elements, 50-200 x 8-25 μm , irregularly cylindrical, often septate, with short elements in between. In deciduous shrubs on rich, sandy soil; autumn; very rare in temp.; DK (EN). – SMT 29(2):29, V&K 33 (as *griseovirens*).
L. poliochloodes Vellinga & Huijser



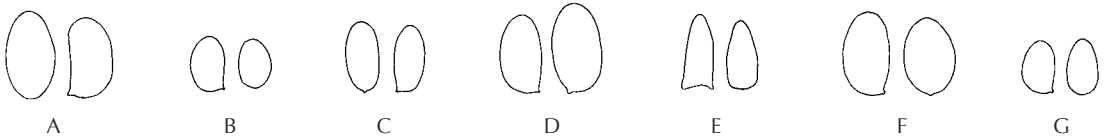
Spores and cheilocystidia: A: *Lepiota subalba*, B: *L. erminea*, C: *L. forquignonii*, D: *L. poliochloodes*, E: *L. grangei*.

- Cap with more deep greenish, dark grey green or dark olivaceous colours, with concentrical scales, often with orange discolourations 8
- 8. Cap fresh green to blue green with orange tinges in flesh in cap and stem, fading brownish green with age; stem typically more than twice as long as cap diam. Cap 15-40 mm, bell-shaped, expanding to plane with a low umbo, at centre with small, erect scales, towards edge radially cracking into appressed scales; gills white or turning faint brownish, medium spaced, edge often a bit irregular; stem 20-60 x 3-6 mm, cylindrical, silky white on an orange-brownish background, without distinct ring zone, in lower half with scattered girdles of scales of cap colour; flesh white to orange brownish; smell unpleasant like *L. cristata*; taste neutral. Sp 8-13 x 3.5-4.5 μm , cylindrical to oblong ovoid, with truncate, spurred base (fig. 541E); cheilocystidia 20-50 x 5-15 μm , clavate to utriform; pileipellis of septate elements, 50-300 x 7-20 μm , with parietal and intracellular pigment. In deciduous or coniferous forests on rich soil; autumn; rare in temp.-southern bore.; DK (EN), FI (VU), NO (EN, Vestf), SE (VU). – B&K 4:225, C&D 677, FAD 10A, GBW 4:83, Svp 26:38, .
L. grangei (Eyre) Kühner
- Cap blackish green, dark greyish green to dark olivaceous, often with a blue hue, without orange colours; stem typically up to twice as long as cap diam. Cap 15-35 mm, conical to plane with a low umbo, at the centre with small tufts of scales, towards margin radially cracking into small scales, exposing the whitish flesh, at margin often with a white rim; gills medium spaced, white or faintly brownish; stem 20-50 x 2-5 mm, cylindrical or with a slightly clavate base, silky white on a cream to pale brown background, without distinct ring zone, in lower half with girdles of cap colour; flesh white to cream or light brown; smell fruity or unpleasant; taste unpleasant. Sp 6-10 x 3.5-4 μm , cylindrical to oblong, with a truncate, spurred base; cheilocystidia 20-40 x 5-10 μm , irregular cylindrical, utriform to clavate, in tufts; pileipellis of 80-300 x 7-20 μm large elements, eventually with one or two septa in lower part, with parietal to incrusting pigment. In deciduous forests and shrubs, often on sandy, rich soil; rare in temp.-bore.; DK (VU), SE (NE). – B&K 4:226, C&D 678 (as *pseudofelina*), Svp 26:38, 31:42 (as *pseudofelina*), Ves 273, .
L. griseovirens Maire (*L. pseudofelina* J.E. Lange s. auct.)
- 9. Cap and/or stem with vinaceous, purple, greyish or black colours 10
- Cap and/or stem with pinkish-brownish, brown to orange brown colours 15
- 10. Cap dark grey brown to black, cracking into concentrical rings of erect patches or scales on a whitish background. Cap 15-40 mm, hemispherical to almost plane, with a low umbo; gills medium spaced, whitish cream to pinkish; stem 30-60 x 2-5 mm, cylindrical to slightly clavate, whitish fibrillose, towards base often darker and with a few girdles of scales of cap colour, with a distinct, cuff-like ring with a dark coloured edge; flesh whitish; smell cedar-like or unpleasant; taste unknown. Sp 6-8.5 x 4-5 μm , broadly ellipsoid (fig. 543A); cheilocystidia 20-50 x 5-10 μm , \pm irregular cylindrical, often with a basal septum; pileipellis a mix of 100-400 x 10-15 μm large, cylindrical, non-septate elements and 15 μm wide, narrowly clavate

elements, with parietal to incrusting dark pigment. In coniferous and deciduous woods on rich soil; occasional in temp.-hemib., rare in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 685, FAD 12E, FE 4:28a, GBW 4:80, Phil 130c, ☉. – Poisonous.

L. felina (Pers.) P. Karst.

- Cap and/or stem with vinaceous to purple colours 11
- 11. Pileipellis a hymeniderm 12
- Pileipellis a trichoderm 13
- 12. With cuff-like ring with coloured underside. Cap 15-40 mm, hemispherical to plane with a low umbo, smooth, when expanding cracking into irregular scaly patches, pale pinkish brown to dark brown, with a faint lilaceous tinge, exposing the whitish flesh; gills medium spaced, whitish; stem 15-50 x 2-4 mm, cylindrical or with slightly clavate base, fibrillose, whitish to pale brown; flesh whitish-pinkish; smell sweetish; taste neutral. Sp 4-6.5 x 2.5-4 μ m, ellipsoid (fig. 543B), metachromatic; cheilocystidia 15-40 x 7-14 μ m, clavate; pileipellis of 25-70 x 8-20 μ m large, clavate elements. In parks and gardens on enriched soil, in FI only found in a greenhouse; autumn; rare in temp.-hemib.; DK (LC), FI (NE), SE (EN). – C&D 689, FAD 13G, GBW 4:88, Svp 28:48. – Very poisonous.
- L. lilacea* Bres.
- Without ring see *L. hymenoderma* 16
- 13. Ring with a coloured edge see *L. pseudolilacea* 29
- Ring absent 14
- 14. Stem with a woolly, greyish tomentum when fresh, normally twice as long as cap diam.; without clamps. Cap 15-45 mm, hemispherical to plane with a broad umbo, first dark purplish-greyish, with age cracking into broad, radially fibrillose, vinaceous scales, exposing the white flesh, margin exceeding gills; gills whitish, crowded; stem 20-80 x 4-10 mm, \pm cylindrical, when fresh purplish, with age more vinaceous brown, with speckled bands on a whitish background, with a woolly-tomentose ring zone; flesh whitish; smell fruity or unpleasant; taste neutral. Sp 4-6.5 x 2-3.5 μ m, ellipsoid to cylindrical (fig. 543C); cheilocystidia 15-45 x 6-15 μ m, clavate, eventually septate; pileipellis of loosely arranged, radiating fibrils, 50-150 x 5-20 μ m. In deciduous and coniferous woods on rich soil or amongst herbs in conifer plantations; autumn; rare in temp., very rare in hemib.; DK (VU), FI (CR, V: Lohja), NO (CR, Busk: N. Eiker), SE (EN). – B&K 4:224, C&D 688, FAD 13H, GBW 4:81 (old specimens), Svp 28:48 (very fresh specimens). – Poisonous.
- L. fuscovinacea* F.H. Møller & J.E. Lange
- Stem without a tomentum, with girdles of scales of cap colour in lower part, of same length as cap width; with clamps. Cap 25-60 mm, broadly bell-shaped to plane, dark reddish brown to vinaceous brown, normally with a faint purple to vinaceous tinge, towards margin cracking into concentric rings of scales, exposing the whitish flesh; gills medium spaced, whitish; stem 25-60 x 5-9 mm, cylindrical, at top silky whitish-pinkish, towards base brownish with a vinaceous tinge, with an inconspicuous, woolly ring zone; flesh white to pinkish, smell fruity, taste unpleasant. Sp 7-10 x 4-5 μ m, oblong to amygdaloid (fig. 543D); cheilocystidia 15-35 x 5-10 μ m, cylindrical to narrowly clavate, often septate; pileipellis with 80-300 x 10-14 μ m large cylindrical cells, mixed with 30-60 x 8-12 μ m large, narrow clavate elements. In deciduous woods, but more typically in disturbed sites along roads, in gardens and parks on rich soil, often solitary; summer to autumn; rare in temp.-bore.; DK (LC), SE (NE). – C&D 683, FAD 13F, GBW 4:70, ☉. – Very poisonous.
- L. brunneoincarnata* Chodat & C. Martín
- 15. Pileipellis a hymeniderm; cap cracking into patchy scales 16
- Pileipellis of elongate cells, in some species intermixed with clavate cells 20
- 16. Sp spurred (fig. 543E). Cap 15-75 mm, bell-shaped to plane, with a low umbo, centre dark



Spores: A: *Lepiota felina*, B: *L. lilacea*, C: *L. fuscovinacea*, D: *L. brunneoincarnata*, E: *L. cristata*, F: *L. ochraceofulva*, G: *L. hymenoderma*.

brown, reddish brown to pale brown, cracking into concentric, patchy scales, spreading towards the edge and almost white; gills medium spaced, white; stem 15-70 x 2-8 mm, cylindrical or with slightly clavate base, silky fibrillose, white, at base pinkish-brownish, with a distinct ring, but often torn and missing or attached to cap margin; flesh white; smell unpleasant, gas-like, strong; taste unpleasant. Sp 5.5-8.5 x 2.5-3.5 μm; cheilocystidia 15-50 x 7-15 μm, clavate; pileipellis cells 15-70 x 5-20 μm, narrowly clavate (fig. 539C). In deciduous and coniferous woods and parks, typical on richer soil; autumn; very common in temp.-hemib., common in bore., very rare in suba.; DK (LC), FI (LC), IS (Ve), NO (LC), SE (LC). – B&K 4:221, C&D 674, GBW 4:76, R&H 413, Ves 272, ☉. – Poisonous.

L. cristata (Bolton: Fr.) P. Kumm.

- Sp ellipsoid 17
- 17. Cheilocystidia present 18
- Cheilocystidia absent 19
- 18. Cap 30-70 mm, dark brown, reddish brown to orange brown. Cap hemispherical to plane, with an indistinct umbo, towards margin cracking into radially fibrillose scales, exposing the whitish-yellowish flesh, turning orange with age; gills remote from stem, medium spaced, white, with age with orange-brown patches; stem 50-80 x 5-10 μm, cylindrical with clavate base, silky white to pale brown, turning orange with age and on handling with a quickly disappearing, tomentose ring zone and a few scattered girdles of cap colour at the base; flesh white, turning orange-reddish with age and handling; smell strong, fruity, like orange chocolate or unpleasant; taste neutral. Sp 6-8.5 x 4-5 μm, cylindrical to ellipsoid (fig. 543F), sometimes slightly metachromatic; cheilocystidia 15-40 x 4-9 μm, narrowly clavate, often a bit irregular; pileipellis a hymeniderm of 20-50 x 8-11 μm large, clavate to utriform cells. In deciduous and coniferous forests and shrubs on rich soil, also on ant-hills; autumn; rare in temp.-hemib., very rare in FI; DK (EN), FI (DD, V: Vihti), SE (VU). – AMK 2004.1.15, pl. 2, Svp 28:48, 51:51.

L. ochraceofulva P.D. Orton

- Cap 5-30 mm, grey brown, dark brown, eventually with a purplish tinge. Cap bell-shaped to plane, towards margin splitting into granulose-fibrillose scales, exposing the whitish cream flesh; gills medium spaced, cream; stem 20-40 x 1-3 mm, cylindrical, whitish fibrillose, discolouring brown to orange from base, without ring, eventually with a few scales of cap colour towards base; flesh white to cream; smell unpleasant, strong; taste unpleasant. Sp 4-6 x 2.5-3.5 μm, ellipsoid to ovoid (fig. 543G), dextrinoid, metachromatic; cheilocystidia 12-35 x 6-10 μm, clavate with a round apex; pileipellis a hymeniderm of 12-60 x 8-20 μm large, clavate to cylindrical cells. In neighbouring countries found in both deciduous and coniferous woods and parks on rich soil; autumn.; UK, NL. – Car 52.1, FE4:35a, Mic Ital 19(1):55.

L. hymenoderma D.A. Reid

- 19. Veil remnants attached to cap margin; smell strong, sweetish, not gas-like. Cap 10-40 mm, bell-shaped to plane, light brown to orange brown, cracking into irregular patches, fading to cream-white towards margin; gills medium spaced, cream to pinkish; stem 20-60 x 2-5 mm, cylindrical or with slightly widened base, white silky fibrillose, towards base dirty reddish

brown; flesh white to cream, in base reddish brown; taste similar. Sp 4.5-6.5 x 3-4 μm , ellipsoid; cheilocystidia absent; pileipellis a hymeniderm of 15-50 x 10-20 μm large cells, clavate to spheropedunculate. In deciduous and mixed woods on rich soil; autumn; very rare in bore.; FI (DD, KP: Sievi, PK: Valtimo). – RdM 36:226 (as *crisatoides*).

L. apatelia Vellinga & Huijser


- Stem with a distinct ring; smell gas-like, like *L. cristata*. Cap 10-30 mm, hemispherical to plane, with a low umbo, smooth, at most cracking into small, concentric scales towards margin, light brown to pinkish brown, fading to white towards margin; gills cream, crowded; stem 20-50 x 1-3 mm, cylindrical, whitish, silky fibrillose, towards base pinkish-reddish; flesh white to cream; taste unknown. Sp 3.5-5 x 2.5-3.5 μm , ellipsoid, dextrinoid, metachromatic; cheilocystidia absent; pileipellis a hymeniderm of 15-50 x 8-25 μm large, clavate to ellipsoid elements. In neighbouring countries found in roadsides and forest edges on rich soil; autumn; DE, NL. – RdM 36:240 (as *rufipes* f. *phaeophylla*).

L. cristatoides Einhell.

- | | | |
|-----|---|----|
| 20. | Sp spurred or with truncate apex | 21 |
| - | Sp ellipsoid or fusiform | 26 |
| 21. | Cap with dull brown colours, at most slightly pinkish | 22 |
| - | Cap with warm orange-brown to yellow-brown colours, often discolouring yellowish orange on handling | 23 |

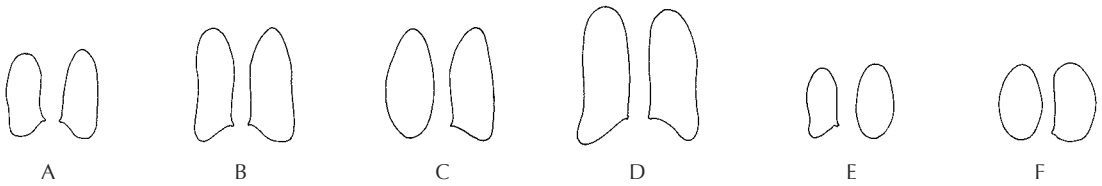
22. Cap 10-30 mm. Cap bell-shaped to low convex, dark grey brown to brown with a cream-pinkish hue, centre covered with minute, pointed scales, towards margin more dispersed, exposing the whitish flesh, at margin eventually with white velar remnants; gills crowded, white to beige; stem 15-50 x 2-5 mm, cylindrical with a slightly broadened base, silky fibrillose, whitish, towards base reddish brown, in lower parts with scattered girdles of scales of cap colour; flesh whitish to pale brown; smell indistinct; taste bitter. Sp 7-9.5 x 3-4 μm , \pm irregularly cylindrical, distinctly spurred (fig. 545A); cheilocystidia 20-40 x 5-12 μm , narrow clavate; pileipellis cells 50-350 x 5-20 μm , typically with 2-3 septa. In deciduous woods and shrubs on rich soil; autumn; rare in temp.-hemib.; DK (NT), SE (VU). – FAD 14D, GBW 4:100, Nit 315, SMT 29(2): cover.

L. tomentella J.E. Lange

- Cap 30-70 mm. Cap hemispherical to plane, with a low umbo, purplish brown, brown to orange brown, at centre covered with small, pointed tufts, towards margin cracking into concentric scales, exposing the whitish flesh; gills with irregular edge, medium spaced, cream; stem 40-80 x 4-10 mm, cylindrical with a slightly clavate base, silky fibrillose, white to pinkish brown, without a ring, with distinct scale girdles of cap colour; flesh cream to pinkish-brownish; smell fruity to unpleasant; taste neutral. Sp 8.5-11 x 3.5-4.5 μm , spurred, cylindrical (fig. 545B), dextrinoid; cheilocystidia 20-55 x 7-17 μm , narrowly clavate to utriform; pileipellis cells 100-350 x 12-15 μm , eventually with basal septa. In deciduous woods on calcareous soil; autumn; very rare in temp.; DK (CR). – BSMF 116:336, GBW 4:72, Mic Due 592, Svp 34:33, . – Very poisonous.

L. cingulum Kelderman

23. Pileipellis elements septate, with 2-5 clamps. Cap 20-60 mm, rusty brown to orange brown, towards margin yellowish brown, radially fibrillose, rarely exposing the whitish flesh; gills crowded, white to cream; stem 30-70 x 3-8 mm, cylindrical, widening towards base, whitish silky fibrillose with a few indistinct, orange-brown bands, ring zone flocculose or indistinct; flesh whitish cream; smell neutral to fruity; taste neutral. Sp 7-10 x 3-4 μm , \pm irregular cylindrical, spurred (fig. 545C), dextrinoid; cheilocystidia 12-40 x 5-12 μm , clavate to utriform; pileipellis elements chains of pigmented cells, terminal element 40-200 x 10-20 μm , pigment vacuolar, dissolving in ammonia. In deciduous woods and shrubs on rich soil; autumn; occasional in temp., rare in hemib.-bore., very rare in FI; DK (LC), FI (VU, V, U), NO (NT), SE



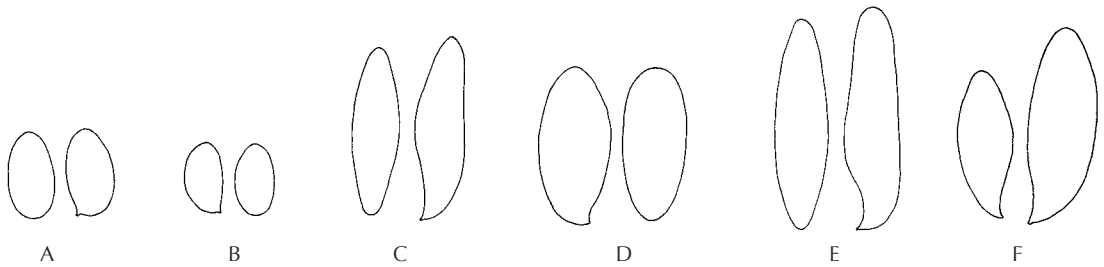
Spores: A: *Lepiota tomentella*, B: *L. cingulum*, C: *L. boudieri*, D: *L. castanea*, E: *L. ignicolor*, F: *L. subincarnata*.

(LC). – B&K 4:216, FAD 12D, 12F, GBW 4:68, Nit 315, Ves 272, ☉. – Very poisonous.

L. boudieri Bres. (*L. fulvella* Rea, *L. acerina* Peck s. Bon)

- Pileipellis elements unicellular or septate, without clamps 24
- 24. Cap greyish brown, brown to dull orange brown, discolouring orange on handling, covered with small scales. Cap 15-30 mm, bell-shaped to flat convex, fading towards margin, exposing the whitish flesh; gills medium spaced, cream with orange tinges; stem 15-50 x 2-4 mm, cylindrical with a slightly broadened base, fibrillose, cream, to orange towards base, without a ring but with scattered girdles of cap colour; flesh whitish cream, turning orange; smell sweetish-fruity; taste unknown. Sp 7-10 x 3-4 μm , \pm cylindrical, spurred; cheilocystidia 20-45 x 5-15 μm , narrowly clavate to irregular cylindrical; pileipellis of 60-300 x 8-20 μm large, cylindrical elements, eventually septate. In neighbouring countries known from deciduous woods on rich soil; DE, NL. – AMK 2004.1.15 pl. 5, Mic Ital 25(2):pl. 3.
L. pilodes Vellinga & Huijser (*L. tomentella* J.E. Lange s. Candusso & Lanzoni 1990)
- Cap warm brown to orange brown 25
- 25. Pileipellis elements 1-3 septate, constricted at septa; sp 7-14 x 3-5.5 μm (fig. 545D); in woods. Cap 10-40 mm, bell-shaped to convex, warm red brown to orange brown, with patchy, appressed scales towards margin breaking into concentrically arranged scales, exposing the whitish-yellowish flesh; gills medium spaced to crowded, whitish, discolouring orange; stem 20-60 x 2-6 mm, cylindrical with a slightly swollen base, silky whitish fibrillose on an orange-brown background, in lower half with scattered girdles of cap colour, without a distinct ring zone; flesh whitish to pale orange brownish; smell fruity or cedar-like; taste neutral. Sp cylindrical-ellipsoid, spurred; cheilocystidia 20-40 x 5-10 μm , utriform to clavate; pileipellis elements 50-350 x 7-20 μm , with 1-3 septa (fig. 539D), with parietal pigment. In coniferous and deciduous woods, parks and gardens on rich soil; autumn; occasional in temp.-bore., with a southern distribution in FI; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:219, FAD 12G, Phil 132a, Svp 26:39, Ves 273, ☉. – Very poisonous.
L. castanea Quél.
- Pileipellis elements non-septate; sp 7-9 x 3.5-4.5 μm (fig. 545E); in xerothermic grasslands. Cap 10-20 mm, warm orange brown, cracking into radially fibrillose scales, but hardly exposing the whitish flesh; gills medium spaced to distant, cream with orange-brown traces; stem 20-30 x 1-2 mm, cylindrical, whitish fibrillose on an orange-brown background, with a few girdles of scales of cap colour, at base with orange-brown rhizomorphs; flesh whitish-brownish; smell neutral to unpleasant; taste neutral. Sp ellipsoid, spurred; cheilocystidia 25-35 x 6-10 μm , narrowly clavate; pileipellis elements 90-250 x 10-20 μm , cylindrical, tapering towards base. Among grass and herbs; autumn; very rare in temp.; DK (DD, EJyl: Helgenæs). – Bon 285.
L. ignicolor Bres.
- 26. Sp ellipsoid (figs 545F, 547A-B); pileipellis of elongate cells intermixed with clavate cells 27
- Sp fusiform to amygdaloid (figs 547C-F); pileipellis of elongate cells 30

27. Cap with pink or yellow colours 28
 - Cap with brownish colours 29
28. Cap pink to pale reddish brown, cracking into flocculose-fibrillose scales, gradually becoming paler towards margin. Cap 15-50 mm, hemispherical to plane; gills medium spaced, white to cream; stem 20-50 x 2-7 mm, cylindrical, slightly broadened towards base, white, silky fibrillose on a pinkish cream background, eventually with white, flocculose ring zone, towards base with whitish-pinkish flocculose girdles; flesh whitish cream; smell fruity; taste unpleasant. Sp 6-7.5 x 3-4 μm , cylindrical to oblong (fig. 545F); cheilocystidia 10-40 x 5-10 μm , clavate, sometimes septate; pileipellis elements 70-400 x 6-15 μm , eventually with a few shorter, narrowly clavate elements. In deciduous shrubs, parks and gardens; autumn; occasional in temp.-hemib., very rare in FI; DK (LC), FI (DD), SE (NE). – BCat 529, FAD 13I, GBW 4:99, Phil 133g, Ves 274, ☉. – Poisonous.
L. subincarnata J.E. Lange (L. s. J.E. Lange var. *josserandii* (Bon & Boiffard) Gminder, *L. josserandii* Bon & Boiffard)
- Cap brown scaly, towards margin cracking into brownish fibrillose tufts on a yellow background. Cap 10-35 mm, margin eventually with yellow tomentose veil remnants; gills medium spaced, yellow to pale yellow; stem 30-60 x 3-5 mm, cylindrical to slightly broadened towards base, cream to yellow, with a woolly-tomentose, yellowish layer and a few scattered scales of cap colour; flesh whitish yellow; smell unpleasant; taste neutral. Sp 6.5-9 x 3.5-4.5 μm , ellipsoid to oblong; cheilocystidia 20-35 x 5-14 μm , \pm utriform; pileipellis with 150-400 x 5-15 μm large, cylindrical elements mixed with clavate elements, 20-80 x 10-25 μm . In deciduous forests and shrubs on rich soil; autumn; very rare in temp.; DK (CR). – BCat 10:480, C&D 681, Svp 26:38. – Poisonous.
L. xanthophylla P.D. Orton
29. Ring with brownish underside; cap brown, dark brown to purplish brown. Cap 15-45 mm, conical to plane, quite densely and minutely scaly, slightly exposing the whitish flesh; gills whitish, crowded; stem 25-50 x 2-9 mm, cylindrical with a slightly clavate base, fibrillose, cream, towards base more brownish and with woolly girdles of cap colour; flesh whitish; smell fruity or unpleasant; taste neutral. Sp 6-10 x 4-5 μm , ellipsoid to oblong (fig. 547A); cheilocystidia 15-40 x 5-12 μm , cylindrical to utriform; pileipellis with 100-350 x 8-16 μm large, cylindrical elements mixed with clavate elements, 15-60 x 10-15 μm . In deciduous woods on rich soil and in arc./alp. heathland; autumn; rare in temp., very rare in hemib.-bore.; DK (VU), IS, NO (VU), SE (VU) – C&D 686, Nit 316. – Very poisonous.
L. pseudolilacea Huijsman (*L. pseudohelveola* Hora, *L. favrei* Bon)
 Note: *L. favrei*, found in rich alpine heathland in NO is primarily separated by sp 6-7.5 x 4-5 μm and the ecology. Further studies are needed to evaluate its status. – AAF 3:45.
- Stem without a ring; cap hazel brown, pale brown to pinkish brown, often with a reddish-pinkish tint. Cap 5-30 mm, convex to plane with a low umbo, at the centre densely scaly from small, upright tufts, towards margin more distantly scaly, exposing the whitish flesh; gills crowded, white to cream; stem 15-35 mm, cylindrical with a slightly clavate base, white silky fibrillose on a pale brown background, towards base with girdles of cap colour, sometimes with a woolly ring zone, at base occasionally with reddish rhizoids (var. *rhodorhiza*); flesh whitish; smell indistinct or unpleasant; taste indistinct. Sp 4.5-6.5 x 3-4 μm , ellipsoid (fig. 547B); cheilocystidia 15-30 x 6-12 μm , lageniform to utriform; pileipellis cells 150-300 (-500) x 8-13 μm , mixed with some shorter, 15-50 x 8-10 μm , clavate to cylindrical cells. In deciduous woods and shrubs on rich soil; autumn; rare in temp.-southern bore.; DK (VU), FI (NT), NO (VU, Nordl: Rana, Østf: Hvaler), SE (VU). – FAD 13C, Nit 316., Sieniop 104.
L. echinella Quéf. & G.E. Bernard (*L. setulosa* J.E. Lange, *L. minuta* J.E. Lange, *L. rhodorhiza* P.D. Orton)
 Note: the names *L. coxheadii* P. D. Orton, *L. clypeolarioides* Rea and *L. speciosa* (Trimb.) Trimb. & Augias have been used for Scandinavian collections here included in *L. echinella*. This group is in need of detailed type studies supplied with molecular analysis.



Spores: A: *Lepiota pseudolilacea*, B: *L. echinella*, C: *L. oreadiformis*, D: *L. subgracilis*, E: *L. magnispora*, F: *L. clypeolaria*.

30. Cap without distinct scales, uniform ochraceous to brown at centre, white towards margin; at roadsides and in grassland on sandy and calcareous soil. Cap 20-60 mm, hemispherical to plane with a low umbo, towards margin adnate fibrillose, margin floccose, whitish; gills medium spaced, white to beige; stem 30-70 x 3-7 mm, cylindrical with a broadened base, whitish fibrillose to floccose, with a floccose ring zone and eventually a few scales of cap colour; flesh white to cream; smell variable, pleasant or unpleasant; taste neutral. Sp 10-16 x 4.5-6.5 μm , fusiform to amygdaloid (fig. 547C); cheilocystidia 10-40 x 5-13 μm , clavate to utriform; pileipellis cells 60-300 x 6-15 μm large, cylindrical, eventually also with 20-60 x 10-15 μm clavate cells. Autumn; rare but locally occasional in temp.-hemib., rare in bore., with a southern distribution in FI; DK (DD), FI (NT), NO (DD), SE (LC). – FAD 11C, GBW 4:92, R&H 415, Sieniop 103.

L. oreadiformis Velen. (*L. laevigata* (J.E. Lange) J.E. Lange, *L. pratensis* (Bull.) Bigeard & H. Guill.)

- Cap with distinct scales, radially fibrillose, cracking towards margin; in forests and shrubs 31

31. Stem with ring-like belts with brown edge; cap orange brown at centre, cracking and fading to cream towards edge; stem discolouring orange at base. Cap 50-90 mm, coloured centre delimited, soon much lighter coloured, cream to beige on a white background, felty; gills white to cream, crowded, stem 60-100 x 10-15 mm, cylindrical, slightly expanding towards base, white, silky fibrillose, towards base more floccose with a few scales of cap colour, discolouring orange towards base, with distinct ring with brownish rim; flesh white; smell unpleasant; taste unpleasant. Sp 8.5-11 x 5-6 μm , amygdaloid; cheilocystidia 15-40 x 9-17 μm , clavate; pileipellis with 200-500 x 10-15 μm large cells mixed with short, clavate ones. In *Fagus* forests on calcareous soil; autumn; very rare in temp.; DK (EN), SE (VU). – B&K 4:229, GBW 4:86, C&D 668, Däh 513, Ves 274, ☉.

L. ignivolvata Bousset & Joss.

- Without distinct ring or belts, but often with a woolly ring zone; stem not discoloring 32

32. Sp 7-9 x 3-3.5 μm . Cap 40-80 mm, conical to plane, brown, orange brown to yellow brown, felty-tomentose, towards margin cracking into concentric zones, but hardly exposing the whitish flesh, at margin woolly-tomentose, exceeding gills; gills crowded, white; stem 50-90 x 4-12 mm, cylindrical with clavate or even abruptly bulbous base, with a cream, yellow to brown tomentose covering and eventually a few girdles of cap colour at the base; flesh white to cream; smell fruity; taste unpleasant. Sp cylindrical-amygdaloid with a \pm flattened base; cheilocystidia 15-50 x 6-13 μm , variable, utriform to clavate; pileipellis with 150-500 x 10-20 μm large, cylindrical elements, sometimes intermixed with clavate elements, 30-35 x 14-18 μm . In deciduous and coniferous woods and parks on rich soil and on anthills; autumn; very rare in hemib.-bore., very rare in temp.; DK (CR), FI (NT), NO (VU, Oppl, Østf). – Døss 2.2, FAD 10B, GBW 4:75. RdM 41:144.

L. cortinarius J.E. Lange (*L. audreae* (D.A. Reid) Bon)

- Sp > 9 μm long 33
- 33. Stem silky fibrillose, with scattered girdles of cap colour in lower part, typical twice as long as cap diam. Cap 20-50 mm, bell-shaped to plane with a low umbo, grey brown to reddish brown, eventually with a pinkish tint, minutely flocculose, towards margin breaking into dense radial, fibrillose scales, but giving a quite uniform impression; gills medium spaced, white; stem 40-90 x 2-6 mm, cylindrical with a slightly clavate base, white on a beige background, eventually with a woolly tomentose, white or brown ring; flesh white; smell neutral to unpleasant; taste neutral. Sp 9-13.5 x 4-6 μm , amygdaloid to oblong (fig. 547D); cheilocystidia 15-45 x 7-11 μm , irregular clavate to utriform; pileipellis with 50-350 x 8-13 μm large, cylindrical, occasionally septate elements mixed with clavate elements, 30-50 x 8-14 μm . In deciduous woods and shrubs on rich soil; autumn; rare in temp.-southern bore.; DK (EN), NO (Oppl: Gjøvik), SE (NE). – AMK 2004.1.15 pl. 3, BCat 776, B&K 4:230, FAD 11F, Svp 55:36, ☉.
L. subgracilis Kühner (*L. kuehneriana* Locq., *L. gracilis* (Quél.) Rea non Peck)
- Stem woolly-tomentose with thick whitish or yellowish girdles, typically more than twice as long as cap diam. 34
- 34. Sp 13-25 x 4-6 μm (fig. 547E); stem with yellowish flocculose girdles with scales of cap colour. Cap 20-60 mm, bell-shaped to low convex, at centre reddish brown, felty, towards margin radially fibrillose-scaly, pinkish-ochraceous to light brown, distinctly paler than centre, exposing the whitish flesh and often with whitish-yellowish remnants of veil at margin; gills crowded, whitish; stem 40-100 x 3-10 mm, cylindrical, slightly clavate towards base, cream fibrillose, with a tomentose ring zone; flesh whitish, yellowish brown in stem; smell unpleasant; taste neutral. Sp cylindrical-fusiform, with straight abaxial side; cheilocystidia 10-40 x 7-15 μm , clavate to utriform; pileipellis with cylindrical elements, 150-400 x 9-16 μm , mixed with 35-80 μm long, narrowly clavate elements. In coniferous and deciduous woods, on neutral to rich soil; autumn; common in temp.-bore., rare in suba.; DK (LC), FI (LC), IS (Na, Au), NO (LC), SE (LC). – B&K 4:235, GBW 4:90, Phil 131f, R&H 415, Ves 275, ☉.
L. magnispora Murrill (*L. ventriospora* D.A. Reid)
- Sp 11-18 x 4.5-6 μm (fig. 547F); stem below the woolly ring zone with a whitish woolly-tomentose girdle-like layer. Cap 30-100 mm, bell-shaped to plane with a low umbo, at centre pale orange brown to brown, gradually cracking into small, dense, fibrillose, yellowish brown scales on a white background, at margin woolly tomentose; gills crowded, white; stem 50-100 x 3-10 mm, cylindrical with a slightly clavate base, at top silky fibrillose, white; flesh whitish; smell unpleasant; taste neutral. Sp amygdaloid-cylindrical, with curved abaxial side; cheilocystidia 12-30 x 5-15 μm , clavate to utriform; pileipellis with 150-400 x 7-13 μm large, cylindrical elements mixed with 15-60 x 6-10 μm large, narrowly clavate elements. In deciduous and coniferous woods on \pm rich soil; autumn; common in hemib.-bore., occasional in temp., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:220, C&D 673, FAD 11D, 11E, GBW 4:73, Ves 275, ☉. – Poisonous.
L. clypeolaria (Bull.: Fr.) Kumm. (*L. ochraceosulphurescens* Bon)

Lepista (Fr.) W. G. Sm.

MORTEN CHRISTENSEN & GRO GULDEN

Frb tricholomatoid to clitocyboid, rarely collybioid. Cap 30-200 mm, convex, convex-umbonate, to plane or funnel-shaped, with incurved margin, faintly viscid to dry, shiny or mat, hygrophanous in some species, whitish, ochre, brown or bluish to violet. Gills emarginate to adnate or decurrent, very crowded to medium spaced, can be removed from the cap, white, pale ochre, beige to bluish, often ± pink when old. Stem cylindrical, with somewhat bulbous or tapering base, solid or in some species becoming pitted to hollow, smooth or fibrillose, often somewhat pubescent to flocculose at top. Veil absent. Flesh in most species with a characteristic, often strong and aromatic or perfume-like smell, rarely indistinct or weakly farinaceous. Taste mild in all the Nordic species. Sp deposit pink to salmon or white, cream to pale clay-coloured.

Sp bluntly ellipsoid to subglobose, verruculose or spiny, less often smooth, strongly cyanophilous, ornamentation best seen in Cotton blue mounts, without iodine reactions, in most species adhering in tetrads in preparations. Basidia 4-spored. Cheilocystidia and pleurocystidia absent or indistinct. Pileipellis a little differentiated cutis, in some species covered by a thin ixocutis. Pigments intracellular or incrusting. Clamps present at all septa.

Saprotrophic; often in nitrogen rich soils, compost, litter, growing gregariously and often in fairy rings, often ± caespitose. Most species are found in man-made habitats such as ditches, roadsides, gardens, also in fields, pastures and forests, or in natural unstable soil in permafrost regions. Several species are edible and good.

15 species in the Nordic countries.

Lit.: Christensen 1997, Gulden 1983c, Gulden in Hansen & Knudsen 1992.



Spores: F: *Lepista nuda*, G: *L. martiorum*, H: *L. flaccida*, I: *L. ovispora*.

1. Frb with some shade of blue or violet, sometimes nearly white; habit tricholomatoid 2
 - Frb white, pinkish, ochre, orange or brown, lacking bluish colours; habit tricholomatoid, collybioid or clitocyboid 5
2. Bluish colours restricted to stem; cap and gills pale brownish. Cap 50-200 mm, convex to plane, often with a low umbo, dry, pale greyish alutaceous, beige to pale grey brown; gills emarginate to adnate, crowded to medium spaced, whitish to pale pinkish brown; stem 30-70 x 15-30 mm, pale brownish with lilac fibrils to distinctly lilac; smell weak, sweetish; taste mild, pleasant; sp deposit pale pinkish. Sp 6-9 x 4-6 μm , ellipsoid, verruculose, cyanophilous. In gardens, deciduous forest, roadsides and parks, calciphilous; already from summer, but mostly in late autumn to early winter; common in temp., occasional in hemib.-bore.; DK (LC), NO (LC), SE (LC). – B&K 3:248, Däh 214, Phil 158ab, Svp 35:13, Ves 191, ⊙. – Edible.
L. saeva (Fr.) P.D. Orton (*L. personata* (Fr.: Fr.) Cooke s. auct.)
 - Entire frb with ± bluish colours 3
3. Frb whitish to pale bluish or pale bluish grey. Cap 50-150 mm, convex to plane; gills emarginate to adnate, crowded, whitish to pale pinkish; stem 50-80 x 10-25 mm, whitish to pale greyish blue, smooth or slightly fibrillose; smell aromatic to weakly farinaceous; taste mild; sp deposit pale salmon. Sp 6-8.5 x 3.5-5 μm , ellipsoid, verruculose, cyanophilous. In deciduous and coniferous forests, parks and gardens, often on calcareous soil, in fairy rings; autumn; rare in hemib.-southern bore.; FI (LC), NO (NE, Rog: Stavanger). – B&K 3:243, Däh

211, M&H 3:75, Sieniop 132, Svp 35:13, ☉. – Edible.

L. glaucocana (Bres.) Singer

- Frb deeper coloured, with brownish or vinaceous tinges added to the blue and violet 4
- 4. Frb slender, habit ± collybioid; cap hygrophanous; stem 5-10 mm thick; sp 5.5-7 x 3.5-4 µm. Cap 30-80 mm, convex to plane, sometimes with a low umbo, violet or vinaceous brown; gills emarginate to adnate, crowded to medium spaced, violet to pale pinkish brown; stem 40-60 mm long, smooth to slightly fibrillose, pale violet to brownish; flesh pale violet brown; smell aromatic, weak; taste mild; sp deposit pale pinkish. Sp ellipsoid, verruculose, cyanophilous. In gardens, forests and shrubbery, on compost and nitrogen rich soil and in more open habitats, e.g. on rotten debris along beaches, etc., in fairy rings; summer to late autumn; common in temp.-bore.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:250, GBW 3:299, RdM 46:167, R&H 277, Svp 35:12, ☉. – Edible.

L. sordida (Schumach.: Fr.) Singer

- Frb robust, habit tricholomatoid; cap not hygrophanous or weakly hygrophanous; stem 10-25 mm thick; sp 6-8.5 x 4-5 µm (fig. 403F). Cap 50-150 mm, convex to plane, pale greyish brown to violet; gills emarginate to adnate, crowded to medium spaced, ± bluish, when old more brownish salmon; stem 50-90 mm long, smooth to slightly fibrillose, bluish to brownish; flesh pale violet or brownish; smell strong, perfume-like, fruity, aromatic; taste mild and pleasant; sp deposit pinkish. Sp ellipsoid, verruculose, cyanophilous. In gardens, parks and forests, most frequent on nitrogen rich soil, deep litter layers such as needle beds and heaps of hay and leaves, compost; summer to late autumn, also in mild winters and spring; very common in temp.-bore., occasional in suba.; DK (LC), FI (LC), IS (Ve: Reykjavík), NO (LC), SE (LC). – B&K 3:247, Däh 212-213, Phil 156c, 157e, R&H 276, Svp 35:12, ☉. – Edible.

L. nuda (Bull.: Fr.) Cooke

- 5. Sp smooth (fig. 403G). Cap 20-80 mm, at first low bell-shaped, later convex to plane with depressed centre, pale ochraceous, becoming dull reddish brown, not hygrophanous; gills decurrent, crowded, partly forked and anastomosing, pale ochraceous, later tinged pinkish brown; stem 25-45 x 4-8 mm, cylindrical, sometimes tapering or widened at base, pale buff, becoming reddish brown from base; sp deposit brownish pink. Sp 4.5-5.5 x 2-3 µm, narrowly ellipsoid, cyanophilous. Found in litter in a conifer plantation on rich soil; autumn; only known from one record in temp.; DK (Loll: Fuglsang Storskov). – Lud 40.12.

L. martiorum (J. Favre) Bon



- Sp verrucose or spiny 6
- 6. Smell indistinct 7
- Smell strong, aromatic, perfumed or unpleasant 9

- 7. Frb tricholomatoid, pale beige or greyish brown or ± whitish from a thin, white pruina; not aggregating litter at stem base; sp ± verrucose; sp deposit pinkish to salmon. Cap 40-130 mm, convex to plane or slightly depressed, margin often pale and somewhat grooved, mostly with darker water-spots near the margin, not hygrophanous; gills emarginate to adnate or subdecurrent, crowded to medium spaced, pale pinkish beige; stem 30-70 x 5-15(-30) mm, fibrillose; smell indistinct, weakly farinaceous; taste mild, pleasant. Sp 5-6.5 x 3.5-5 µm, broadly ellipsoid, verruculose, cyanophilous; pigment incrusting. Gregarious or subfasciculate, in rings, in dry grassland, natural pastures, meadows, fields, deciduous forests and on compost, often on calcareous ground; summer to late autumn; occasional in temp.-bore., with a southern distribution in FI; DK (LC), FI (LC), NO (NT), SE (LC). – B&K 3:246, Phil 156a, R&H 278, Svp 35:16, Ves 191. – Edible.

L. luscina (Fr.: Fr.) Singer (*L. panaeolus* (Fr.) P. Karst.)

Note: varying much e.g. in cap colours; probably a complex of species.

- Frb clitocyboid, ochre to fulvous or warm red brown; stem base aggregating needles and litter; sp spiny; sp deposit white or cream 8

8. Cap and stem yellow brown, orange brown to red brown, without darker water-spots. Cap 50-80 mm, at first convex with a broad umbo, soon funnel-shaped, slightly hygrophanous, glabrous, often with rusty spots; gills long decurrent, crowded, cream to pale brownish, paler than the cap; stem 20-50 x 5-15 mm, with shade of cap colour, smooth to white fibrillose; flesh elastic, whitish to pallid; smell weak; taste mild. Sp 4-5 x 3-4.5 μm , subglobose to broadly ellipsoid, spiny (fig. 403H), cyanophilous. Gregarious or in rings and rows, mostly in needle-beds, but also in deciduous forests, gardens and on compost, on rich and poor soil; summer to autumn; very common in temp., occasional, but locally common in hemib.-bore, rare in suba.: DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:244, Lud 40.8, Phil 159d, Svp 35:17, Ves 188, .
- L. flaccida* (Sowerby: Fr.) Pat. (*Clitocybe inversa* (Scop.) Quél., *Lepista i.* (Scop.) Pat.)
- Cap and stem cream, yellow, ochre to pale yellowish brown, with darker water-spots. Cap 40-120 mm, first convex later plane to shallowly funnel-shaped, dry, faintly hygrophanous; gills decurrent, crowded, paler than the cap; stem 30-70 x 5-10 mm, concolorous with the cap or paler, smooth to slightly fibrillose; flesh rather tough, whitish to pallid; smell weak; taste mild. Sp 4-5 x 3-4.5 μm , subglobose to broadly ellipsoid, verruculose-spiny, cyanophilous. Gregarious in rings and rows under conifers, often under *Juniperus*, also in deciduous forests, gardens, ruderal areas and on compost; summer to autumn; common in hemib.-bore., occasional in temp., rare in suba.; DK (LC), FI (LC), NO (LC), SE. – Däh 219, Lud 40.9, R&H 279, Sieniop 131, Svp 35:17.
- L. gilva* (Pers.: Fr.) Pat. (*Clitocybe g.* (Pers.: Fr.) P. Kumm., *L. flaccida* (Sowerby: Fr.) Pat. f. *gilva* Krieglst., *Clitocybe infundibuliformis* (Schaeff.) Quél.)
9. Frb singly or at most in loose clusters, tricholomatoid; gills \pm emarginate. Cap 50-150 mm, first hemispherical to convex-umbonate, later plane, margin often slightly grooved, cream, buff, pinkish, to pale beige, mat, often with darker spots and radial darker shades when old; gills crowded to medium spaced, pinkish to beige, \pm like the cap and stem; stem 60-110 x 10-20 mm, fibrillose, near the base often brownish; smell strongly sweetish, aromatic to flower-like; taste mild and pleasant; sp deposit pink to salmon. Sp 6.5-9 x 4-5 μm , ellipsoid, faintly verruculose, cyanophilous. Calciphilous, in fairy rings, at roadsides, in forests and in gardens; autumn to late autumn; occasional in temp.-bore., with a southern distribution in FI; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:245, Däh 215, Phil 158c, R&H 278, Svp 35:16, .
- Edible.
- L. irina* (Fr.) H.E. Bigelow
- Frb caespitose, clitocyboid; gills decurrent 10
10. Frb whitish, pale beige or pale brown 11
- Frb red brown to liver brown 12
11. Flesh discolouring reddish; gills deeply decurrent; cap not hygrophanous; smell very strong, unpleasant; sp 4-4.5 x 3-3.5 μm . Cap 50-140 mm, convex, becoming depressed and with lobed margin, young and fresh with a thin, white pruina and appearing white, discolouring buff to pale brownish with age and when bruised; gills narrow, very crowded, initially white, soon beige and darker than the cap; stem 50-100 x 5-10 mm, \pm clavate, up to 15 mm broad at base, smooth to fibrillose, tomentose at base, when young concolorous with the cap, discolouring red to brownish with age and by handling; flesh white, discolouring slowly to red and rusty brown; taste mild; sp deposit pink to salmon. Sp subglobose to broadly ellipsoid, verruculose, cyanophilous. Fasciculate in needle beds and litter in coniferous forests and fields, often on calcareous soil; autumn; rare in hemib.-bore.; FI (LC), NO (NT), SE (NT). – C&D 421, Lud 40.6, RdM 146:136.
- L. densifolia* (J. Favre) Singer & Cléménçon
- Flesh not discolouring reddish; gills emarginate to subdecurrent; cap somewhat hygrophanous; smell aromatic; sp 4.5-6(-7) x 4.5-5 μm . Cap 50-120 mm, plane to almost funnel-shaped

with irregularly lobed margin, dry, pruinose, white to greyish beige; gills narrow, crowded, white to horn grey, almost like the cap and stem, becoming pinkish; stem 30-40 x 6-10 mm, ± cylindrical, smooth to finely fibrillose, becoming brownish, ± tomentose at base; taste mild, indistinct; sp deposit pink to salmon. Sp ellipsoid, verruculose, cyanophilous. In coniferous and *Betula* forests and in fields, often on calcareous soil; autumn; rare in southern bore.-suba.; FI (DD), NO (DD). – M&J 5, RdM 46:152.

L. subconnexa (Murrill) Harmaja

12. Stem pale, whitish; in grassland including lawns in lowland. Cap 40-130 mm, first convex, soon depressed, strongly hygrophanous, dark liver brown when moist, drying pale yellow brown to grey brown; gills emarginate to somewhat decurrent, crowded, whitish to beige; stem 50-120 x 5-15 mm, rather soon hollow and often wavy and compressed, slightly fibrillose; smell pleasant, weak; taste mild, pleasant; sp deposit pale pinkish. Sp 5.5-8.5 x 3.5-4.5 μm, ovoid to ellipsoid, faintly verruculose (fig. 403I), cyanophilous. Fasciculate, on rich soil, in lawns, gardens, grass-herb mixed forests, at roadsides, in ditches; summer to late autumn; occasional in bore.-suba., but common in suba. in IS, very rare in temp.; DK (DD), FI (LC), IS, NO (LC), SE (LC). – FAD 40G, Lud 40.7, RdM 46:161, Svp 35:20. – Edible.

L. ovispora (J. E. Lange) Gulden (*Clitocybe aggregata* var. *o.* J. E. Lange, *Lyophyllum o.* (J.E. Lange) D.A. Reid)

- Stem red brown, ± like the cap; in 408 arc./alp. habitats on unstable soils, disturbed habitats, newly exposed soils such as ditches in peat bogs 13
13. Sp 6-7.5(-9) x 3.5-5 μm. Cap 40-120 mm, convex to depressed, smooth to somewhat fibrillose near margin, when moist grey brown, vinaceous brown to liver brown, slowly drying to pinkish brown and yellow brown, typically with darker radial shades when drying; gills decurrent, crowded, when young whitish to pallid, becoming pinkish brown with shade of the cap colour, when old often with reddish edge; stem 35-110 x 5-20 mm, fibrillose; flesh rather tough and persistent; smell aromatic, sweetish and persistent, in dried frb strong and coumarine-like; taste mild and pleasant; sp deposit pale pinkish to pale clay coloured. Sp ellipsoid, faintly verruculose, cyanophilous. Fasciculate, frb very slow growing, in natural habitats on solifluction lobes, in palsa mires, and on peat in bog ditches, also in disturbed, man-made sites like construction sites and roadsides, often in fairy rings; autumn to late autumn; common in suba.-arc./alp., rare in bore.; FI, IS, NO (LC, incl. SvB), SE (LC). – AAF 1:19, Bor 53, GJS 46, RdM 46:157, Svp 35:20, ☉. – Edible.
- L. multiformis* (Romell) Gulden (*Clitocybe polygonarum* Laursen, O.K. Mill. & H.E. Bigelow)
- Sp 4.5-6.5 x 3-3.5 μm. Cap 40-85 mm, umbonate to depressed, vinaceous brown to reddish brown, minutely appressed scaly; gills decurrent, crowded, whitish to pinkish brown; stem 30-75 x 3-16 mm, concolorous with the cap; flesh whitish; smell sweetish, pleasant of coumarine; taste mild. Sp ellipsoid, verruculose. Fasciculate and in fairy-rings, often on unstable and newly exposed soil; autumn; rare in arc./alp.; NO (SvB), SE (LC, Abisko).
- L. pseudoectypa* (M. Lange) Gulden

Leucoagaricus Singer

CHRISTIAN LANGE

Frb lepiotoid or agaricoid. Cap dry, silky or cracking into erect scales or radiating fibrils, with white, yellow, orange, red brown, purple, grey or blackish colours. Gills free, white, cream or pinkish, medium spaced to crowded. Stem clavate or ± rooting, silky fibrillose or with bands of scales of cap color. Ring thin or thick, often movable. Flesh white or whitish, in some species discolouring red, yellow or black on handling. Smell indistinct. Taste mild. Sp deposit whitish.

Sp ellipsoid to ± amygdaloid, smooth, with or without a germ pore, ± dextrinoid, metachromatic. Basidia normally 4-spored. Cheilocystidia clavate, lageniform, eventually with apically excrescences, with or without crystals dissolving in KOH. Pleurocystidia absent. Pileipellis very variable, from a cutis to trichoderm. Clamps absent.

Saprotrophic, on nutrient rich soil, mostly under deciduous trees and shrubs, frequently on base-rich soil, mixed with sand along coasts. Autumn. The genus has an expressed southern distribution in Scandinavia, almost restricted to temperate areas, with most records following the coastlines in Denmark and southern Sweden. A few species found on compost heaps, litter beds and decaying wood.

13 species in the Nordic countries, but higher temperatures could result in more records and more species showing up.

Vellinga (2004) has indicated, that the delimitation between *Leucoagaricus* and *Leucocoprinus* is artificial and to be reevaluated.

Lit.: Heilmann-Clausen 1992, Lange 1994, 1995, 2005, Vellinga in Noordeloos et al. 2001, Vellinga 2004.

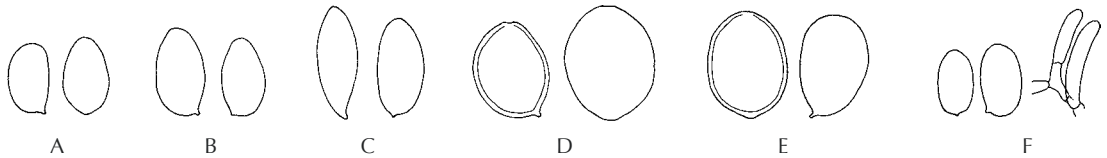


Fig. 549. Spores and pileipellis elements: A: *Leucoagaricus ionidicolor*, B: *L. badhamii*, C: *L. babosiae*, D: *L. americanus*, E: *L. meleagris*, F: *L. melanotrichus*



Fig. 551. Spores: A: *Leucoagaricus leucothites*, B: *L. barssii*, C: *L. nympharum*, D: *L. sublittoralis*, E: *L. tener*, F: *L. crystallifer*.

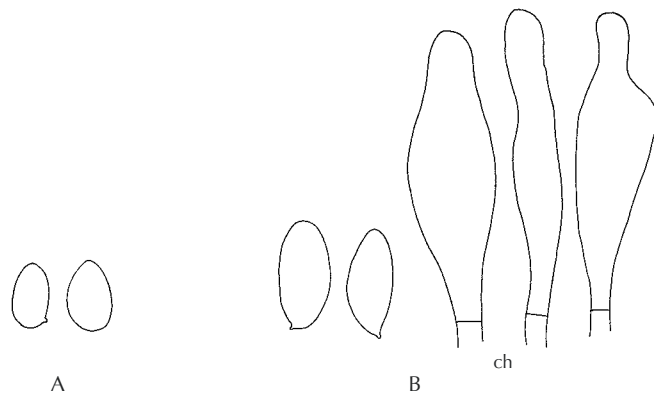


Fig. 553. Spores, cheilocystidia and pileipellis elements: A: *Leucoagaricus medioflavoides*, B: *L. sericifer*.

1. Cap with blue, purple, red-brown or blackish colours, either homogenous or as appressed or erect scales 2
 - Cap white or with grey, yellow, pale orange or pale brown colours, typically only at centre 7
2. Cap and lower part of stem with bluish to vinaceous colours. Cap 30-70 mm, hemispherical to plane, finely scaly, first bluish purple, with age fading to vinaceous brown; stem 50-80 x 3-6 mm, slightly widening towards base, hollow, pruinose, concolorous with cap in lower part, upper part white, with an ascending ring similarly coloured on lower side. Sp 6-7 x 3.5-4.5 μm , ellipsoid, without germ pore (fig. 549A), dextrinoid; cheilocystidia 20-45 x 8-12 μm , narrowly clavate; pileipellis with tapering cells, 100-300 x 10-15 μm . On soil or strongly decomposed wood in deciduous forests, outside the area also under conifers; autumn, very rare in temp.; SE (Sk: Örupskog). – BCat 1132 ('1032'), FM 2(3):75, SMT 26(2):21.
L. ionidicolor Bellù & Lanzoni
 - Cap with red-brown or blackish colours; stem whitish or with scattered bands concolorous with cap 3
3. Frb turning red and later black on handling 4
 - Frb unchanging or turning yellow to faintly red on handling 5
4. Cap with fine, dark brown to almost black appressed scales; pileipellis cells 150-300 x 8-15 μm , olive green in KOH. Cap 20-120 mm, first egg-shaped, later convex; stem 30-100 x 3-6 (-10) mm, clavate, with a thin, white, ascending ring; all parts of frb turning blood red, later reddish brown to black upon handling, greenish with KOH treatment. Sp 5.5-7.5 x 3-4.5 μm , amygdaloid, without distinct germ pore (fig. 549B), dextrinoid; cheilocystidia 7-20 x 5-7 μm , irregularly clavate with constricted apex; in deciduous shrubs; autumn; very rare in temp.; DK (VU), SE (NE). – B&K 4:237, C&D 701, GBW 4:103, SMT 26(2):23, Svp 26:19, ☉.
L. badhamii (Berk. & Broome) Singer (*Leucocoprinus b.* (Berk. & Broome) Locq.)
 - Cap with \pm erect scales, purple brown to red brown on whitish background; pileipellis cells 50-100 x 7-15 μm , red brown in KOH. Cap 15-30 mm, convex with a low umbo, covered with radial, fibrillose scales; stem 25-35 x 3-4 mm, slightly widening towards base, with a thin, collar-like ring, white; all parts of frb turning orange brown to red upon handling or treatment with KOH. Sp 5.5-8 x 3-4 μm , amygdaloid to citriform, without a distinct germ pore; cheilocystidia 35-50 x 7-15 μm , lageniform to clavate, with a small, constricted apex; in deciduous shrubs; autumn, very rare in temp.; DK (DD, EJyl: Karlskold). – BCat 834, Car 52.1, RdM 41:47, Svp 26:19, ☉.
L. croceovelutinus (Bon & Boiffard) Bon & Boiffard (*Leucocoprinus c.* Bon & Boiffard)
5. Frb solitary, not rooting, unchanging; cap white with purple to vinaceous fibrils, without distinct scales. Cap 20-45 mm, with a low umbo; stem 25-50 x 2-6 mm, slightly clavate towards base, white, with a thin, collar-like ring; flesh white, but turning reddish brown on handling, soon fading, green with NH_3 treatment. Sp 7-8.5 x 4-5 μm , amygdaloid, without germ pore (fig. 549C); cheilocystidia 30-50 x 9-12 μm , cylindrical to utriform, irregular; pileipellis a trichoderm of 60-70(-120) x 10 μm cells with a intracellular, granular to thread-like pigment. In deciduous shrubs on rich sand mixed soil along coast; autumn, very rare in temp.; DK (DD).
L. babosiae Bon (*L. jubilaei* (Joss.) Bon)
 - Frb \pm fasciculate, \pm rooting, \pm yellowing or faintly reddening on handling; cap with reddish brown, radially arranged scales 6
6. Cap with big, vinaceous brown patches or fibrillose scales; stem whitish or slightly reddish brown, sometimes with a few girdles of cap colour towards base; pileipellis cells tapering; sp with germ pore. Cap 100-250 mm, convex, low convex to plane; stem 100-250 mm, clavate, smooth, discolouring on handling. Sp 9-10 x 6-7 μm , ellipsoid (fig. 549D); cheilocystidia 50-80 x 10-20 μm , clavate, often with a moniliform outgrowth; pileipellis cells 100-150 x

10-12 μm , often irregularly cylindrical. On compost heaps, in gardens and parks, on bark and logging debris, chips; summer to autumn; very rare in temp.-hemib.; DK (NA), NO (NA), SE (LC). – B&K 4:238, C&D 703, SMT 26(2):24, ☉.

L. americanus (Peck) Vellinga (*L. bresadolae* (Schulzer) Bon)

- Cap and stem covered with small, reddish brown scales on a whitish background, turning red to purple on handling; stem whitish, covered with scattered small scales of cap colour, fusiform with a tapering base; pileipellis cells with constricted apex; sp with an inconspicuous germ pore. Cap 50-80 mm, bell-shaped, rarely plane; stem with a white, thin and evanescent ring. Sp 7.5-11 \times 5.5-8 μm , broadly ellipsoid (fig. 549E), dextrinoid. Cheilocystidia 20-60 \times 8-15 μm , clavate, with apical excrescences; pileipellis cells 30-150 \times 10-20 μm , irregularly cylindrical, often with intermixed shorter, clavate cells. On compost heaps, wood chips; autumn; very rare in temp.-southern bore.; DK (NE), FI (DD), SE. – FE 4:45a, SMT 26(2):28.

L. meleagris (Sowerby) Singer

7. Cap with greyish colours, smooth, radially fibrillose or with concentrically arranged scales 8

- Cap pure white or with coloured centre (yellow, orange, pale reddish brown or brown), smooth, \pm silky shiny 11

8. Cap 10-20 mm, with mouse-grey fibrils on a white base. Cap convex to plane, fragile; stem 20-40 \times 2-3 mm, white, silky, fragile, ring thin and hanging, grey on upper side. Sp 6-7 \times 4-5 μm , \pm ellipsoid, without distinct germ pore (fig. 549F); cheilocystidia 30-50 \times 10-20 μm , cylindrical to irregularly clavate; pileipellis with cylindrical end cells 20-60 \times 7-10 μm , in short chains. In deciduous shrubs and on *Juniperus* litter; autumn, very rare in temp., in NO and FI found in greenhouses; DK (DD). – BCat 483, C&D 698, Svp 29:40.

L. melanotrichus (Malençon & Bertault) Trimbach

- Cap > 30 mm, \pm greyish, smooth or radially fibrillose-scaly 9

9. Cap smooth, agaricoid; sp with germ pore (fig. 551A). Cap 40-160 mm, first conical-hemispherical, expanding to plane, smooth, finely punctate, eventually radially cracking when dry, grey to grey brown, even when young; gills white to pink, crowded; stem 40-120 \times 5-15 mm, with clavate base, white, with thin, ascending or hanging ring; flesh often turning yellow on handling, especially at stem base and cap; smell indistinct; taste neutral. Sp 8-11 \times 5-7 μm , ellipsoid to amygdaloid, thick-walled, dextrinoid; cheilocystidia 20-70 \times 5-15 μm , numerous, narrowly clavate, \pm irregular; pileipellis with cylindrical terminal cells, 10-100 \times 8-15 μm . In parks and shrubs, lawns, sandy shell banks, gravel and soil; autumn to late autumn; occasional in temp.-hemib., rare in southern bore.; DK (LC), FI (LC), NO (NE), SE (LC). – B&K 4:239, SMT 26(2):27.

L. leucothites (Vittad.) Bon var. *carneifolius* (Gillet) Vellinga (*L. cinerascens* (Quél.) Bon & Boiff. s. auct.)

- Cap radially fibrillose or cracking into concentric scales, \pm collybioid to agaricoid; sp with or without germ pore. 10

10. Cap radially fibrillose, greyish white all over, hemispherical to convex; stem tapering towards base. Cap 30-80 mm; stem 60-140 \times 8-12 mm, broadest in the middle, white to greyish white, with a thin, removable ring, of cap colour; flesh white, not changing colour on handling; smell indistinct; taste neutral. Sp 6-10 \times 4-5 mm, ellipsoid, without germ pore (fig. 551B), dextrinoid; cheilocystidia 20-80 \times 5-25 μm , \pm clavate; pileipellis a trichoderm with terminal cells with acute apex; in grassland on sandy soil along the coast; autumn, very rare in temp.; DK (NA, Fyn: Flyvesandet). – B&K 4:241, C&D 697, ☉.

L. barssii (Zeller) Vellinga (*L. macrorhizus* E. Horak)

- Cap cracking into concentric, erect grey scales on white background; stem clavate with a

± bulbous base. Cap 30-120 mm, first ± cylindrical, uniformly grey, with age expanding to plane; stem 50-120 x 5-15 mm, white, eventually slightly yellowing on handling; ring often double and movable. Sp 8-12 x 6-8 μm , broadly ellipsoid, with germ pore (fig. 551C), dextrinoid; cheilocystidia 30-60 x 10-20 μm , variable, subglobose to lageniform, eventually with excrescences; pileipellis a cutis of irregular, cylindrical cells, 20-50 x 8-10 μm . On conifer debris, including old ant-hills and *Juniperus* litter; autumn, occasional in temp., rare in hemib., very rare in bore.; DK (LC), FI (NT), NO (NT), SE (LC). – B&K 4:255, GBW 4:126, SMT26(2):25, Ves 280, ☉.

L. nympharum (Kalchbr.) Bon (*Macrolepiota n.* (Kalchbr.) Wasser, *M. puellaris* (Fr.) M.M. Moser)

- 11. Cap with orange to brownish colours, at least at centre 12
- Cap white, or with faint yellow to pale brown centre 13

- 12. Cap with orange or brownish colours, darkest at centre, smooth, shiny, radially fibrillose; cheilocystidia ± clavate, with or without crystals. Cap 30-60 mm, ovoid, expanding to plane with a low umbo; stem 30-70 x 4-5 mm, slightly clavate towards base, white, with an ascending ring; flesh white; smell indistinct; taste neutral. Sp 6.5-10 x 3.5-5 μm , ± amygdaloid, without germ pore (fig. 551D), dextrinoid; cheilocystidia 20-70 x 5-15 μm , numerous; pileipellis of long, cylindrical cells, 3-6 μm broad. In deciduous shrubs and forest edges; autumn; rare in temp.; DK (EN), SE. – Mic Ital 21(1): t.63, SMT 26(2):22, Svp 57:36, ☉.

L. sublittoralis (Hora) Singer

- Only cap centre with brown to orange-brown colours, silky to finely scaly; cheilocystidia ± cylindrical, without crystals. Cap 10-35 mm, ovoid, expanding to plane with a low umbo; stem 20-50 x 2-4 mm, ± cylindrical, white to cream, more like cap colour at base, with a thin, white ring coloured on lower side; frb with yellow to brown guttules when fresh; flesh white; smell indistinct; taste neutral. Sp 6.5-8 x 3.5-5 μm , ellipsoid to amygdaloid, without germ pore (fig. 551E), dextrinoid; cheilocystidia 20-70 x 5-15 μm , in tufts; pileipellis of cylindrical cells, 30-150 μm , with brown intracellular pigment. In herb-rich forests on rich soil; autumn; very rare in temp.; DK (DD), SE. – GBW 4:109, RdM 41:330.

L. tener (P.D. Orton) Bon

- 13. Cap white with faint brownish, radiating fibrils at centre. Cap 20-40 mm, bell-shaped, smooth; stem 40-70 x 4-10 mm, clavate, white, with a thin ascending ring, fragile. Sp 8.5-10 x 4-5 μm , oblong-amygdaloid, without germ pore (fig. 551F), dextrinoid; cheilocystidia 25-35 x 6-10 μm , clavate, with apex covered with crystals dissolving in KOH; pileipellis without differentiated terminal cells, 4-10 μm wide. In deciduous shrub on rich sandy soil along the coasts; autumn; very rare in temp.; DK (DD, Vosnæs), SE (Sk). – RdM 33:20.


L. crystallifer Vellinga

- Cap pure white or with yellowish centre 14

- 14. Cap white to cream; frb agaricoid; sp with germ pore. Cap 40-160 mm, first conical-hemispherical, expanding to plane, smooth, finely punctate, eventually radially cracking when dry; gills crowded, white to faintly pink; stem 40-120 x 5-15 mm, with clavate base, white, with a thin, ascending or hanging ring; frb often turning yellow on handling, especially stem base and cap. Sp 7-11 x 5-7 μm , ellipsoid to amygdaloid, thick-walled, with germ pore, dextrinoid; cheilocystidia 20-70 x 5-15 μm , narrowly clavate, ± irregular, numerous; pileipellis with cylindrical terminal cells, 20-140 x 6-15 μm . In gardens, parks and shrubs, in flower-beds and lawns, on bark-heaps and compost; autumn; occasional in temp.- hemib., rare in bore.; DK (LC), FI (LC), NO (LC), SE. – B&K 4:240, C&D 704, R&H 418, SMT 26(2):26, Ves 282, ☉.

L. leucothites (Vittad.) Wasser var. *leucothites* (*L. holosericeus* (Fr.) Locq., *L. cretaceus* (Bull.: Fr.) M.M. Moser s. auct., *L. subcretaceus* Bon, *L. naucinus* (Fr.) Singer)

- Cap with faintly coloured centre; frb pluteoid; sp without germ pore 15

15. Cap white, with faint cream to ochraceous fibrils at centre; cheilocystidia \pm regular, clavate, smooth. Cap 10-40 mm, first obovoid, expanding to \pm plane; stem 20-70 \times 2-3 mm, with clavate base, white, fragile, with a thin ring. Sp 6-10 \times 3-5 μm , ovoid to amygdaloid; cheilocystidia 20-60 \times 8-15 μm , without crystals; pileipellis a cutis of 2-5 μm broad hyphae. On rich, \pm sandy soil in deciduous forests or shrubs; autumn; very rare in temp.; DK (DD).
L. serenus (Fr.) Bon & Boiffard
- Cap with \pm yellow centre; cheilocystidia with crystals or excrescences 16
16. Cap smooth and shiny; cheilocystidia clavate, covered with crystals. Cap 15-50 mm, with a low umbo, light greyish orange at centre; stem 35-70 \times 5-10 mm, widened towards base, white, silky, with a thin ascending ring; flesh slightly pinkish. Sp 5.5-6.5 \times 3-4.5 μm , ovoid-amygdaloid (fig. 553A); cheilocystidia 15-40 \times 6-15 μm ; pileipellis without differentiated end cells, 3-12 μm wide, with a distinct layer of pigmented cells, about 40 μm deep in pileipellis. In deciduous shrub on sandy, rich soil along the coast; autumn; very rare in temp.; DK (DD, EJyl: Vosnæs, Fyn: Tiselholt). – Bol Bres 40(1):8, Win 93:63.
L. medioflavoides Bon (*Sericeomyces m.* (Bon) Contu)
- Cap silky, \pm radially fibrillose; cheilocystidia irregularly lageniform with apical outgrowths (fig. 553B). Cap 10-50 mm, ovoid, expanding to plane with a low umbo, white with yellowish centre; stem 20-90 \times 2-4 mm, widening towards base, white, with a thin, ascending ring. Sp 6-10 \times 3-5 μm , narrowly amygdaloid, dextrinoid; cheilocystidia 15-90 \times 10-20 μm , including excrescences; pileipellis without differentiated end cells, 5-20 μm wide. In deciduous shrubs, parks and forest edges on rich, often sandy soil; autumn; rare in temp.; DK (LC), SE. – SMT 26(2):20, Svp 29:40, .
- L. sericifer* (Locq.) Vellinga (*Sericeomyces s.* (Locq.) Døssing, *Lepiota serena* Fr. s. Lange, *Pseudobaeospora sericifera* Locq.)

Leucocoprinus Pat.

CHRISTIAN LANGE

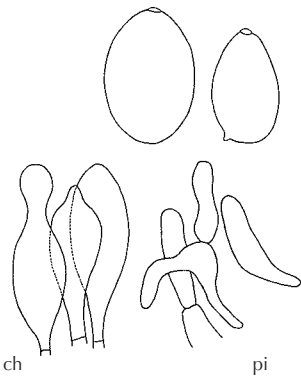
Frb lepiotoid, often with sulcate cap margin. Cap 10-60 mm, first egg- to bell-shaped, expanding to low convex to plane, granulose-tomentose, with age ± smooth, margin sulcate, thin fleshed. Gills free, medium spaced, white or yellow. Stem 15-120 x 2-6 mm, brittle, silky to pruinose, with ± clavate base, with thin, often ascending ring. Smell indistinct. Taste indistinct. Sp deposit white.

Sp ellipsoid to ± amygdaloid, hyaline, smooth, with germ pore, but hardly visible in *L. cygneus*, dextrinoid, metachromatic. Cheilocystidia clavate to lageniform, often irregular. Pleurocystidia absent. Pileipellis made of irregular or elongate, even branched cells, 5-15 x 20-30 μm. Clamps absent.

Saprotrophic; terrestrial in litter on rich soil or compost heaps. Several species only known from flower pots or hot-houses in the region are not treated in the key (*L. straminellus* (Bagl.) Narducci & Caroti, *L. ianthinus* (Cooke) P. Mohr, *L. heinemanii* Migl.), but in recent years an increasing number of records of such *Leucocoprinus* species have been registered from places outside, e.g. in the Netherlands. A similar trend is to be expected in the Nordic countries.

At least eight species in the Nordic countries, but some only known from indoor localities; five species in the key.

Lit.: Migliozi et al. 1989, Vellinga in Noordeloos et al. 2001.



Spores, cheilocystidia and pileipellis elements: *Leucocoprinus birnbaumii*.

1. Cap distinctly yellow or grey, at least at centre 2
 - Cap white or with light rose to pale grey tones, without distinct contrast between centre and edge 3
2. Frb yellow with slight brownish patches and granules at cap centre. Cap 20-60 mm; stem 20-80 x 3-7 mm, with a thin ring. Sp 8-12 x 5-9 μm (fig. 553C); cheilocystidia 25-50 x 10-15 μm, quite variable, often narrowing at the apex; pileipellis a mix of very variable elements, both elongate cellular, ± branched and swollen, 10-15(-35) μm broad. Most often in flower-pots and indoor localities, but found outdoors on compost heaps, etc.; autumn (indoor all year); occasional in temp.-hemib., rare in bore.; DK (NE), FI (LC), NO (NA), SE (LC). – B&K 4:244, FAD 14G, GBW 4:111, R&H 419, Sieniop 105, ☉.
 - L. birnbaumii* (Corda) Singer (*Lepiota lutea* (Bolton) Godfrin, *Leucocoprinus flos-sulphuris* (Schnizl.) Cejp)
 - Frb white with mouse grey, dark grey to almost black cap centre, cracking into fine scales when expanding. Cap 20-80 mm; stem 30-80 x 2-8 mm, white, with a thin ring. Sp 8.5-13 x 5-8 μm; cheilocystidia 35-80 x 10-20 μm, clavate to lageniform; pileipellis with cylindrical, clavate to globose elements, 15-70 x 10-25 μm, ± arranged in chains. Terrestrial in nutrient rich, deciduous woods; autumn; rare in temp.-hemib., in NO only and in FI mostly in flowerpots and

greenhouses; DK (NE), FI (DD), NO (NE), SE. – B&K 4:245, C&D 705, FAD 14H, Phil 135h, ☉.
L. brebissonii (Godey) Locq.

3. Cap 5-15 mm, thin-fleshed, pure white. Gills white; stem 10-30 mm x 0.5-2 mm, with thin ring, white. Sp 5-7 x 3.5-4.5 μ m, germ pore only visible after colouring; cheilocystidia 25-40 x 9-15 μ m, broadly lageniform to subcapitate; pileipellis of cylindrical, < 10 μ m broad hyphae, and chains of ellipsoid to globose cells, 15-35 μ m long. Terrestrial or on very rotten wood in deciduous forests; autumn; very rare in temp.; DK (DD). – FAD 13A, FE 4:59a, FMDS 138:9, RdM 32:18.

L. cygneus (J.E. Lange) Bon (*Lepiota* c. J.E. Lange, *Cystolepiota* c. (J.E. Lange) M.M. Moser)

- Cap mostly > 20 mm, more robust, white, pinkish or brownish at centre 4

4. Cap with tufts of a white to pale buff, woolly-powdery covering, not discolouring; stem woolly-granulose, of cap colour. Cap 30-90 mm; stem 20-100 x 2-15 mm, with a floccose ring; frb slightly discolouring to yellow, especially on stem. Sp 8-12 x 5.5-7.5 μ m; cheilocystidia 30-100 x 7-20 μ m, irregularly clavate; pileipellis of very variable, elongate, branched cells, 5-10 μ m broad. On compost heaps, wood chips and in lawns; autumn; rare in hemib.; FI (DD, U), NO (NA), SE (LC). – Bol Bres 39:4,6, FE 4:60.

L. cretaceus (Bull.: Fr.) Locq. (*L. cretatus* Lanzoni)

- Cap with a beige brown to brown, thin, smooth to minutely granular, with age concentrically cracking cover, discolouring yellow; stem almost smooth. Cap 30-60 mm; stem 30-120 x 2-5 mm, with a thin ring with traces of cap colour. Sp 7.5-13 x 6-8 μ m; cheilocystidia 25-60 x 8-15 μ m, \pm clavate to irregular lageniform; pileipellis with terminal cells 30-100 μ m, \pm lageniform with long necks. On compost heaps and piles of leaves; autumn; rare, in FI and NO only in flowerpots and greenhouses; DK (NE), FI (NE), NO (NA), SE (LC). – B&K 4:246, FAD 14F (as *Lepiota* c.), FE 4:59b, GBW 4:113.

L. cepistipes (Sowerby: Fr.) Pat. s. J.E. Lange

Leucocortinarius (J.E. Lange) Singer

TOBIAS GULDBERG FRØSLEV

Monotypic genus; see description below.

Note: *Leucocortinarius* was recently placed near *Fayodia* by Garnica et al. (2007).

Lit.: Singer 1945.

Frb tricholomatoid, with veil, bulbous stem base and whitish sp deposit. Cap 30-100 mm, convex, with incurved margin when young, later plane, smooth, slightly glutinous in moist weather, reddish to vinaceous brown to leather brown, later more ochraceous brown, when old, in moist weather sometimes with pale, mottled patches, in dryer conditions more evenly dull brown, when young usually with abundant, appressed, white, fibrillose veil remnants, especially at margin. Gills emarginate, white. Stem 30-90 × 7-15 mm, with a distinct, ± rounded, marginate, flattened bulb, whitish, later staining somewhat brownish. Partial veil white, coarsely fibrillose (not cobweb-like as in *Cortinarius*), seen both as a cottony, ring-like zone in the upper part of the stem, and as fibrillose remnants on the cap margin when young. Flesh whitish. Smell indistinct. Sp deposit cream.

Sp 7-9 × 4-5 μm, ellipsoid, smooth (fig. 817F), hyaline. Cystidia absent. Clamps present.

On soil in association with coniferous trees, mainly *Picea* and *Abies*, on calcareous soil; autumn; rare, but locally occasional in hemib.-middle bore., very rare in temp.; DK (RE), FI (LC), NO (LC), SE (LC). – Däh 828, FAD 81A, Phil 138d, R&H 523, Ves 375, ☉.

L. *bulbiger* (Alb. & Schwein.: Fr.) Singer



Spores.

Leucopaxillus Boursier

MORTEN CHRISTENSEN

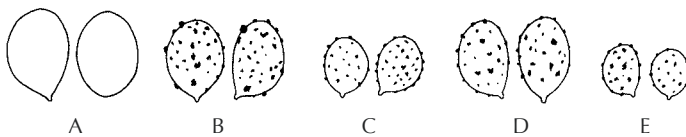
Frb with central, rarely eccentric stem, tricholomatoid to clitocyboid. Cap 30-400 mm, convex, convex-umbonate, plane or funnel-shaped, dry, rarely slightly viscid, mat to shiny, rarely hygrophalous, white, whitish, yellowish, pinkish, ochraceous or reddish brown. Gills mostly decurrent, in some species adnate, crowded to medium spaced, loosely attached to the cap flesh, white, cream, yellowish or pinkish. Stem cylindrical or subbulbous, smooth, fibrillose or flocculose. Veil absent. Flesh white or whitish. Smell farinaceous, cyanic, aromatic, sweetish, rancid or indistinct. Taste mild to bitter. Sp deposit white or cream.

Sp ellipsoid to subglobose, smooth or verruculose with low warts, smooth sp weakly amyloid, verrucose sp with strongly amyloid and cyanophilous warts. Cheilocystidia absent or hyphoid. Pileipellis weakly differentiated. Clamps present.

Saprotrophic, in forests and grassland. Most species are widespread but rare in the Nordic countries.


11 species in the Nordic countries. The genus is not yet well covered by DNA studies but it is likely that the genus is polyphyletic. Species seems to be closely related to both *Tricholoma* and *Clitocybe*.

Lit.: Bon 1991, Gulden in Hansen & Knudsen 1992, Ludwig 2001, Møller 1954.



Spores and cheilocystidia: A: *Leucopaxillus giganteus*, B: *L. rhodoleucus*, C: *L. gentianeus*, D: *L. compactus*, E: *L. alboalutaceus*.

1. Sp ellipsoid, smooth, weakly amyloid; frb white, beige or pale brownish 2
 - Sp ellipsoid or subglobose, verruculose with amyloid warts; frb white, brown, yellowish or pinkish 3
2. Sp (5.5-)6-9(-11) x (3.5-)4-5.5 μm (fig. 409A); cap 100-400 mm, cream to pale brownish. Cap first convex, later irregular funnel-shaped, smooth to slightly velvety, in old frb often shiny, often with darker brown spots; gills decurrent, crowded, whitish to cream; stem 40-90 x 15-40 mm, smooth or slightly scaly, whitish to cream or pale brownish; flesh white to cream; smell weak; taste indistinct, mild. Sp ellipsoid, smooth. In grassland, at roadsides, in parks or in shrubland, more rarely in open forests, forming large fairy rings; autumn; common in temp.-hemib., occasional in bore.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 456, Jordst 17(2), Lud 42.1A-C, R&H 310, Ves 182, ☉.
L. giganteus (Sowerby: Fr.) Singer (*Clitocybe g.* (Sowerby: Fr.) Quél.)
 - Sp 6-8 x 3-4(-5) μm ; cap 70-150 mm, white to cream. Cap first convex, soon funnel-shaped, minutely tomentose; gills decurrent, crowded, white to cream; stem 50-80 x 20-30 mm, cylindrical or subbulbous, smooth or slightly fibrillose, white to cream; flesh white; smell weakly farinaceous or indistinct; taste mild. Sp ellipsoid, smooth. In coniferous forests, at roadsides and in arc./alp. vegetation; autumn; rare in hemib.-arc./alp.; SE. – B&K 3:251, C&D 455, Däh 293, RdM 44:45.
L. candidus (Bres.) Singer (*Clitocybe c.* Bres.)
3. Gills pink, at least in young frb 4
 - Gills white to cream, rarely pinkish buff 5

4. Sp 6.5-7.5 x 4.5-5.5 μm , ellipsoid to ovoid with scattered rather large warts mixed with numerous smaller ones (fig. 409B). Cap 30-80(-110) mm, convex, often with a broad umbo, white, cream to pale rose, smooth, mat, slightly viscid or dry; gills decurrent or adnate, crowded, salmon or pink, with age yellowish; stem 30-60 x 8-10 mm, cylindrical or subclavate, smooth to minutely fibrillose, cream, often pink at the base; flesh whitish, pale rose or cream; smell weak; taste mild, indistinct. Sp with amyloid warts. In forests and scrubs on rich, often calcareous soil; autumn; rare in temp.-southern bore.; DK (NT), NO (VU), SE (NT). – BCat 876, C&D 457, GBW 3:304, Lud 42.5, R&H 310, .
- L. rhodoleucus* (Romell) Kühner
- Sp 4.5-6 x 3.5-5 μm , broadly ellipsoid, with large warts. Cap 15-55 mm, shape, white to cream, later beige to grey brown; gills salmon to cream rose, smell and taste indistinct. Sp with amyloid warts. In deciduous forests; autumn; PL.
- L. salmonifolius* M.M. Moser & Lamoure
5. Cap yellow brown, ochraceous or reddish brown 6
- Cap white, whitish or pale yellow 7
6. Gills white to cream; cap dark reddish brown to ochraceous, with paler margin. Cap 30-120 mm, convex to plane, often with sulcate margin, smooth, mat or subtomentose; gills adnate to emarginate, crowded, edge often with reddish brown spots; stem 40-80 x 8-20 mm, cylindrical or clavate to subbulbose, white or whitish; flesh white; smell farinaceous or rancid; taste very bitter. Sp 4-6 x 3.5-5 μm , broadly ellipsoid to subglobose, with amyloid warts (fig. 409C). In coniferous, more rarely in deciduous forests, often on calcareous soil; autumn; rare in hemib., very rare in temp. and bore.; DK (RE), FI (NT), NO (EN), SE (LC). – FAD 24D (as *Tricholoma amarum*), GBW 3:302, Lud 42.7A-B, R&H 309, Sieniop 134.
- L. gentianeus* (Qué.) Kotl. (*L. vulpeculus* (Kalchbr.) Bon, *L. amarum* (Alb. & Schwein.) Kühner s. auct.)
- Gills pale yellow; cap yellow to ochraceous orange brown. Cap 90-200-(300) mm, convex to plane or depressed with deflexed, sulcate margin, smooth to slightly tomentose, cracking; gills adnexed to decurrent, crowded; stem 40-80 x 20-60 mm, robust, often clavate, whitish to yellowish, sometimes greyish orange at base; flesh white to yellowish; smell sweetish, unpleasant; taste farinaceous, mild. Sp 6-8(-9) x 4-5(-5.5) μm , ellipsoid, with amyloid warts (fig. 409D). Under *Fagus* and *Quercus* on calcareous soil; autumn; very rare in temp.-hemib.; DK (CR), FI (CR, A: Hammarland, V: Lohja.), NO (EN), SE (VU). – B&K 3:252, C&D 459, Phil 96a, R&H 309, Svp 45:46, .
- L. compactus* (Fr.) Neuhoff (*L. tricolor* (Peck) Kühner, *L. pseudoacerebus* (Costantin & L.M. Dufour) Boursier)
7. Taste bitter or bitterish; sp subglobose to broadly ellipsoid 8
- Taste mild; sp ellipsoid 9
8. Cap 80-150 mm, convex to irregularly depressed, whitish, but soon becoming cream or yellowish, not hygrophanous. Cap smooth, mat to finely tomentose, turning ochraceous brown when bruised; gills adnate to short decurrent, first white to cream, later yellowish; stem 20-80(-100) x 10-24 mm, smooth or slightly floccose, white to yellowish; flesh white; smell farinaceous; taste farinaceous, bitterish. Sp (3.5-)4-5(-6.5) x 3-4(-4.5) μm , subglobose to broadly ellipsoid, with scattered amyloid warts (fig. 409E); cheilocystidia hyphoid. In coniferous forests on needle litter; autumn; rare in hemib.-bore., very rare in temp.; DK (EN), FI (LC), NO (LC), SE (LC). – Bol Bres 48:10, Sieniop 133.
- L. alboalutaceus* (F.H. Møller & Jul. Schäff.) F.H. Møller (*L. baeospermus* Kühner, *L. lentus* (H. Post) Singer s. auct.)
- Cap 50-80 mm, convex, yellow, hygrophanous, pruinose. Frb recalling a species of *Hygrophoropsis*; gills decurrent, crowded, pale yellow; stem 20-60 x 5-13 mm, yellowish; flesh yellowish; smell weak, pleasant; taste bitter. Sp 4-6 x 3.5-4.5 μm , subglobose to broadly ellips-

oid, with amyloid warts; cheilocystidia absent. In mixed boreal forests on rich soil, in DK in a conifer plantation; autumn; rare in bore., very rare in temp.; DK (NA, Sj: Tisvilde Hegn), FI (VU), SE (VU). – Sieniop 135.

L. subzonalis (Peck) H.E. Bigelow (*L. pulcherrimus* (Peck) Singer & A.H. Sm.)

9. Stem eccentric; smell unpleasant. Cap 100-200 mm, convex, smooth, cream to yellow brown; gills adnate to decurrent, crowded, white or pale cream; stem 50-140 x 10-50 mm, smooth or fibrillose, whitish; flesh whitish; smell weak, pleasant at first, later strong and unpleasant, taste mild. Sp 7-8 x 5-5.5 μm , ellipsoid, with amyloid warts. In coniferous forests; autumn; very rare in hemib.-southern bore., distribution poorly known; FI (DD, A: Eckerö, EH: Tam-mela).

L. nauseosodulcis (P. Karst.) Singer & A.H. Sm.

- Stem central; smell pleasant 10

10. Cap white or whitish, smooth, mat, not cracking; cheilocystidia absent. Cap 30-120 mm, convex with a broad umbo; gills crowded, adnate to decurrent, cream to pale yellowish; stem 40-100 x 6-30 mm, subclavate or subbulbose; flesh whitish, smell weak, indistinct; taste mild, rarely slightly bitter. Sp 5.5-8.5 x 4-5.5 μm , ellipsoid, with amyloid warts. In coniferous forests on needle litter on rich to calcareous soil; autumn; rare in hemib.; FI (NT), NO (EN), SE (NT). – Däh 295, Lud 42.2, R&H 311 (as *lentus*).

L. cerealis (Lasch) Singer s.l. (*L. albissimus* (Peck) Singer, *L. paradoxus* (Costantin & L.M. Du-four) Boursier, *L. piceinus* (Peck) Pomerl., *L. lentus* (H. Post) Singer & A.H. Sm. s. auct. pp.)

Note: *L. cerealis* is here treated in a broad sense. The species complex is in need of a revision.

- Cap whitish to cream, tomentose, cracking with age; cheilocystidia hyphoid. Cap 40-120 mm, convex to plane; gills medium spaced to crowded, decurrent, white or whitish; stem 25-60 x 8-30 mm, subclavate, flocculose or striate fibrillose, white to whitish; flesh white; smell sweetish or subfarinaceous; taste aromatic, mild. Sp 6.5-8(-8.5) x 4.5-6(-6.5) μm , ellipsoid, with amyloid warts. In grassland, sand dunes and deciduous forests, on calcareous, sandy soil; autumn; very rare in hemib.-bore.; FI (CR, A: Eckerö and Lemland), SE (NA). – BCat 930, C&D 460, Jordst 17(2), Lud 42.3A-B (as *albissimus* var. *cutefractus*), RdM 38:274.

L. cutefractus Noordel.

Leucopholiota (Romagn.) O.K. Mill., T.J. Volk & Bessette

HENNING KNUDSEN

Armillariella P. Karst. subgen. *Leucopholiota* Romagn., *Amylolepiota* Harmaja

Monotypic genus; see description below.

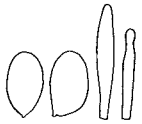
Lit.: Miller et al. 1996, Harmaja 2002.

Frb brown scaly, on *Betula*. Cap 35-70 mm, convex, covered with cylindrical, 2-4 mm long, 0.5 mm broad, orange to orange-brown scales. Gills narrowly adnate, appearing almost free, with finely eroded edge, crowded, whitish. Stem 40-100 x 5-10 mm, cylindrical or slightly enlarged below, above with a faint ring-zone, above this whitish, below orange tomentose with scales similar to cap scales. Smell and taste indistinct. Sp deposit white.

Sp 5.5-6(-7) x 3.5-4 μm , ellipsoid (fig. 517B), strongly amyloid. Cheilocystidia 20-25 x 3-5 μm , clavate with attenuated apex. Cap cuticle a trichoderm, cells 60-120 x 8-15 μm , orange to yellow brown. Clamps present.

Saprotrophic on fallen, rotten, old trunks of *Betula* in coniferous dominated virgin forests; very rare, restricted to a small area in southern bore.; FI (CR, EH: Lammi, Padasjoki, Tammela); distributed throughout Siberia and a part of USA. – Bes 82, Seinil 43(1): cover, ☉.

L. decorosa (Peck) O.K. Mill., T.J. Volk & Bessette (*Armillaria d.* (Peck) A.H. Sm. & Walters, *Floccularia d.* (Peck) Bon & Courtec., *Lepiota lignicola* P. Karst., *Cystolepiota l.* (P. Karst.) Nezdajm., *Amylolepiota l.* (P. Karst.) Harmaja, *Lepiota amyloidea* Singer)



Spores and cheilocystidia.

Lichenomphalia Redhead, Lutzoni, Moncalvo & Vilgalys STEEN A. ELBORNE

Phytoconis Bory, *Botrydina* Bréb., *Coriscium* Vain.

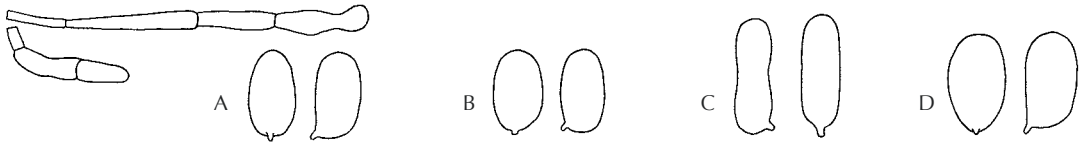
Frb omphalinoid, lichenized. Cap 3-23(-30) mm, convex, low convex to plane, centre often depressed to umbilicate or funnel-shaped, smooth to sulcate, margin crenulate, dry to moist, white, pale to bright yellow, olivaceous ochre, dark red brown or olive brown. Gills decurrent, relatively thick, distant, often forked or intervenose, concolorous with cap or paler. Stem (3-)10-25(-40) x 0.5-3 mm, ± cylindrical, smooth to pubescent, dry, dull, white, yellowish or olive brown. Veil absent. Smell and taste indistinct. Sp deposit white to yellowish.

Sp subglobose to cylindrical or dacryoid, smooth, hyaline, thin-walled, without iodine reactions. Basidia 2- or 4-spored. Cheilo- and pleurocystidia absent. Caulocystidia absent, but with protruding hyphae present in some species. Pileocystidia absent. Pileipellis a cutis, rarely with transitions to a trichoderm. Clamps absent.

Biotrophic, lichenised with either a granulate *Botrydina* thallus or a scale-like *Coriscium* thallus. On naked mineral or peaty soil, or in *Sphagnum*, often in the alpine zone. Spring to autumn.

Five species in the Nordic countries.

Lit.: Cléménçon 1982, Høiland 1987, Kuyper 1986b, Redhead & Kuyper 1987.




Spores and stem hairs: A: *Lichenomphalila velutina*, B: *L. hudsoniana*, C: *L. alpina*, D: *L. umbellifera*.

1. Frb with dark olive to red brown colours; with a *Botrydina* thallus 2
 - Frb with pale to bright yellow colours; with a *Botrydina* or *Coriscium* thallus 3
2. Basidia 2-spored. Cap 5-13 mm, low convex, with slightly depressed centre, with crenulate margin, smooth, dry, when young non-striate, then translucently striate to centre, dull, hygrophanous, dark grey brown to red brown, paler between striae; gills decurrent, almost triangular, forked, distant, beige to pale grey brown, when old often with darker edge; stem 4-15(-30) x 1-1.5 mm, cylindrical, solid, pubescent over entire length, with white tomentose base, dry, dull, concolorous with cap, with a dark green, granulate *Botrydina* thallus at base; flesh pale brown in cap, darker in stem; sp deposit white. Sp 7-10(-11) x (3-)-4-6 μm, oblong ellipsoid, pyriform, dacryoid or cylindrical, thin-walled, smooth (fig. 225A), hyaline; pileipellis a cutis; hairs on stem of 50-120 x 2-7 μm, cylindrical, thin- to slightly thick-walled, hyaline to pale brown, septate hyphae with subclavate, flexuose ends. Biotrophic, lichenised; solitary or in small groups on naked, often unstable soil, e.g. roadsides, river-beds, snow-beds and lichen heathland; summer to autumn; occasional in temp.-arc./alp.; DK (NT), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – AAF 2:35, BSMF 120:415, Ves 176.
L. velutina (Qué.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina v.* (Qué.) Qué., *O. grisella* (P. Karst.) M.M. Moser)
- Basidia 4-spored. Cap 3-7 mm, convex to low convex, centre slightly depressed, margin crenulate, atomate to velvety, when young non-striate, then translucently striate 2/3 to centre, moist, dull, hygrophanous, dark olive brown to grey brown, drying clay buff; gills arcuate-decurrent, relatively thick, distant, pale olive brown to greyish white; stem 3-11 x 0.5-1 mm, central, cylindrical to slightly tapering towards base, minutely pubescent over entire length, white strigose at base, dark olive brown, somewhat paler than cap, with a dark green granulate *Botrydina* thallus at base; flesh concolorous with surface; sp deposit white. Sp 7-9(-11) x 3-4.5 μm, oblong ellipsoid, ovoid, dacryoid to subcylindrical, thin-walled,


smooth, hyaline; pileipellis a cutis with transition towards a trichoderm; hairs on stem of 40-90 x 3-7 μm , cylindrical, flexuose, septate, thin-walled, brown hyphae. Biotrophic, lichenised; in small groups on naked peaty soil in dwarf shrub heathland, e.g. with *Empetrum*; summer; in the area only known from Hord: Ulvik in NO.

L. pararustica (Cléménçon) Elborne, see p. 913 (*Omphalina* p. Cléménçon)


3. Stem with a pale green scale-like *Coriscium* thallus at base. Cap 8-23 mm, convex, low convex to plane, slightly depressed, at margin crenulate to sulcate, smooth to minutely rough, \pm translucently striate, hygrophanous, dry, dull, cream to apricote yellow, fading to almost white on drying; gills decurrent, thick, sometimes forked, intervenose, distant, bright yellow; stem 10-25 x 1-3 mm, central, cylindrical to slightly tapering towards top, minutely white pubescent over entire length, at base white strigose, white to pale yellow, sometimes with slight violaceous tinge; flesh white to pale yellow; sp deposit ochre yellow. Sp 6.5-9.5(-10) x 4.5-5.5 μm , ellipsoid, smooth (fig. 225B), thin-walled, hyaline to pale yellowish; basidia 4-spored; hairs on stem of simple, cylindrical, septate, thin-walled hyphae, up to 200 μm long; pileipellis a cutis. Biotrophic, lichenised; solitary to subfasciculate or in small groups on soil and peat in bogs, mires and lichen heathland; summer to autumn; common in suba.-arc./alp., rare in bore., very rare in temp.; DK (EN), FI (LC), FO, NO (LC, incl. SvB), SE (LC). – AAF 1:13, B&K 3:213, Bor 45, Fav 55:4.9, Lud 55.12, .

L. hudsoniana (H.S. Jenn.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina* h. (H.S. Jenn.) H.E. Bigelow, *O. luteolilacina* (J. Favre) D.M. Hend.)

- Stem with a *Botrydina* thallus of numerous minute green globules at base 4

4. Cap bright yellow; stem smooth, white to yellow all over. Cap 4-20(-30) mm, convex, low convex to plane, often shallowly depressed, at margin crenulate to flexuose, smooth to minutely rough, translucently striate at margin, hygrophanous, fading on drying, dry, dull to shiny; gills adnate to strongly decurrent, rather thin, intervenose, distant, concolorous with cap or slightly paler; stem (2.5-)10-20(-40) x 1-3 mm, central to eccentric, cylindrical or tapering towards base, at base white tomentose to strigose with dark green granulose *Botrydina* thallus; flesh yellow; sp deposit pale yellow. Sp (6.5-)7-13.5(-16) x (3.5-)4-5.5(-6.5) μm , ellipsoid to cylindrical, often constricted, smooth (fig. 225C), thin-walled, hyaline to yellowish; basidia (2-) and 4-spored; pileipellis a cutis. Biotrophic, lichenised; in small groups on or between low mosses and lichens, on naked mineral soil or peat, in dwarf shrub heathland, lichen heathland, subalpine *Betula* forests, mires and snow-beds; summer to autumn, vernal in lowland localities; occasional, but locally common in arc./alp. and in the arctic section of the coast belt in NO, rare down to middle bore., in FI down to Kn; FI (LC), FO, IS, NO (LC, incl. SvB), SE (LC). – AAF 1: 15, B&K 3:211, Fav 55:4, Lud 55.11, R&H 259, .

L. alpina (Britzelm.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina* a. (Britzelm.) Bresinsky & Stangl, *O. flava* (Cooke) M. Lange, *O. luteovitellina* (Pilát & Nannf.) M. Lange)

- Cap olivaceous ochre, yellow brown to pale yellow; stem minutely pubescent in entire length, at least in top purplish to olivaceous brown. Cap 4-20 mm, low convex to plane with depressed to umbilicate centre or funnel-shaped, at margin crenulate to sulcate, translucently striate 3/4 to centre, dry, dull, smooth, hygrophanous, fading to pale yellow or almost white on drying; gills deeply decurrent to triangular, thick, sometimes forked and anastomosing, distant, pale cream yellow or isabelline; stem 10-23 x 1-2(-3) mm, central, cylindrical to slightly tapering towards base, white tomentose to strigose at base, below paler yellowish brown to isabelline, with dark green granulose *Botrydina* thallus at base; flesh concolorous with surface; sp deposit whitish. Sp 7-10.5(-11) x (4.5-)6-8 μm , subglobose, ovoid to broadly ellipsoid, smooth (fig. 225D), thin-walled, hyaline; basidia 2- and 4-spored; pileipellis a cutis; hairs on stem of cylindrical, thin-walled, septate, hyaline hyphae. Biotrophic, lichenised; solitary or in small groups on peaty soil or on decayed wood, on mosses, often *Sphagnum* in bogs; spring to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC, incl. SvB), SE (LC). – B&K 3:212, Lud 55.13, R&H 259, Sieniop 161, Ves 176, .

L. umbellifera (L.: Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys (*Omphalina* u. (L.: Fr.) Quél., *O. ericetorum* (Fr.: Fr.) M. Lange, *O. pseudoandrosacea* (Bull.) M.M. Moser)

Limacella Earle

JAN VESTERHOLT

Amanitella Maire, *Amanita* subgen. *Lepiotopsis* J.E. Lange

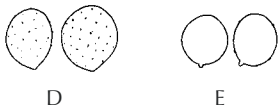
Frb with central stem and free gills, with ring or ring-zone. Cap 15-120 mm, conical, convex or bell-shaped, expanding with or without an umbo, smooth, viscid to slimy, sometimes becoming dry, not hygrophanous, whitish, cream, pale buff, brownish orange, reddish or brownish. Gills free, white or whitish, rarely pale greyish buff. Stem slimy or dry, sometimes with girdles of veil, cream or tinged like cap. Partial veil membranous, floccose or slimy. Smell and taste faintly to strongly farinaceous or indistinct. Sp deposit white to cream.

Sp globose to subglobose, verruculose to seemingly smooth, dextrinoid or without iodine reactions. Basidia mostly 4-spored. Cystidia absent. Pileipellis an ixotrichoderm or an ixopalissadoderm. Clamps present.

Saprotrophic on soil.

Five species in the Nordic countries.

Lit.: Gminder 1994, Ludwig 2001, Neville & Poumarat 2004.



D

E

Spores D: *Limacella guttata*, E: *L. vinosorubescens*.

1. Ring thin, membranous and rather persistent. Cap 50-120 mm, convex to expanded or slightly depressed, with or without a low umbo, smooth, viscid, becoming almost dry, cream to buff, uniformly coloured or darkest at centre; gills crowded, white to cream; stem 70-120 x 10-25 mm, cylindrical or slightly widened at base, fibrillose, dry, cream; upper side of ring often with exuded olive grey drops; smell strongly farinaceous, rarely faint. Sp 4.5-6.5 x 4-6 μm , subglobose, verruculose (fig. 333D). In deciduous and coniferous forests on rich, often rather damp soil, calciphilous; autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 819, Lud 43.1, Phil 153d, R&H 403, Ves 264, ⊙.
L. guttata (Pers.: Fr.) Konrad & Maubl. (*L. lenticularis* (Lasch) Maire)
- Ring absent, slimy or fibrillose, fugacious 2
2. Ring absent or formed of slime; stem smooth and slimy. Cap 15-60 mm, convex to expanded, slimy, whitish to greyish cream or tinged pale greyish buff, sometimes orange brown when young; gills crowded, cream to pale buff; stem 50-100 x 5-10 mm, cylindrical or slightly narrowed at base, dry at the top, whitish to cream; smell faint or farinaceous-rancid. Sp 5-6 x 4-5 μm , subglobose, verruculose to almost smooth, some sp dextrinoid. Under *Picea* or *Pinus*, possibly also under other coniferous or deciduous trees, often on calcareous soil; autumn; rare but locally occasional in bore., very rare in temp.-hemib.; FI (LC), NO (VU), SE (NE). – B&K 4:163, C&D 821, Jordst 13(1), Lud 43.7, Phil 153f, ⊙.
L. illinita (Fr.: Fr.) Murrill
- Ring fibrillose; stem floccose or girdled from veil 3
3. Cap 15-40 mm; stem 25-45 x 3-5 mm; smell none. Cap low bell-shaped, later expanded with an umbo, slimy, smooth, faintly grooved towards margin when old, flesh-coloured or yellowish with a brownish rose centre; gills medium spaced, white; stem cylindrical, whitish to pale rose, with flocks of veil under the fugacious ring-zone. Sp 4-5 x 3.5-5 μm , globose to subglobose, finely punctate to seemingly smooth, without iodine reactions. In coniferous forests; late summer to autumn; very rare in hemib.; SE (NA). – Mic Ital 1991(2): pl. 61.
L. delicata (Fr.: Fr.) Earle

- Cap 30-100 mm; stem 5-12 mm broad; smell farinaceous to cucumber-like, at least when fresh or cut
4. Gills and flesh reddening with age; cap often conspicuously cracking when dry and expanded. Cap 30-70 mm, broadly conical to convex, later expanded, mostly with an umbo, slimy when young, vividly orange red to blood red or wine red; gills crowded, cream; stem 35-75 x 5-10 mm, cylindrical, whitish, with girdles of \pm reddish veil; smell farinaceous to cucumber-like, at least when fresh or cut. Sp 3.5-5 x 3-5 μ m, globose to subglobose, verruculose to smooth (fig. 333E), some sp dextrinoid. On rich soil under deciduous trees, rarely with conifers; autumn; very rare in temp.-hemib.; DK (EN), SE. – GBW 3:116, Jordst 16(3), Lud 43.2, Phil 153e, Svp 32:9, ☉.
- L. vinosorubescens* Furrer-Ziogas (*L. delicata* (Fr.: Fr.) Earle var. *v.* (Furrer-Ziogas) Gminder)
- Gills and flesh not reddening; cap hardly cracking. Cap 30-100 mm, convex, later expanded, with or without an umbo, slimy when young, brownish orange to brownish red; gills crowded, white to cream; stem 40-100 x 5-12 mm, cylindrical, whitish, mostly with well defined girdles of brownish red veil; smell strongly farinaceous. Sp 3.5-5 x 3-5 μ m, globose to subglobose, verruculose to smooth, some sp dextrinoid. In deciduous or coniferous forests on calcareous soil, often solitary; late summer to autumn; occasional in bore.-suba., very rare in temp.-hemib.; DK (EN), FI (LC), NO (LC), SE (LC). – Däh 483, GBW 3:115, Lud 43.3, R&H 403, Sieniop 162, ☉.
- L. glioderma* (Fr.) Maire (*L. delicata* (Fr.: Fr.) Earle var. *g.* (Fr.) Gminder)

Loreleia Redhead, Moncalvo, Vilgalys & Lutzoni STEEN A. ELBORNE

Gerronema Singer s. auct. p.p.

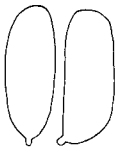
Frb omphalinoid with orange, hygrophanous cap. Cap 2-25 mm, convex to plane and depressed, with incurved to straight margin, hygrophanous, ± translucently striate, smooth, orange. Gills decurrent, rather thick to thin, medium spaced to distant, white to yellowish. Stem 5-70 × 0.5-2 mm, smooth, top pruinose, orange. Smell indistinct. Taste indistinct. Sp deposit white.

Sp smooth, thin-walled, hyaline, without iodine reactions, non-cyanophilous, non-metachromatic. Basidia (2-)4-spored. Cheilo- and pleurocystidia absent. Caulocystidia present. Pileocystidia absent. Pileipellis a cutis. Clamps absent.

Saprotrophic or biotrophic, associated with mosses or liverworts; spring to autumn.

Two species in the Nordic countries.

Lit.: Cléménçon 1982, Kuyper in Bas et al. 1995, Redhead, Moncalvo et al. 2002, Senn-Irlet et al. 1990.



Spores: *Loreleia marchantiae*

1. Cap margin even; gills medium spaced, thin, not forked; oleiferous hyphae absent in trama; pigment incrusting, parietal and intracellular. Cap 5-25(-50) mm, low convex to plane with depressed centre, becoming umbilicate to funnel-shaped, margin incurved, then straight, hygrophanous, translucently striate 2/3 towards centre, smooth, first bright orange brown, then orange yellow; gills deeply arcuate-decurrent, white to pale yellow, with smooth edge; stem 20-55(-80) × 1-2(-4) mm, cylindrical, slightly tapered towards base, innately fibrillose to smooth, shiny, pruinose at top, white tomentose at base, orange brown to orange cream, stuffed; flesh concolorous beneath surface, white in stem. Sp 7-10(-11) × 4.5-6.5 μm, ellipsoid to dacryoid, smooth, thin-walled; basidia 4-spored; caulocystidia 35-70 × 4-6 μm, cylindrical, flexuose, smooth, thin-walled. Saprotrophic; solitary or in small groups on soil and peat, often in burnt sites, among mosses and liverworts, e.g. *Marchantia*, in pioneer and wet spring communities and in greenhouses; summer to autumn; rare, but locally occasional in temp.-arc./alp.; DK (DD), FI (LC), NO (NE), SE (LC). – AAF 3:19, Bres 262, C&D 333, Lud 55.6, Phil 79h.

L. postii (Fr.) Redhead, Moncalvo, Vilgalys & Lutzoni (*Gerronema p.* (Fr.) Singer, *Omphalina p.* (Fr.) Singer)

- Cap margin crenulate; gills distant, relatively thick, forked; oleiferous hyphae present in trama; pigment parietal, not incrusting. Cap 2-13 mm, convex to low convex with slightly depressed centre, decurved to straight, smooth, hygrophanous, not or indistinctly translucently striate, first bright orange red, then orange brown or orange yellow, fading to ochre; gills deeply decurrent to triangular, distant, whitish to yellowish; stem 5-35 × 0.5-1.5 mm, cylindrical to slightly widened towards base, innately fibrillose to smooth, pruinose at top, white tomentose at base, orange, paler towards base, hollow; flesh orange. Sp (7.5-) 8.5-10.5 × (4.5-)5-7 μm, broadly ellipsoid to dacryoid, smooth (fig. 67I), thin-walled; basidia (2-)4-spored; caulocystidia 50-70 × 4.5-8 μm, cylindrical to subclavate, sometimes flexuose, smooth, thin-walled. Saprotrophic or biotrophic; solitary or in small groups on living *Marchantia polymorpha* on muddy soil along brooks and ditches, along roads and in greenhouses; spring to autumn; rare, but locally occasional in temp.-arc./alp.; DK (LC), FI (LC), NO (NE), SE (LC). – AAF 3:17, B&K 3:214, C&D 332, Lud 55.4, ⊙.

L. marchantiae (Singer & Cléménçon) Redhead, Moncalvo, Vilgalys & Lutzoni (*Gerronema m.* Singer & Cléménçon, *G. daamsii* Marxm. & Cléménçon)

Lyophyllum P. Karst.

JAN VESTERHOLT & ERHARD LUDWIG

Tephroclybe Donk

Frb mycenoid, collybioid, clitocyboid or tricholomatoid. Cap 2-120 mm, convex, conical, bell-shaped, expanded or with depressed to umbilicate centre, mostly with rather dull, greyish or brownish colours, hygrophanous in most species. Gills narrowly attached to almost free or emarginate, adnate or short decurrent, whitish to cream, greyish or brownish, in sect. *Lyophyllum* turning bluish or blackish, less often orange when bruised. Stem ± rooting in some species, in sect. *Difformia* (Fr.) Kühner connate or fasciculate. Smell farinaceous, rancid-farinaceous, cucumber-like, unpleasant or indistinct. Taste mostly like smell, bitter in some species. Sp deposit white to cream.

Sp globose, subglobose, ellipsoid, fusiform, rhomboid or tetrahedral, smooth or ornamented, hyaline, without iodine reactions. Basidia siderophilous, with an acetocarmine reaction. Cheilocystidia absent or inconspicuous and little differentiated. Pileipellis typically a cutis of radially repent hyphae with incrusting, less often intracellular or parietal pigmentation. Clamps almost always present.

Saprotrophic on litter and humus in forests, charcoal, *Sphagnum*, etc.

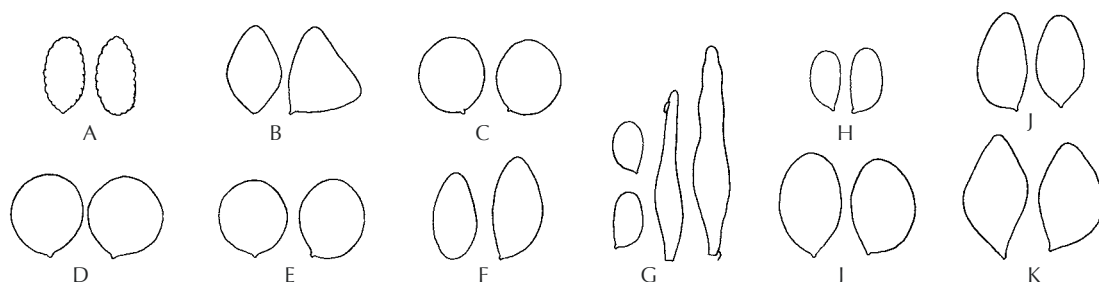
34 species in the Nordic countries, 33 species in the key. *L. ignobile* (P. Karst.) Cléménçon, *L. schulmannii* (Harmaja) Harmaja and *L. subsimulans* (P. Karst.) Cléménçon are insufficiently known and therefore not included. Molecular data indicate that the genus is polyphyletic, but until more data are available, and the typification of the genus with *L. leucophaeatum* is reconsidered, *Lyophyllum* is here kept in its traditional broad sense.

Lit.: Cléménçon 1986, Consiglio & Contu 2002, Kalamees 2004, Ludwig 2001.

1. Gills turning bluish to blackish when bruised; flesh blackening when cut 2
Key A sect. *Lyophyllum* p. 498
 - Gills and flesh not discolouring 2
2. Frb often caespitose or connate; flesh conspicuously firm; stem 5-20 mm broad 2
Key B sect. *Difformia* p. 501
 - Frb solitary to subcaespitose; flesh not conspicuously firm; stem often narrower 2
Key C sect. *Tephrophana* p. 501

Key A: Sect. *Lyophyllum*

1. Sp verrucose, but ornamentation may disappear in base solutions 2
 - Sp smooth 3
2. Stem 5-15 mm broad; sp 5.5-8.5 × 3-4 μm, narrowly ellipsoid, verrucose, but ornamentation disappearing in base solutions (fig. 499A). Cap 20-80 mm, convex to expanded, sometimes with a low umbo, radially fibrillose, greyish, becoming sordid grey to greyish brown, not hygrophanous; gills narrowly to broadly adnate, crowded, greyish buff to greyish brown; stem 45-70 mm long, ± cylindrical, fibrillose, grey, becoming greyish brown; all parts of frb turning bluish, later blackish when bruised; smell farinaceous; taste mild to slightly bitter. In coniferous or deciduous forests, often in *Alnus* forests, along roads and in gardens; summer to autumn; rare but locally occasional in hemib.-bore., very rare in temp.; DK (EN), FI (LC), IS (Na, Au), NO (LC), SE (LC). – B&K 3:261, FAD 25F, 32B, Lud 44.6, Phil 113g, R&H 299. *L. leucophaeatum* (P. Karst.) P. Karst. (*Clitocybe gangraenosa* Fr. s. J.E. Lange)
 - Stem 0.5-4 mm broad; sp 6-8 × 4-6.5 μm, subglobose to broadly ellipsoid, echinulate 2
see *L. tylicolor* key C 2
3. Sp triangular in outline (fig. 499B). Cap 35-80 mm, convex to expanded, sometimes with slightly depressed centre, smooth, often shiny, pale grey, soon becoming greyish buff to blackish brown, slightly hygrophanous, not translucently striate; gills adnate, crowded, pale



Spores and cheilocystidia: A: *Lyophyllum leucophaeatum*, B: *L. transforme*, C: *L. eustygium*, D: *L. caeruleascens*, E: *L. paelochroum*, F: *L. aemiliae*, G: *L. konradianum*, H: *L. hebelomoides*, I: *L. conocephalum*, J: *L. brunneo-ochraceum*, K: *L. deliberatum*.

grey, becoming brownish grey, turning blackish when bruised; stem 30-70 x 5-15 mm, cylindrical or with clavate base, pale grey, becoming greyish buff to greyish brown with age and when bruised; smell and taste insignificant. Sp 8-9.5 x 4.5-7.5 μm , smooth. In deciduous and coniferous forests on rich soil; late summer to autumn; very rare in temp.-bore.; DK (RE), FI (DD, EH: Korpilahti, Kn: Puolanka), NO (vU), SE (LC). – B&K 3:270, Däh 271, FAD 39B, Lud 44.14, M&J 3, ☉.

L. transforme (Britzelm.) Singer

- Sp not triangular 4
- 4. Sp globose to subglobose; frb \pm blackening in all parts 5
- Sp ellipsoid, fusiform, subcylindrical, rhomboid or amygdaloid; frb blackening in all parts or not 7

5. Cap and stem whitish to greyish cream, becoming greyish to sordid brown with age or when bruised. Cap 30-80 mm, convex to expanded, not hygrophanous, but sometimes marbled; gills emarginate, medium spaced, cream, soon becoming grey, turning bluish, later blackish when bruised or immediately blackening; stem 40-80 x 10-20 mm, cylindrical to clavate, sometimes with pointed-tapering base, floccose at top; smell farinaceous-rancid; taste adstringent to bitter or mild and farinaceous. Sp 5-7 x 4.5-6 μm , subglobose, smooth (fig. 499C). In deciduous forests on calcareous soil and in rich coniferous forests, often near species of *Cortinarius* subgen. *Phlegmacium*; autumn; rare in temp.-hemib.; DK (EN), NO (EN), SE (DD). – C&D 467 (as *amariusculum*), FAD 25C, Svp 43:11, Ves 209.

L. eustygium (Cooke) Cléménçon (*L. crassifolium* (Berk.) Singer s. auct.)

- Cap ochraceous to yellowish brown or greyish brown 6
- 6. Stem distinctly tapering towards base. Cap 40-100 mm, convex to bell-shaped, later expanded to depressed, smooth, shiny, ochraceous to yellowish brown or greyish brown, often with darker centre, slightly hygrophanous, not translucently striate; gills adnate, distant, whitish to pale grey, turning bluish, later blackish when bruised; stem 25-80 x 5-15 mm, often compressed, pruinose, becoming smooth, whitish to pale grey; smell strongly rancid; taste mild. Sp 6-7 μm , globose, smooth (fig. 499D). In deciduous and coniferous forests; DE. – Lud 44.19.

L. caeruleascens Cléménçon

- Stem cylindrical or slightly widened at base. Cap 30-60 mm, convex to expanded, with innate radial fibrils, ochraceous to yellowish brown, not hygrophanous; gills adnate, medium spaced, cream, turning bluish, later blackish when bruised; stem 30-50 x 6-10 mm, whitish to pale buff; smell rancid farinaceous to cucumber-like; taste mild. Sp 4-7 x 4-6.5 μm , globose to subglobose, smooth (fig. 499E); sometimes with scattered, up to 50 μm long, cylindrical to fusiform cheilocystidia. In parks and copses on clay; summer to autumn; very rare

in temp.; DK (NT). – Lud 44.21, M&J 4, Svp 18:89.

L. paelochroum Cléménçon

7. Gills turning orange, later blackish when bruised. Cap 20-70 mm, convex to expanded, greyish brown, hygrophanous; gills emarginate, medium spaced, whitish to pale grey; stem 40-70 x 4-8 mm, cylindrical, fibrillose, silvery grey; smell farinaceous. Sp 7.5-9 x 4-5 μm , ellipsoid to fusiform, smooth (fig. 499F). In coniferous forests, in the area with *Abies*; autumn; very rare in temp.; DK (NA). – RdM 41:100-101, 45:118, Svp 55:29, ☉.

L. aemiliae Consiglio

- Gills turning bluish, later blackish when bruised, or directly blackening 8
 - 8. Sp $\leq 6 \mu\text{m}$ long 9
 - Sp $\geq 6 \mu\text{m}$ long 10
9. Frb blackening in all parts. Cap 15-55 mm, hemispherical to convex, with a low umbo or depressed when old, aeriferous-pruinose, not hygrophanous, whitish, soon pale grey to silvery grey brown; gills emarginate-adnate, \pm concolorous with cap; stem 20-50 x 5-8 mm, often eccentric, concolorous with cap; taste and smell weak or slightly sourish. Sp 3.5-6 x 2-3 μm , narrowly ellipsoid to subcylindrical, smooth (fig. 499G); cheilocystidia 20-40 x 4-8 μm , lageniform, with apical mucoid deposits. With conifers on calcareous soil; late summer to autumn; very rare in temp.; SE (NE, Sk: Ravlunda). – Lud 44.22, M&J 5.

L. konradianum (Maire) Konrad

- Frb not blackening. Cap 30-80 mm bell-shaped, later plane with an umbo, buff to clay brown, hygrophanous, not translucently striate; gills adnexed, very crowded, pale buff, becoming sordid brown; stem 20-60 x 3-8 mm, cylindrical, fibrillose, concolorous with cap; smell indistinct. Sp 4-6 x 2-3 μm , ellipsoid, smooth (fig. 499H). On calcareous, sandy soil in mixed forests; autumn; very rare in temp., only known from one locality in DK (CR, Sj: Kistræde Banker). – Lud 44.15, RdM 45:145, Svp 57:32.
- L. hebelomoides* (Ew. Gerhardt) E. Ludw.

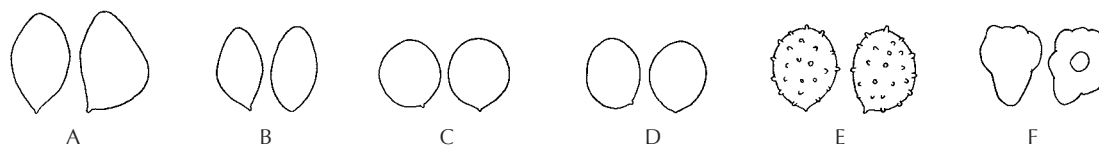
10. Cap 10-30 mm, cream to pale buff, permanently bell-shaped; smell strongly rancid. Cap hygrophanous, drying whitish; gills emarginate with a decurrent tooth, white to cream, soon becoming more grey; stem 20-30 x 2-3 mm, cylindrical with a tapering base, smooth or flocculose at top, whitish to cream or pale buff. Sp 7-9 x 4-5 μm , ellipsoid to fusiform, smooth (fig. 499I). In coniferous or mixed forests and in alpine *Juniperus* scrubs; autumn; very rare in bore.-arc./alp., two records from NO (He: Hamar, Hord: Ulvik: Finse); FI (DD, EH: Tam-mela [type locality]), NO (NE). – Lud 44.29, RdM 42:304, 45:121.

L. conocephalum (P. Karst.) Cléménçon

- Cap larger, darker, convex to expanded; smell pleasant or \pm farinaceous 11
11. Sp ellipsoid (fig. 499J); frb instantly blackening in all parts. Cap 20-45 mm, convex to expanded with depressed centre, smooth, sepia with a paler, yellowish brown margin, hygrophanous, drying ochraceous; gills broadly adnate to short decurrent, medium spaced, pale sordid ochraceous; stem 20-35 x 3-8 mm, tapering towards base, mostly compressed, sordid ochraceous; smell strongly farinaceous; taste mild. Sp 7-9.5 x 4.5-6 μm , smooth. Found at base of *Betula*; summer; very rare and only known from the type locality in SE (Sk: Immeln). – Lud 44.5.

L. brunneo-ochrascens E. Ludw.

- Sp rhomboid, amygdaloid to fusiform; frb blackening in all parts or not 12
12. Sp 8.5-11.5 x 5-6.5 μm , rhomboid in face view, amygdaloid in side view (fig. 499K). Cap 30-90 mm, convex to plane, sometimes umbonate, smooth, yellowish brown to greyish brown, hygrophanous, not translucently striate; gills broadly adnate, medium spaced to crowded, whitish to greyish, turning bluish, later blackish when bruised; stem 30-100 x 5-20 mm, cylindrical to clavate, sometimes with tapering base, whitish or tinged greyish brown, slowly



Spores: A: *Lyophyllum amygdalosporum*, B: *L. semitale*, C: *L. fumosum*, D: *L. decastes* var. *decastes*, E: *L. tylicolor*, F: *L. gibberosum*.

turning blackish when bruised; smell farinaceous. Sp smooth. In rich or calcareous, deciduous or coniferous forests and meadows; autumn; rare, but locally occasional in temp.-bore.; DK (EN), FI (LC), NO (LC), SE (LC). – FAD 31E, 199H, Jordst 16(1), Lud 44.13, M&J 3, R&H 299. *L. deliberatum* (Britzelm.) Kreisel (*L. infumatum* (Bres.) Kühner)

- Sp on av < 9 μm long, amygdaloid to fusiform (figs 501A-B) 13
- 13. Sp 7.5-9.5 \times 5-6 μm , \pm ellipsoid to fusiform in face view, angular-amygdaloid in side view (fig. 501A). Cap up to 100 mm, plane with depressed centre and inrolled margin, smooth, pale greyish brown with a yellowish or ochraceous tinge, slightly hygrophanous, not translucently striate; gills emarginate to short decurrent, medium spaced to distant, rather thick, venose, whitish, turning grey to black when bruised; stem up to 70 \times 30 mm, thickest in the median part, with tapering base, smooth, whitish to greyish brown; smell and taste slightly farinaceous. Sp smooth. In coniferous forests; autumn; EE.

L. amygdalosporum Kalamees

- Sp 6-8 \times 4-5 μm , amygdaloid to fusiform (fig. 501B). Cap 30-70 mm, convex to expanded, sometimes umbonate or with depressed centre, buff to greyish brown or dark greyish brown to sepia, hygrophanous, translucently striate at margin or not; gills adnate or emarginate, medium spaced, cream to buff, turning black when bruised; stem 40-80 \times 5-15 mm, cylindrical, greyish white to sordid grey, becoming darker from base and when bruised; smell farinaceous. Sp smooth. In coniferous forests, with *Picea*, *Abies* and *Pinus*, often on sandy soil; late summer to autumn; occasional in hemib.-bore., rare in temp.-suba.; DK (EN), FI (LC), NO, SE (NT). – B&K 3:268, Lud 44.20, RdM 45:123.
- L. semitale* (Fr.: Fr.) Kühner

Key B: Sect. *Difformia* (Fr.) Kühner

1. Cap white to cream; sp 5.5-6.5 \times 3.5-4 μm , ellipsoid see *Clitocybe connata* p. 394
 - Cap some shade of brown; sp 5-6.5 μm , globose 2
2. Smell farinaceous with acidulous-spermatocal components. Cap 10-80 mm, convex, later expanded to slightly depressed, smooth, buff to greyish brown or yellowish brown; gills adnate to short decurrent; narrow, crowded, cream; stem 50-100 \times 5-10 mm, cylindrical, whitish to pale buff, central to somewhat eccentric; frb fasciculate. Sp 5-6.5 μm , globose, smooth (fig. 501C). In deciduous and coniferous forests and in parks, mostly fasciculate; autumn; occasional, but locally common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Cet 610, FAD 39A&C, Lud 44.2D, R&H 300, Ves 208.

L. fumosum (Pers.: Fr.) P.D. Orton (*L. conglobatum* (Vitt.) M.M. Moser, *L. decastes* (Fr.: Fr.) Singer var. *fumosum* (Pers.: Fr.) Kühner)

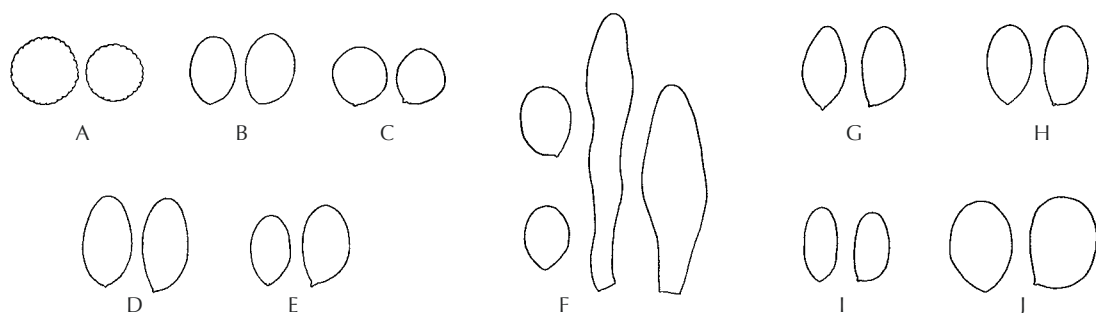
 - Smell insignificant. Cap 20-120 mm, convex to expanded, smooth, sepia to umber; gills broadly adnate, narrow, crowded, cream to pale buff; stem 40-70 \times 4-20 mm, cylindrical, whitish to pale buff, central to slightly eccentric; flesh firm and rigid. Sp 5-6.5 μm , globose, smooth (fig. 501D). In deciduous and coniferous forests, in heathland, at roadsides, gardens, etc., fasciculate, occasionally solitary; summer to autumn; common in temp.-hemib., oc-

casional in bore.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:257, Däh 275, FAD 39D, Lud 44.2B&C, Phil 114b, ☉.

L. decastes (Fr.: Fr.) Singer var. *decastes* (*L. aggregatum* (Schaeff.: Fr.) Kühner)
var. *loricatum* (Fr.) Kühner (*L. loricatum* (Fr.) Kühner) differs in having a ± burning aftertaste and a very thick cap cuticle. DK, SE (LC). – Cet 609 (as *Clitocybe cartilaginea*), Däh 274, Phil 114c.

Key C: Sect. *Tephrophana* (Fr.) Singer

1. Sp distinctly ornamented (figs 501E-F, 503A) 2
 - Sp smooth or indistinctly rough 4
2. Sp echinulate (fig. 501E). Cap 2-25 mm, convex to expanded, often with a small umbo, greyish brown to umber, hygrophanous, translucently striate in outer part; gills adnate to emarginate, medium spaced, whitish to pale grey or buff, often blackening; stem 18-80 x 0.5-4 mm, cylindrical or tapering towards base, sometimes rooting, buff to greyish brown, with whitish fibrils; smell farinaceous or indistinct. Sp 6-8 x 4-6.5 µm, subglobose to broadly ellipsoid. In forests, grassland, etc. on ± nitrogen rich places, including pastures, dung, burnt and fertilized soil, decaying fungi, etc.; summer to autumn; common in temp.-hemib., rare in bore.-arc./alp.; DK (LC), FI (LC), FO, IS (Na), NO (LC), SE (LC). – B&K 3:258, 269, 271, Cet 2396, FAD 46B, 46C, GBW 3:328, Lud 44.30.
L. tylicolor (Fr.: Fr.) M. Lange & Sivertsen (*Tephroclybe t.* (Fr.: Fr.) M.M. Moser, *Lyophyllum oldae* (Svrček) Cléménçon, *L. erosum* (Fr.) Svrček s. auct. non Fr.)
 - Sp nodulose (fig. 501F) or with small, rounded warts (fig. 503A) 3
3. Sp nodulose (fig. 501F). Cap 3-25 mm, conical to bell-shaped or convex, often with a papilla, sometimes with depressed centre with age, smooth to finely tomentose, brownish grey to greyish brown, hygrophanous, translucently striate in outer part; gills emarginate to almost free, medium spaced to crowded, greyish to greyish brown; stem 20-70 x 1-3 mm, cylindrical, greyish brown, often whitish floccose, sometimes with a pseudorrhiza connected to black sclerotia; smell and taste farinaceous. Sp 5-8 x 4-6.5 µm. In forests, amongs mosses, etc., sometimes on burnt ground; summer to late autumn; rare in temp.-suba.; DK (DD), NO (LC). – B&K 3:254, Lud 44.27 (both as *L. ambustum*), Rdm 45:151.
L. gibberosum (Jul. Schäff.) M. Lange (*Tephroclybe g.* (Jul. Schäff.) P.D. Orton)
 - Sp with small, rounded warts (fig. 503A). Cap 5-25 mm, convex to plane or slightly depressed, smooth, yellowish brown to dark brown, hygrophanous, not or slightly translucently striate; gills emarginate, medium spaced to crowded, whitish to pale yellowish buff; stem 25-60 x 1-4 mm, cylindrical, yellowish brown to dark brown; sometimes subfasciculate; smell faintly farinaceous. Sp 5-7 µm, globose. On burnt ground; autumn; rare in temp.-suba.; DK (NT), FI (LC), SE (LC). – Mic Due 378, Rdm 33:267, 45:152.
L. ambustum (Fr.: Fr.) Singer (*Tephroclybe a.* (Fr.: Fr.) Donk)
4. On burnt ground 5
 - Not on burnt ground 6
5. Sp 5-8 x 3-4 µm, broadly ellipsoid (fig. 503B). Cap 10-50 mm, convex to expanded, smooth, blackish brown, hygrophanous, drying greyish brown; gills adnate, greyish to pale brownish; stem 10-30 x 2-6 mm, cylindrical, often compressed, blackish brown; frb often caespitose; smell rancid-farinaceous. Sp smooth. On burnt soil; spring to late autumn; rare in temp.-arc./alp.; DK (NT), FI (LC), IS (Na), NO (LC, incl. Svb), SE (LC). – K&M 210,2, Rdm 33:264, 45:168.
L. atratum (Fr.: Fr.) Singer (*Tephroclybe a.* (Fr.: Fr.) Donk)
 - Sp 4.5-6.5 µm, globose (fig. 503C). Cap 5-40 mm, convex to expanded with a slightly depressed centre, dark brown to greyish brown, sometimes paler near margin, hygrophanous, translucently striate in outer part; gills emarginate to adnate or short decurrent, medium



Spores and cheilocystidia: A: *Lyophyllum ambustum*, B: *L. atratum*, C: *L. anthracophilum*, D: *L. rancidum*, E: *L. palustre*, F: *L. cessans*, G: *L. inolens*, H: *L. murinum*, I: *L. platypus*, J: *L. striaepileum*.


spaced to crowded, pale grey to pale greyish brown; stem 10-60 x 1-8 mm, cylindrical or with tapering base, sometimes compressed, smooth with a floccose top, brownish grey, becoming dark greyish brown from base; smell mostly farinaceous or cucumber-like. Sp smooth or very delicately spiny-warty. On burnt ground; spring to autumn; occasional, locally very common in temp.-bore., rare in suba.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:257, Däh 277, GBW 3:318, Lud 44.32, Ves 209.

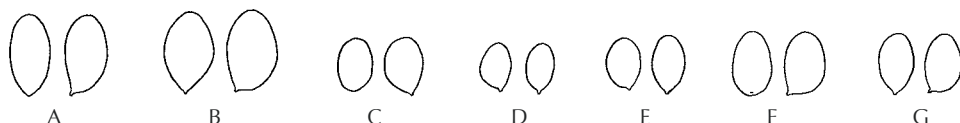
L. anthracophilum (Lasch) M. Lange & Sivertsen (*Tephrocybe a.* (Lasch) P.D. Orton)

6. Stem with an up to 80 mm long pseudorrhiza. Cap 20-40 mm, convex to expanded with a small umbo, dark grey to brownish grey, hygrophamous, but not translucently striate, drying paler grey; gills narrowly attached, crowded, grey; stem 50-140 x 2-5 mm, cylindrical or compressed, smooth, dark grey; smell strongly rancid-farinaceous. Sp 7-8.5 x 4-4.5 μm , ellipsoid, smooth (fig. 503D). In coniferous and deciduous forests on rich soil, rarely in gardens, often solitary; autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:267, Däh 279, Lud 44.26, Phil 125e, R&H 301, ☉.

L. rancidum (Fr.: Fr.) Singer (*Tephrocybe r.* (Fr.: Fr.) Donk)

- Stem not or only very short rooting 7
- 7. In *Sphagnum*. Cap 10-30 mm broad, convex to expanded or slightly depressed, sometimes with a papilla, greyish brown with a paler margin, hygrophamous, translucently striate; gills emarginate, medium spaced, pale grey; stem 40-80 x 1-3 mm, cylindrical, smooth, brownish grey, becoming dark greyish brown from base; smell rancid, cucumber-like. Sp 5.5-8 x 3.5-5 μm , oblong to amygdaloid, smooth (fig. 503E), often agglutinating in exsiccates. Spring to autumn; very common in temp.-hemib., common in bore., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 484, Lud 44.41, Phil 125e, R&H 301, Ves 209, ☉.
- L. palustre* (Peck) Singer (*Tephrocybe p.* (Peck) Donk)
- Not in *Sphagnum* 8
- 8. Smell insignificant 9
- Smell distinctly to strongly farinaceous, rancid, cucumber-like, aromatical or unpleasant 12
- 9. Cheilocystidia 40-65 x 8-16 μm , \pm cylindrical to clavate or lageniform (fig. 503F); sp 5.5-6.5 x 4-5 μm , subglobose to broadly ellipsoid. Cap 8-30 mm, convex to expanded with depressed to umbilicate centre, smooth, greyish to greyish brown, hygrophamous, translucently striate in outer part; gills broadly adnate, distant, whitish to pale greyish; stem 5-35 x 1-2 mm, cylindrical, with finely pruinose top, greyish to greyish brown; smell and taste insignificant. Sp smooth. In coniferous forests among needles; autumn; rare in temp.; DK (DD). – FAD 46A, Lud 44.37.
- L. cessans* (P. Karst.) M.M. Moser (*Tephrocybe c.* (P. Karst.) M.M. Moser)
- Cheilocystidia absent; sp 6.5-8 x 4-5 μm , ellipsoid 10

10. Sp $\leq 6 \mu\text{m}$ long see *L. hebelomoides* key A 9
 - Sp $\geq 6 \mu\text{m}$ long 11
11. Stem 2-7 mm broad, often compressed, grey to brownish grey, \pm unicoloured. Cap 20-40 mm, conical to bell-shaped, later expanded with an umbo, grey to greyish brown, hygrophanous, not translucently striate or only at margin; gills narrowly attached to emarginate, medium spaced to crowded, grey to brownish grey; stem 35-60 mm long, cylindrical with a widened and sometimes pointed to slightly rooting base, whitish floccose over entire length; smell and taste insignificant. Sp 6.5-8 \times 4-5 μm , ellipsoid to subamygdaloid, smooth (fig. 503G). In needle-beds in rich coniferous forests; autumn to late autumn; occasional in bore., rare in temp.-hemib.; DK (DD), FI (DD), NO (LC), SE (LC). – Bres 218, Däh 281, FAD 45J, GBW 3:321, Lud 44.31.
L. inolens (Fr.) Kühner & Romagn. (*Tephrocycbe i.* (Fr.) M.M. Moser)
 - Stem 1-3 mm broad, not compressed, grey, becoming dark brownish grey to umber from base. Cap 20-30 mm, conical to bell-shaped, greyish brown to dark brown, hygrophanous; gills narrowly attached to free, medium spaced to crowded, grey to brownish grey; stem 30-50 mm long, cylindrical, whitish pruinose at top; smell insignificant. Sp 6.5-8 \times 4-5 μm , ellipsoid, smooth (fig. 503H). In rich soil in deciduous forests, in needle-beds in coniferous forests and in grassland; autumn; rare in temp.-suba.; DK (DD), FI (DD), NO (LC), SE (LC). – FAD 45F.
L. murinum (Batsch: Fr.) M.M. Moser (*Tephrocycbe m.* (Batsch: Fr.) M.M. Moser)
12. Cap and stem whitish to cream, pale buff or pale greyish 13
 - Cap and stem grey to dark brown 14
13. Cap umbonate; sp 7-9 \times 4-5 μm see *L. conocephalum* key A 10
 - Cap convex to slightly depressed; sp 4.5-6.5 \times 3-4 μm (fig. 503I). Cap 5-30 mm, smooth to somewhat fluffy, buff to sordid buff, paler towards margin, not or slightly hygrophanous; gills broadly adnate to short decurrent, medium spaced, cream to pale buff; stem 15-40 \times 2-4 mm, cylindrical or with tapering base, often compressed, cream to buff; smell and taste strongly rancid-farinaceous. Sp ellipsoid, smooth. In deciduous forests among fallen leaves in late autumn to winter. DE. – B&K 3:266, Lud 44.25, RdM 45:169.
L. platypus Kühner (*Tephrocycbe p.* (Kühner) M.M. Moser)
14. Sp on av $> 6 \mu\text{m}$ long 15
 - Sp on av $< 6 \mu\text{m}$ long 17
15. Gills broadly adnate to \pm decurrent; sp 6-7.5 \times 4.5-6 μm , subglobose to broadly ellipsoid (fig. 503J). Cap 10-25 mm, at first convex to expanded, depressed with age, sometimes with an umbo, greyish brown, hygrophanous, translucently striate to centre, drying whitish; gills medium spaced, whitish; stem 20-50 \times 1-3 mm, cylindrical, greyish brown; smell farinaceous. Sp smooth. In coniferous forests on needle litter; autumn; rare in temp.-bore., only two records from NO (Oppl: Lunner, Nordl: Rana); DK (DD), FI (DD), NO (NE), SE (LC). – Bol Bres 42:29, FAD 59D, M&J Tephrocycbe 6, Mic Due 113, RdM 45:160.
L. striaepileum (Fr.) Kalamees (*Tephrocycbe s.* (Fr.) Donk)
 - Gills adnate to narrowly attached; sp 3-4.5 μm broad, oblong to ellipsoid 16
16. Cap conical to bell-shaped, later expanded with an umbo. Cap 8-30 mm, smooth, dark greyish brown to sepia, at margin slightly paler, hygrophanous, translucently striate at margin; gills narrowly attached, crowded, pale greyish brown; stem 25-55 \times 1-3 mm, cylindrical, whitish floccose over entire length, umber to sepia; smell and taste strong, cucumber-like. Sp 6-8.5 \times 3-4.5 μm , oblong, smooth (fig. 505A). In rich deciduous and coniferous forests; autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (DD), EH: Pälkäne, Myttäälä, NO (NE, Oslo, NTr: Leksvik), SE (LC). – BCat 847, Cet 2397, Lud 44.40, 
L. boudieri Kühner & Romagn. (*Tephrocycbe b.* (Kühner & Romagn.) Derbsch)



Spores: A: *Lyophyllum boudieri*, B: *L. coracinum*, C: *L. osmophorum*, D: *L. mephiticum*, E: *L. baeospermum*, F: *L. confusum*, G: *L. putidum*.

- Cap becoming deeply depressed with wavy-crenate margin. Cap 27-40 mm, smooth, sepia, hygrophanous, not translucently striate; gills narrowly attached, distant to medium spaced, grey to dark greyish brown; stem 20-50 x 2-8 mm, cylindrical, sometimes narrowed or widened towards base, often compressed, smooth, buff to greyish brown; smell and taste rancid-farinaceous or cucumber-like. Sp 5.5-7 x 3.5-4.5 μm , ellipsoid, smooth (fig. 505B). In grassy coniferous or mixed forests; late summer to autumn; very rare in bore.; SE. – Lud 44.38.
L. coracinum (Fr.) Singer (*Tephrocybe c.* (Fr.) M.M. Moser)
- 17. Smell sweet and aromatic or very unpleasant, like *Camarophylloopsis foetens*. Cap 6-40 mm, convex with depressed centre, smooth, dark brown, strongly hygrophanous, translucently striate; gills broadly adnate, medium spaced to crowded, dark brownish grey; stem 20-40 x 1-4 mm, cylindrical, silvery grey, becoming blackish brown from base. Sp 4-6 x 2.5-3.5 μm , ellipsoid, smooth (fig. 505C). In coniferous or deciduous forests, on soil or rotten wood; autumn; very rare in temp.; DK (NA). – FND 9:1, Lud 44:28, M&J *Tephrocybe* 5, Svp 55:30, .
L. osmophorum (E.-J. Gilbert) E. Ludw. (*Tephrocybe o.* (E.-J. Gilbert) Bon)
Note: it is possible that more than one taxon is involved.
- Smell farinaceous, rancid or cucumber-like 18
- 18. Sp av < 5 x 3 μm 19
- Sp av > 5 x 3 μm 20
- 19. Sp broadly ellipsoid (fig. 505D); cap grey, sometimes sepia at centre, not hygrophanous, not translucently striate. Cap 9-24 mm, convex to expanded or slightly depressed; gills adnate to emarginate, crowded, grey to greyish brown; stem 15-35 x 1.5-2.5 mm, cylindrical or with clavate base, grey to greyish brown, whitish floccose over entire length, tomentose at base; smell and taste rancid. Sp 3.5-4.5 x 2.5-3 μm , smooth. In coniferous and mixed forests on needle litter and in grassland; autumn; rare in temp.-southern bore.; DK (DD), FI (LC), SE (LC). – C&D 488, FAD 45B, Lud 44.36, Phil 124c, Sieniop 163.
L. mephiticum (Fr.) Singer (*Tephrocybe m.* (Fr.) M.M. Moser)
- Sp ellipsoid (fig. 505E); cap greyish brown, \pm hygrophanous, slightly translucently striate in outer part. Cap 15-45 mm, convex to expanded with a slightly depressed centre; gills narrowly attached to almost free, crowded, white to cream or pale greyish; stem 20-45 x 1-3.5 mm, cylindrical, smooth, floccose at top, pale brown, turning dark greyish brown to blackish brown from base; smell farinaceous. Sp 4-5 x 2.5-3 μm , smooth. In deciduous and coniferous forests; autumn; rare in temp.-hemib.; DK (LC), SE (LC). – RdM 45:163.
L. baeospermum Romagn. (*Tephrocybe b.* (Romagn.) M.M. Moser)
- 20. Cap 15-35 mm, convex to expanded; gills adnate; stem 25-60 x 2-5 mm. Cap smooth, greyish brown to dark brown, hygrophanous, not translucently striate, drying greyish buff; gills medium spaced, whitish to greyish buff; stem cylindrical or slightly widened downwards, fibrillose, greyish brown; smell rancid-farinaceous; taste mild. Sp 4.5-6.5 x 3-3.5 μm , ellipsoid, smooth (fig. 505F). In forests and in heathland, often in needle litter in rich *Picea* forests; autumn; rare in temp.-bore.; DK (LC), NO (LC), SE (LC). – FAD 45D (as *Collybia ozes* forma), Phil 124d.
L. confusum (P.D. Orton) Gulden (*Collybia c.* P.D. Orton, *Tephrocybe c.* (P.D. Orton) M.M. Moser)

- Cap 20-70 mm, convex to plane with an umbo; gills narrowly attached; stem 30-140 x 4-15 mm. Cap smooth, hygrophanous, translucently striate at margin, greyish brown to sordid brown; gills crowded, grey to greyish brown; stem cylindrical to clavate, sometimes slightly rooting, whitish to pale greyish; smell farinaceous to unpleasant; taste farinaceous. Sp 5-6 x 3-3.5 μm , ellipsoid, smooth (fig. 505G). In forests and in open land, often in *Picea* needle litter; autumn; occasional in temp.-bore.; DK (LC), FI (DD), NO (LC), SE (LC). – FAD 30B, B1, RdM 45:165.
L. putidum (Fr.) Singer (*Tephrocybe p.* (Fr.) M.M. Moser, *L. putidellum* (P.D. Orton) P.D. Orton)

Macrocystidia Earle

HENNING KNUDSEN

One species in the Nordic countries; see description below.

Frb dark brown with a strong smell of cucumber. Cap 10-50 mm, mostly conical to bell-shaped, glabrous to finely velvety, dry, dark brown with a paler, striate margin, sometimes rather pale all over, hygrophanous. Gills almost free, pale ochre, buff to clay pink, with finely fimbriate edge. Stem 20-55 x 2-4 mm, fistulose, dry and velvety, concolorous with cap, paler above. Flesh brittle in cap, tough in stem. Smell strong, of cucumber or marinated herring. Taste farinaceous. Sp deposit ochraceous pink.

Sp 7.5-10 x 4-5 μm , ellipsoid, smooth (fig. 315A), \pm hyaline, without iodine reactions, outer wall-layer cyanophilous. Pleuro- and cheilocystidia 60-100 x 12-24 μm , lageniform-fusiform, thin-walled with yellowish vacuolar pigment; caulo- and pleurocystidia similar. Pileipellis of repent, radial hyphae with parietal pigment. Clamps present.

Saprotrophic on rich soil and litter, mainly in deciduous forests, along brooks, in pastures and parks; autumn; common in temp.-hemib., occasional in bore., rare in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Däh 348-349, FAD 126B, Phil 154a, R&H 342, Ves 231, ⊙.

M. cucumis (Pers.: Fr.) Joss. var. *cucumis*

var. *latifolia* (J.E. Lange) Imazeki & Hongo is smaller and striate to the central papilla; DK, SE (Sk). – FAD 126A, Lud 45.1B.



Spores and hymenial cystidia.

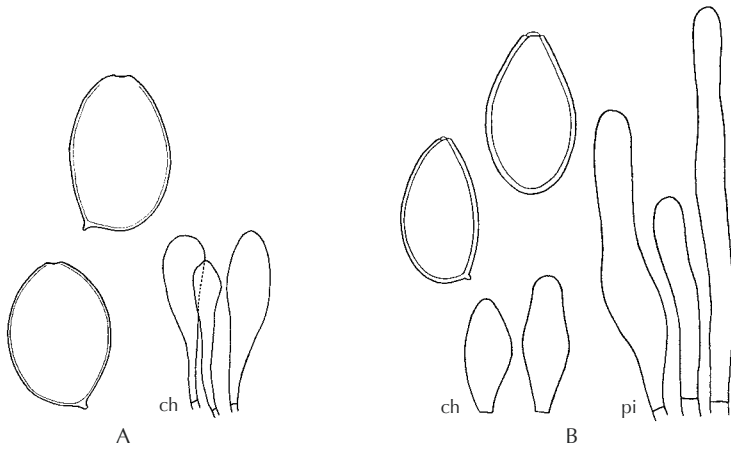
Macrolepiota Singer

CHRISTIAN LANGE

Frb agaricoid, with a long stem. Cap 50-250 mm, first globose to subglobose, expanding to convex to plane, often with an umbo, whitish, cream, grey brown, red brown or brown, splitting into radially fibrillose or patchy scales on a whitish or brownish background. Gills free, remote from stem, crowded, white to cream. Stem 30-230 x 7-30 mm, cylindrical, at base ± clavate to bulbous, smooth to fibrillose. Flesh whitish in cap. Smell indistinct or fungoid. Taste mild. Sp deposit whitish, cream to pinkish.

Sp ellipsoid to ovoid, smooth, thick-walled, with an apical germ pore covered with hyaline cap, dextrinoid, metachromatic. Cheilocystidia cylindrical, utriform to slightly clavate, often a bit irregular. Pileipellis a trichoderm. Clamps present, at least at base of basidia, but often hard to find.

Lit.: Bellù & Lanzoni 1987, de Kok & Vellinga 1998, Ryberg & Holmberg 1993, Vellinga 2003b, Vellinga in Noordeloos et al. 2001, Vellinga, de Kok & Bruns 2003.



Spores, cheilocystidia and pileipellis elements: A: *Macrolepiota mastoidea*, B: *M. excoriata*.

- | | | |
|----|--|---|
| 1. | Stem whitish, smooth or pruinose, without speckled bands | 2 |
| - | Stem brownish coloured, with speckled bands | 4 |
| 2. | Cap with brownish velar remnants, often left at the centre as a detachable layer. Cap 50-150 mm, ovoid to subglobose, expanding to convex-plane, often with a small, distinct umbo, beneath the detachable layer cream to pale brown, radially fibrillose; gills crowded, some forked, white to cream; stem 60-160 x 6-12 mm, cylindrical with a clavate base, minutely floccose to pruinose, whitish to pale brown, turning darker brown on handling, with a thick, often double, cuff-like ring, upperside whitish cream, underside concolorous with stem; flesh whitish, when cut slowly turning reddish yellow; smell neutral to fungoid; taste neutral. Sp 11-18 x 7.5-12 μm, ellipsoid (fig. 555A); cheilocystidia 10-40 x 5-15 μm, clavate to narrowly utriform, a bit irregular; pileipellis a trichoderm with terminal cells 15-120 x 4-10 μm, with parietal, sometimes intracellular brown pigment and incrusting at the base. In grassland and woods, mostly on calcareous soil; late summer to autumn; occasional in temp.-hemib., rare in FI; DK (LC), FI (VU), NO (NT), SE. – B&K 4:251, FAD 8C (as <i>Lepiota umbonata</i>), Phil 128a,b, R&H 417, Ves 278, ⊙. | |
| | <i>M. mastoidea</i> (Fr.: Fr.) Singer (<i>M. gracilentata</i> (Krombh.) Wasser, <i>M. rickenii</i> (Velen.) Bellù & Lanzoni, <i>M. konradii</i> (P.D. Orton) M.M. Moser) | |
| - | Cap homogenously covered with small, cream to brown, radially or concentrically arranged scales | 3 |

3. Cap white, cream to pale grey brown; ring thin and simple, hanging. Cap 50-110 mm, hemispherical, expanding convex to plane with an umbo; gills crowded, whitish to greyish cream; stem 90-120 x 8-10 mm, cylindrical, with a bulbous, up to 20 mm wide base, white to cream, brownish when handled; ring whitish, with a greyish-brownish edge; flesh white, unchanging; smell neutral to fungoid; taste neutral. Sp 11-17 x 8-11 μm , ellipsoid (fig. 555B); cheilocystidia 20-40 x 6-14 μm , clavate to utriform; pileipellis a trichoderm with terminal cells 60-150 x 5-17 μm , with light brown pigment. In sandy grassland, pastures, dunes and at roadsides; summer to autumn; common in temp., occasional in hemib., rare in southern bore.; DK (LC), FI (VU), NO (LC), SE (LC). – B&K 4:251, C&D 709, GBW 4:122, R&H 418, Svp 50:33, ☉.

M. excoriata (Schaeff.: Fr.) Wasser

- Cap dark brown to brown; ring thick and cuff-like. Cap 50-120 mm, hemispherical, expanding to broadly convex with an umbo, towards margin cracking into minute, dense, radially to concentrically arranged fibrillose scales on a paler background; gills remote from the stem, crowded, white to dirty cream; stem 80-120 x 10-12 mm, cylindrical, with a clavate base up to 35 mm wide; ring with cream coloured upperside and brownish underside; flesh whitish, unchanging; smell indistinct; taste neutral. Sp 12-16 x 8-10 μm , ovoid to ellipsoid; cheilocystidia 25-50 x 8-15 μm large, clavate to lageniform; pileipellis a trichoderm with terminal cells 20-90 x 10-15 μm , with brown pigment, incrusting at the base. In dunes; autumn; probably rare in temp.; DK (DD, WJyl: Vejers). – FE 4:78, Svp 50:35 (as *psammophila*).

M. fuliginosquarrosa Malençon

Note: probably synonymous with *M. psammophila* Guinb. described from France.

4. Frb dark brown, with a distinct red-brown tinge; flesh and stem turning reddish when bruised or cut. Cap 120-200 mm, subglobose, expanding to plane with a low umbo, cracking into concentrically arranged scales on a cream to pale reddish brown, fibrillose background; gills crowded, cream, with pinkish-brownish discolourations; stem 150-200 x 8-12 mm, cylindrical with a bulbous base, up to 30 mm wide, with dark brown to red brown speckles on a pale brown background, with a double ring with whitish upperside and dark brown underside; flesh whitish; smell and taste neutral to fungoid. Sp 12-18 x 8-11 μm , ellipsoid; cheilocystidia 20-50 x 10-15 μm , clavate to utriform, variable; pileipellis a trichoderm with end cells up to 300 x 8-12 μm , septate, thick-walled, with brown pigment and eventually incrustated at the base. In deciduous woods, parks and roadsides; autumn; rare, but probably overlooked in temp.-hemib.; DK (LC). – B&K 4:253, FE 4:64 (as *procera* var. *fuliginosa*), GBW 4:130, Svp 50:32.

M. permixta (Barla) Pacioni (*M. procera* (Scop.: Fr.) Singer var. *permixta* (Barla) Candusso)

- Frb pale brown, greyish brown, brown to dark brown, without reddish colours; flesh not discolouring or turning reddish when cut; stem eventually turning reddish or greenish on the bark when scratched or wounded 5
5. Frb with olivaceous green patches on cap and stem, especially when handled 6
- Frb without greenish colours 7
6. Sp deposit pinkish; sp 11.5-16 x 9-11 μm . Cap 130-200 mm, first subglobose, expanding to convex to plane, with a \pm pointed umbo, brown to dark brown, towards margin cracking into concentrically arranged scales on a whitish to dirty cream, fibrillose background; gills crowded, cream to pinkish, with a reddish brown edge; stem 175-300 x 10-15 mm, cylindrical with a clavate base, up to 30 mm wide, with brown speckles on a cream to pale brown background, with a double ring with cream to pale brown upperside and brownish underside; flesh whitish; smell neutral to fungoid; taste neutral. Sp ellipsoid; cheilocystidia 30-60 x 6-18 μm , clavate to utriform, a bit irregular; pileipellis a trichoderm with terminal cells 100-200 x 5-12 μm , septate, thick-walled, with brown pigment. In grassland

under or close to conifers; autumn; very rare in temp.; SE (NA). – B&K 4:252, FE 4:62, Jordst 14(1).

M. olivascens M.M. Moser & Singer

Sp deposit white to cream; sp 12.5-18 x 8-12 μm

see *M. procera* 7

7. Cap with brownish, concentrically arranged scales on a fibrillose-scaly background. Cap 120-280 mm, subglobose, expanding to plane with a low umbo; gills crowded, white to cream, with white edge; stem 100-400 x 10-20 mm, cylindrical, with a clavate to bulbous, up to 50 mm wide base, with speckled bands of cap colour on a whitish background, with a double ring with cream upperside and brown underside; flesh white to buff; smell and taste indistinct to fungoid. Sp 12.5-18 x 8-12 μm , ellipsoid; cheilocystidia 15-60 x 9-18 μm , cylindrical to utriform, irregular; pileipellis a trichoderm with end cells up to 200 x 8-10 μm , septate, thick-walled, with brown pigment. In grassland, dunes, roadsides and open woods, often on sandy soil; summer to autumn; common in temp., occasional in hemib.-bore., in NO only in hemib.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:254, C&D 714, FAD 8B, FE 4:63, R&H 416, ☉.

M. procera (Scop.: Fr.) Singer

Note: specimens with olivaceous patches on the cap have been found in DK. The taxonomical status of such forms is unknown.

- Cap with grey brown, loose, patchy scales on a radially fibrillose background. Cap 60-220 mm, subglobose, expanding to plane with a low umbo; gills crowded, often forked, white to cream, with brownish stains, with white edge; stem 90-250 x 5-15 mm, cylindrical, with a clavate to bulbous, up to 40 mm wide base, with speckled bands of cap colour on a pale brownish cream background, often turning reddish brown when scratched, especially at base, with a double ring with cream upperside and grey-brown underside; flesh whitish; smell and taste indistinct to fungoid. Sp 12-20 x 7-12 μm , ellipsoid; cheilocystidia 15-60 x 7-15 μm , clavate to lageniform, irregular; pileipellis with end cells up to 250 x 12 μm , septate, thick-walled, with brown, often incrusting pigmentation. In deciduous woods, dunes, roadsides; autumn; rare, but probably overlooked in temp.-hemib.; DK (DD, Lol: Systofte 1921). – GBW 4:129 (as *procera* var. *fuliginosa*).

M. fuliginosa (Barla) Bon

Marasmiellus Murrill

MACHIEL NOORDELOOS

Micromphale Gray

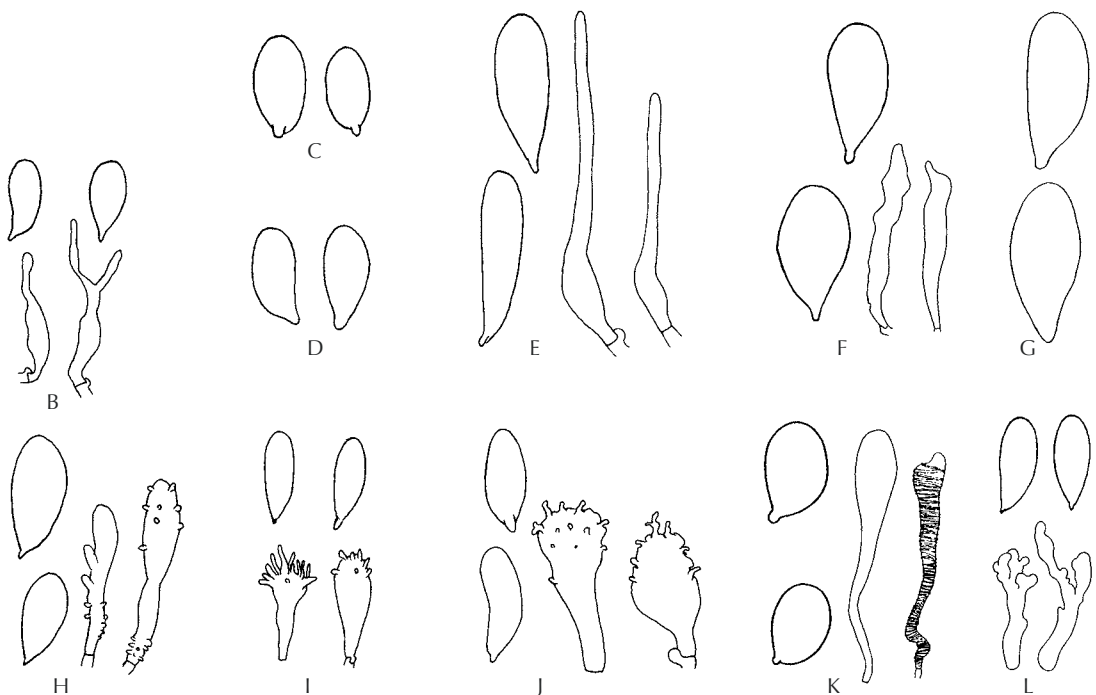
Frb marasmioid, collybioid or omphalinoïd, rarely pleurotoïd. Cap convex, with or without papilla, white, yellow or brown. Gills usually well developed, rarely venose, adnate to decurrent. Stem insititious or subsititious, rarely with well developed basal mycelium, typically bicoloured with pale top and dark basal part. Smell indistinct, farinaceous or fetid. Taste mild or unpleasant. Sp deposit white.

Sp ellipsoid to oblong or obovoid, rarely subcylindrical, fusiform, pip-shaped, dacryoid, phaeoliform or amygdaloid, usually with confluent hilar appendage, smooth, hyaline, thin-walled, without iodine reactions, not metachromatic in cresyl blue, not cyanophilous. Cheilocystidia often present. Pleurocystidia usually absent. Pileipellis an (ixo-)cutis, sometimes with transitions to a trichoderm, with or without well-differentiated rameales-structure. No part of basidiocarp with iodine reactions; usually not metachromatical in cresyl blue. Clamps usually present.

Saprotrophic, more rarely parasitic on all kinds of living plants, some are host specific; gregarious, more rarely solitary, many species in rather exposed habitats, where moisture may vary considerably, ie. coastal dunes and xerophytic grassland, some salt tolerant. Widespread.

Seven species in the Nordic countries, 10 species in the key.

Lit.: Antonín & Noordeloos 1993, 1997, Gröger 2006.



Spores and cheilocystidia: B: *Marasmiellus lateralis*, C: *M. perforans*, D: *M. foetidus*, E: *M. candidus*, F: *M. trabutii*, G: *M. tricolor* var. *tricolor*, H: *M. tricolor* var. *graminis*, I: *M. humillimus*, J: *M. ramealis*, K: *M. pachycraspedum*, L: *M. vaillantii*.

1. Frb cup-shaped, then pleurotoid or flabelliform without or with reduced, eccentric or lateral stem, white. Cap 3-8 mm, convex to plane, pruinose, opaque; gills adnate-decurrent, distant, L = 8-12. Sp 5.5-7 x 2.5-3 μm , oblong to subcylindrical (fig. 303B); cheilocystidia 24-52 x 2-5 μm , lageniform to filiform or coralloid. On dead wood of *Pseudotsuga menziesii*; NL.
M. lateralis Bas & Noordel.
 - Frb omphalinoid, marasmioid or collybioid with central, well developed stem, not entirely white when mature 2
2. Smell fetid, like rotten cabbage or garlic, particularly when crushed 3
 - Smell different or indistinct 4
3. On needles of *Picea*, rarely *Pinus*; cap 5-15(-20) mm, pinkish brown, fading on drying. Cap convex to plane; gills narrowly adnate, distant, L = 13-19, pallid; stem 15-40 x 0.5-1 mm, cylindrical, dark brown to black with paler top, entirely covered with fine, concolorous hairs. Sp 6-9.5 x 3-5 μm , oblong to dacryoid (fig. 303C); cheilocystidia absent; pileipellis an ixocutis of incrustated hyphae, without rameales-structure. Early summer to autumn; very common in temp.-suba., very rare in IS; DK (LC), FI (LC), IS (Ve), NO (LC), SE (LC). – B&K 3:310, Bon 177, Cet 121, Lud 46.10, R&H 325, ☉.
M. perforans (Hoffm.: Fr.) Antonín, Halling & Noordel. (*Micromphale* p. (Hoffm.: Fr.) Gray)
 - On wood, usually of *Fagus*, *Quercus*, *Corylus*, *Salix caprea* and *Fraxinus*, often on rich clay or calcareous soil; cap 10-30 mm, red brown, with paler yellow-brown margin. Cap irregularly conical-convex to bell-shaped or convex, expanding to irregularly plane with crenulate margin; gills free to narrowly adnate, often anastomosing and venose, distant, L = 15-25; stem 15-30(-40) x 1-4 mm, tapering towards base, tough, stiff, entirely pruinose-hairy, reddish brown to blackish brown. Sp 7-10(-11) x 3.5-5(-5.5) μm , oblong to broad hilar appendage (fig. 303D); cheilocystidia absent; pileipellis a thin cutis of narrow, brown incrustated hyphae overlaying a strongly gelatinized pileitrama. Summer to late autumn; common in temp., occasional in hemib., rare in bore.; DK (LC), FI (EN, U: Helsinki), NO (LC), SE (LC). – A&N 97:176, Lud 46.9, Phil 78d, R&H 326, Ves 222, ☉.
M. foetidus (Sowerby: Fr.) Antonín, Halling & Noordel. (*Micromphale* f. (Sowerby: Fr.) Singer)
4. Frb omphalinoid with a distinctly umbilicate to funnel-shaped, pink or pinkish-lilacinous cap; gills decurrent see *Contumyces rosellus* p. 66
 - Frb different or differently coloured 5
5. Sp on av > 11 μm long 6
 - Sp on av < 11 μm long 8
6. Cap usually white, 10-20 mm; pileipellis without rameales-structure. Cap hemispherical or conical to bell-shaped or convex, then irregularly plane; gills often reduced to anastomosing veins, very distant, L = 9-20; stem 4-15 x 1 mm, cylindrical with bulbous base, white at top, dark brown to black below, entirely white pruinose. Sp 10-15(-17) x 3.5-6.5 μm , ellipsoid to subcylindrical (fig. 303E); cheilocystidia 40-90 x 6-12.5 μm , irregularly lageniform with long, 3-5 μm broad neck; pileipellis of weakly diverticulate, incrustated hyphae. On twigs and fallen branches of deciduous trees, preferably on calcareous soil; autumn; very rare in temp.-bore.; DK (DD, Sj: Boserup Skov, Lol: Møns Klinteskov), NO (NE, Oppl: Ringebu), SE (LC). – Cet 1880, GBW 3:332, Lud 46.2, Phil 119h, BCat 181, ☉.
M. candidus (Bolton) Singer (*M. albuscorticis* Singer)
 - Cap sordid white, cream, pale brown, grey or grey brown, 2-11 mm; pileipellis with distinct rameales-structure or with distinctly diverticulate hyphae 7
7. In salt marshes on *Juncus*, *Schoenus*, *Scirpus* or *Eryanthus*; cap trama distinctly gelatinized. Cap 4-8 mm, convex to plane, sordid white with pale ochre centre; gills adnate-decurrent, often triangular, sometimes forked or anastomosing, distant, L = 10-15, white; stem 5-8 x

0.2-1 mm, cylindrical with bulbous base. Sp 11.5-18(-20) x 5.5-8 μm , obovate to dacryoid (fig. 303F); cheilocystidia 30-50 x 5-9 μm , cylindrical to coralloid; pileipellis a cutis of diverticulate hyphae. *NL.* – A&N 93 pl. 15, Bol Bres 37:82, Lud 46.3.

M. trabutii (Maire) Singer (*M. caespitosus* (Pat.) Singer)

- On other substrates in grassland, etc.; cap trama not gelatinized. Cap 2-11 mm, convex, usually with small papilla, minutely pruinose, white to cream; gills broadly adnate to deeply decurrent, distant, L = 10-17, often tinged pink; stem 8-20 x 0.5-1 mm, cylindrical, entirely white, then turning blackish brown from base upward. Sp 8.5-12.5 x 3.5-6 μm , ellipsoid to pip-shaped (fig. 303G); gill edge fertile or with very scattered, inconspicuous cheilocystidia; pileipellis with distinct rameales-structure. Summer; occasional in temp.-hemib., rare in southern bore.; DK (LC), FI (DD), NO (LC), SE (LC). – Cet 1991, Lud 46.11A, ☉.

M. tricolor (Alb. & Schwein.: Fr.) Singer var. *tricolor*

var. *graminis* (Murrill) Singer differs in having abundant cheilocystidia (fig. 303H). *DE.* – Lud 46.11B.

8. Pileipellis with distinctly developed rameales-structure 9
- Pileipellis without or with poorly developed rameales-structure, but sometimes with diverticulate or nodulose hyphal elements 10

9. Cap 1-4 mm; stem 2-3 x 0.1-0.2 mm; on grasses, e.g. *Deschampsia caespitosa*; sp elongate, almost cylindrical, 7-9.5(-10.5) x 2-3.5 μm (fig. 303I). Cap hemispherical to convex or plane, white then sordid cream or ochre, radially wrinkled; gills adnate-decurrent, distant, L = 10-11, white; stem white at top, darker below. Cheilocystidia 20-35 x 8-10 μm ; broom cells of siccus-type with hyaline or pale yellow appendages. Summer; very rare or overlooked in temp.; DK (DD, Sj: Amager Fælled). – Svp 40:11.

M. humillimus (Quél.) Singer

- Cap 5-20 mm; stem 5-20 x 0.5-1 mm; on wood including *Rubus canes*, rarely on herbaceous plants, grasses and sedges; sp subcylindrical to phaseoliform, 7.5-11(-12.5) x 2.5-4.5(-5.5) μm (fig. 303J). Cap hemispherical to convex or plane, white with brownish centre, or entirely pinkish brown or yellow brown; gills adnate or slightly decurrent, medium spaced, L = 10-20, white to cream or yellowish brown; stem whitish or pinkish at top, brown below, entirely flocculose. Cheilocystidia 15-40(-60) x 6.5-22 μm ; broom cells of siccus-type with yellowish appendages. Summer to autumn; very common in temp.-hemib., common in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:274, FAD 48c, Lud 46.12, Phil 119g, Ves 222, ☉.

M. ramealis (Bull.: Fr.) Singer

10. Cap and stem (dark) brown; gills thick, often with thickened edge, distant. Cap 5-12 mm, convex to plane, minutely tomentose, becoming paler; stem 10 x 1-1.5 mm, with dense white floccose covering. Sp 6-8(-10) x 4.5-5.5(-7) μm , broadly ellipsoid (fig. 303K); cheilocystidia (40-)60-120(-130) x 10-18 μm , clavate or fusiform; pileipellis a poorly developed rameales-structure. On soil among mosses; *NL.* – Lud 46.1.

M. pachycraspedum Noordel.

- Cap white to sordid ochre cream with slightly darker centre when moist; gills without thickened edge, normally distant. Cap 3-20 mm, low convex to plane or depressed, often with a small papilla; stem 5-25 x 0.3-1 mm, pale above, dull orange yellow to brown towards base, white pruinose in upper part, subflocculose towards base. Sp 7-10 x 3-4.5(-5) μm , ellipsoid to ovoid (fig. 303L); cheilocystidia (12.5-)16-45 x (3.5-)6-18 μm , distinctly lobed with two or more bladder-like apical projections; pileipellis a weak rameales-structure. On wood or woody herbs, rarely on debris of conifers, often in damp places; summer to autumn; common in temp.-hemib., occasional with a southern distribution in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:275, FAD 47C, GBW 3:338, Lud 46.14, Phil 118f.

M. vaillantii (Pers.: Fr.) Singer

Marasmius Fr.

MACHIEL NOORDELOOS

Frb marasmoid, tough, often reviving. Cap 1-50 mm, conical to convex, finally plane, often truncate, smooth or radially grooved to sulcate, glabrous or finely pruinose to tomentose or hairy. Gills free to adnate, sometimes reduced and vein-like or completely absent, usually distant, more rarely medium spaced to crowded, in some species forming a collarium round the stem, narrow to broad, white, cream to brownish. Stem often filiform or hair-like, ± tough, cartilaginous, cylindrical or compressed, glabrous, pubescent or hairy, insititious or with basal mycelium, sometimes rooting, sometimes with minute side branches; rhizomorphs and sterile stems present in some species. Smell variable from none to sweetish, like almonds. Taste mild. Sp deposit white.

Sp ellipsoid to broadly ellipsoid, sometimes fusiform, pip-shaped or dacryoid, rarely subglobose, hyaline, without iodine reactions, not or weakly cyanophilous. Basidia 4-, rarely 2-spored. Hymenial cystidia often present. Pileipellis regularly to irregularly hymeniform, made up of smooth, diverticulate cells, broom cells or irregularly branched, diverticulate elements. Pileocystidia sometimes present. Clamps present or rarely absent.

On leaves, sticks, branches or culms of herbaceous and woody plants, rarely seemingly on bare soil. Often host specific.

18 species in the Nordic countries, 20 species in the key. The genus *Marasmius* in the current morphological concept (e.g. Singer 1984, Antonín & Noordeloos 1993) appears to be polyphyletic in recent phylogenetical studies based on molecular markers. Owings & Dennis (1997), Moncalvo & al. (2002), Mata & al. (2004), and Wilson & Desjardin (2005) confirm the existence of three lineages. The core of the emended genus *Marasmius* is formed by sections *Marasmius*, *Sicci*, and *Globulares*. Sect. *Chordales*, incl. sect. *Alliacei*, forms with *Lentinula* a distinct, non-related clade. Based on the evidence of Wilson & Desjardin (2005), this group is treated here as the genus *Mycetinis* Earle. Section *Epiphylli* is also very distant and appears to be more related to the xeruloid fungi. However, statistical support is still too weak, and more taxa and genes need to be studied for a final decision of the status of that group. For this reason the genus *Marasmius* in the current work is necessarily polyphyletic, like e.g. *Gymnopus* and *Marasmiellus*.

Lit.: Antonín & Noordeloos 1993, 2008, Gröger 2006.

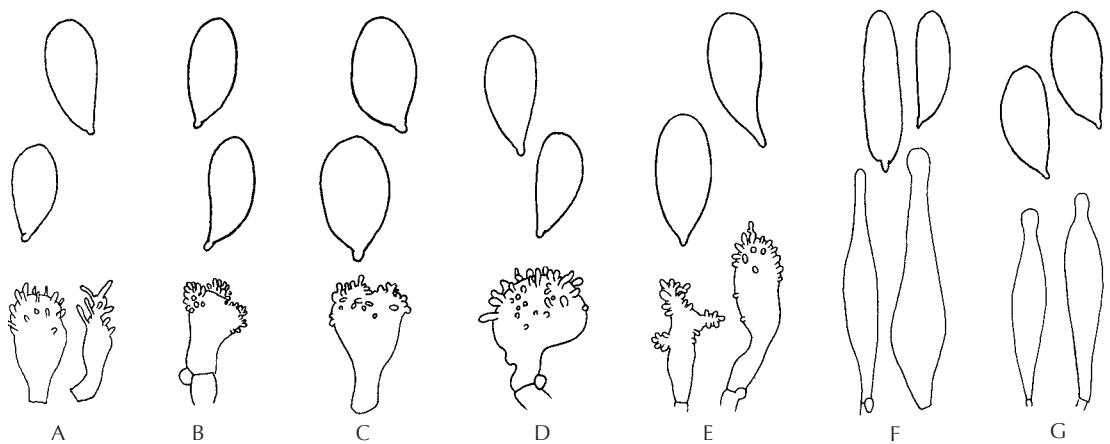


Fig. 289. Spores and cheilocystidia: A: *Marasmius curreyi*, B: *M. limosus*, C: *M. rotula*, D: *M. bulliardii*, E: *M. wettsteinii*, F: *M. epiphylloides*, G: *M. setosus*.

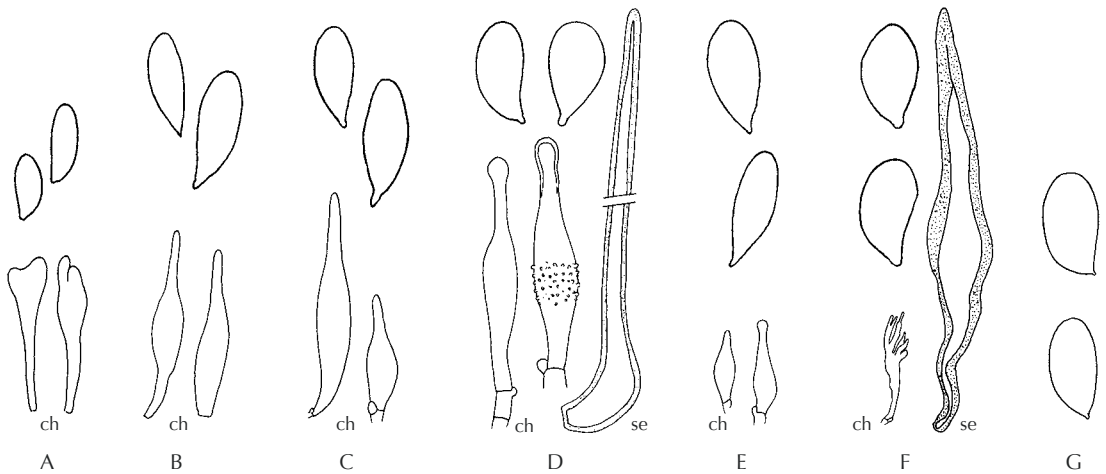


Fig. 291. Spores, cheilocystidia and setiform hairs from cap: A: *Marasmius saccharinus*, B: *M. favrei*, C: *M. epiphyllus*, D: *M. hudsonii*, E: *M. buxi*, F: *M. cohaerens*, G: *M. collinus*.

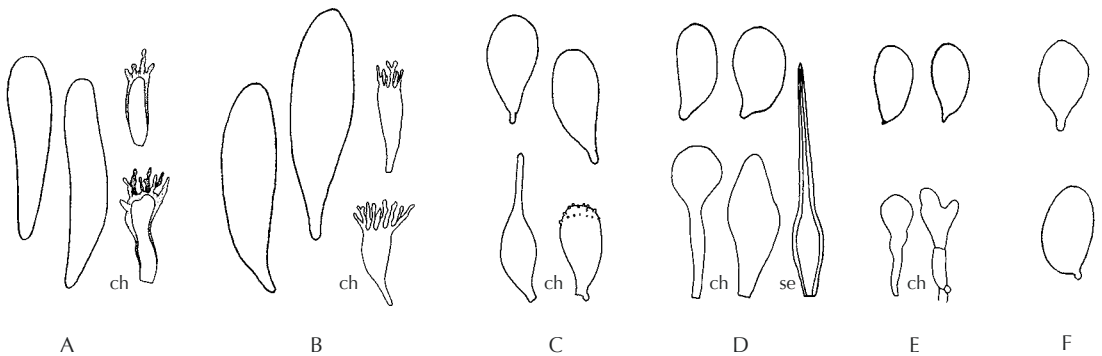






Fig. 293. Spores, cheilocystidia and seta from stem: A: *Marasmius siccus*, B: *M. anomalus* var. *anomalus*, C: *M. minutus*, D: *M. torquescens*, E: *M. wyneii*, F: *M. oreades*.

1. Gills attached to a distinct collarium 2
 - Gills not attached to a collarium, but sometimes partly loosening from stem in form of a pseudocollarium 6
2. Cap reddish, red brown, orange or pale orange. Cap 4-15 mm, convex to plane, radially furrowed; gills white to yellowish, collarium often narrow (lens!); stem 20-40 x 0.3-1 mm, smooth, polished, dark red brown, sordid brown or yellowish brown, insititious. Sp 8-14 x 4-6 μm, ellipsoid (fig. 289A); cheilocystidia 10-20 x 5-12 μm, of the broom-cell type, with brown, 2.5-6 μm long appendages. On dead grasses or on leaf sheaths of living grasses and *Juncus* in open localities, also in rather dry places, including garden lawns; summer to autumn; common in temp., occasional in hemib., rare in bore., in FI north to OP; DK (LC), FI (DD), NO (LC), SE (LC). – A&N 93 pl. 1, Cet 998, FAD 48D, Lud 47.20, M&J 1, . *M. curreyi* Berk. & Broome (*M. graminum* (Libert) Berk. s. auct. Eur.) 3
 - Cap whitish, greyish or brownish

3. Cap 0.5-4 mm, pale brown, beige or greyish; L = 6-9; on grasses, frequently on *Phragmites* in moist localities, swamps, etc.; hymenium up to 10 μm thick. Cap convex to plane, radially furrowed; stem 6-25 x 0.3-0.5 mm, smooth, polished, pale at top, downwards dark brown to black, insititious. Sp 8.5-9.5 x 5-6 μm , ovoid to ellipsoid (fig. 289B); cheilocystidia 12-17 x 7.5-9 μm , of the broom-cell type, with yellow warts at apex. Summer to early winter; very common in temp., occasional in hemib.-bore., in FI north to EnL; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 48B, Lud 47.29, Win 93:50, ☉.
M. limosus Quél.
- Cap 3-15 mm, whitish or brown; L = 13-20; usually on leaves, needles or sticks, hymenium 20-30 μm thick 4
4. Cap whitish, sometimes with greyish papilla; pileipellis of hyaline elements with hyaline warts. Cap 4-20 mm, convex to plane, radially furrowed; gills sordid white; stem 20-60 x 0.5-1 mm, smooth, shiny, white at top, downwards black, insititious. Sp 7-8.5 x 3.5-4.5 μm , ellipsoid to pip-shaped (fig. 289C); cheilocystidia of the broom-cell type. In deciduous forests, parks and gardens, on exposed or buried sticks and branches, rarely on leaves; summer to autumn; very common in temp.-hemib., common in southern bore., occasional in middle-northern bore., rare suba.-arc./alp., in FI north to OP; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:291, Däh 343, Lud 47.26, Phil 118e, R&H 327, Ves 221, ☉.
M. rotula (Scop.: Fr.) Fr.
- Cap brown often with very dark blackish brown papilla; pileipellis of elements with brownish warts 5
5. On leaves of deciduous trees in rather moist, fertile forests; stem sometimes with 0.5-7 mm long side branches, often with a small, sterile cap. Cap 1-10 mm, convex to plane, radially furrowed, pale brown with much darker central spot; gills attached to a collarium, L = 12-15; stem 30-70 x 0.5-1 mm. Sp 8-9.5 x 3.5-4.5 μm , ellipsoid (fig. 289D); cheilocystidia 15-25 x 8-13 μm , of the broom-cell type, with branched yellowish warts. Autumn; common in temp.-hemib.; DK (LC), SE (LC). – BCat 977, FAD 48F, GBW 3:353, Lud 47.16, RdM 34:7, ☉.
M. bulliardii Quél.
- On needles of *Picea*, rarely *Pinus* or *Cryptomeria*, in \pm fertile coniferous or mixed forests; stem without side branches. Cap 1.5-7 mm, convex to plane, radially grooved, dirty whitish to pale brown, without distinctly darker centre; gills attached to a collarium, L = 12-15(-19); stem 14-24 x 0.2-0.5 mm, red brown to blackish brown with white top, glabrous. Sp 8-12(-14) x 4.5-6 μm , ellipsoid to cylindrical (fig. 289E); cheilocystidia 15-26 x 9-22 μm , of the broom-cell type, with hyaline projections. Autumn; occasional in temp.-bore.; DK (DD), FI (LC), NO (LC), SE. – Lud 47.18, R&H 327.
M. wettsteinii Sacc. & P. Syd. (*M. bulliardii* Quél. f. *acicola* (S. Lundell) Noordel.)
6. Cap white 7
- Cap distinctly coloured 11
7. On dead leaves of *Hedera helix*, often in late autumn to early winter; pileipellis of broom-cells; gills reduced, usually not reaching the cap margin; hyphae of trama without iodine reactions. Cap 0.5-6(-18) mm, convex, then irregularly plane with undulating marginal zone, sometimes weakly radially grooved; stem 2.5-10(-17) x 0.1-0.3 mm, filiform, red brown to grey brown in lower part, white pruinose. Sp (11-)14-17 x 3-3.5(-4) μm , cylindrical to narrowly ellipsoid (fig. 289F). Rare in temp., only two records from NO (AA: Arendal, Lille-sand); DK (DD), NO (NE), SE (NE). – BCat 732, B&K 3:284, GBW 3:345, Lud 47.24, M&J 7.
M. epiphylloides (Rea) Sacc. & Trotter
- On other substrates, usually earlier in the season; pileipellis of smooth or slightly roughened elements; gills reduced or well-developed; hyphae of trama dextrinoid or without iodine reactions 8

8. Gills well developed; hyphae of trama dextrinoid, at least in top of stem 9
 - Gills usually \pm reduced, less frequently well developed; hyphae always without iodine reactions 10
9. Sp (9-)10-14.5 \times 4-6 μm , usually broadly fusiform (fig. 289G); stem with up to 1 mm long, hyaline hairs, especially when young; cap 0.5-5 mm; gills L = 5-7(-11); cheilocystidia cylindrical to fusiform, often capitate; hyphae in top of stem dextrinoid, in other parts not. Cap hemispherical then convex or plane, sometimes depressed at centre; stem 5-40 \times 0.3-0.5(-1) mm, white at top, reddish brown below. Solitary or in groups on petioles and veins of dead *Fagus* leaves, rarely on other substrates, e.g. *Salix* and *Betula* leaves; autumn; very common in temp., rare in hemib.-southern bore.; DK (LC), FI (DD), FO, NO (LC, Vestf: Tønsberg, Østf: Rygge), SE (LC). – B&K 3:290, Bol Bres 37:86, FAD 48E, Lud 47.25, .
- M. setosus* (Sowerby) Noordel.
- Sp 5-7.5 \times (2.5-)3-4 μm , ellipsoid (fig. 291A); stem without long hairs; cap 4-9 mm; L \leq 16; cheilocystidia clavate, with one or more apical projections; hyphae dextrinoid in all parts of frb, except in the subhymenium. Cap convex with papilla; stem 9-25 \times 0.5-1.5 mm, white above, rusty ochre below, slightly pruinose. On dead leaves of *Fagus*; UK.
M. saccharinus (Batsch) Fr.
10. Cap 1-4 mm, white; gills reduced, usually not reaching the cap margin; sp (7.5-)10-14 \times 3.5-4 μm , almost cylindrical (fig. 291B); basidia mostly 2-spored; without clamps. Cap convex with flat or depressed centre; stem 1-15 \times 0.1-0.3 mm, white above, reddish brown below, slightly pruinose. On decayed leaves of *Populus*; UK.
M. favrei Antonín
- Cap 2-10 mm, white; gills reduced or well developed; sp 8-12(-14) \times 3-5 μm , usually broadly ellipsoid (fig. 291C); basidia usually 4-spored; with clamps. Cap convex, then plane, usually slightly depressed at centre, rarely with papilla; stem 5-35 \times 0.2-0.6 mm, white at top, turning brown from base upwards, entirely white pruinose. On leaves, especially the petioles, often of *Fraxinus* or *Populus*, and small sticks of deciduous and herbaceous plants; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:285, FAD 49F, Lud 47.23, Phil 117f, R&H 329, .
- M. epiphyllus* (Pers.: Fr.) Fr. (*M. tenuiparietalis* Singer)
11. On dead leaves of *Ilex aquifolium*; cap and stem with long, setiform hairs (fig. 291D). Cap 1-6 mm broad, convex to plane, pale to dark reddish; gills reduced, often vein-like, sometimes entirely lacking, L = 0-8, white; stem 5-40 \times 0.1-0.5 mm, white above, brown below. Sp 7.5-13.5 \times 4-6.5 μm , ellipsoid to dacryoid; cheilocystidia 30-69(-124) \times 8-14 μm , lageniform to lecythiform; pileipellis a hymeniderm of broom-cells or rotalis-type mixed with setae. Autumn; very rare, but possibly overlooked in temp.; DK (DD). – BCat 624, B&K 3:287, Däh 341, Lud 47.31, RdM 34:19, .
- M. hudsonii* (Pers.: Fr.) Fr.
- On other substrates; cap and stem without setiform hairs 12
12. On dead leaves of *Buxus sempervirens*. Cap 0.5-4 mm, convex to plane, finely pruinose or rugulose, dark yellow brown or red brown with pale margin; gills distant, L = 3-7; stem 2-15(-25) \times 0.1-0.2 mm, filiform, blackish below. Sp (7-)8-12.5(-13) \times 3.5-4(-4.5) μm , ellipsoid to cylindrical (fig. 291E); cheilocystidia tibiiform to lageniform; pileipellis a mixture of broom cells and lageniform pileocystidia. DE, UK. – B&K 3:279, Lud 47.15.
M. buxi Fr.
- On other substrates 13

13. Gills pale yellow to yellow brown with conspicuous stiff, brown hairs (lens). Cap 10-35 mm, conical to convex, expanding with age, pale brown, pinkish brown to dark (yellow) brown; gills medium spaced, L = 12-20(-25), with brown edge; stem 50-90 x 0.5-4 mm, glabrous, shiny, with dark reddish brown basal part. Sp (7-)8-10.5 x 4-5.5(-6) μm , ellipsoid to amygdaloid (fig. 291F); cheilocystidia 14-22 x 6-9 μm , as broom cells of siccus-type; pileipellis with broom cells of the siccus-type. In small groups, sometimes fasciculate on raw humus and litter in deciduous forests, rarely in rich coniferous forests; summer-autumn; occasional in temp., rare, but locally occasional in hemib., rare in bore.; DK (LC), FI (LC), NO (NT), SE (LC). – B&K 3:282, FAD 47F, GBW 3:358, Lud 47.8, R&H 332.
M. cohaerens (Pers.: Fr.) Cooke & Quél.
- Gills white or pale, without stiff, brown hairs 14
14. Stem smooth, polished 15
- Stem pruinose or hairy 17
15. Cap and stem with about the same ochre brown to medium reddish brown colour; frb collybioid with brittle flesh; cheilocystidia absent; elements of pileipellis smooth, rarely with a few apical projections. Cap 15-40 mm convex, slightly translucently striate at margin; gills medium spaced, L = 20-30; stem 25-60 x 2.5-4.5 mm, concolorous or paler than cap, glabrous; smell indistinct or acidulous. Sp 8-11 x 4-5.5 μm , ellipsoid, oblong or cylindrical (fig. 291G). In grassy vegetations, on calcareous soil; very rare in temp.; DK (DD, EJyl: Rubjerg), SE (NE, Sk). – BCat 835, Bol Bres 37:84, Lud 47.3, M&J 5, Svp 57:34.
M. collinus (Scop.: Fr.) Singer
- Cap and stem with different colours; frb typically marasmiod with tough, horny stem; cheilocystidia present; pileipellis of broom-cells of siccus-type 16
16. Cap 10-30 mm broad, usually bright orange yellow when fresh; gills narrow, often somewhat reduced and vein-like, L = 15-23; in litter in boreal forests, moist *Alnus* and *Prunus padus* forests, in heath-like vegetation and in rich subalpine *Betula* forests. Cap conical, bell-shaped to convex, finally expanded, radially grooved; stem 15-90 x 0.2-1 mm, filiform, glabrous, shiny, red brown in basal half. Sp 15-23.5 x 2.5-5 μm , subcylindrical to fusiform (fig. 293A); cheilocystidia 8-21 x 4.5-10 μm , as broom cells of siccus-type. Summer-autumn; rare in bore.-suba., in FI south to Kn; FI (NT), NO (NT), SE (LC). – Lud 47.14, .
- M. siccus* (Schwein.) Fr.
- Cap 5-15 mm broad, dull yellowish ochre or yellowish white when fresh; gills well-developed, often lageniform, L = 8-13(-20); on remnants of grasses in rather exposed, often xerophytic grassland. Cap bell-shaped to hemispherical, expanding with age, radially grooved; stem 15-40 x 0.2-1 mm, white at top, dark red brown at base, glabrous. Sp (12-)16-22(-24) x (3-)3.5-4.5(-6) μm , Qav = c. 4.4, subcylindrical to dacryoid (fig. 293B); cheilocystidia 9-30 x 5-10 μm , as broom cells of siccus-type. Autumn; rare in temp., one locality in NO (Vestf: Tjøme); DK (DD), NO (LC), SE (NE). – Lud 47.17.
M. anomalus Lasch var. *anomalus*
var. *microsporus* (Maire) Antonín differs in having sp 12-18(-19) x (3.5-)4-5(-6) μm , Qav = c. 3.8. DE.
17. Cap 0.4-2(-3) mm; on dead leaves of *Salix* or other deciduous trees. Cap convex to plane, finely pruinose, (pale) red brown; gills vein-like, often reduced, distant, L = 3-9; stem 3-20 x 0.05-0.25 mm, filiform, slightly pruinose, brown to blackish brown. Sp 6-9.5 x 2-4(-5) μm , ellipsoid to dacryoid (fig. 293C); cheilocystidia of two types, one in form of broom-cells of rotalis-type, 10-16 x 6-12 μm , easily overlooked, second lageniform to fusiform, sometimes with a capitulum, 20-32 x 6-16 μm ; pileipellis of broom cells of rotalis-type mixed with lageniform to lecythiform pileocystidia. Very rare or overlooked in temp.; DK (DD). – B&K 3:280, Lud 47.21, Svp 49:42.
M. minutus Peck (*M. capillipes* var. *macrosporus* Kühner)
- Cap > 5 mm broad; on other substrates 18

18. Stem, and often also cap, with brown, thick-walled setae; pileipellis with diverticulate broom cells. Cap 5-30 mm, conical to bell-shaped, then convex, with sulcate margin, ochre brown with paler margin, fading on drying to almost white; gills rather thick, distant, L = 15-20; stem 30-90 x 1-3 mm, dark brown towards base, entirely finely pruinose. Sp 7-10 x 3-5.5 μm , ellipsoid to cylindrical (fig. 293D); cheilocystidia 14-40 x 6-15 μm , clavate to fusiform. On litter in rich to calcareous deciduous forests; summer to autumn; occasional in temp., rare in hemib.; DK (LC), FI (VU), NO (VU), SE (LC). – B&K 3:294, FAD 47G, Lud 47.6, R&H 333, Ves 221, ☉.

M. torquescens Quél.

- Stem and cap without setae; pileipellis with smooth cells 19
19. Cap and stem white or greyish when young; cap remaining white or turning grey to violaceous grey and stem getting a red brown basal part; in woods, preferably among dead leaves, especially of *Fagus*. Cap 10-50 mm, hemispherical to conical, expanding with age; gills distant, L = 16-29, white, soon with grey or violaceous tinges; stem 20-85 x 1-4.5 mm, glabrous or with scattered flocks. Sp 6-9 x 3-4.5 μm , ellipsoid to oblong (fig. 293E); cheilocystidia 15-40 x 4.5-10 μm , clavate or fusiform with obtuse apical projections. On rich or calcareous soil; autumn; common in western temp., rare in eastern temp. and hemib.-middle bore.; DK (LC), FI (VU), NO (NT), SE (NT). – Jordst 24(3):50, Lud 47.4, Phil 117e, R&H 332, Ves 221, ☉.

M. wynnei Berk. & Broome

- Cap and stem yellow brown to reddish brown; stem unicoloured; in grassland, often in fairy rings. Cap 10-50 mm, conical or hemispherical, expanding to low convex with a broad umbo and irregularly undulating margin, drying pale; gills medium spaced, L = 27-31, yellowish brown; stem 40-80 x 2.5-6 mm, concolorous with cap, finely pruinose all over; smell cyanic. Sp 8-11 x 4-6 μm , ellipsoid to oblong (fig. 293F); cheilocystidia absent. Parasitic on grasses, in large fairy rings in grassland; late spring to autumn; very common in temp.-hemib., common in bore., in FI north to PeP; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:289, Lud 47.1, Phil 117d, R&H 331, Ves 220, ☉.

M. oreades (Bolton: Fr.) Fr.

Megacollybia Kotl. & Pouzar

JAN VESTERHOLT

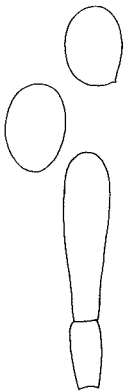
Monotypic genus; see description below.

Frb tricholomatoid, with a conspicuous white hyphal chord at stem base. Cap 30-150 mm, convex to expanded, sometimes with slightly depressed centre, radially fibrose, sometimes with small scales, with age with divergent fibres, dry, greyish brown, later pale greyish brown to buff, not hygrophanous. Gills adnate or narrowly adnate to emarginate, broad, distant, white. Stem 50-140 x 8-25 mm, cylindrical or widened at base, often compressed, whitish, greyish brown fibrillose. Smell insignificant. Taste mild. Sp deposit white.

Sp 7-10 x 6-8.5 μm , globose to subglobose, smooth (fig. 287A), hyaline, without iodine reactions. Basidia 4-spored. Cheilocystidia 30-75 x 15-20 μm , broadly clavate. Pleurocystidia absent. Pileipellis a cutis to a trichoderm. Clamps present.

Saprotrophic on deciduous wood in contact with soil, more rarely on conifers, most common on *Fagus*, *Betula* and *Quercus*, sometimes apparently on soil; spring to autumn; very common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:296, Lud 14.3, Phil 96c, R&H 335, Ves 213, 📍.

M. platyphylla (Pers.: Fr.) Kotl. & Pouzar (*Tricholomopsis p.* (Pers.: Fr.) Singer, *Clitocybula p.* (Pers.: Fr.) Malençon & Bertault)



Spores and cheilocystidia.

Melanoleuca Pat.

JAN VESTERHOLT

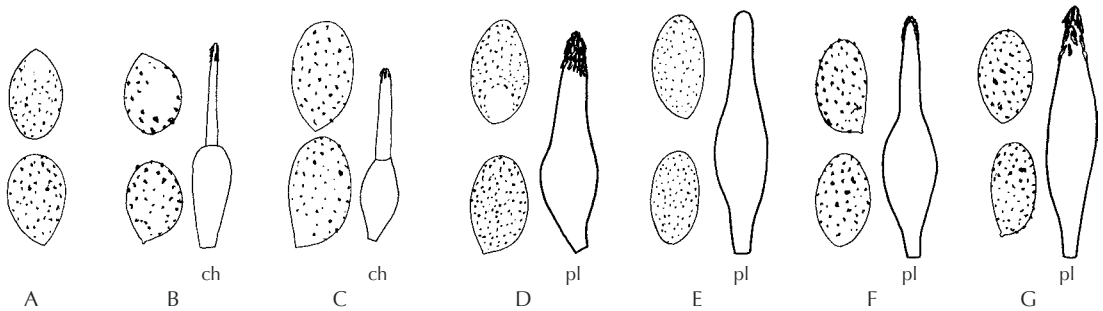
Frb with central stem, collybioid to tricholomatoid. Cap mostly low convex to slightly depressed, often umbonate, smooth to slightly fibillose or felty, dry or slightly greasy, whitish, greyish, ochraceous, brown, umber or sepia, hygrophanous or not. Gills emarginate to narrowly or broadly adnate, rarely short decurrent, mostly crowded, white to grey or brownish or tinged salmon to orange. Stem smooth to fibrillose, often pruinose, in one species punctate-finely scaly. Veil absent. Smell mostly faint, less often aniseed-like or sweetish-aromatic. Taste mild to acrid and unpleasant. Sp deposit white to pale yellowish.

Sp ellipsoid, hyaline, with amyloid warts. Basidia mostly 4-spored. Cheilocystidia mostly present, either ± urticoid and mostly septate and thin-walled (figs 349B-C) or fusiform to lageniform and mostly aseptate and slightly thick-walled (figs 349D-G), sometimes with crystals at apex. Pleurocystidia present or absent, similar to cheilocystidia. Pileipellis a cutis, an ixocutis or a trichoderm. Clamps absent.

Saprotrophic on soil, organical litter or wood chips in forests, grassland, dunes and alpine heathland.

16 species in the Nordic countries, 18 species in the key.

Lit.: Boekhout 1988, Boekhout in Bas et al. 1999, Bon 1978, 1991, Bresinsky & Stangl 1977, Fontenla et al. 2001a, 2001b, 2003, Gminder & Krieglsteiner in Krieglsteiner 2001, Métrod 1948, Vesterholt 2008.



Spores, cheilocystidia and pleurocystidia: A: *Melanoleuca melaleuca*, B: *M. microcephala*, C: *M. excissa*, D: *M. cognata*, E: *M. subalpina*, F: *M. friesii*, G: *M. polioleuca*.

1. Stem black punctate to finely scaly on a white background. Cap 30-100 mm, low convex to plane or slightly depressed, often umbonate, smooth, sometimes breaking up into small scales, dry, sordid white to cream; gills emarginate to adnate, crowded, white to pale cream; stem 35-60 x 5-20 mm, cylindrical or a with slightly widened base; smell faint, aniseed-like. Sp 8-10.5 x 5.5-6 μm, ellipsoid to oblong, verruculose; cheilocystidia 30-60 x 9-11 μm, urticoid, often with crystals at apex. On soil, compost heaps, dung or wood chips, in parks, meadows, gardens and roadsides, rarely in coniferous forests; autumn; occasional in hemib.-bore., rare in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – GBW 3:380, R&H 312, Sienil 30(3) cover, Sieniop 169, Ves 211, ☉.

M. verrucipes (Fr.) Singer

- Stem not black punctate-scaly 2
- 2. Cheilo- and pleurocystidia absent. Cap 35-80 mm, low convex to expanded or slightly depressed, sometimes with a low umbo, smooth, dry, reddish brown to greyish brown or dark brown; gills emarginate, very crowded; stem 45-100 x 6-18 mm, cylindrical or widened at base, fibrillose, pale brown to greyish brown; smell faint or grass-like. Sp 6.5-8.5 x 5-6 μm,

ellipsoid (fig. 349A), verrucose. At roadsides and in open places in forests, in heathland, etc., often on calcareous soil; autumn; occasional in temp.-suba., rare in arc./alp.; DK (DD), FI (LC), IS, NO (LC), SE (LC). – B&K 3:304, C&D 436, FND 25:51, GBW 3:374, Svp 57:19.

M. melaleuca (Pers.: Fr.) Murrill s. lato (*M. graminicola* (Velen.) Kühner & Maire, incl. *M. vulgaris* (Pat.) Pat. s. auct., incl. *M. brachyspora* Harmaja, *M. brevispora* Harmaja non Singer, *M. robertiana* Bon, *M. stridula* (Fr.) Singer s. auct. plur.)

Note: some authors recognize several species by differences in spore dimensions and colours, but the complex is in need of a revision.

- Cheilocystidia present (figs 349B-G), but sometimes difficult to find; pleurocystidia present or absent 3
- 3. Cheilocystidia in majority septate, ± urticoid with a sharply delimited, 2-5 µm broad apical part and a 5-10 µm broad basal part (figs 349B-C), thin-walled, often difficult to find; pleurocystidia mostly absent 4
- Cheilo- and pleurocystidia in majority non-septate, fusiform to lageniform, 7-20 µm broad (figs 349D-G), slightly thick-walled, not always numerous, but easy to locate in a preparation 10
- 4. Sp on av < 8 µm long 5
- Sp on av > 8 µm long 6
- 5. Gills dark greyish beige. Cap 20-60 mm, low convex to expanded or slightly depressed with a low umbo, smooth, dark brown, paler brown towards margin, often greyish pruinose; gills emarginate, medium spaced; stem 30-90 x 3-15 mm, cylindrical or widened at base, pruinose, striate, pale buff to dark greyish brown; smell insignificant. Sp 6-8 x 4-6 µm, ellipsoid, verrucose; cheilocystidia 30-50 x 5-9 µm, urticoid to lageniform with a 2-5 µm broad upper part, septate, often with crystals at apex. In dry grassland and in dunes; late summer to autumn; rare in temp.-bore.; NO (Nordl: Rana), SE (Sk). – Bres 130, FeA 2000:149, FND 25:53, GBW 3:376.
- M. rasilis* (Fr.) Singer
- Gills white or tinged pale buff. Cap 10-30 mm, low convex to plane with a small umbo, smooth, yellow brown to dark brown; gills adnate, medium spaced to crowded; stem 20-80 x 1.5-4 mm, cylindrical, whitish, turning brownish from the base. Sp 6-8 x 4-5 µm, ellipsoid (fig. 349B), verrucose; cheilocystidia 40-60 x 6-10 µm, urticoid with a 2-3 µm broad upper part, septate, often with crystals at apex. In coniferous forests; summer to autumn; rare in temp.-bore.; DK (DD), FI (LC), NO (NE), SE (LC). – BSMF 64: pl.1.2, FeA 2000:151, Svp 57:22.
- M. microcephala* (P. Karst.) Métrod (*M. leucophylloides* (Bon) Bon, *M. rasilis* (Fr.) Singer var. *leucophylloides* Bon)
- 6. Stem much shorter than cap diam. 7
- Stem about as long as cap diam. or longer 8
- 7. Cap 100-200(-300) mm, low convex to expanded or slightly depressed with a low umbo and decurved or involute margin, slightly felty, ochraceous grey to greyish brown; gills emarginate, crowded, cream; stem 60-80 x 10-20 mm, cylindrical or slightly widened at base, fibrillose, concolorous with cap; smell faint and pleasant or like *Lycoperdon*. Sp 7.5-9 x 5-6 µm, ellipsoid, verrucose; cheilocystidia 30-50 x 8-10 µm, urticoid with a 2.5-4 µm broad upper part, septate. In grass and heathland; summer; occasional in suba.-arc./alp.; NO (LC), SE (LC). – FND 25:54, RdM 44:34.
- M. subbrevipes* Bon s. lato
- Cap 40-100 mm, low convex to expanded or slightly depressed with a low umbo, innately fibrillose to slightly felty, pale to dark greyish brown; gills emarginate, crowded, cream, becoming greyish brown; stem 20-60 x 5-18 mm, cylindrical to clavate, fibrillose, brownish grey to greyish brown; smell insignificant or acid-herbaceous. Sp 7.5-9.5 x 4-6 µm, ellipsoid,

verrucose; cheilocystidia 25-50 x 5-10 μm , urticoid with a 2-4 μm broad upper part, septate, often with crystals at apex. In forests and grassland, on compost, etc.; spring and autumn; occasional in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – C&D 441, FND 25:54-55, R&H 313, Svp 57:22.

M. brevipes (Bull.: Fr.) Pat.

8. Stem longitudinally striate. Cap 50-150 mm, low convex to expanded or slightly depressed, often with a low umbo, smooth, dry, buff to pale greyish brown; gills emarginate to adnate or short decurrent, crowded to very crowded, cream or tinged buff; stem 60-120 x 8-13 mm, cylindrical or with slightly widened base, buff to pale greyish brown; smell faint, slightly acidulous. Sp 7.5-10 x 4-6 μm , ellipsoid to oblong, verrucose; cheilocystidia 30-55 x 5-9 μm , urticoid with a 2-4 μm broad upper part, mostly septate, often with crystals at apex. In deciduous forests and scrubs and on compost, sometimes in moist areas, sometimes in fairy rings; late summer to autumn; occasional, but locally common in temp.-suba.; DK (LC), FI (DD), IS (Au, Na), NO (LC), SE (LC). – C&D 442, Phil 99e, R&H 313, Ves 211, Svp 57:23.

M. grammopodia (Bull.: Fr.) Pat.

- Stem fibrillose, but not longitudinally striate 9

9. Cap 20-70 mm; stem 20-60 x 3-7 mm. Cap low convex to expanded or depressed with an umbo, smooth to innately fibrillose, dry, pale grey to dark greyish brown; gills emarginate to adnate or short decurrent, crowded, white to pale pinkish beige or greyish; stem cylindrical, whitish to pale beige, sometimes sordid brown; smell insignificant. Sp 7.5-9.5 x 5-6.5 μm , ellipsoid (fig. 349C), verrucose; cheilocystidia 30-55 x 5-10 μm , lageniform to urticoid, septate, often with crystals at apex, scattered to numerous. In forests and grassland, including lawns; spring to late autumn; common in temp., occasional, but locally common in hemib.-bore.; DK (LC), NO (LC), SE (LC). – B&K 3:300, Bres 131, FAD 31C, FeA 2000:141, Svp 57:24, ☉.

M. excissa (Fr.: Fr.) Singer var. *excissa* (*M. kuehneri* Bon)

var. *iris* (Kühner) Boekhout differs in having a sweet smell, like burnt sugar or *Lepista irina*. DK. – FND 25:32.


- Cap 60-120 mm; stem 100-120 x 8-15 mm. Cap low convex to expanded or slightly depressed with an umbo, often with radiating ribs near margin, smooth, dry, grey to brownish grey, like *Clitocybe nebularis*; gills emarginate to adnate, crowded, white to cream; stem cylindrical or compressed, fibrillose, greyish brown; smell indistinct. Sp 8-10 x 4-5 μm , ellipsoid, verrucose; cheilocystidia urticoid, up to 7 μm broad in lower part, often with crystals at apex. In deciduous forests; autumn; rare in temp.-bore.; DK (DD), NO (Vestf: Tjøme, Troms: Lyngen), SE (LC). – Däh 304, FAD 31A (as *Tricholoma strictipes* var.), GBW 3:376.

M. schumacheri (Fr.: Fr.) Singer

10. Gills with a distinct orange to salmon tinge. Cap 60-140 mm, low convex, later expanded to depressed, umbonate, smooth, dry to greasy, buff to greyish brown or salmon ochraceous; gills emarginate, crowded to very crowded; stem 60-140 x 6-14 mm, cylindrical or slightly widened at base, fibrillose, pale ochraceous to buff; smell faint and pleasant. Sp 7-9.5 x 4-6 μm , ellipsoid (fig. 349D), verrucose; cheilo- and pleurocystidia 40-75 x 10-15 μm , fusiform to lageniform, slightly thick-walled, often with crystals at apex. In forests, often at roadsides, and in grassland; spring and autumn; common in temp.-suba., rare in arc./alp.; DK (LC), FI (LC), IS (Au), NO (LC, incl. Sv), SE (LC). – Däh 308, GBW 3:365, Phil 99d, Sieniop 168, Svp 57:25, ☉.

M. cognata (Fr.) Konrad & Maubl. (*M. adstringens* (Pers.: Fr.) Konrad s. auct.)

- Gills white to cream or grey 11
11. Cap white or whitish, at least when young 12
- Cap some shade of grey or brown 13

12. Stem shorter than cap diam.; cheilocystidia mostly with rounded apex (fig. 349E). Cap 60-120 mm, low convex to plane or depressed, mostly with a low umbo, smooth, dry, white to cream, becoming pale buff; gills emarginate, crowded, whitish; stem 40-70 x 8-15 mm, cylindrical, fibrillose, whitish; smell aromatic, unpleasant. Sp 8-10 x 4.5-6 μm , ellipsoid, verrucose; cheilo- and pleurocystidia 38-55 x 11-14 μm , lageniform, often with crystals at apex. In dry grassland, pastures and alpine heathland; summer to autumn; occasional in bore.-arc./alp.; FI (DD), NO (LC), SE (LC). – BCat 936, B&K 3:305, Däh 299, FE 5:51. – Edible.
M. subalpina (Britzelm.) Bresinsky & Stangl (*M. evenosa* (Sacc.) Konr. s. auct.)
- Stem longer than cap diam.; cheilocystidia mostly with acute apex. Cap 50-100 mm, low convex to plane or depressed with a broad umbo, smooth, dry, white, with age turning pale greyish buff; gills emarginate to short decurrent, crowded, white to cream; stem 90-140 x 5-10 mm, cylindrical with a widened base, whitish, turning pale greyish brown; smell faint. Sp 8-10 x 4.5-6 μm , ellipsoid, verrucose; cheilo- and pleurocystidia 40-55 x 10-13 μm , \pm lanceolate, often with crystals at apex. In grassland, deciduous and mixed forests and in gardens; late spring to autumn; common in hemib.-suba., rare in temp.; DK (NT), FI (LC), IS, NO (LC), SE (LC). – Däh 298, R&H 312, Svp 57:27, . – Slightly toxic.
M. strictipes (P. Karst.) Murrill
13. Gills grey, at least in mature frb 14
- Gills white to cream 15
14. Cap greyish brown; sp 7-11 x 4.5-6 μm ; in sand in shifting dunes, often among *Ammophila*. Cap 30-100 mm, low convex to plane or slightly depressed with a low umbo, smooth, dry to slightly greasy; gills narrowly adnate to emarginate, crowded, grey, less often sordid whitish; stem 30-80 x 5-15 mm, cylindrical, sometimes with widened base, pale greyish brown with darker base; smell faint. Sp ellipsoid, verrucose; cheilo- and pleurocystidia 50-80 x 7-15 μm , fusiform or lageniform, slightly thick-walled, often with crystals at apex. Late autumn; occasional in temp.; DK (LC). – C&D 451, FeA 2000:139, Svp 57:27.
M. cinereifolia (Bon) Bon
- Cap blackish brown; sp 6-7.5 x 4-5 μm ; at grassy roadsides, etc. Cap 30-70 mm, low convex to expanded or depressed, hygrophanous, smooth; gills crowded, brownish beige; stem 35-50 x 4-8 mm, cylindrical, yellowish buff to dark brown; smell indistinct. Sp ellipsoid, verrucose; cheilo- and pleurocystidia 45-70 x 10-20 μm , fusiform, \pm thick-walled, often with crystals at apex. Autumn; very rare or overlooked in temp.; DK (DD, EJyl: Als Odde). – BSMF 64: pl.1.9, Svp 57:28.
M. atripes Boekhout (*M. nigripes* Métrod nom. nud.)
15. Frb connate. Cap 50-100 mm, low convex to expanded or depressed with a low umbo, smooth, hygrophanous, dark greyish brown to olivaceous brown; gills emarginate to adnate, crowded, white to pale cream; stem 45-80 x 7-20 mm, cylindrical to clavate, pale greyish buff to greyish brown; smell insignificant. Sp 7-8 x 4-5 μm , ellipsoid, verrucose; cheilo- and pleurocystidia 50-70 x 10-14 μm , fusiform to lanceolate, slightly thick-walled, often with crystals at apex. In coniferous forests, on wood chips; autumn; rare in hemib.-bore., poorly known; FI (DD). – Bres 128 (as *Tricholoma humile* f. *robustum*), FND 25:66.
M. turrita (Fr.) Singer (*M. robusta* (Bres.) Fontenla, Gottardi & Para)
- Frb solitary 16
16. Cap strongly pruinose from erect terminal elements in pileipellis. Cap 30-80 mm, low convex to expanded or slightly depressed with a low umbo, grey to greyish brown; gills emarginate, crowded, white to cream; stem 60-80 x 5-8 mm, cylindrical to clavate, fibrillose, whitish; smell slightly unpleasant. Sp 6.5-10 x 5-6 μm , ellipsoid, verrucose; cheilo- and pleurocystidia 50-60 x 10 μm , often with crystals at apex. In open places in forests; autumn; LT. – C&D 450, Däh 303, FDN 25:65.
M. subpulverulenta (Pers.) Métrod
- Cap smooth; terminal elements in pileipellis not erected 17

17. Cheilocystidia in majority lageniform (fig. 349F). Cap 25-50 mm, low convex to expanded or depressed with a low broad umbo, smooth, dark reddish brown to sepia; gills emarginate to short decurrent, crowded, white; stem 25-80 x 4-7 μm , cylindrical or widened at base, pale, soon turning dark greyish brown in lower part; flesh becoming dark brown; smell indistinct. Sp 7-9.5 x 4.5-5 μm , ellipsoid, verrucose; cheilo- and pleurocystidia 45-70 x 10-16 μm , slightly thick-walled, often with crystals at apex. In dry grassland and dunes, in open places in forests; autumn; rare in temp.-southern bore.; DK (LC), FI (DD), NO, SE (Sk). – Bol Bres 44(2):40,44, FeA 2000:137, FND 25:64, GBW 3:368, Svp 57:29.
M. friesii (Bres.) Bon (*M. albifolia* Boekhout, *M. leucophylla* Métrod nom. nud., *M. arcuata* (Bull.: Fr.) Singer s. auct.)
- Cheilocystidia in majority fusiform with a conical apex (fig. 349G). Cap 20-80 mm, low convex to expanded, often with a low umbo, smooth, slightly greasy, greyish brown to dark greyish brown, drying greyish; gills emarginate, crowded, white to pale cream; stem 30-100 x 3-10 mm, cylindrical or with a slightly widened base, fibrillose, whitish to greyish buff, becoming dark greyish brown from the base; smell indistinct. Sp 6.5-8.5 x 4-5 μm , ellipsoid, verrucose; cheilo- and pleurocystidia 40-70 x 8-14 μm , slightly thick-walled, often with crystals at apex. In grassland and grassy areas in forests; autumn; very common in temp., rare, but locally occasional in hemib.-suba.; DK (LC), FI (DD), NO (LC), SE (NE). – Däh 306, Phil 99g, R&H 314, Svp 57:29, Ves 210, ☉.
- M. polioleuca* (Fr.: Fr.) Kühner & Maire f. *polioleuca* (*M. oreina* (Fr.) Kühner & Maire, *M. melaleuca* (Pers.: Fr.) Murrill s. auct.)
 f. *pusilla* Boekhout & Kuyper differs in having a small cap, 17-35(-45) mm. DK, NO. – FAD 30A (as *Tricholoma humile* var. *fragillima*)
 f. *langei* Boekhout differs in having a stem being shorter than the cap diam. DK. – FAD 29D (as *Tricholoma brevipes*), FeA 2000:145, FND 25:64.

Melanomphalia M.P. Christ.

THOMAS LÆSSØE

One species in the Nordic countries; see description below.

Lit.: Christiansen 1936, Eyssartier & Boisselet 2004, Horak 1968, Ludvig 2001, Læssøe 1989, Montag 1996, Singer 1971, Watling 1989.

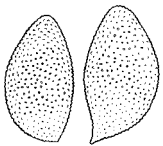
Frb omphalinoid, with black sp deposit. Cap 10-21 mm, plane with a depressed centre to funnel-shaped, with dark scaly centre and slightly striate margin, dark olive grey, drying paler. Gills decurrent, some forked, distant to medium spaced, $L = c. 20$, rather thick, whitish, greyish to finally blackish. Stem 22-30 × 1.5-2 mm, ± cylindrical to tapering towards base, with some veil-like fibres near the top, smooth, fibrillose, dry, olive brown, but soon black from the base upwards, base with attached substrate. Veil seemingly absent, but traces of threads at stem top and cap margin could indicate the presence of a fugacious veil. Flesh thin. Smell very faint. Taste indistinct, recalling *Russula flava*. Sp deposit brownish black or with a faint olive tinge.

Sp (7-)9-12(-15) × 5-7.5(-8) μm , amygdaloid to citriform-fusiform, punctate warty, less so basally (fig. 861E), without a germ pore, sooty brownish black. Basidia mostly 4-spored, 32-40 × 6-8 μm , clamped. Hymenial cystidia absent. Pileipellis ± a cutis with incrusting dark pigment. Stipitipellis with cystidioid end-cells. Clamps present.

Saprotrophic, in small groups on rich, disturbed soil, fx with *Aegopodium*, *Lepiota cristata* and species of *Cystolepiota* in cemeteries, back yards and city parks; late summer to autumn; very rare or overlooked in temp.; DK (DD), SE (VU). – BSMF 120:425, FAD 161A, Lud 48.1, Svp 19:33, 📍.

M. nigrescens M.P. Christ.

Note: the phylogenetic position of this fungus has been highly debated and controversial ranging from suggested positions near *Gomphidius*, over *Cortinariaceae* and *Crepidotaceae*. Recent DNA sequencing (Aime & al. 2005) would suggest a relationship with a white spored clade with *Lichenomphalina velutipes* and *O. ericetorum*, a truly remarkable result when considering the differences of these taxa in sp shape, colour, ornamentation and ecology.



Spores.

Melanophyllum Velen.

CHRISTIAN LANGE

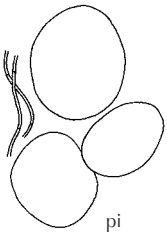
Frb lepiotoid with green or purple gills and pulverulent surface. Cap 15-40 mm, first conical to hemispherical, expanding to plane with a low umbo, covered with a granulose to pruinose layer, wearing off with age, exposing a smooth to fibrillose flesh. Veil often leaving a rim at cap edge. Gills free, medium spaced, reddish or greenish. Stem slender, 10-50 x 1-3 mm, pruinose, of cap colour, without ring, eventually with a granulose ring zone. Smell indistinct or slightly unpleasant. Taste indistinct. Sp deposit reddish or greenish when fresh, fading to brown.

Sp ellipsoid to oblong, smooth or finely verrucose, without iodine reactions, metachromatic. Cheilocystidia inconspicuous. Pleurocystidia absent. Pileipellis a layer of ± globose elements, 10-50 µm diam. Clamps present.

Saprotrophic; terrestrial in deciduous forests on rich soil.

Two species in the Nordic countries.

Lit.: Kelderman 1994, Vellinga in Noordeloos et al. 2001.



Spores and pileipellis elements: *Melanophyllum haematospermum*.

1. Cap brown to dark greyish brown, 15-30 mm, convex, later plane; gills red when fresh, turning dark brown to black. Cap when fresh covered with a greyish brown, pruinose layer; stem 20-50 x 2-3 mm, cylindrical, concolorous with cap. Sp 5-6.5 x 2.5-4 µm, ellipsoid, minutely verrucose (fig. 555C); pileipellis a layer of ± globose to pyriform elements, 10-55 µm in diam. Terrestrial in deciduous forests on rich soil, rarely also on compost heaps and in hothouses; autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (LC), NO (NT), SE (LC). – C&D 717, Nit 317, Phil 136b, R&H 410, Ves 281, ⊙.
M. haematospermum (Bull.: Fr.) Kresiel (*Lepiota h.* (Bull.: Fr.) QuéL., *M. echinatum* (Fr.: Fr.) Singer)
- Cap ochre, curry brown to whitish, 10-20(-30) mm, conical, later plane; gills green to blue green when fresh. Cap when fresh covered with an ochre to curry coloured, pruinose layer, quickly dissolving, exposing the whitish flesh; gills bluish green; stem 15-40 x 1-3 mm, cylindrical, whitish. Sp 4-5.5 x 2.5-3.5 µm, ellipsoid, minutely verrucose; pileipellis a layer of globose to spheropedunculate cells, 15-50 µm in diam. Terrestrial in deciduous forests on rich soil; autumn; very rare in temp.-hemib.; DK (EN), FI (CR, V: Halikko), NO (EN), SE (VU). – C&D 718, FAD 13B (as *Lepiota e.*), Nit 317 (old frb), Phil 137c, R&H 410, ⊙.
M. eyrei (Masse) Singer

Merismodes Earle

HENNING KNUDSEN

Cyphellopsis Donk, *Maireina* (Pilát) W.B. Cooke, *Phaeocyphellopsis* W.B. Cooke

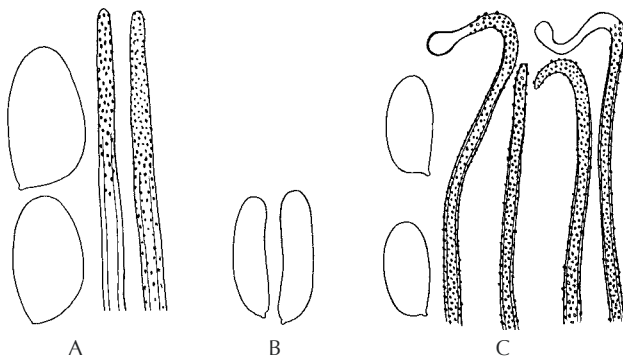
Frb cyphelloid with brown hairy outside. Frb 0.5-3 x 0.5-1 mm, cup-shaped, sessile or stipitate; outside covered with yellow brown to brown hairs, hymenium pale, whitish; gregarious to crowded in large numbers, forming patches from a few mm in diam. and up to several cm length, more rarely scattered. Subiculum absent or well developed. Smell and taste insignificant. Sp deposit whitish.

Sp ovoid, ellipsoid, cylindrical to allantoid, smooth, thin-walled, hyaline, without iodine reactions. Clamps present. Cystidia absent. Hairs up to 250 x 7 µm, thick-walled, incrustated above, smooth below, apex in some hairs smooth and inflated, and subsequently breaking off as a conidium, in others slightly attenuated, straight or curved like a crosier or s-shaped.

Saprotrophic on decorticated wood or bark of deciduous, rarely coniferous trees, or on stems of herbs and scrubs.

Four species are treated, but species limits are poorly understood and the genus is in strong need of a molecular treatment. Practically all authors have arrived at different results concerning the number of genera and species. Only *M. granulosa* is unambiguous, but there is also a general consensus among most authors (except Cooke) concerning *M. anomala*, but the rest is confusion. The most 'authoritative' treatment of the genus was by W.B. Cooke (1961). However, his monograph of these and other cyphelloid fungi should be used with much caution, being loaded with errors.

Lit.: Cooke 1961, Reid 1964.



Spores and marginal hairs: A: *Merismodes granulosa*, B: *M. confusa*, C: *M. anomala*.

1. On stems of herbs or thin scrubs, rarely on deciduous twigs; hairs very regular, 4.5-6.5 µm broad, smooth on the lower part, finely granulose on the upper part, rather stiff and straight, apex short attenuated, without formation of conidia (fig. 249A). Frb c. 1 mm broad and 0.5 mm high, sessile, low cup-shaped, greyish brown. Sp 7.5-9.5(-12) x 5-7(-8) µm, broadly ellipsoid to ellipsoid or slightly reniform; basidia up to 40 x 7.5 µm, 4-spored. Saprotrophic, occurring scattered one by one on last years dry stems of herbs, in the area found in dry places on *Tanacetum*, *Thalictrum*, *Orobanchae*, *Artemisiae*, *Lupinus*, *Rubus* and *Ullmus*, in literature reported from many similar hosts; the few records are from summer; rare in temp. or overlooked; DK (DD), FO.

M. granulosa (Fuckel) Knudsen, see p. 913 (*Solenia* g. Fuckel, *Phaeosolenia* g. (Fuckel) W.B. Cooke, *Cyphella leochroma* Bres., *C. gregaria* Sydow, *C. bresadolae* Grelet, *C. bresadolae* Grelet var. *gregaria* (Sydow) Pilát, *Merismodes b.* (Grelet) Singer)

- On wood or bark, rarely on stems of herbs and then hairs different

2. Sp allantoid, 7.5-11 x 2-3 μm , Q = 3.5-4 (fig. 249B). Otherwise similar to *M. anomala*. On twigs and branches of *Salix* and *Betula*; winter to summer; common in temp., known from southern bore; DK (LC), FI (DD, EH) – ☉.

M. confusa (Bres.) D.A. Reid (*Cyphellopsis c.* (Bres.) D.A. Reid)

Note: the American *M. fasciculata* (Schwein.) Donk has similar spores but frb like *M. stipitata*. They may be conspecific, and then *M. fasciculata* has priority.

- Sp ellipsoid to cylindrical, 8-10 x 3.5-5 μm , Q = c. 2-2.5 (fig. 249C) 3
3. Frb short stipitate; stem unbranched and shorter than cup is high, carrying only one cup; cup c. 0.5 mm in diam., subiculum present between frb and sometimes also outside the area with frb, but also sometimes almost missing. Sp 8-11 x 3.5-5 μm , ellipsoid to cylindrical, smooth, sp Q = c. 2-2.5 (fig. 249C); basidia up to 30 x 6 μm , 4-spored; hairs of different types, thick-walled, brown or hyaline towards apex, smooth on the lower part, the upper part finely granulose incrustated, usually stronger incrustated at the apex, straight, crossier-formed or s-shaped at apex, some hairs terminating with a \pm regular, balloon-shaped, lageniform or almost moniliform, hyaline or brown, thick-walled conidium. Saprotrophic, forming large mats or more loose, cm-large aggregations on decorticated wood or bark of deciduous trees, very rarely on *Abies* or on large herbs like *Epilobium angustifolium*, often occurring on or next to large, dead pyrenomycetes breaking through the bark; recorded most commonly from *Salix*, *Fagus* and *Betula*, more rarely from *Quercus*, *Alnus*, *Ulmus*, *Carpinus*, *Prunus*, *Populus*, *Fraxinus* and *Rosa*; all year round, but possibly more common in winter and spring; common in temp.-suba.; DK (LC), FI (LC), NO, SE. – B&K 2:224, Ves 126, ☉.
- M. anomala* (Pers.: Fr.) Singer (*Solenia a.* (Pers.: Fr.) Fuckel, *Cyphella a.* (Pers.: Fr.) Pat.)
- Frb distinctly stipitate; stem longer than cup, c. 1 mm high, 0.5 mm broad, each stem carrying one or more cups, cup margins often merged into a coherent mat, when dried the whole mat cracks up in polygonal fashion at least in the oldest and largest parts; subiculum present and often well developed; frb at first golden brown, but soon becoming whitish at the apex and darker brown below; hymenium whitish. Sp, basidia and hairs as for *M. anomala*. Saprotrophic on decorticated wood or bark on trunks, stumps, branches and twigs of deciduous trees and scrubs, mostly on *Salix*, but also on *Fagus*, *Alnus*, *Betula*, *Quercus*, *Crataegus* and *Pyrus*; all year round, but possibly more common in the winter and spring; distribution unknown, probably widespread and occasional.
- M. stipitatus* (Fuckel) Knudsen (*Peziza s.* Fuckel, *Solenia anomala* (Pers.: Fr.) var. *mali* Pilát, *Solenia connivens* P. Karst.)
- Note: this taxon is morphologically distinct when typical, but intermediates exist towards *M. anomala*, and it should possibly rather be treated like a variety (var. *mali*).

Mycaureola Maire & Chemin

HENNING KNUDSEN

Monotypic genus; see description below.

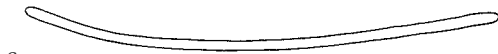
Lit.: Binder et al. 2006, Maire & Chemin 1922, Porter & Farnham 1986.

Frb cyphelloid, marine. Frb 0.3-0.5 mm, almost spherical with small opening at the top.

Sp 105-118 x 2.5-3 μm , cylindrical, needle-shaped, slightly curved, smooth, without sterigmata (fig. 257E). Basidia cylindrical to subclavate, 1-4-spored, c. 50 x 3.5-5 μm . Cystidia absent. Clamps absent.

Parasitic on the red alga *Dilsea carnosa*, causing pale olivaceous brown to yellow-brown spots and later holes in the alga, with frb occurring along the margin; marine and found in the sea and washed ashore; DK (LC). – AmJBot 93:549.

M. dilseae Maire & Chemin



Spore.

Mycena (Pers.) Roussel

ERNEST E. EMMETT, ARNE ARONSEN,
THOMAS LÆSSØE & STEEN A. ELBORNE

Incl. *Prunulus* Gray

Frb mycenoid, very small to medium sized, often delicate, but some species robust and rather long lived; species with large frb may become spotted with red during late stages of fruiting. Cap paraboloid, bell-shaped, convex to plane, sometimes umbonate or papillate, mostly distinctly striate and sometimes sulcate, glabrous, pruinose or rarely hairy, dry to slimy, multicoloured, but often in dull grey brown shades, some yellow, red, blue, purple or black. Gills almost free or pseudo-collarioid to deeply decurrent, distant to crowded, but mostly medium spaced, sometimes with strong interveining, variously coloured but often pale, some with contrasting edge colour. Stem typically cylindrical and rather thin, fragile to very tough, smooth, pruinose, floccose to hairy, base often with strigose hairs but may be smooth and inserted or with distinct downy disc. Smell often diagnostic, iodoform, radish and nitrous smells are common, when not mentioned the smell is indistinct. Taste insignificant, mealy or bitter. Sp deposit white.

Sp globose to cylindrical, often dacryoid, smooth, hyaline, thin-walled, amyloid, more rarely without iodine reactions. Basidia 2-4-spored, ± clavate, when not mentioned the basidia are 4-spored. Cheilo- and often pleurocystidia present and diagnostic or very rarely absent, either smooth or with variously shaped short and regular to highly irregular and long diverticulae over entire length or on top or only in median part. Pileocystidia or terminal elements of pileipellis elements also diagnostic and often with diverticulae, which may be so numerous as to appear coralloid. Caulocystidia or terminal elements of stipitipellis hyphae likewise important. Gill trama mostly dextrinoid (vinaceous) but not reacting in some groups, and this typically coinciding with non-amyloidity of spores. Clamps present or absent, when not mentioned clamps are present.

Saprotrophic, outside the area also parasitic; on litter of all kinds, fern rhizomes, herbs, all kinds of dead wood, decaying fruits, etc., also on humose soil, including burnt turf.

99 species in the Nordic countries, 104 species in the key. *M. alphithophora* is not included since it only occurs in indoor environments in the Nordic countries. At least *M. rosea* is known to be poisonous, but other members of sect. *Calodontes* are equally suspect. Species of *Mycena* are often attacked by the zygomycetous parasite *Spinellus fusiger*. For further information and a wealth of pictures see the *Mycena* page by Arne Aronsen (home.online.no/~araronsen/mycenapage/mycenapage.html).

Lit.: Aronsen 1986a, 1986b, 1988a, 1988b, 1993, 1994a, 1994b, 1996, Aronsen & Gulden 2007, Aronsen & Maas Geesteranus 1989, 1990, 1992, 1997, Bendiksen & Halvorsen 1984, Gminder & Krieglsteiner in Krieglsteiner 2001, Gulden & Jenssen 1982, Hintikka 1963, Krieglsteiner & Schwöbel 1982, Kühner 1938, Maas Geesteranus 1992, 1995, Miersch 1991, Miersch & Rönsch 2003, Moreau 2003, Rexer 1994, Robich 2003, Ronikier & Aronsen 2007.

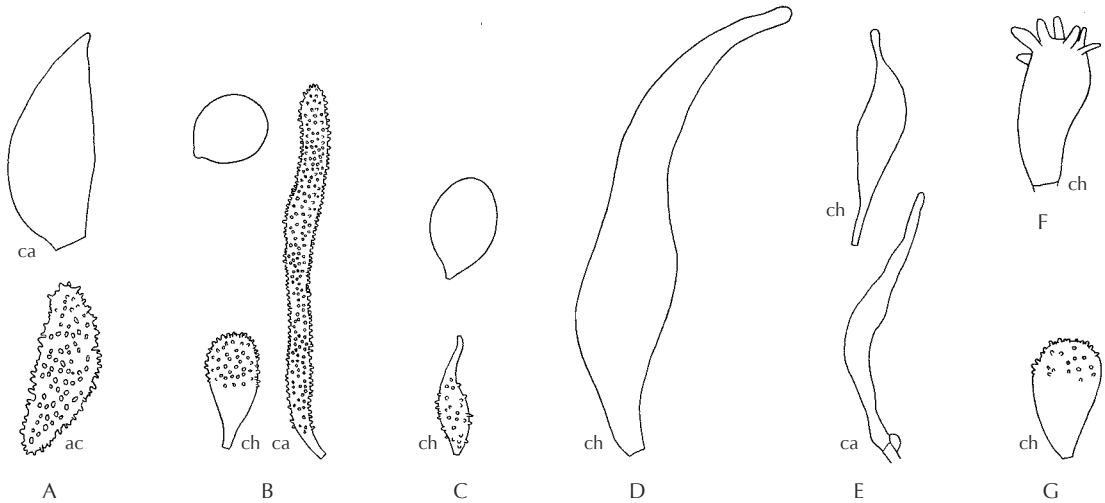
Main key

1. Cap with the appearance of being dusted with icing sugar, or with a glistening, textured surface Key A p. 354
 - Cap either smooth or pruinose, but not as if dusted 2
2. Gill edge darker or of contrasting colour to the gills Key B p. 355
 - Gill edge without contrasting colour 3
3. Frb yielding cloudy, white or coloured liquid from broken tissue, especially the stem base Key C p. 360
 - Frb not yielding such liquid but may produce a water-like liquid 4
4. Frb attached to substrate by a basal disc Key D p. 362
 - Frb without a basal disc 5
5. Cap with a separable pellicle, the surface layer of the cap can be peeled off as a gelatinous layer Key E p. 363
 - Cap with no separable pellicle 6

6. Stem glutinous or slimy; gills decurrent Key F p. 365
 - Stem dry or slightly sticky; gills adnexed to decurrent 7
7. Gills clearly decurrent Key G p. 365
 - Gills not clearly decurrent 8
8. Frb with bright colours such as blue, green, red or yellow Key H p. 368
 - Frb white, grey, brown or in black shades 9
9. Cap white, < 5 mm broad Key I p. 372
 - Cap at least coloured at centre *or* > 5 mm broad 10
10. On all kinds of substrates except wood Key J p. 373
 - On all kinds of woody substrates including bark of living trees and roots Key K p. 379

Key A: Cap with the appearance of being dusted with icing sugar, or with a textured glistening surface.

1. Frb sticky; with capitate cheilo-, caulo- and pileocystidia see *Resinomycena saccharifera* p. 389
 - Frb not sticky; without capitate cystidia 2
2. On knopper galls from *Quercus robur* acorn cups; gill trama without iodine reactions; sp amyloid. Cap 3-10 mm, at first ovoid and greyish, then expanding to bell-shaped and then almost flat, white with brownish centre, minutely pruinose especially away from centre; gills narrowly adnate or free, sometimes forming a pseudocollarium, ventricose, L = 20-30, white; stem 12-22 x 0.5-0.75 mm, entirely pruinose, white or brownish, at base attached by disc-like, thin pad of fine hairs. Sp 5-8.5 x 3-4.5 μm , Qav = 1.7-1.9, ellipsoid, amyloid; cheilo- and pleurocystidia absent; caulocystidia 30-70 x 10-22 μm , mostly conical to broadly conical, with acute, sometimes rostrate apex (fig. 355A); pileipellis a cutis of cylindrical slightly inflated diverticulate elements, with terminal acanthocysts, diverticulae 2 x 1 μm , forming a uniform surface feature. Summer to autumn; absent or overlooked in area; *NL, UK*. – Pers 17:513.
M. cecidiophila A.P. Berg, Berg-Blok, Noordel. & Uljé
 - Frb on other substrates *or* gill trama dextrinoid and sp amyloid 3
3. Without basal disc; sp subglobose (fig. 355B). Cap 2-5 mm, hemispherical to bell-shaped, \pm pulverulent, white; gills adnate with a decurrent tooth, ascending, ventricose to horizontal, L = 8-16, white; stem 5-18 x 0.1-1 mm, hyaline, densely covered with white hairs forming parallel lines, especially at the top. Sp 6-8.5 x 5.5-8.5 μm , Qav = 1.1-1.2, amyloid; basidia 2- and 4-spored; cheilocystidia 18-40 x 5-20 μm , clavate, densely covered with 1-2 μm long diverticulae; caulocystidia abundant and similarly ornamented, 34-68 x 17-30 μm , from clavate to long cylindrical types, these especially at the base of the stem, up to 250 x 10 μm , some with up to 5 μm long diverticulae; clamps sometimes abundant, often absent. Singly or in swarms on mossy trunks or decaying wood of many species of broadleaved trees, not least *Salix* and *Alnus*; autumn to early winter; *DE, UK*. – B&K 3:325, Cou 112, GBW 3:465, M&J 28, Rob 637.
M. corynephora Maas Geest.
 - With small basal disc; sp ellipsoid 4
4. Frb white; many cheilocystidia with a long, narrow, pointed rostrum (fig. 355C). Cap 1-5 mm, hemispherical to bell-shaped, pure white to grey brown at centre when very old; gills narrowly adnate, then forming a pseudocollarium, ventricose ascending, L = 7-12, white to greyish with a white edge; stem 5-20 x 0.1-0.5 mm, white to pale grey, hirsute especially towards the 0.2-0.7 mm wide, hirsute disc. Sp 7-11 x 4-6 μm , Qav = 1.3-1.8, dacryoid, amyloid; basidia 2-spored, rarely 4-spored; cheilocystidia 13-36 μm long, variable, with small diverticulae, lageniform, many with a smooth, long and narrow rostrum; caulocystidia scattered, clustered towards the base, smooth to slightly verrucose, tapering, 20-110 x 4-15 μm ; clamps mostly present and abundant. On plant debris of broadleaved trees, including *Corylus*, *Craetaegus* and *Fagus* fruits, sometimes on mossy trunks and on coarse herbs; early summer to early winter, all year in the south; very common in temp., occasional in hemib., rare in bore.;



Spores, caulocystidia, cheilocystidia and acanthocystidia: A: *Mycena cecidiophila*, B: *M. corynephora*, C: *M. adscendens*, D: *M. haematopus*, E: *M. sanguinolenta*, F: *M. chlorantha*, G: *M. flavescens*.

DK (LC), FI (DD), FO, NO (LC), SE (LC). – B&K 3:314, FAD 57C, M&J 40, Rob 633, Svp 52:9, Ⓞ.
M. adscendens (Lasch) Maas Geest. (*M. tenerrima* (Berk.) Sacc.)

Note: An attempt to separate a 4-spored taxon with non-rostrate cheilocystidia occurring on *Corylus* husks (as *M. nucicola* Huijsman) is considered problematic and we currently exclude this taxon from our treatment.

- Frb initially pale blue, then white; cheilocystidia lacking rostrum. Cap 0.5-2 mm, bell-shaped, convex, sulcate, minutely granulose, viscid; gills narrowly adnate, ascending, L ≤ 8, white; stem 5-20(-30) × 0.1 mm, viscid, almost glabrous, arising from a small white disc. Sp 6.5-10 × 3.7-5 μm, Q = 1.3-1.8, dacryoid, amyloid; basidia 4-spored; cheilocystidia 12.5-18 × 5.5-7 μm, occurring mixed with basidia, clavate, covered with from few to many short straight diverticulae; caulocystidia inconspicuous, lageniform, 25-100 × 7-17 μm, thin-walled, smooth; pileipellis hyphae end cells clavate to globose with very small and crowded cylindrical diverticulae; clamps absent or present. On decaying conifer needles in rich forests or mesic heaths; summer to autumn; very rare in hemib. or overlooked; FI (DD).
M. occulta Harmaja

Key B: Gill edge darker or of contrasting colour to the gills

1. With coloured fluid, especially from damaged stem base 2
 - Without coloured fluid 3
2. Frb strongly pruinose, robust. Cap 10-30 mm, hemispherical to bell-shaped, often with crenate margin, pinkish brown to purplish date, hygrophorous, drying to clay pink; gills broadly adnate to subdecurrent, ventricose, L = 15-26, pinkish white to pale vinaceous, edge usually with some reddish brown colour, at least towards the cap margin, sometimes concolorous with the gill; stem 30-100 × 2-4 mm, hollow, fragile, concolorous with the cap or darker towards the base, yielding dark red fluid when damaged. Sp 7-11 × 4-7 μm, Q_{av} = 1.5-2.5, dacryoid, amyloid; cheilocystidia smooth, acuminate, sometimes forked (fig. 355D); caulocystidia clustered, clavate with irregular, often diverticulate shapes. Typically on the wood of broadleaved trees; summer to autumn; very common in temp., common in hemib.bore., occasional in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:340, GBW 3:439, M&J 11, Rob 459, Ves 235, Ⓞ.
M. haematopus (Pers.: Fr.) P. Kumm.

Note: forms with and without coloured gill edge are sometimes recognised.

- Frb hardly pruinose, delicate. Cap 5-15 mm, paraboloid to hemispherical, glabrous, distinctly striate or sulcate, colour variable, pale buff with reddish buff to coral lines over gills to dark red brown, often with a purple tint, at margin often coloured like gill edge; gills adnate

to subdecurrent, ventricose, L = 13-21, often white with a dark red-brown edge extending along the whole gill; stem 20-100 x 0.5-1.5 mm, fawn to vinaceous buff, clay pink to dark red brown, sometimes densely spotted with red dots at the top, may be shiny, at base attached by fine hyphae, usually yielding a brownish red fluid when damaged. Sp 7-10 x 4.5-6 μm , Qav = c. 1.5, dacryoid, amyloid; cheilocystidia sharply acuminate (fig. 355E), useful for collections with no fluid; caulocystidia variable, but usually narrow tipped. On humus and litter of coniferous trees, often in deep moss, but also occurs with *Betula*, *Fagus* and *Quercus* in oligotrophic environments; early summer to late autumn; common in temp.-bore.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:322 (as *capillaripes*), 364, FAD 50A, GBW 3:440, Rob 463, 465, Ves 234, ☉.

M. sanguinolenta (Alb. & Schwein.: Fr.) P. Kumm.

- | | | |
|----|---|------------------------------------|
| 3. | Gill edge yellow, green or brown | 4 |
| - | Gill edge orange, pink or red to purple | 9 |
| 4. | Gill edge some shade of brown or green | 5 |
| - | Gill edge lemon yellow, pale yellow, golden yellow to olivaceous buff, if with olive tones then cheilocystidia clavate with diverticulae | 7 |
| 5. | Cap cylindrical with only margin slightly flaring, umbilicate; gill edge brownish | |
| | | see <i>M. picta</i> key K 17 |
| - | Cap opens up at maturity, not umbilicate; gill edge brown or greenish | 6 |
| 6. | On soil in short grass | see <i>M. olivaceomarginata</i> 19 |
| - | On fallen conifer trees, stumps or buried wood. Cap 6-40 mm, bell-shaped to obtusely conical, plicate, hygrophanous, yellowish brown to grey brown, hazel or sepia, often darkest at the centre, sometimes with olivaceous tones; gills adnate, ventricose, L = 13-27, white to greyish, with brown or olive-green edge, sometimes concolorous with the gill; stem 20-100 x 1-3.5 mm, yellowish brown to olivaceous brown; smell usually nitrous. Sp 8-10 x 6-8 μm , Qav = 1.2-1.5, subglobose to dacryoid, amyloid; cheilocystidia lageniform or fusiform, with obtuse or forked ends; caulocystidia similar to cheilocystidia in fig. 359D. Early summer to autumn; occasional in hemib.-bore., locally common in eastern parts; FI (LC), NO (LC), SE (LC). – ČM 8(4), B&K 3:370, GBW 3:424, R&H 356, Rob 335. | |

M. viridimarginata P. Karst.

- | | | |
|----|--|---|
| 7. | On grass in sand dunes, especially <i>Ammophila arenaria</i> , more rarely other grasses; smell of iodoform on drying. Cap 6-25 mm, convex to hemispherical or bell-shaped, hygrophanous, translucently striate when wet, olivaceous green or olivaceous brown at the centre, paling to pale yellow at the margin; gills narrowly adnate with short decurrent tooth, ventricose, L = 18-30, grey with yellow or olivaceous tone, with paler or pale yellow to olivaceous buff edge; stem up to 50 x 1-2 mm, minutely pruinose at first, becoming shiny, but tomentose at the base, smoke grey to greyish brown with olivaceous tinge, paler near the top. Sp (8)-9-11.5 x 5-6.5(-7), Qav = 1.5-1.6, dacryoid, amyloid; cheilocystidia include some similar to fig. 355G, but with a longer pedicel, others have longer diverticulae (fig. 355F), with some heads branched. Autumn, but mostly late autumn to early winter; common in temp., very rare in hemib.; DK (LC), NO (NT), SE (LC). – C&D 559, Cou 127, OPN 9C, SMT 29(2):24, Svp 19:9, ☉. | |
| | <i>M. chlorantha</i> (Fr.: Fr.) P. Kumm. | |
| - | In other habitats; smell not of iodoform on drying | 8 |
| 8. | Cheilocystidia smooth and narrow tipped; smell if any nitrous or of swimming pool. Cap 5-25 mm, bell-shaped to paraboloid, pale yellowish grey, sometimes more yellow at disc to darker olivaceous with olivaceous buff towards the margin; gills adnate with a decurrent tooth and ventricose, L = 13-22, whitish or grey, perhaps with a yellow tinge, with a lemon-coloured to pale golden yellow edge; stem 30-80 x 1-3 mm, glabrous except near the top, pale buff to olivaceous buff. Sp 7-12 x 4-6 μm , Qav = 1.4-1.8, ellipsoid, amyloid; cheilocystidia similar to fig. 359I. On plant debris and humus, among grasses and mosses in meadows | |

and forests; summer to autumn; very common in arc./alp., common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – AAF 2:37, Bor 58, FAD 50F, Rob 247.

M. citrinomarginata Gillet

- Cheilocystidia very evenly ornate, balloon-shaped with a short pedicel (fig. 355G); smell of earth, potato or radish, especially when crushed. Cap 5-17 mm, conical, bell-shaped to paraboloid, vinaceous buff to dark buff or sepia, darker at the disc; gills adnate and ventricose, L = 14-22, white, tinted yellow or grey, often with pale yellow to lemon-coloured edge; stem 15-70 x 0.5-2 mm, often joined in clusters, shiny, vinaceous buff to snuff brown, paler above to almost white. Sp 8-12 x 4.5-6 μm , Qav = 1.7-2.0, ellipsoid to subcylindrical, amyloid; pleurocystidia similar to cheilocystidia; pileipellis and stipe surface hyphae ornamented with short diverticulae. On forest litter, often decaying *Fagus* leaves or cupules, or in grassland, in FI found in *Corylus* dominated forests on rich ground; late summer to late autumn; very common in temp., occasional in hemib., but rare in FI; DK (LC), FI (DD, V: Houtskari, Iniö), NO (LC), SE (LC). – B&K 3:335 (old), C&D 554, FAD 54E (as *luteoalba* var. *sulphureo-marginata*), M&J 29, Rob 167.

M. flavescens Velen.

- | | | |
|----|--|----|
| 9. | Gill edge orange | 10 |
| - | Gill edge pink, red, violaceous purple or purplish black | 11 |

10. Frb \pm uniformly orange; cap 1-8 mm; sp without iodine reactions. Cap bell-shaped, bright yellow to orange, often with a papilla which may be darker orange; gills arcuate and decurrent, L = 7-16, pale orange with bright orange edge; stem 6-40 x 0.2-0.7 mm, pruinose, orange with a darker orange pruina at the top. Sp 6.5-8.5 x 3-4.5 μm , Qav = c. 2.4, dacryoid; basidia 2-spored; cheilocystidia clavate or ventricose, sometimes bluntly forked; caulocystidia simple. On conifer litter including small twigs, usually in herb and fern rich *Picea* forests close to watercourses; summer to autumn; rare, but locally occasional in hemib.-bore.; FI (NT), NO (NT), SE (VU). – Jordst 5(1): cover, M&J 4, Rob 533,

M. oregonensis A.H. Sm.

- Frb in various shades of brown and orange; cap 8-22 mm; sp amyloid. Cap obtusely conical to convex, slightly sulcate and hygrophanous, dark clay buff to grey or olivaceous brown, often with a yellow to rich golden margin; gills adnate, may have decurrent tooth, ventricose, L = 16-25, pale greyish yellow to beige with a distinctly orange edge; stem 35-80 x 1-2 mm, grey brown to orange with orange coarse and fine fibrils at the base attached to the substrate. Sp 7-10.5 x 4-7 μm , Qav = 1.5-2.1, cylindrical; cheilocystidia variable, but many evenly ornate (fig. 359A); caulocystidia cylindrical or clavate, often diverticulate. On litter in eutrophic coniferous forests; summer to late autumn; common in hemib.-bore, occasional in temp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:320, FAD 54G (as *elegans*), GBW 3:441, M&J 6, Rob 473,

M. aurantiomarginata (Fr.: Fr.) Quél.s

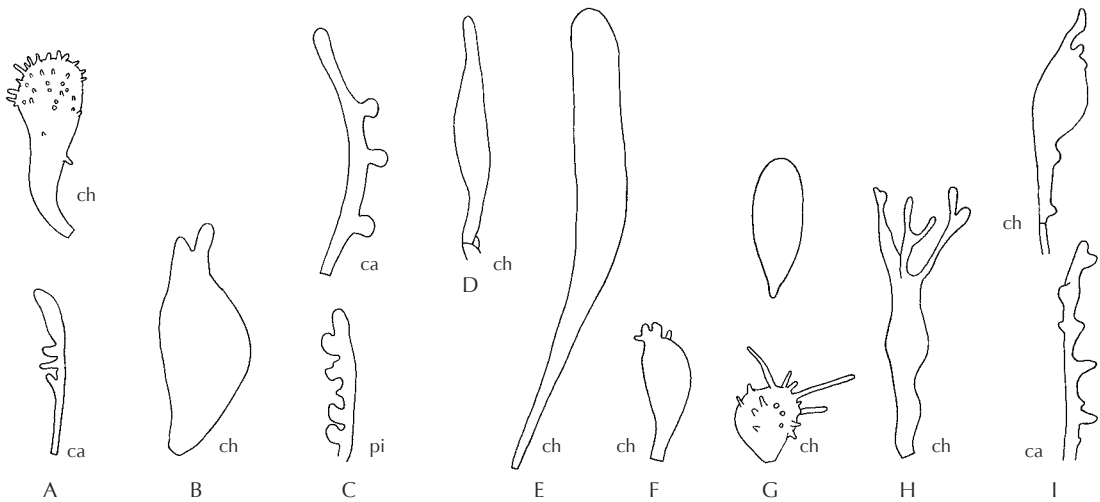
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|-----|---|----|
| 11. | On wood, including stumps, small fallen branches and living trees | 12 |
| - | On leaf litter, among grass or ferns | 14 |

12. Cap, stem and gill edge violaceous purple. Cap 5-35 mm, paraboloid to hemispherical, brown vinaceous purple, fading to sepia or hazel, hygrophanous; gills narrowly adnate, ventricose, L = 15-26, greyish with dark violet edge; stem 10-100 x 1-3(-5) mm, quite tough, silvery lilac pink to purplish chestnut. Sp 9.5-10.5 x 6-7 μm , Qav = 1.4-1.6, ellipsoid, amyloid; cheilocystidia variably shaped, utriform, clavate and often quite broad distally (fig. 359B); pleurocystidia absent; pileipellis of densely diverticulate hyphae; stem surface hyphae smooth to sparsely diverticulate, caulocystidia simple diverticulate sometimes broadened at the end. Frb solitary to caespitose on bark of living conifers, decorticated fallen conifer trunks or large boughs, or in soil close to living conifers; autumn; occasional in hemib.-bore., rare in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 566 (too brown), ČM

8(4), M&H 3:110, R&H 357, Rob 607.

M. purpureofusca (Peck) Sacc.

- Cap, stem and gill edge pinkish to reddish brown or stem with yellow shades 13
- 13. Stem uniformly yellow. Cap 10-40 mm, bell-shaped to hemispherical, ochraceous brown to dark clay pink, paler towards the edge; gills adnate, ventricose, L = 18-22, white, becoming salmon to pink or yellowish, edge yellow to red, sometimes only over the outer part; stem 15-50 x 1-4 mm, yellow to pale orange buff. Sp 8-10 x 5.5-7 μm , Qav = 1.4-1.5, ellipsoid, amyloid; cheilocystidia lageniform, broadened ventrally; caulocystidia often with branches with rounded tips (fig. 359C); pileipellis hyphae with inflated diverticulae. Caespitose on dead wood of broadleaved trees, e.g. *Fagus*, *Ulmus* and *Corylus*; early summer to autumn; common in south eastern DK, rare, but locally occasional further north and west in temp.-bore., in FI rare in hemib.; DK (LC), FI (VU, V: Houtskari and Tammissaari), NO (LC), SE (LC). – B&K 3:359, GBW 3:461, M&J 19, Rob 611, Ves 236.
M. renati Quél.
- Stem lacking yellow colour. Cap 5-25(-30) mm, paraboloid to hemispherical, translucently striate, buff to brownish pink, usually darker at the centre, greyish red; gills adnate with a decurrent tooth, ventricose, L = (12-)14-20(-22), white to pale grey, edge red; stem 10-50 x 1-2 mm, concolorous with cap, but paler at the top, shiny smooth. Sp 8-12 x 5-8 μm , Qav = 1.4-1.6, ellipsoid, amyloid; cheilocystidia lageniform with narrower tips which are sometimes forked (fig. 359D); stem surface hyphae smooth with sparse diverticulae. Solitary or in groups on fallen woody conifer litter, but also on deciduous wood, e.g. *Betula*, sometimes low down on the bark of living trees, rarely on broadleaved trees; late summer to late autumn; common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:363, GBW 3:463, M&J 39, Rob 615, Ves 238, ☉.
M. rubromarginata (Fr.: Fr.) P. Kumm.
- 14. Gill edge purplish black; on leaf litter of broadleaved trees, rarely on conifer litter; smell strong, of radish. Cap 15-55 mm, convex, hygrophanous, pale vinaceous buff to dark brown or purplish brown, often with a darker edge; gills emarginate, ventricose to sinuate, L \geq 28, violaceous grey to grey brown, coloured cystidia visible on the face as many dark dots, edge crenulate, dark violet black; stem 30-70 x 2-8 mm, broader below than above, silky pale fawn with darker longitudinal fibrils. Sp 6.5-8.5 x 3.5-4.5 μm , Qav = 1.6-2, ellipsoid, amyloid; cheilo- and pleurocystidia narrowly lageniform, up to 100 μm long, (fig. 359E) with purple brown contents; pileipellis and stem surface hyphae smooth, caulocystidia simple curved hairs. On litter of *Fagaceae* on rich soils, also with *Alnus* in northern part of distribution area, rarely in mountain *Betula* forests or on conifer litter; late summer to autumn; common in temp.-hemib., occasional. in bore.; DK (LC), FI (EN, U: Helsinki), NO (VU), SE (LC). – B&K 3:352, GBW 3:397, M&J 31b, Ves 232, ☉.
M. pelianthina (Fr.: Fr.) Quél. (*Prunulus p.* (Fr.: Fr.) Jacq. Johnson, Vilgalys & Redhead)
Note: forms from FI occurring north to PS with *Alnus* and *Picea*, with sp > 4 μm wide and pleurocystidia protruding further from the hymenium than in the typical *M. pelianthina*, have been described as *M. lammiensis* Harmaja (*Prunulus l.* (Harmaja) Harmaja). This difference is not easily demonstrated since the difference in sp size is so small. Collections from southern *Fagus* forests sometimes have sp > 4 μm wide. It may be simply within the intraspecific variation of *M. pelianthina*; this should soon be resolved using molecular methods.
- Gill edge red or reddish; on conifer or fern litter or among grass; smell nitrous, indistinct or only faintly of radish or slightly mealy 15
- 15. On conifer litter 16
- On decaying ferns or among grass 18
- 16. Frb reddish grey brown; smell nitrous or like swimming pool; cheilocystidia with rounded or narrow tips. Cap 5-30 mm, paraboloid to hemispherical, pale drab to grey vinaceous, usually with a darker disc; gills adnate with a decurrent tooth, ventricose, L = 10-20, greyish



Spores, cheilocystidia, caulocystidia and pileipellis elements: A: *M. aurantiomarginata*, B: *M. purpureofusca*, C: *M. renati*, D: *M. rubromarginata*, E: *M. pelianthina*, F: *M. rosella*, G: *M. pterigena*, H: *M. albidolilacea*, I: *M. olivaceomarginata*.

white with a brownish red edge to part or all of the gill, sides with similarly coloured dots visible with a hand lens or under dissecting microscope; stem 20-90 x 1-2 mm, vinaceous buff to grey. Sp 9-11 x 5-6 μm , Qav = 1.7-2, ellipsoid, amyloid; cheilo- and pleurocystidia lageniform, the narrow ends with rounded tips, with red brown contents. Typically on leaf litter from *Pinus*, but also of *Picea*; late summer to autumn; common in temp., occasional in hemib.-bore.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – C&D 562, Cou 116, M&J 27, Rob 597, SMT 29(2):18.

***M. capillaripes* Peck**

- Frb more highly coloured; smell not nitrous; cheilocystidia with needle-like tips or clavate and diverticulate 17
17. Gills pale pink with a red edge; cheilocystidia clavate and often diverticulate (fig. 359F); pleurocystidia coloured, visible on the gill faces with a lens. Cap 5-15 mm, paraboloid to hemispherical, slightly glutinous when wet, peach, deep salmon to coral red with darker coral lines when moist, may be hazel to blood red at the disc, paling with age; gills adnate, ventricose becoming plane, L = 15-20; stem 20-50 x 0.5-2 mm, pale pink to cinnamon. Sp (6-)7-9(-10) x 4-5.5 μm , Qav = (1.5-)1.7-1.8, dacryoid, amyloid. Typically on leaf litter in herb rich, moist *Picea* forests or plantations, but also in poor, *Vaccinium-Picea* forests, often under *Pinus*, also on cones, small twigs, etc.; autumn; common in hemib.-bore., rare in temp. (DK); DK (DD), FI (LC), NO (LC), SE (LC). – B&K 3:362, FAD 54F, GBW 3:443, M&J 5b, Rob 481.

***M. rosella* (Fr.: Fr.) P. Kumm.**

- Gills white with dark red-brown edge; cheilocystidia with needle-like tips; coloured pleurocystidia absent (check for coloured fluid from damaged stem) see *M. sanguinolenta* 2
18. Cap narrowly paraboloid, up to 5 mm; on decaying fern fronds. Cap pale salmon to pale pink, at margin sometimes darker pink; gills arcuate or with plane edge, broadly adnate with a decurrent tooth, L = 4-10, white to pale salmon, with entirely pink edge; stem 5-40 x 0.1-0.3 mm, pale salmon to apricot, often more strongly coloured towards the base. Sp 8-11.5 x 4-5 μm , Qav = 2-2.2, ellipsoid to subcylindrical (fig. 359G), amyloid; cheilocystidia spheropedunculate and diverticulate, very variable in size and with some diverticulae extending

well beyond the others; hyphae of the surface layer of the cap and stem with many short, even diverticulae. In moist forests or *Salix* and *Alnus* carrs with a rich fern flora; autumn to early winter; common in temp.-bore., very rare in arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:357, C&D 561 (pale form), FAD 54H, GBW 3:457, R&H 355, ☉.

M. pterigena (Fr.: Fr.) P. Kumm.

- Cap less paraboloid, > 5 mm; among grass 19
19. Cap very pale with ± lilaceous tinge. Cap 10-20 mm, convex, becoming almost plane, pinkish lilac or flesh-coloured to clay buff; gills adnate and ventricose, L = 11-17; vinaceous buff, with very pale pink to red edge; stem 12-25 x 0.5-1 mm, pink in upper third or golden yellow. Sp 8-12 x 5-8 μm, Qav = 1.6-2.2, dacryoid, amyloid; cheilocystidia clavate with one to several necks (fig. 359H); caulocystidia similar to fig. 359I. Among grass or herbaceous litter; DE, UK. – M&J 25, MMB 34(1):41, SZP 77(5):220.

M. albidolilacea Kühner & Maire

- Cap distinctly pigmented, from drab grey, sometimes with yellow or purplish tinges, through pale brown to violet brown, often with olivaceous tones. Cap 8-22 mm, conical to hemispherical; gills adnate and ventricose, L = 14-20, off white to grey, the edge from yellowish to brown, brownish red or greenish brown; stem 20-80 x 1-2 mm, pale straw to pale yellowish straw, pale vinaceous buff to pale olivaceous brown. Sp (8-)10-13(-14) x 5-7 μm, Qav = 1.7-2.0, ellipsoid, amyloid; cheilocystidia fusiform to lageniform, often branched (fig. 359I); caulocystidia diverticulate, sometimes branched. Among grass, mosses and lichens in meadows and other short grasslands, including dry grassland, dunes, parks, etc.; autumn to early winter; very common in temp., occasional, but locally common in hemib., rare, but locally occasional in bore.-arc./alp.; DK (LC), FI (DD), FO, IS, NO (LC, incl. Svb), SE (LC). – C&D 564, FAD 49B, Phil 85e, Rob 603, Ves 239 (rose form).

M. olivaceomarginata (Masse) Masee (*M. avenacea* (Fr.: Fr.) Qué. s. auct.)

Note: this is a highly variable species and the variability of the pigment has led to many forms being described; it has also been suggested (Arnolds 1982) that it is conspecific with *M. citrinomarginata*, which name would have precedence. Molecular studies are awaited to resolve these questions.

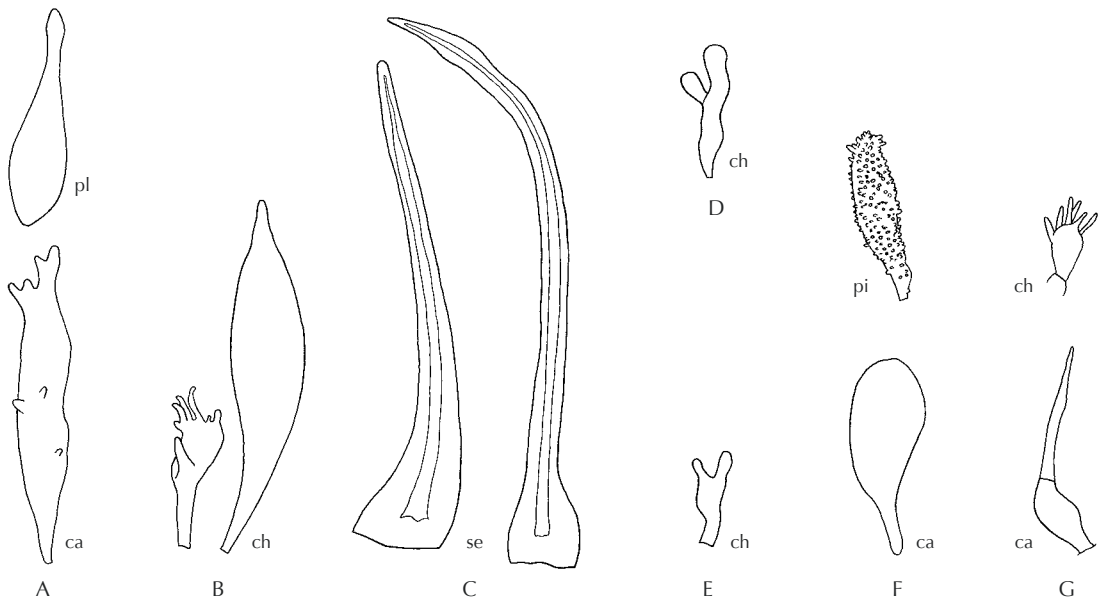
Key C: Frb yielding cloudy, white or coloured liquid from broken tissue, especially the stem base of fresh specimens; gill edge not coloured

1. Fluid milky white, not staining brown. Cap 10-20 mm, bell-shaped to paraboloid, grey brown, from pale clay buff to hazel with sepia disc and radial lines, sometimes white or very dark brown to black; gills ventricose, adnate with a decurrent tooth, L = 14-19(-20), white or off white; stem 50-80 x 0.5-1.5(-2) mm, slightly pubescent, concolorous with the cap, normally grey brown, darker below, white or blackish in some collections. Sp 9-13 (-14) x 5-7 μm, Qav = 1.5-2.0, ellipsoid to subcylindrical, amyloid; cheilo- and pleurocystidia 60-100 x 5-15 μm, lageniform with rounded ends, but often with a characteristic broader tip, slightly arrow shaped (fig. 361A); pleurocystidia very evident, protruding conspicuously from the gill face, visible with a lens on fresh material; caulocystidia variable, many like in fig. 359I, often longer, but some wider and variously diverticulate. On all kinds of forest litter, including burnt sites and also in more open habitats, not or rarely on decaying trunks, also among *Sphagnum*; early summer to early winter; very common in temp.-bore., also observed in arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:339 (poor), FAD 50E (dark form), 51G, GBW 3:437, Rob 443-444, 452 (white form), 455 (dark form), Ves 234, ☉.

M. galopus (Pers.: Fr.) P. Kumm.

Note: some authors treat the white and dark forms as varieties, viz. var. *candida* J.E. Lange and var. *leucogala* (Cooke) J.E. Lange, or even as species; this view is not accepted here (see Chard et al. 1983).

- Fluid orange, dark red to cloudy white, staining brown 2
2. Frb ± smooth; fluid cloudy, sparse, staining brown; typically on mossy trunks of living broadleaved trees, including *Quercus* and *Fagus*. Cap 5-20 mm, convex to hemispherical,



Pleurocystidia, caulocystidia, cheilocystidia, setose hairs and pileipellis elements: A: *Mycena galopus*, B: *M. erubescens*, C: *M. aciculata*, D: *M. stylobates*, E: *M. bulbosa*, F: *M. rhenana*, G: *M. clavularis*.

warm brown colours like date brown, sometimes with a darker cigar-brown umbo; gills narrowly adnate with a decurrent tooth, ventricose and rather thick, L = 11-17(-20), greyish white, staining orange red when damaged; stem 10-50 × 0.5-2 mm, smooth but minutely pubescent at the top, milky coffee to fulvous, usually paler at the top; taste bitter. Sp 7-11 × (4-)5-8 μm, Qav = 1.3-1.4, broadly ellipsoid, amyloid; basidia 2-spored; cheilocystidia of two types, one narrowly pointed, the other, which mostly occurs near the cap margin, very variable, often clavate with long narrow irregular fingers (fig. 361B); pleurocystidia like the narrowly pointed type. Autumn to early winter; common in temp., rare, but locally more frequent in hemib.-southern bore.; DK (LC), FI (LC), NO (NT), SE (LC). – B&K 3:333, C&D 594, FAD 50B, GBW 3:436, Rob 439.

M. erubescens Höhn. (*M. fellea* J.E. Lange)

- Frb pruinose; fluid dark blood red or orange; on fallen wood or stumps 3
- 3. Fluid orange; frb often stained orange; in deciduous woodland, especially on woody *Fagus* litter. Cap 5-25(-30) mm, convex to hemispherical, sometimes umbonate, rimose, grey olivaceous buff to brown, vinaceous and sepia; gills narrowly adnate and ventricose, L = 20-25 (-29), white to off white; stem 50-150 × 1-2 mm, umber, pale orange to deep apricot, tough, can be twisted beyond 90° without breaking. Sp 5-10(-11) × 5-7 μm, Qav = 1.6-1.8, ellipsoid to subcylindrical, amyloid; cheilocystidia similar to fig. 359A. Late summer to late autumn; very common in temp. and where *Fagus* occurs in hemib.; DK (LC), NO (LC), SE (LC). – B&K 3:326, GBW 3:434, FAD 55D, M&J 11, Ves 234, ☉.

M. crocata (Schrad.: Fr.) P. Kumm.

- Fluid deep blood red; frb often stained blood red; caespitose on fallen wood of broadleaved trees see *M. haematopus* key B 2

Key D: Frb small, attached to substrate by a basal disc

1. Cap with long projecting setose hairs, visible in profile, like deep bedded rose thorns (fig. 361C). Cap 3-7 mm, mouse grey to drab, with a separable pellicle; gills adnate or arcuate, sometimes to a pseudocollarium, ventricose, L = 12-16, grey with a pale edge; stem 10-30 x 0.1-0.5 mm, white to silky white; basal disc pubescent. Sp 7-10 x (3.5-)4-5(-6) μm , ellipsoid, without iodine reactions, Qav = 1.8-2.1; cheilocystidia clavate to inflated, often with an acuminate extension (like a small fig. 379A). On litter from both deciduous and coniferous trees, mostly in oligotrophic habitats, but also in more rich sites; late summer to autumn; rare, but locally occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – M&J 23 (as *longisetata*), Rob 69 (as *longisetata*), ☉.
M. aciculata (A.H. Sm.) Desjardin & E. Horak (*M. longisetata* Höhn. s. auct. Eur.)
 - Cap without setose hairs, but may have short hyphal pegs 2
2. Cap with \pm distinct hyphal pegs (small spines) especially at centre, visible when viewed in profile. Cap 4-10 mm, with a tenacious separable pellicle, white, greyish to pale brownish grey; gills adnate, adnexed to almost free, ventricose, forming a pseudocollarium, L = 14-21, white to greyish white; stem 15-50 x 0.3-1 mm, white to pale buff, may be darker towards base; basal disc distinctly plicate-hairy. Sp 7-10 x 4-5 μm , subcylindrical to ellipsoid, Qav = c. 1.7, amyloid; cheilocystidia variable, often with broad fingers (fig. 361D). Often solitary on leaf litter, including leaves from conifers, small twigs, *Vaccinium* litter, etc., often on rich ground; summer to autumn; common in temp.-hemib., occasional in bore.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:369, FAD 54C, GBW 3:391, M&J 10, Svp 52:8, ☉.
M. stylobates (Pers.: Fr) P. Kumm.
 - Cap without hyphal pegs 3
3. On riparian herbaceous plants, especially *Juncus effusus*; basal disc strongly pubescent hairy; cap pellicle separable. Cap up to 4 mm, hemispherical, sulcate, pale drab to brownish grey; gills adnate, forming a pseudocollarium, ventricose, L = 8-16, white to greyish white; stem 3-20 x 0.1-0.2 mm, pubescent especially in the lower third, silky or watery white; basal disc large in proportion to the frb. Sp 9-11(-13) x 4-5 μm , subcylindrical, Qav = c. 1.8 occasionally to 2.5, amyloid; cheilocystidia short with broad, rounded fingers (fig. 361E). Also on *Carex acuta*, etc.; summer to autumn; common in temp., in hemib. locally common on the south coast of NO, rare but poorly known in bore. in FI; DK (LC), FI (DD, PH: Keuruu, PK: Ilomant-si), NO (LC), SE (LC). – B&K 3:321, C&D 546, GBW 3:393, M&J 10b, ☉.
M. bulbosa (Cejp) Kühner
 - On other substrates *or* without plicate basal disc or separable pellicle 4
4. On decaying female catkins of *Alnus*; cap margin with a granular appearance. Cap 2-6 mm, plane when expanded, with a central depression, strongly plicate, viscid, greyish white with grey at the centre, striate and nearly translucent, at margin fringed with sugary granules; gills narrowly adnate forming a pseudocollarium, ventricose, L = 14-18, white; stem 10-25 x 0.2-0.5 mm, white, translucent, under lens with scattered hairs; basal disc small, hollow and covered with fine white hairs, especially at the edge, where attached to the substrate. Sp 6-8 x 3-5 μm , Qav = c. 1.8; cheilocystidia absent; pileipellis hyphae verrucose, with terminal elements easily separating (fig. 361F); caulocystidia to over 40 μm long, inflated, smooth. *DE, UK*. – C&D 547, Rob 74, Win 93:25.
M. rhenana Maas Geest. & Winterhoff
 - On decaying *Quercus* leaves or bark on broadleaved trees; cap margin not granular 5
5. On the mossy or bare trunks of living or recently fallen broadleaved trees; basal disc 2 mm, pubescent; sp globose. Cap up to 6 mm, pubescent, with a separable pellicle, white to greyish white, or pale sepia away from the margin; gills adnate, with plane edge to ventricose, L = (7-)9-12, white or tinted grey; stem 5-20 x 0.1-0.6 mm, smooth to sparsely floccose; basal

disc white or grey; smell if any, faintly nitrous. Sp 7.5-11 x 7.5-11 μm , $Q_{av} = c. 1.1$; cheilocystidia spheropedunculate with long narrow finger-like extensions, some as long as the main structure (fig. 361G); caulocystidia broadest at the base, often septate with the outer part quite thick-walled, narrowing to a point, sometimes twisted. Autumn to early winter; occasional in temp., rare in hemib.; DK (LC), NO (NE), SE (LC). – Phil 86c, Rob 65, ☉.

M. clavularis (Batsch) Sacc.

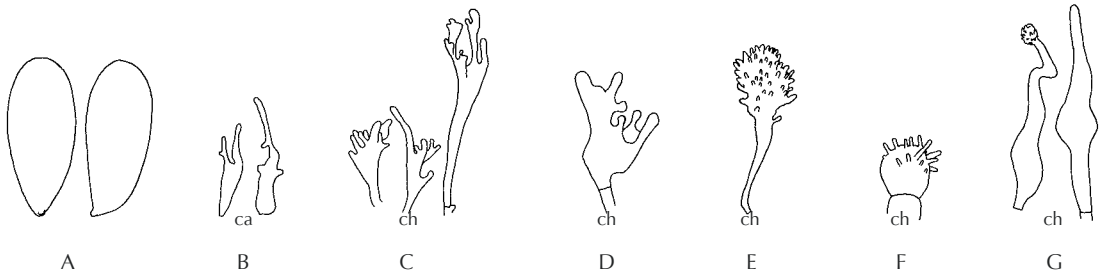
- On leaves of *Quercus* sp.; basal disc of radial fibrils which are not persistent; sp almost cylindrical. Cap 1-5 mm, greyish brown, paler at the edge, with a separable pellicle; gills adnate, forming a pseudocollarium, ventricose, L = 8-14, greyish with paler edge; stem 3-30 x 1-4 mm, hyaline white or grey; disc white. Sp 8-12 x 3-4.5 μm , $Q > 2$, cylindrical, strongly amyloid; cheilocystidia similar to cheilocystidia in fig. 361G, but with unevenly elongate diverticulae. Autumn to late autumn; status not well understood, but possibly overlooked and at least occasional in temp., rare in hemib.-southern bore.; DK (LC), FI (DD), NO (NE), SE (LC). – FAD 56A, M&J 40.

M. mucor (Batsch : Fr.) Quél.

Key E: Cap with a separable pellicle

1. Stem dry or only slightly sticky 2
 - Stem glutinous 4
2. Frb on the stems of *Phragmites* above or half in water; gills deeply decurrent and arcuate. Cap 4-20 mm bell-shaped, soon becoming flat, then depressed, umbilicate or funnel-shaped, at first with inrolled margin, clay pink, dingy yellowish brown becoming darker, the separable pellicle tough; gills dingy white to pale sepia, sometimes with a pinkish tinge, L = 18-26; stem 5-65 x 0.5-3 mm, coarsely granular-pubescent, off white, becoming yellowish to pale brown, eventually reddish brown from the base. Sp 10-15 x 5-7 μm (fig. 365A), $Q_{av} = c. 2.3$, cylindrical, amyloid; cheilocystidia simple clavate or like in fig. 359H or caulocystidium in fig. 361A. Solitary or subcaespitose, in fresh water lakes; autumn to early winter; probably common in temp.; DK (LC), SE (LC). – C&D 557, Cou 94, FAD 61F, Knu 126, M&J 26, ☉.
M. belliae (Johnst.) P.D. Orton
 - On other substrates; gills not deeply decurrent 3
3. Gill edge separable as a gelatinous thread, test by inserting a needle behind the edge. Cap 3-9 mm, globose to bell-shaped, sulcate, translucently striate, white with a slight milky coffee tone; gills narrowly adnate to almost free, ventricose, L = 10-13, whitish to grey with paler edge; stem 3-30 x 0.3-1 mm, very pruinose, white at the top, milky coffee below, the base deep turquoise blue; smell absent to faintly nitrous. Sp 6-9 x 3.5-5 μm , $Q_{av} = 1.6$, ellipsoid, amyloid; cheilocystidia congested, like in fig. 365C; caulocystidia broad at the base, attenuated to a point often branched (fig. 365B). On conifer twigs or fallen bark, in area on *Picea* and *Pinus*; late summer to autumn; rare in hemib.-bore.; FI (EN, Ks: Kuusamo), NO (NE), SE (LC). – B&K 3:327, BSMF Atlas 314, C&D 550, M&J 12, Rob 677, ☉.
M. cyanorrhiza Quél.
 - Gill edge not gelatinised or separable. Cap 3-20 mm, convex to paraboloid, vinaceous buff to olivaceous buff, with drab disc, often showing a dull blue rim at margin; gills narrowly adnate, sometimes seceding to form a pseudocollarium, ventricose or with plane edge, L = 16-25, pale to dark grey; stem 40-80 x 0.5-2 mm, densely pubescent, whitish, pale brown to shiny dark brown, covered densely with white hairs, the base often with blue patches or rarely the whole stem entirely blue. Sp 6-10.5 x 4-5.5 μm , $Q_{av} = 1.5-1.7$, dacryoid to sub-cylindrical, amyloid; cheilocystidia and caulocystidia simple clavate. On woody debris, especially from conifers, but also on wood from broadleaves trees such as *Fagus*, *Populus* and *Betula*; late summer to late autumn; occasional in temp.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – BCat 784, B&K 3:318, FAD 50C, Rob 55, Ves 234, ☉.
M. amicta (Fr.: Fr.) Quél. (*M. iris* (Berk.) Quél.)

4. Cap with pale dull colours, grey to drab or pale brown; stem very pale greyish 5
 - Cap and/or stem with bright or strong colours, yellow, greenish, red or dark brown to almost black 6
5. Sp on av < 5 μm wide; L = 13-22; cheilocystidia highly congested (fig. 365C). Cap 2-20 mm, paraboloid to hemispherical, pellucid striate, plicate, sometimes depressed sometimes with a small umbo, from white through pale grey to drab clay buff; gills arcuate and subdecurrent to decurrent, white to pale grey brown, edge separable as an elastic thread; stem 20-60 x 1-2 mm, hollow, watery white to dark grey brown, sometimes with a pale yellowish tinge, glutinous with a separable gelatinous pellicle, tough. Sp 7-8.5 x 4-5 μm , Qav = 1.7-2, dacryoid, amyloid; cheilocystidia apparently entangled at their outer ends, embedded in a gelatinous layer. On needle-litter, especially of *Picea*; late summer to winter; common, but locally very common in temp.-bore., rare in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – C&D 593, M&J 1, R&H 345, Rob 353, Ves 238, ☉.
M. vulgaris (Pers.: Fr.) P. Kumm.
- Sp on av > 5 μm wide; L = (20-)26-32; cheilocystidia clavate with broad and narrow diverticulae (fig. 365D). Cap up to 20 mm, conical, becoming irregularly bell-shaped, shallowly sulcate and translucently striate, blackish grey, blackish brown to dark grey brown, paler when dry; gills decurrent, with plane edge to arcuate, pale to dark grey, the edge paler and separable as an elastic thread; stem up to 65 x 1.5-3.5 mm, hollow, smooth, pruinose but glabrescent except for the top, viscid, grey. Sp 7-11 x 5-6 μm , Qav = 1.7-1.8. In grass, sometimes near conifers; autumn; known from a few collections from NO (DD, Vestf: Tjøme, Moutmarka).
M. agrestis Aronsen & Maas Geest.
6. Basidia 4-spored. Cap 5-35 mm, convex, conical, paraboloid or bell-shaped, often papillate, very glutinous, from pale grey through buff, olivaceous buff over sulphur yellow, lemon yellow, blood red to dark brown and almost black, extremely variable; gills broadly adnate often with a decurrent tooth or even decurrent, ventricose, L = 11-30, white often with a yellow tone, sometimes pinkish or becoming red, edge separable as an elastic thread; stem 14-110 x 0.8-4 mm, viscid, white, pale straw, lemon yellow, pale greenish yellow, dark brick to brown vinaceous. Sp 8-10 x 5-8 μm , Qav = 1.1-2, ellipsoid, dacryoid to amygdaloid, amyloid; cheilocystidia very variable, congested with many irregular shaped fingers like in fig. 365C, embedded in the gelatinous gill edge. On small standing trees, all sorts of litter including fallen wood, and in grass; autumn to early winter; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:329-330, 332, GBW 3:432-433, M&J 36 (as *viscosa*), Rob 389, 407, 409, Ves 238, ☉.
M. epipterygia (Scop.: Fr.) Gray var. *epipterygia* (incl. *M. viscosa* Maire)
 Note: this is a highly variable species (possibly many closely related species) with many attempts to describe varieties on field characters. This has resulted in a large number of described forms. These are not easy to separate, there being no microscopical characters yet identified to separate them. For this reason they are not included in this key. We have found apparently different varieties adjacent to each other possibly on the same mycelium, with no good characters to separate them. We have just included the two varieties with 2-spored basidia.
- Basidia 2-spored 7
7. Clamps present. Frb with pale colours especially with stem having luteous to yellow with greenish tones, very dark colours have not been recorded, otherwise similar to the main variety. In moist habitats on herbaceous and woody substrates throughout; rare, but locally occasional in temp.-bore., possibly overlooked; DK, SE.
M. epipterygia (Scop.: Fr.) Gray var. *epipterygioides* (Pearson) Kühner
- Clamps absent. Cap (4-)6-12(-16) mm, olive brown, dark sepia, cigar brown, umber drab, olive grey or pale grey brown, often with yellow or white margin; L = 16-22; stem 15-75 x 1-2.5 mm. Sp 11.5-13.5(-14.5) x 5.5-7(-9.5) μm , Qav = 1.7-2.1. In other characters as the main



Spores, cheilocystidia and caulocystidia: A: *Mycena belliae*, B: *M. cyanorrhiza*, C: *M. vulgaris*, D: *M. agrestis*, E: *M. clavicularis*, F: *M. smithiana*, G: *M. clavata*.

variety. Gregarious in damp moss, mostly *Sphagnum*, but also *Polytrichum*, *Aulaacomnium* and *Hylocomium*, in mires and dwarf shrub heaths, along brooks and roadsides; often on north slopes on acid soil; common in suba.-arc. / alp.; FI, IS, NO, SE.

M. epipterygia (Scop.: Fr.) Gray var. *badiceps* M. Lange

Key F: Stem glutinous or slimy; gills decurrent; cap without separable pellicle

1. Stem encapsulated in a thick glutinous layer; pileipellis hymeniform see *Roridomyces* p. 389
- Stem glutinous, but layer thin; pileipellis of repent hyphae with diverticulae. Cap (7-)10-20 (-22) mm, bell-shaped, becoming depressed at the centre, often umbonate, sulcate, translucently striate, drab to brownish orange; gills broadly adnate with a decurrent tooth or clearly decurrent, L = 13-23, grey to greyish brown; stem 20-80 x 1-2 mm, glutinous, grey brown, yellowish brown to brownish orange, tough, can be rotated beyond 180°. Sp 7-9.5 x 4-5.5 μm , Q_{av} = 1.8-2.1, subcylindrical, amyloid; cheilocystidia clavate and ornamented with short broad diverticulae (fig. 365E); caulocystidia like small cheilocystidia. On woody debris and leaves from conifers, especially *Pinus*, especially on poor sandy soil; summer to late autumn; very common in hemib.-bore., occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – BCat 840, C&D 591, M&J 28, R&H 345, Rob 133, ☉.

M. clavicularis (Fr.: Fr.) Gillet

Key G: Gills clearly decurrent; frb dry and without any gelatinised aspect

1. Cap < 4 mm; on fallen leaves of broadleaved trees especially *Quercus* 2
- Cap > 5 mm or on bark, conifer twigs or fern rhizomes 3
2. Frb white. Cap up to 3 mm, paraboloid to convex or even flat, under the lens, textured and like parachute panels; gills decurrent and arcuate, L = (4-)6-9(-11), may be absent in minute frb; stem up to 25 x 0.1-0.2 mm, silky smooth, apparently insititious, but seen at x 50 a small radial pad of fine fibrils is often present. Sp 8-11 x 4-5 μm , Q_{av} = 1.9-2.2, subcylindrical, amyloid; cheilocystidia like in fig. 377B or even almost spherical like in fig. 365F; pileipellis hyphae densely verrucose with short, even diverticulae. On fallen leaves of broadleaved trees, especially *Quercus*; autumn to winter; probably common in temp., occasional in hemib.; DK (LC), NO (NE), SE (LC). – GBW 3:455, ☉.

M. polyadelpa (Lasch) Kühner

- Cap or entire frb pink. Cap up to 3 mm, paraboloid to convex or even flat, under the lens textured and like parachute panels, from pale pink to strikingly pale rose; gills adnate and ventricose, rarely decurrent and arcuate, L = (4-)6-9(-11), concolorous with cap or slightly paler, may be absent in minute frb; stem up to 25 x 0.1-0.2 mm, silky smooth, concolorous with cap or paler, apparently insititious (arising cleanly from the leaf), but seen at x 50 a

small radial pad of fine fibrils is often present. Sp 8-11 x 4-5 μm , $Q_{av} = 1.9-2.2$, subcylindrical, amyloid; cheilocystidia like fig. 377B or even almost spherical (fig. 365F); pileipellis hyphae densely verrucose with short even diverticulae. On leaves of e.g. *Quercus* and *Betula*, in temperate woods, rarely boreal *Betula* woods; autumn to early winter; occasional in temp.-southern bore.; DK (LC), FI (DD), NO (LC), SE (LC). – Cet 2748.

M. smithiana Kühner

- 3. On fern rhizomes see *M. lohwegii* key J 10
- Not on fern rhizomes 4
- 4. On wood, including twigs 5
- On leaf litter, mosses, soil, etc. 7

- 5. Sp $Q > 1.5$. Cap 2-10(-15) mm, convex, may be papillate, usually pale drab or pale buff to fawn often with a darker centre; gills slightly to distinctly decurrent, arcuate, L = 8-18, pale grey; stem up to 50(-60) x 0.5-1(-1.5) mm, distinctly pruinose, usually concolorous with the cap, but may be pale luteous or lemon. Sp 6.5-10 x 4-6 μm , $Q_{av} = 1.6-1.9$, ellipsoid, without iodine reaction; cheilocystidia cylindrical or lageniform; caulocystidia as curved simple hairs in clusters. On small pieces of woody debris in moist habitats, also on rotten bark; all year, at least in the south; very common in temp.-hemib., occasional, but locally common in bore., rare in suba.-arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:366, M&J 2, Rob 382, Ves 239, ⊙.

M. speirea (Fr.: Fr.) Gillet

Note: the form with a yellow stem, all or in part, is often referred to as f. *camptophylla* (Berk.) Kühner. – C&D 612, ⊙.

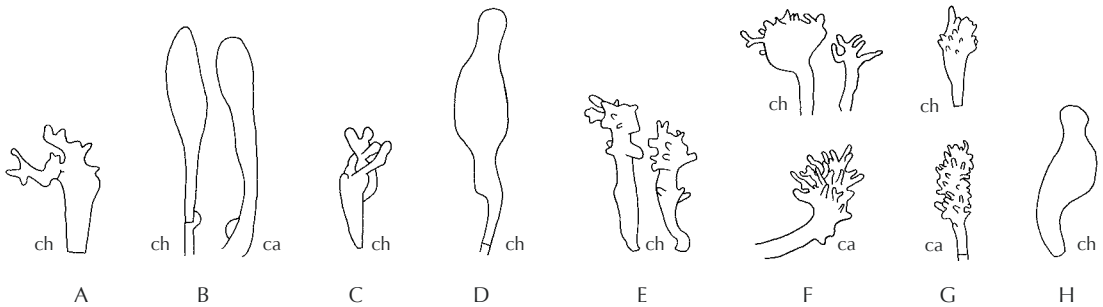
- Sp $Q < 1.5$ 6
- 6. Frb grey brown, including gills; on bark and wood of conifers and possibly broadleaved trees. Cap 3-10 mm, at first bell-shaped, becoming convex with slight papilla or a depressed centre, pale grey brown, milky coffee, darker when young, translucently striate; gills broadly adnate to decurrent, arcuate, L = 8-15(-20), concolorous with cap or slightly paler; stem 8-25(-30) x 0.5-1 mm, pale ochraceous to cinnamon buff or beige brown. Sp 6-9 x 5-7 μm from 4-spored basidia, 7-10 x 5-8 μm from 2-spored basidia, $Q_{av} = 1.2-1.5$, subglobose to slightly ellipsoid, non-amyloid, punctate from obscure ornamentation; cheilocystidia irregularly lageniform often with gelatinous covering to the tip (fig. 365G); hyphae of the pileipellis diverticulate with long tangled diverticulae; caulocystidia also diverticulate but not tangled. Singly or subcaespitose; late summer to autumn; rare in temp.-hemib.; DK (VU), NO (NE), SE (LC). – ⊙.

M. clavata (Peck) Redhead (*M. phaeophylla* Kühner)

- Frb with yellow tones; on *Juniperus communis* see *M. juniperina* key K 2
- 7. Frb pale grey; smell farinaceous, especially when crushed. Cap 4-15 mm, bell-shaped, becoming broadly convex to almost plane, pale grey to brownish grey with a matt appearance; gills decurrent, shallow, arcuate, L = 10-25, concolorous with cap, paler at edge; stem 20-50 x 0.5-1.5 mm, at first lightly pubescent, becoming shiny smooth, concolorous with cap or paler, sometimes buff. Sp from 4-spored basidia 8-10.5 x 4-6 μm , $Q_{av} = 1.6-1.9$, from 2-spored basidia 9-12.5 x 4.5-7 μm , $Q_{av} = c. 1.9$, dacryoid to ellipsoid, amyloid; cheilocystidia clavate with broad tips, irregularly branched and densely packed (fig. 367A); caulocystidia asymmetrically ornamented with \pm elaborate diverticulae. On forest litter, e.g. under *Quercus*, *Pinus*, *Juniperus*, more rarely in turf near trees, or under *Pteridium*; late autumn to early winter; common to very common in temp.-suba., occasional in arc./alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:324, C&D 590, FAD 61H, M&J 37, R&H 358, ⊙.

M. cinerella (P. Karst.) P. Karst. (*M. cineroides* V. Hintikka)

- Frb with different colours; smell indistinct or radish-like 8



Cheilocystidia and caulocystidia: A: *Mycena cinerella*, B: *M. kuehneriana*, C: *M. pseudopicta*, D: *M. rosea*, E: *M. tubarioides*, F: *M. riparia*, G: *M. pseudocorticola*, H: *M. leptophylla*.

8. Frb with pinkish-vioaceous colours; smell radish-like 9
 - Frb darker, lacking pinkish colours; smell indistinct 10
9. Sp amyloid, Qav = c. 2. Cap 5-15(-20) mm, convex, sometimes papillate and/or depressed at the centre, pinkish white through pale pink to dull red, hygrophane; gills sinuate and slightly decurrent, L = 18-25, very pale grey to pinkish; stem 20-40 x 1-2(-4) mm, concolorous with cap. Sp 6-8 x 3.5-4.5 μm , Qav = 1.9-2.0, subcylindrical; cheilocystidia oblong to clavate, often with stipitate ones present (fig. 367B); caulocystidia with rounded tips as well as acute. In deciduous and rich *Picea* dominated forests, on litter of deciduous trees; autumn; apparently very rare in hemib.-bore.; FI (DD), NO (NE).
M. kuehneriana A.H. Sm.
 Note: a poorly understood taxon, originally described from North America. Collections examined from NL and UK fit well with the type description.
- Sp without iodine reactions, Qav = c. 1.6. Cap 4-25 mm, convex to paraboloid, but often rather flattened, with or without a depressed centre, very pale rose through clay pink to pale violaceous, hygrophane, translucently striate; gills adnate with a decurrent tooth to quite deeply decurrent, ventricose, L = 18-30, concolorous with cap; stem 20-60 x 1-2.5 mm, concolorous with cap. Sp 6-7.5 x 3.5-5 μm , Qav = 1.6, dacryoid; cheilocystidia similar to cheilocystidium in fig. 367B, more often without long stems, clavate or fusiform; caulocystidia similar to fig. 367B. Sometimes fasciculate, more often solitary in litter of deciduous trees in damp places or on conifer debris, especially in *Populus* and *Alnus* forests; summer to autumn; locally common but few records, perhaps overlooked in temp.-bore., in FI north to Kn; DK (DD), FI (LC), NO (NE), SE (LC). – C&D 604, M&J 31.
M. pearsoniana Singer s. auct. Eur.
10. Basidia 4-spored; in *Sphagnum* moss or other deep, wet, acidic soils. Cap up to 12 mm, hemispherical, then shallowly bell-shaped, blackish brown to grey; gills relatively deep, arcuate decurrent, L = 14-20, sepia grey brown to grey with a paler edge; stem 20-60 x 1-2 mm seeming relatively long for the cap, dark brownish grey to grey, radicating in wet substrates. Sp 7-11 x 4-5 μm , Qav = 1.8-2.2, oblong to subcylindrical, amyloid; cheilocystidia with intermixed basidia, clavate and like in fig. 367A; caulocystidia diverticulate and some large and very coralloid. As well as the typical site above, it has been recorded from a burnt oligotrophic forest site in NO; autumn; rare in temp.-arc./alp.; DK (EN), IS, NO (LC), SE (LC). – FAD 61I, SMT 29(2):21.
M. concolor (J.E. Lange) Kühner
- Basidia 2-spored; with lichens and mosses in dry, open habitats. Cap 5-15 mm, hemispherical to convex or broadly umbonate, with crenulate margin, dark sepia brown to grey brown; gills broad, arcuate and quite deeply decurrent, L = 12-20, whitish towards the edge; stem 20-35 x 0.7-1.5 mm, pale brown below, greyer above, may be swollen towards the top, base

slightly bulbous with strigose hairs. Sp 9-13 x 5-7 μm , Qav = 1.7-1.9, dacryoid, amyloid, in some collections a small proportion of 4-spored basidia have been observed; cheilocystidia branched with diverticular ornamentation, more regular than in the previous two species (fig. 367C), continuous, without intermixed basidia. Typically in dry rather acid, sandy grassland, sometimes with low shrubs such as *Salix repens* and *Juniperus communis*; but also recorded from calcareous grassland and from a burnt oligotrophic forest site, the latter in NO; autumn to early winter; rare in temp.-suba.; DK (EN), IS, NO, SE (NE). – FAD 61J, GBW 3:403, Rob 137. *M. pseudopicta* (J.E. Lange) Kühner

Key H: Frb dry, with bright colours (blue, green, red, yellow), without distinctly decurrent gills

1. Frb collybioid; smell radish-like or strongly aromatic; cheilo- and pleurocystidia voluminous, clavate to lageniform 2
 - Frb mycenoid; smell absent or different; cheilo- and pleurocystidia not voluminous, variously shaped 4
2. Frb in shades of violet, often in concentric zones on cap; smell usually aromatic, of radish when crushed; gills some dark shade of mauve or violet. Cap 15-45 mm, bell-shaped, soon flattening, usually with an umbo, often with upturned edge, hygrophanous and translucently striate, brownish vinaceous to violet, with umbo, often contrasting with ochraceous or grey pinkish tones; gills narrowly adnate, ventricose, may have a small decurrent tooth, L = 20-45; stem 40-110 x 2-6 mm, often flattened, lilac smoke grey to brownish violet. Sp 7-10 x 3.5-5.5 μm , Qav = 1.6-1.7, dacryoid, amyloid; cheilocystidia simple clavate or lageniform; caulocystidia similar. In troops or fasciculate, on leaf litter, in mainly rich, often calcareous forests, e.g. *Fagus* forests, possibly also with conifers; autumn; occasional, but locally common in temp.; DK (LC), NO, SE (NT). – B&K 3:328, C&D 602, GBW 3:395, M&J 35, Rob 97. – Presumably poisonous.
M. diosma Krieglst. & Schwöbel
 - Frb some shade of pink, lilac, occasionally white, pale blue or pale yellow; smell of radish; gills white, pink or pale vinaceous 3
3. Cap umbonate, bright rose or vinaceous pink; stem pale pinkish, clavate, occasionally whole frb white. Cap 25-60 mm, convex with an umbo which is often emphasised by a shallow depression between it and the cap margin, hygrophanous, drying from the centre to vinaceous pink; gills emarginate, L > 40, pale rose; stem 70-150(-200) x 3-12 mm. Sp 7-9 x 4-5.5 μm , Qav = 1.5-1.6, dacryoid to subcylindrical, amyloid; cheilocystidia very variable, clavate, globose, fusiform to narrowly utriform (fig. 367D); caulocystidia similar to fig. 367B. On leaf litter, in deciduous and coniferous forests, typically in rich to fairly rich *Fagus* forests; autumn; very common in temp., occasional in hemib.-bore., but rare in FI, rare in suba.; DK (LC), FI (NT), NO (LC), SE (LC). – B&K 3:361, GBW 3:401, M&J 21, Rob 125, 128 (white form), Ves 233, ☉. – Poisonous.
M. rosea (Schumach.) Gramberg
 - Cap not or hardly umbonate, colours highly variable, typically vinaceous pink to pale rose, but also almost white, yellow or pale blue; stem typically with violaceous shades. Cap 10-50(-60) mm, convex; gills emarginate, L = 20-40; stem 30-100 x 1-7 mm. Sp (5)-6-7(-10) x 3-4(-5) μm , Qav = 1.6-1.8, ellipsoid, amyloid; cheilocystidia similar to fig. 367D and caulocystidium in fig. 367B. In all sorts of habitats, but mainly on leaf litter in broadleaved or coniferous forests or in turf in open areas; late summer to late autumn, rare in late spring; very common in temp.-suba., rare in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – GBW 3:398, M&J 21, Ves 232, ☉. – Poisonous.
M. pura (Pers.: Fr.) P. Kumm. (*Prunulus p.* (Pers.: Fr.) Murrill)

Note: a wide range of the colour variation described above has been the basis for the description of a whole range of further taxa mostly at the level of variety or forma. Molecular results indicate clear

separation of *M. rosea* and *M. diosma*, but the picture is less clear with the remaining variation although further species will apparently have to be recognized.

4. Stem with dull to bright blue base see *M. cyanorrhiza* and *M. amicta* key E 3
 - Stem base not blue 5
5. On leaves of broadleaved trees 6
 - On soil, herbaceous stems, litter or wood 7
6. On leaves of e.g. *Quercus* and *Betula*, not *Salix*, in temperate woods, rarely boreal
Betula woods see *M. smithiana* key G 2
 - On leaves of *Salix* in boreal-subalpine sites. Cap 1-3 mm, paraboloid to hemispherical, often with a flattened centre, translucently striate, sulcate, pinkish apricot to brownish pink, often darkest at the centre; gills ventricose, narrowly adnate, L = 5-10, pinkish white; stem up to 12 x 0.3 mm, with a somewhat bulbous base, pruinose, glabrescent except at the base, hyaline-white, insititious. Sp 7-10 x 4-5 μm , Q_{av} = 1.9-2.1, subcylindrical, amyloid; cheilocystidia clavate with fairly regular and quite abundant ornamentation, with mostly short diverticulae, but some up to 5 μm long, up to 30 x 16 μm , similar to figs 355G, 377B, 365F. On leaf litter of *Salix*; late summer to autumn; rare or overlooked in bore.-suba.; NO.
M. exilis Aronsen & Gulden
7. On rotting riparian plants 7
 - Rooting in soil, or directly on litter or wood 10
8. Sp 10-12(-15) x 3-5 μm . Cap 2-7 mm, hemispherical to convex, sometimes more bell-shaped, sulcate, translucently striate, pink to lilaceous pink, becoming deep straw yellow; gills adnate with a decurrent tooth, arcuate, L = 6-11, pink to pinkish white becoming more brownish; stem 3-15 x 0.2-0.7 mm, flexuous, pruinose when young, then glabrescent, concolorous with the cap or more yellowish to brownish, the base attached by short coarse fibrils. Sp Q_{av} = 2.1-2.5, subcylindrical, amyloid; basidia 4-spored; cheilocystidia slightly clavate with short rounded elaborate diverticulae (fig. 367E), hyphae of the stem surface diverticulate, the caulocystidia, simply terminal cells, occasionally clavate. In close groups in wet habitats on remnants of e.g. *Carex* species such as *C. acuta*, *C. rostrata* and *C. aquatilis*, *Juncus*, etc.; autumn; rare in temp.-southern bore., but possibly overlooked; DK (DD), FI (LC), NO (NT).
 - M&J 34b, SZP 81(6):237, ☉.
M. tubarioides (Maire) Kühner
- Sp \leq 10 μm long 9
9. Caulocystidia simple diverticulate, hyphal terminations without inflated ends, similar to fig. 359I. Cap 2-7 mm, convex to bell-shaped, sometimes with a flared margin, vinaceous buff, pale pink or greyish sepia brown, shallowly sulcate; gills adnate to subdecurrent, arcuate, L = 7-9, buff to pale pink or whitish; stem 5-13 x 0.2-0.5 mm, flexuous, lightly pruinose, then glabrescent, vinaceous buff, may be darker below, the base slightly broadened into a pad with short coarse fibrils penetrating the substrate. Sp 7-9(-10) x 4-5 μm , Q_{av} = c. 1.7, dacryoid to ellipsoid, amyloid; basidia 4-spored; cheilocystidia variable, similar to figs 355F and 359F; stem surface hyphae diverticulate with diverticulae up to at least 7 μm long. In wet habitats, on *Juncus*, *Carex*, *Deschampsia*, etc.; autumn; very rare or overlooked in temp.-bore.; NO, SE.
M. juncicola (Fr.: Fr.) Gillet
- Caulocystidia diverticulate with clavate and subglobose ends (fig. 367F). Cap 2-4 mm, convex to low convex, sometimes paraboloid, somewhat sulcate, pink to brownish pink; gills slightly ventricose, broadly adnate to distinctly decurrent, colour reflecting that of the cap, L = to 10; stem 3-5 x 0.2-0.3 mm, pruinose, may be broadened at the base, with pinkish hues, white, finely pubescent. Sp 8-10 x 4.5-5.5 μm , Q_{av} = c. 2, ellipsoid to subcylindrical, amyloid; basidia 4-spored; cheilocystidia very variable, mostly clavate, with irregularly shaped diverticulae, unevenly spaced up to 7 μm long; caulocystidia abundant at the stem

base with distinct globose ends as well as clavate ones, with dense diverticulae up to 4.5 μm long. On decaying riparian plants, *Carex*, *Scirpus*, etc.; autumn; very rare in temp.-hemib.; DK, NO, SE. – C&D 571, MMB 34(1).

M. riparia Maas Geest.

10. On bark of living trees, often in moss 11
 - On litter, wood or soil 13
11. Frb blue or bluish grey. Cap 2-8(-10) mm, hemispherical to bell-shaped, sulcate, pruinose when fresh, from mouse grey through bluish grey to dark blue or violet grey, browning with age; gills adnate with a decurrent tooth, broad, ventricose, L = 8-12, pale grey; stem 5-20 x 0.2-1 mm, profusely pruinose, greyish white or concolorous with the cap. Sp 9-14 μm , Qav = 1-1.1 globose to subglobose, amyloid; cheilocystidia clavate with short broad diverticulae (fig. 367G); caulocystidia more densely ornamented than the cheilocystidia and up to 35 μm from tip to septum, abundant. On bark of many species of broadleaved trees, often in association with mosses; autumn to winter; common in temp.-hemib. occasional in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:356, FAD 57E1-2, M&J 32b, Rob 667, Ves 236, ☉.
M. pseudocorticola Kühner
- Frb in shades of yellow, yellow brown, reddish brown or pink 12
12. On *Juniperus communis*; frb in yellowish shades see *M. juniperina* key K 2
 - On broadleaved trees; frb in shades of reddish brown or pink. Cap 2-8 mm, hemispherical to bell-shaped, sulcate, pruinose when fresh, colour varies from brown vinaceous, through pinks to burgundy; gills adnate, with plane edge to ventricose, often with a decurrent tooth, L = 8-12, concolorous with cap or off white; stem 4-20 x 0.2-1 mm, concolorous with cap, but paler near the top. Sp 9-14 μm , Qav = 1-1.1 globose to subglobose, amyloid; cheilocystidia like in *M. pseudocorticola*, clavate with short broad diverticulae; caulocystidia more densely ornamented than the cheilocystidia, but terminal cell of caulocystidia up to 100 μm long. On the bark of broadleaved trees, often in association with mosses; autumn to winter; occasional in temp.-hemib., rare in southern bore.; DK (NT), FI (LC), NO (LC), SE (LC). – B&K 3:348, C&D 551, FAD 57E, M&J 32, Rob 663.
M. meliigena (Berk. & Cooke) Sacc.
13. Frb strikingly violet to blue grey or blackish violet. Cap 5-15 mm, conical, convex or bell-shaped, violet to violet grey when young, fading to grey, paler at margin, may be darker at centre; gills adnate, slightly ventricose, L = 17-20(-22), grey violet to grey, with paler edge; stem 20-60 x 0.5-1 mm, pruinose especially at the top, becoming shiny, concolorous with cap or paler lilaceous to grey brown, at base white tomentose. Sp 8-10 x 3-5 μm , ellipsoid, amyloid; cheilocystidia clavate with even ornamentation, like cheilocystidia in figs 359A and 377B; pleurocystidia similar; stem surface hyphae evenly diverticulate. On litter among moss or ericaceous plants under conifers, in mountain *Betula* forests and in arc./alp. habitats; summer to autumn; occasional in hemib.-arc./alp.; FI (LC), NO (LC), SE (LC). – M&J 8, Rob 200, SMT 29(2):22.
M. urania (Fr.: Fr.) Quél.
- Frb without bluish or violet colours 14
14. Cap with dull pinkish grey to orange brownish colours (young frb may be more orange); cheilocystidia clavate with small diverticulae 15
 - Cap distinctly orange, apricot, bright yellow or coral red; cheilocystidia smooth, \pm lageniform 16
15. Frb vinaceous buff to flesh pinkish grey see *M. metata* key J 17
 - Frb reddish orange to light brown, looking like a *Galerina* see *M. alexandri* key J 9

16. Stem white, discolouring brown from base, with a long pseudorrhiza. Cap 5-25(-30) mm, conical to bell-shaped, often umbonate or papillate, pale orange yellow at the margin, becoming darker towards the deep orange centre; gills adnate with a decurrent tooth, slightly ventricose, L = 10-25(-30), concolorous with the cap to pale ochraceous, paler at the edge; stem 10->100 x 0.5-2 mm including the radicating part, finely pubescent. Sp 6-9 x 5-7 μm , Qav = 1.2-1.4, subglobose to ovoid, with prominent apiculus, non-amyloid; cheilocystidia smooth and with various simple shapes, clavate, fusiform or even capitate (fig. 367H); caulocystidia simple, smooth, mostly linear. Emanating from decaying wood or roots in broad-leaved or mixed woodland, often along stream banks, typically with *Fagus*; late summer to autumn; rare and local in temp., in NO only in two localities; DK (VU), NO, SE (LC). – C&D 607, FAD 199E (as *Collybia ventricosa* var. *subaequalis*), M&J 12, Rob cover, Svp 6:101.
M. leptophylla (Peck) Sacc.
- Stem not discolouring brown, not strongly rooting 17
17. Cap yellow 18
- Cap orange red, coral to red, sometimes fading to yellow 19
18. Sp without iodine reactions; in leaf-beds or in grassland see *M. flavoalba* key J 4
- Sp amyloid; on needle litter or small twigs of *Juniperus communis*. Cap 6-12(-21) mm, obtusely conical to hemispherical, hygrophanous, translucently striate and shallowly sulcate, straw to yellow, with greenish tints, to clear yellow or olivaceous with yellow at the margin; gills narrowly adnate to emarginate, ventricose, L = 16-19, whitish; stem 40-60 x 1-1.5 mm, lightly pruinose especially at the top, grey to brownish grey. Sp 7-11 x 6-8 μm , Qav = 1.4, dacryoid to ellipsoid, amyloid; cheilocystidia clavate with short broad diverticulae of irregular length and spacing, some longer and may be curved or forked (fig. 373A) or like cheilocystidia in fig. 359A; caulocystidia simple terminations of the diverticulate stem surface hyphae; basidia 2-spored. Solitary or gregarious; late autumn; rare in temp.; NO (LC).
M. citrinovirens M. Lange
19. Stem orange, yellow to straw. Cap 2-7 mm, conical to bell-shaped, often papillate, shallowly sulcate, apricot orange, at least at the centre, sometimes paling outwards to yellow; gills sinuate to adnate, slightly ventricose, L = 7-16, pale luteous to whitish with a white edge; stem 20-50 x 0.25-0.8 mm, bright to pale yellow or straw. Sp 9-11 x 3-4 μm , Qav = c. 3, subfusiform to cylindrical, non-amyloid; cheilo- and pleurocystidia smooth, simple, clavate or subfusiform; pileipellis hyphae and stem surface hyphae mostly with simple short diverticulae. On plant debris in scrub and woodland, often rooting to small woody items; early summer to late autumn; very common in temp., common in hemib., occasional in bore., in FI north to KiL; DK (LC), FI (LC), FO, NO (LC), SE (LC). – BCat 782, B&K 3:312, FAD 53D, GBW 3:385, M&J 4, ☉.
M. acicula (Schaeff.) P. Kumm.
- Stem white or pink 20
20. Sp Q > 1.8. Cap 4-15(-25) mm, \pm conical to bell-shaped, often papillate, striate, smooth, dry to lubricous, coral red, fading to yellow and thus resembling *M. flavoalba*; gills almost free to adnate with a decurrent tooth, L = 21-27, basally coral red to white towards edge; stem 30-70 x 1-2 mm, cylindrical to widened towards base, pruinose, especially at top, translucent white. Sp 7-9.5 x 3.5-4 μm , dacryoid to cylindrical, non-amyloid; basidia 4-spored; cheilo- and pleurocystidia 45-55 x 7-10 μm , lageniform with slender neck; caulocystidia include scattered globose forms like fig. 373C; pileipellis hyphae with coralloid clusters of diverticulae; gill trama without iodine reactions; clamps present. In grassy places, often in wet fens; autumn; rare in temp., occasional in hemib.-bore.; DK (DD), NO (LC), SE (LC). – BSMF 46, pl. 1, Rob 40.
M. floridula (Fr.) Quél. s. Kühner
Note: It is possible that *M. floridula* s. Kühner is a colour form of *M. flavoalba* as suggested by several French mycologists. Maas Geesteranus considered *M. floridula* s. orig. as a likely synonym of *M. adonis*.

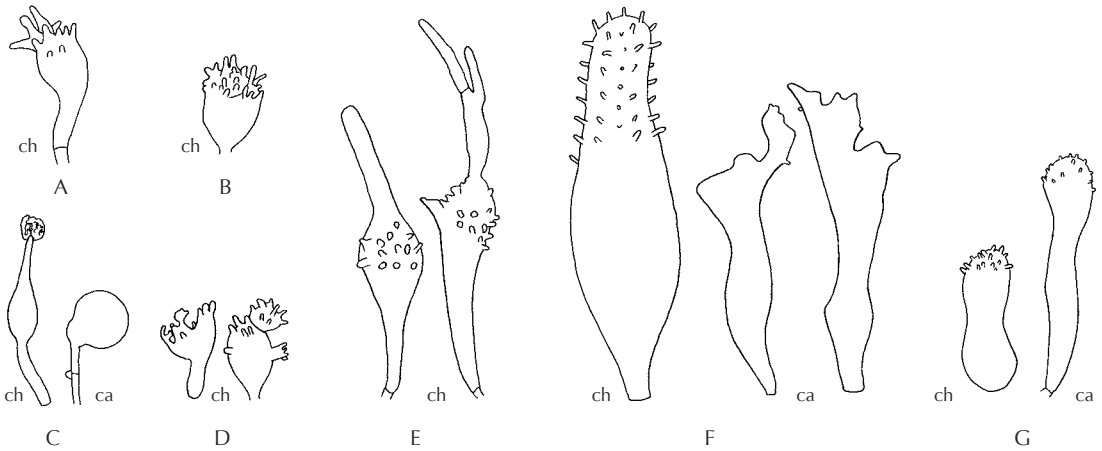
- Sp Q < 1.8. Cap 5-22 mm, conical, bell-shaped to low convex, ± striate, smooth, dry to lubricous, scarlet, coral red, salmon pink, fading to pinkish white, occasionally pale orange; gills adnate with a decurrent tooth, L 14-21, pinkish to white, edge white; stem 14-55 x 0.5-2 mm, short pruinose, white, strigose hairy at base. Sp 8-11 x 4-7 µm, Qav = 1.8-2.4, dacryoid to ellipsoid, without iodine reactions; basidia 2(-4)-spored; cheilo- and pleurocystidia 30-70 x 6-15 µm, lageniform, acuminate lageniform to acute lageniform; caulocystidia clavate, more rarely resembling cheilocystidia; pileipellis hyphae with simple to somewhat branched diverticulae; gill trama indextrinoid. In forests and grassland, among grass and moss, on bare peat on open sites or on woody litter, rarely in more rich sites; autumn; occasional in temp.-suba., rare in arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – BCat 783, B&K 3:313, GBW 3:386, M&J 3, Rob 29, ☉.

M. adonis (Bull.: Fr.) Gray var. *adonis*

var. *coccinea* (Sowerby) Kühner differs in having a red stem, and possibly in growing on twigs. Autumn; rare in temp.-suba.; DK, NO, SE. – FAD 53B.

Key I: Cap < 5 mm, pure white or greyish brown towards the centre

1. Sp without iodine reactions see *Hemimycena* p. 265
 - Sp amyloid 2
2. On fern debris or living rhizomes 3
 - On flowering plant debris 4
3. L > 10; on rhizomes see bleached form of *M. lohwegii* key J 10
 - L < 10; mostly along the rachis and on pinnae see albino form of *M. pterigena*, key B 18
4. On the lower part of monocots, *Carex* and *Juncus*, in wet places. Cap 0.5-3 mm, paraboloid, conical to convex or hemispherical, papillate or not, not striate, white; gills often reduced, adnate to decurrent, L = 0-5, white; stem 1-3(-4) x 0.1-0.3 mm, cylindrical or widened just below the gills, pruinose then smooth, attached with very fine, radiating whitish fibrils which are united by a very thin film of gelatinous matter to form an irregularly shaped plaque. Sp 9.5-11 x 3.5-4.5 µm, Qav = 2.6, dacryoid, amyloid; basidia 4-spored; cheilocystidia 20-27 x 4.5-7 µm, rather scarce, occurring mixed with the basidia, subcylindrical, subfusiform, clamped, smooth; pleurocystidia absent; caulocystidia 20-40 x 2.5-9 µm, variously shaped, much branched, becoming less branched or even simple and subcylindrical farther upwards, then just below the gills gradually passing into lageniform elements, 22.5-35 x 6.5-9 x 3.5-4.5 µm; hyphae of the pileipellis covered with cylindrical, simple diverticulae, 2.5-5.5 x 1-2 µm. Autumn; only known from the type locality, but possibly overlooked and mistaken for *Hemimycena* spp.; NO (NE, Vestf: Tjøme).
M. oligophylla Aronsen & Maas Geest.
 - On leaves of trees 5
5. On leaves, especially of *Quercus*; gills broadly adnate with a decurrent tooth to decurrent see *M. polyadelpha* key G 2
 - On leaves of *Fagus*; gills narrowly adnate. Cap 1-2.5(-5) mm, hemispherical, plicate, translucently striate, white to drab, darker colours when present towards the centre; gills narrowly adnate, sometimes to a pseudocollarium, slightly ventricose, L = 6-10, white; stem up to 25 x 0.25 mm, white to brownish grey, attachment to the leaf variable, etioliating among the leaves, from insititious, to attachment with a very small pad of radially arranged pale strigose fibres or fine brown ones, all possible on the same leaf. Sp 8-10 x (3.5-)4-5 µm, Qav = c. 2.1, cylindrical, amyloid; basidia usually 4-spored, but some 2-spored yielding spores up to 13 µm long; cheilocystidia clavate and diverticulate with irregular diverticulae up to 6 µm long (fig. 373B), mixed with others with even, short diverticulae, like in fig. 377B, caulocystidia just simple hyphal terminations with diverticulae. In quantity on leaves, often with many on each leaf; autumn to winter; very common in temp., probably common where



Cheilocystidia and caulocystidia: A: *Mycena citrinovirens*, B: *M. capillaris*, C: *M. flavoalba*, D: *M. alexandri*, E: *M. latifolia*, F: *M. silvae-pristinae*, G: *M. septentrionalis*.

Fagus occurs in hemib.; DK (LC), FI (DD), NO (LC), SE (LC). – B&K 3:323, FAD 56B, Knu 127, R&H 354, Rob 545, ☉.

M. capillaris (Schumach.: Fr.) P. Kumm.

Key J: Frb not bright coloured, if white, cap > 5 mm, not viscid and not with coloured gill edges; on all kinds of substrates except wood

- 1. Frb white or very pale yellow 2
 - Frb with more colour 5
- 2. With few complete, ± forked gills; sp amyloid see *Delicatula integrella* p. 277
 - With normal gills; sp without iodine reactions 3
- 3. Frb white see *Hemimycena* p. 265
 - Frb with cream or pale yellow colours 4
- 4. Cap 5-20 mm; gills broadly to very narrowly adnate, with a small decurrent tooth. Cap paraboloid to convex, sometimes papillate, slightly sulcate, translucently striate, cream to pale ochre, whiter towards the margin; gills ventricose, L = 14-24, white to cream; stem 20-60 (-80) × 1-2.5 mm, lightly pubescent when fresh, glabrescent, silky, whitish to pale ivory. Sp 6.5-8 × 3.5-4.5 μm, Qav = 1.7-1.8, subcylindrical, without iodine reactions; cheilocystidia mixed with basidia, fusiform, often with a gelatinous cap (fig. 373C); pleurocystidia similar; caulocystidia mostly globose. In grassland or on litter in oligotrophic and eutrophic coniferous and deciduous forests; autumn to early winter; very common in temp.-hemib., common in bore., also recorded in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – C&D 606, FAD 53G, GBW 3:388, M&J 3, Rob 33.
M. flavoalba (Fr.) Quél.
 - Cap < 15 mm, ochraceous yellow; gills arcuate decurrent see *Hemimycena* p. 265
- 5. Cap strikingly dome-shaped with parallel sides and umbilicate; gills broader than long see *M. picta* key K 17
 - Frb opening out normally; gills longer than deep 6
- 6. Sp without iodine reactions or showing two layers, one of which is amyloid and trama without iodine reactions 7
 - Sp amyloid and single walled 8

7. Sp without iodine reactions, with large apiculus; lageniform pleurocystidia very evident see *Mycenella salicina* p. 259
 - Sp globose, with double walls, one amyloid; in damp places in mixed forests see *Fayodia bisphaerigera* p. 278
8. Cheilocystidia with short regular or irregular diverticulae, like in figs 355G and 365E 9
 - Cheilocystidia smooth or with broad, irregular finger-like extensions (fig. 383B), which may be further divided into irregular diverticulae (fig. 377C) 19
9. Frb brown, looking like a *Galerina*. Cap (2-)4-15 mm, conical to hemispherical and bell-shaped, often with an umbo, smooth to sulcate, translucently striate, fulvous to pale orange brown, paler and sometimes with a cream tinge at margin, occasionally with a salmon pink hue; gills weakly ventricose, variously adnate, sometimes with a small decurrent tooth, L = 14-18(-20), concolorous with the cap or paler; stem 20-60 x 0.5-1.5 mm, concolorous with or slightly paler than the cap. Sp 7-10 x 4-6 μ m, Qav = c. 1.8, ellipsoid, amyloid; basidia 4-spored; cheilocystidia clavate and variable, some with regular short diverticulae, others with irregular diverticulae and sometimes branched (fig. 373D); caulocystidia simple hyphal terminations with regular diverticulae like fig. 377B. Often among mosses or on litter of shrubby or dwarf trees, e.g. with *Salix glauca*, but also in moist *Betula* and conifer forest habitats; occasional, but locally common and probably overlooked as a *Galerina*, in bore.-arc./alp.; NO (LC), FI (DD), ☉.
M. alexandri Singer (*M. aphanes* Aronsen & Gulden)
 Note: at present the evidence for this synonymy is based on the morphological similarities of 30 collections from various countries, including material from North America and the type of *M. aphanes*.
 - Frb some shade of grey, or with clay pink hues, if with brown shades, then shape unlike a *Galerina* 10
10. Fasciculate on fern rhizomes such as *Athyrium filix-femina* and *Matteuccia struthiopteris*. Cap 3-7 mm, paraboloid, bell-shaped to conical, with a small papilla, sulcate, translucently striate, pale brown to whitish, often with a dark brown centre and pallid to white margin; gills arcuate, broadly adnate to decurrent, L = 14-17, white; stem 20-60 x 0.5-1 mm, cartilaginous, glabrous, pale yellow brown, whiter towards the top and darker towards the base. Sp 7-10 x 4-6 μ m, Qav = c. 1.5, dacryoid to ellipsoid, amyloid; cheilocystidia clavate and diverticulate, some like in fig. 365E, others like in fig. 377B. Autumn; very rare in temp.-southern bore., one record from arc./alp. on *Athyrium*, only known from a few collections from NO (DD) and SE.
M. lohwaigii Singer
 - On other substrates 11
11. Most cheilocystidia ornamented only in the ventral part, the narrower tip without diverticulae. Cap 5-20 mm, hemispherical to convex, hygrophanous, milky coffee to hazel, with sepia lines, sometimes with sepia disc; gills broadly adnate with a pronounced decurrent tooth and may appear decurrent, ventricose or sinuate, L = 10-20, whitish smoke grey or white; stem (20-)35-75 x 1-2 mm, dull brown, milky coffee to sepia, smooth, quite tough, can be twisted to 180°. Sp 6-10 x 3.5-5 μ m, Qav = 1.7-2.0, ellipsoid to subcylindrical, amyloid; basidia 4-spored; cheilo- and pleurocystidia similar, either clavate with light verrucose ornamentation, or characteristically lageniform with the ventral part ornamented, but the tip usually smooth (fig. 373E), some with forked tips, ornamentation hardly more than 1 μ m high, mixed with basidia on the gill edge. In open or lightly wooded grassland or on conifer litter; autumn; rare in temp.-southern bore.; DK (DD), FI (DD), NO (DD). – B&K 3:344, FAD 55B, FRIC 3:21b, Myc 7(2):64, Rob 427.
M. latifolia (Peck) A.H. Sm. (*M. pinetorum* J.E. Lange)
 - Cystidia ornamented at all surfaces or only at apex 12
12. Cystidia cylindrical to clavate, ornamented only at the outer end (fig. 373F). Cap 4-25 mm,

paraboloid, then bell-shaped with a small umbo, with a crenulate margin when young, hygrophanous, translucently striate, sulcate, dark grey brown when moist, pale grey brown when dry; gills sinuate and broadly adnate, slightly notched at the stem, L = 15-22, grey; stem up to 30 x 1-2 mm, slightly broader below, conspicuously pruinose when young, when dry slightly shiny, grey to grey brown. Sp 7-10 x 5.5-7 μm , Q_{av} = 1.3-1.5, broadly ellipsoid; cheilocystidia mixed with basidia, distally ornamented; pleurocystidia similar; caulocystidia up to 85 x 30 μm , irregularly shaped. On *Quercus* stumps or on brown rotted wood; autumn; very rare in DK (DD, EJyl: Åbenrå).

M. silvae-pristiniae M.T. Veerkamp & Kuyper

- Cystidia ornamented \pm all over 13
- 13. Cystidia spheropedunculate with a narrow stem, ornamentation mostly < 1 μm high (fig. 355G) 14
 - Cystidia with longer diverticulae or other shapes 15
- 14. Frb often with a lilac tinge when young; gill edge concolorous with gills; stem base coarsely strigose; sp Q_{av} < 1.6; smell like iodoform, especially when drying

see *M. arcangeliana* key K 11

 - Frb without any lilac tinge; gill edge may be pale yellow when young; stem base not coarsely strigose; sp Q > 1.6; smell not like iodoform, but especially when crushed with smell of potatoes or earth

see *M. flavescens* key B 8
- 15. Cheilocystidia spheropedunculate, clavate or saccate, some constricted in the middle (fig. 373G); smell in fresh frb pleasant aromatic-spicy, not of iodoform on drying out. Cap 5-15(-20) mm, bell-shaped to convex, often with a small umbo, drab, sepia, cigar brown to fuscous black; gills ventricose, adnate with a decurrent tooth, L = 15-20(-25), drab, milky coffee, to whitish, edge paler; stem (25-)30-75 x 1-5 mm, pale vinaceous buff to hazel or sepia, darker towards the base. Sp 7-9 x 4-5(-5.5) μm , Q_{av} = 1.7-1.9, ellipsoid, amyloid; pleurocystidia sparse, similar to cheilocystidia; stem surface hyphae sparsely diverticulate, caulocystidia with diverticulate slightly capitate apex. On conifer litter, especially leaf beds of *Picea* and *Pinus*; early autumn to early winter; occasional, but locally common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – SMT 29(2):23, Svp 6:101.

M. septentrionalis Maas Geest. (*M. sepia* J.E. Lange s. Lundell)

 - Cheilocystidia spheropedunculate and balloon-shaped, not constricted in the middle; smell insignificant or on drying of iodoform 16
- 16. L < 16. see *M. mirata* key K 16
 - L > 16 17
- 17. Cheilocystidia mostly stipitate, up to 70 μm long; frb with pinkish hues. Cap 5-25 mm, conical to bell-shaped, often with a slight umbo or papilla, sometimes sulcate, but often with a silky texture, clay buff to vinaceous buff, often with a pinkish tinge or even with a clay-pink centre; gills ventricose or sinuate, narrowly to broadly adnate, may be with surface ridges, L = (14-)17-23(-25), clay buff to pinkish; stem 25-100 x 1-2.5 mm, silky smooth, clay or vinaceous buff to pale pink, often more fawn below. Sp 8-11 x 4-6 μm , Q_{av} = 1.7-2.2, dacryoid to ellipsoid, amyloid; cheilocystidia predominantly stipitate and voluminous, with diverticulae from 1-10 μm long (fig. 377A). Usually on conifer litter; very common in temp.-coniferous suba., occasional in mountain *Betula* forests and in arc./alp.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:349, FAD 56F, M&J 30, R&H 359, Rob 173.

M. metata (Fr.: Fr.) P. Kumm.

 - Cheilocystidia spheropedunculate, both sessile (fig. 377B) and stipitate (like in fig. 377A), the shorter ones plentiful, stipitate ones \leq 40 μm long; frb lacking pink hues 18
- 18. L = (25-)30-35; frb cream to yellowish white, looking similar to *M. flavoalba*. Cap 4-25 mm, narrowly conical to paraboloid when young, becoming bell-shaped, then low convex, trans-

lucently striate towards the margin, creamy white when young, later yellowish pale brown, white at margin, more brown at the centre with age; gills ventricose, narrowly adnate, white to cream sometimes with a pink tinge; stem 30-120 x 0.5-2.5 mm, watery white, becoming grey brown. Sp 7-10 x 3.5-5 μm , $Q_{av} = 1.7-2.3$, dacryoid to ellipsoid, amyloid; cheilocystidia like in fig. 377B, with some stipitate ones. Solitary to fasciculate on litter including twigs but often among moss in forest habitats, conifer and broadleaved; late summer to late autumn. DE. – B&K 3:372.

M. xantholeuca Kühner

Note: Indicated as Norwegian in The Norwegian Mycological Database, and one Danish collection may belong here. Status not clarified at present.

- L = (14-)17-20(-25); frb with shades of grey. Cap 5-20 mm, conical to bell-shaped, becoming more plane, often with an umbo, pale buff to vinaceous buff with darker centre, hazel to pale umber, sometimes almost white towards the margin; gills ventricose to sinuate, sometimes slightly arcuate, adnate with a decurrent tooth, white, often with a vinaceous or pink tone; stem 40-100(-150) x 0.5-2 mm, lightly pruinose, vinaceous buff to snuff brown, usually darker towards the base, paler to almost white at the top. Sp 8-10(-12) x 5-6.5 μm , ellipsoid, amyloid; cheilocystidia predominantly spheropedunculate (fig. 377B). On plant debris and litter, often in eutrophic sites, also along roads in disturbed sites with *Urtica* etc.; summer to autumn; very common in temp., common in hemib.-suba., also recorded from arc./alp.; DK (LC), FI (DD), FO, IS, NO (LC, incl. SvB), SE (LC). – Rob 161.

M. filopes (Bull.: Fr.) P. Kumm.

- 19(8) In mire habitats associated with *Sphagnum*, *Molinia*, etc. 20
- In drier habitats 21

- 20. Cap up to 20 mm, distinctly translucently striate; $L \leq 20$; stem fragile

see *M. concolor* key G 10

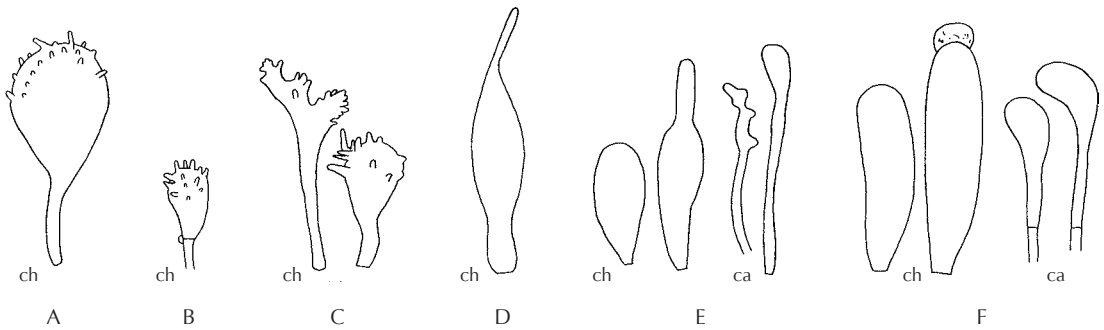
- Cap up to 40 mm; L rarely < 20; stem tough, can be twisted through 180°. Cap 10-35 mm, at first paraboloid to conical, spreading to shallowly convex, often umbonate, sometimes radially wrinkled, grey brown or pale cigar brown to sepia, date brown or fuscous black; gills ventricose-adnate, interveining obvious by their open nature, L = 17-28(-30), vinaceous buff to pale smoke grey or whitish, sometimes tinted pink; stem 20-200 x 2-4 mm including radicating part, hazel to date brown, paler at the top, radicating quite deep in moss or soil to buried roots. Sp 8-16 x 6-9 μm , varying over a wide range, $Q_{av} = 1.3-2.0$, dacryoid or almost cylindrical; basidia 2- or 4-spored, but do occur mixed; cheilocystidia irregularly clavate, sometimes branched and ornamented with uneven diverticulae (fig. 377C). Rooting in soil or *Sphagnum*, often in heathland and sometimes on burnt sites; summer to late autumn, occasional, but locally common in temp.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – FRIC 7: 51b, M&J 8, R&H 358, Rob 523.

M. megaspora Kauffman (*M. uracea* A. Pearson, *M. permixta* (Britzelm.) Sacc., *M. dissimulabilis* (Britzelm.) Lapl. s. auct.)

- 21. On cones of *Picea abies*, often buried; in spring; sp $Q < 2$. Cap 10-40 mm, hemispherical to conical, often with an umbo, which may be narrow, radially fibrillose, grey brown to dark sepia or chestnut brown; gills ventricose, adnate, L = 20-30(-40), pale grey; stem 30-70 x 1.5-3 mm, grey brown, generally paler than the cap; smell nitrous. Sp 6-11 x 4-6 μm , $Q_{av} = 1.5-1.9$, dacryoid to ellipsoid, amyloid; cheilo- and pleurocystidia fusiform (fig. 377D); caulocystidia cylindrical, fasciculate, up to 100 μm long. Occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – B&K 3:368, GBW 3:423, R&H 362, Rob 315, Sieniop 177.

M. plumipes (Kalchbr.) P.A. Moreau (*M. strobilicola* J. Favre & Kühner)

- On other substrates or later in the year and sp $Q > 2$ 22
- 22. On leaves of *Fagus sylvatica*; stem tough; cheilocystidia similar to fig. 367E; sp $Q > 2$. Cap 10-25 mm, conical to bell-shaped, becoming low convex, plicate, grey brown to brown; gills adnate, often with a small decurrent tooth, ventricose, L = 20-30, white to grey brown; stem



Cheilocystidia and caulocystidia: A: *Mycena metata*, B: *M. filopes*, C: *M. megaspora*, D: *M. plumipes*, E: *M. parca*, F: *M. ustalis*.

30-80 x 1-3 mm, yellowish grey to shades of brown, very tough. Sp 8-11 x 3.5-4.5 μm , Qav = 2.3-2.5, cylindrical, amyloid; cheilocystidia with irregular, broad diverticulae. Late autumn; rare or overlooked in temp.-hemib.; DK (DD), NO (NT), SE (NE). – FAD 56E, SMT 29(2):25.

***M. fagetorum* (Fr.) Gillet**

- On other substrates *or* stem not tough and cheilocystidia otherwise 23
- 23. Cap up to 3 mm; on leaf litter of *Salix* spp. 24
- Cap larger *or* on other substrates 25

24. Stem black when young, becoming grey from the base upwards; L = 0-8. Cap up to 3 mm, hemispherical, convex to bell-shaped, occasionally with a small papilla when young, shallowly sulcate, brownish grey or pale grey, often with a darker grey centre, fading to white with centre yellowish or ochraceous brown; gills arcuate, adnate to subdecurrent, sometimes reduced to shallow ridges or even absent, white; stem 5-10(-23) x < 0.2 mm, flexuous, glabrescent, entirely black when young, except for the base, which is whitish, fading from the bottom to grey as the frb matures, leaving black if any only present at the top, finally watery white, attached to the substrate by fine white fibrils. Sp 7-9 x 4.5-5.5 μm , dacryoid, amyloid; cheilocystidia smooth, simple clavate like in fig. 381A. On leaf litter of *Salix* spp.; autumn; rare or overlooked in hemib.; NO (NE, Vestf). – M&J 5.

***M. terena* Aronsen & Maas Geest.**

- Stem not black at any stage; L = 5-10 see *M. exilis* key H 6
- 25. On litter of *Juniperus communis*, especially in needle-beds 26
- On other substrates 27

26. Caulocystidia clavate, typically narrowing at apex; cap grey to dark brown with paler margin. Cap 7-30 mm, conical to convex, sometimes umbonate, translucently striate, strongly hygrophanous, sulcate; gills narrowly adnate, ventricose, L = 22-27, grey with a pale edge; stem c. 60 x 1-3(-5) mm, fragile, glabrous, shining, grey brown or concolorous with the cap. Sp 7-9(-10) x 4-6 μm , Qav = 1.4-2.2, dacryoid to ellipsoid, amyloid; cheilocystidia lageniform or clavate, smooth (fig. 377E); pleurocystidia similar; caulocystidia narrow, with or without broad rounded diverticulae, narrow at the tip, very rarely broadened, hyphae of the cap surface sparsely diverticulate. Gregarious in grass near *Juniperus* or on *Juniperus* needle litter; autumn; so far only known from two localities in southern hemib.; NO (LC, Vestf).

***M. parca* Aronsen**

- Caulocystidia inflated at apex; cap very dark sepia brown to black or even bluish black at the centre, sepia to beige towards the margin. Cap up to 40 mm, paraboloid, conical or bell-shaped, becoming applanate, often umbonate, finely radially fibrillose, translucently striate;

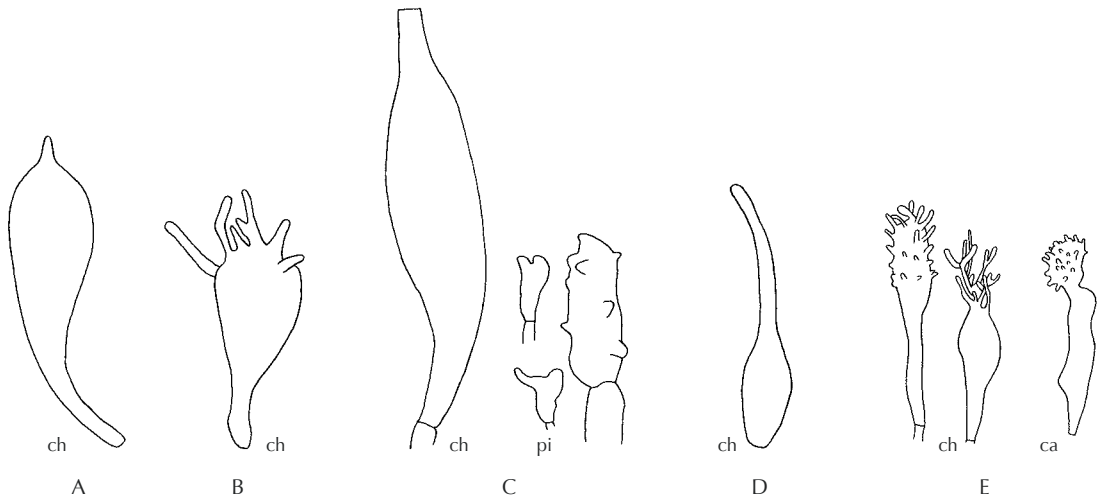
gills narrowly adnate, ventricose, L = 20-25, white, becoming grey with a pale edge; stem up to 80 x 4-5 mm, stocky, somewhat compressed and cracked lengthwise, finely pubescent at first, then glabrescent, slate to bluish grey brown at the top, paler below; smell nitrous. Sp 7-12 x 5-7(-8) μm , $Q_{av} = 1.5$; basidia 2- or 4-spored; cheilocystidia clavate, apically rounded, smooth, some with a gelatinous cap (fig. 377F); hyphae of the cap and stem surface smooth; caulocystidia characteristically broadened or bulbous at the apex. Gregarious to fasciculate in grass near *Juniperus* or on *Juniperus* needle litter, in coastal scrub; autumn; very rare or overlooked in northern temp., only known from type locality; NO (DD, Vestf). – C&D 574, Rob 324.

M. ustalis Aronsen & Maas Geest.

27. In coniferous and broadleaved woodland; stem markedly pubescent; cheilocystidia inflated, smooth, many with an acuminate apex (fig. 379A). Cap 10-40(-50) mm, conical, bell-shaped to convex with an acute papilla, pale vinaceous buff to fawn and umber, frequently spotted; gills sinuate to adnate with a decurrent tooth, ventricose, L = (18-)20-28, white, becoming red spotted; stem 30-70 x 2-4 mm, finely pruinose, vinaceous buff, pale fawn to brown vinaceous, firm but not tough. Sp 8-12 x 4-5.5 μm , $Q_{av} = 2-2.7$, subcylindrical, amyloid; cheilocystidia smooth and variable, but mostly inflated, many with one or more acuminate tips; surface hyphae of cap smooth, those of the stem almost smooth, but with long broad smooth or irregularly diverticulate caulocystidia, which are often curved and branched, occurring as fascicles. On debris, from especially *Picea* and *Pinus*, more rarely from *Fagus*; autumn to early winter; common in temp.-southern bore. in FI north to EH; DK (LC), FI (LC), NO (LC), SE (LC). – C&D 583, GBW 3:426, M&J 17, R&H 361, Rob 347, ☉.

M. zephirus (Fr.: Fr.) P. Kumm.

- In various habitats; stem not markedly pubescent; cheilocystidia not inflated, either smooth, lageniform or digitate 28
 - 28. Caulocystidia with narrow, acuminate diverticulae (fig. 383C) 29
 - Caulocystidia with broad, rounded or inflated diverticulae (fig. 381D) 31
 - 29. L < 22 see *M. vitilis* key K 26
 - L > 22 30
 - 30. Cheilocystidia with few fingers which may be broad or with many short irregular diverticulae (fig. 383C); hyphae of the cortical layer of the stem smooth with only occasional diverticulae see *M. polygramma* key K 26
 - Cheilocystidia very variable, but with many long narrow fingers which may be branched, (fig. 379B); hyphae of the cortical layers of the stem lightly diverticulate. Cap up to 40 mm, conical, flattening to become shallowly conical with a broad low umbo, sulcate, hygrophorous and translucently striate, very dark grey to almost blackish, drying with a more brownish tint; gills narrowly adnate, ventricose, L = 25-30, grey; stem up to 80 x 3-4 mm, fragile, blackish grey when young, then date brown to grey brown, paler than the drying cap; smell indistinct. Sp 8-12 x 5-7 μm , Q = 1.4-1.9, dacryoid, amyloid; cheilocystidia clavate and smooth, mixed with types with long narrow fingers; basidia 4-spored, also present on gill edge; caulocystidia similar to fig. 359I, with diverticulae up to 11 μm high. Among grass and herbs at forest edges, such as fire breaks, among mossy grass on needles and plant debris; very rare or overlooked, so far only known from FI (DD, EH, PK). – Sieniop 178.
- M. tristis* Maas Geest.
Note: a very poorly known taxon in need of further study.
- 31. Caulocystidia with many short diverticulae, but only slightly inflated, like in fig. 359C 32
 - Caulocystidia considerably inflated distally (fig. 381D)(check for buried wood) see *M. leptcephala* key K 22
 - 32. Frb very dark; on *Salix* litter; inflated diverticulate pileocystidia present as terminal cells of the cap surface hyphae. Cap up to 20 mm, conical to convex, flattening with age, mostly



Cheilocystidia, pileocystidia and caulocystidia: A: *Mycena zephrus*, B: *M. tristis*, C: *M. austera*, D: *M. aetites*, E: *M. juniperina*.

with a prominent umbo, sulcate, hygrophanous, translucently striate, dark grey with a darker greyish brown to almost black centre, margin paler to whitish; gills narrowly adnate with a decurrent tooth, ventricose, L = 25-30, grey to dark grey, with paler edge; stem up to 50 x 3 mm, pale grey at the top, darker greyish below, paler than cap; smell nitrous. Sp 9.5-11(-12.5) x 5-6.5 μm , Qav = 1.85, dacryoid to ellipsoid, amyloid; cheilocystidia smooth, fusiform, to over 100 x 20 μm (fig. 379C); pleurocystidia similar and frequent; caulocystidia broadly diverticulate; cap surface hyphae densely diverticulate with some terminal elements enlarged, inflated and of irregular shapes. On soil among *Salix* shrubs; so far only known from the type locality in southern NO (DD, Vestf).

M. austera Aronsen

- Frb paler; pileocystidia not inflated. Cap 10-25(-30), convex to bell-shaped, flattening and forming a broad umbo, hygrophanous, translucently striate, dark grey brown or sepia when young, becoming grey brown to drab; gills narrowly to broadly adnate, sinuate or ventricose, L = 14-20(-24), grey; stem 24-80 x 1-3 mm, concolorous with cap or slightly paler, to clay buff, fragile; smell not nitrous, rather rancid or farinaceous. Sp 8-10.5 x 5-7 μm , ellipsoid to subcylindrical, amyloid; cheilocystidia mostly fusiform (fig. 379D) or like in fig. 377D, sometimes with furcate necks; caulocystidia diverticulate, like fig. 359C. In grass, at roadsides, in lawns and other types of grassland; autumn; common in temp.-hemib.; DK (LC), FI (DD, V: Turku), IS, NO (LC), SE (LC). – B&K 3:315, C&D 572, Cou 132, M&J 42, Rob 223, Ⓢ.
- M. aetites*** (Fr.) Quél.

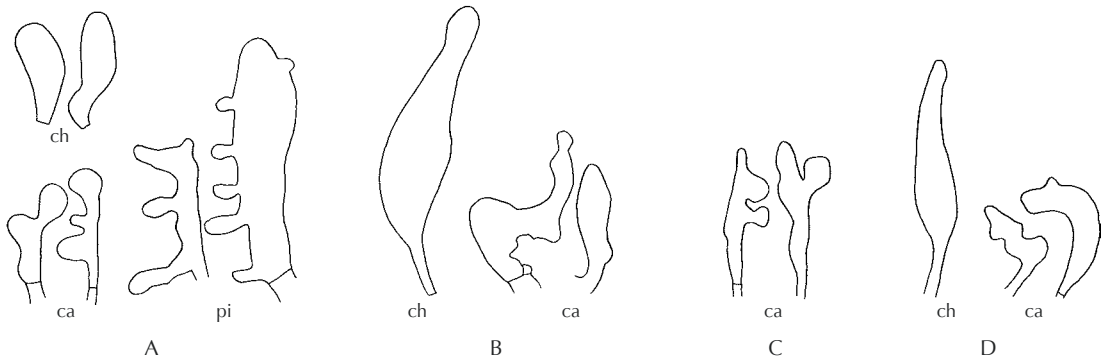
Key K: Frb not bright coloured, if white, then cap > 5 mm; not viscid or with coloured gill edges; on all kinds of woody substrates including bark of living trees and roots

1. Frb on trunks, root buttresses or branches of standing live trees, often among moss 2
- Frb on fallen trees, stumps, logs or fragments of woody debris 15
2. Scattered or in small groups on bark of living *Juniperus communis*. Cap 2.5-8 mm, hemispherical to paraboloid, finally convex, sometimes with a small papilla, conspicuously sulcate, pruinose to flocculose, pale brown or yellowish brown to rather bright brownish yellow, often darker at the centre, paler to white at the margin; gills arcuate and broadly

adnate with a decurrent tooth sometimes distinctly decurrent, L = (7-)10-13, pale yellowish grey or beige, edge white pruinose; stem 3-5 x 0.5 mm, slightly widened below the gills and at base, pruinose, beige to pale brown. Sp 9-12 x 8-10.5 μm , subglobose to globose, $Q_{\text{av}} = 1.0-1.3$, amyloid; cheilocystidia clavate with terminal diverticulae in dense groups, tangled, forked and up to > 30 μm long (fig. 379E); caulocystidia with fewer and shorter diverticulae; pileipellis hyphae with structures, like small cheilocystidia, giving a tangled coralloid appearance. Late summer to autumn; rare or overlooked in temp.-hemib.; DK (NA, EJyl: Vandplasken, Glatved Strand, Lol: Møn, Høvblege), NO (DD, Vestf), SE. – Rob 654, 658, SMT 29(2):20, Svp 51:56, ☉.

M. juniperina Aronsen (*M. cupressina* Antonín & Maas Geest.)

- On broadleaved trees 3
- 3. Sp non-amyloid 4
- Sp amyloid 9
- 4. Sp ornamented with round protuberances see *Mycenella* p. 257
- Sp smooth 5
- 5. Sp almost spherical, $Q \leq 1.2$ 6
- Sp ellipsoid, $Q \geq 1.3$ 7
- 6. Cap 2-6(-10) mm; stem minutely pruinose. Cap hemispherical to shallowly bell-shaped, sometimes papillate, sulcate, pruinose, \pm white to greyish brown; gills broadly adnate to decurrent and arcuate, L = 8-15, concolorous with the cap; stem 5-20 x 0.2-1 mm, concolorous with the cap or paler, minutely pruinose. Sp 7-10 μm , almost spherical, non-amyloid; basidia either predominantly 4-spored or 2-spored; cheilocystidia simple clavate (fig. 381A); caulocystidia and cuticular hyphae with inflated diverticulae. On mossy, living trunks; autumn; rare in temp.-hemib.; DK (DD, EJyl: Mønsted), NO (NT), SE (LC). – Rob 361.
- M. alba* (Bres.) Kühner
- Note: immature *M. hiemalis* might key to here with sp of low Q, but the cuticular hyphae diverticulae are not inflated.
- Cap > 8 mm; stem punctate-hirsute with hairs showing dark pigment with a lens; sp with a conspicuous apiculus, like a *Mycenella* see *Hydropus floccipes* p. 283
- 7. Cap creamy white. Cap 2-15 mm, bell-shaped to low convex, white to very pale cream to buff; gills adnate, ventricose, L = 16-22, concolorous with the cap or paler; stem 15-35 x 0.5-1.5 mm, distinctly pubescent, tough, can be twisted considerably without snapping, watery white or concolorous with the cap. Sp 6-9 x 5-6 μm , ellipsoid, $Q_{\text{av}} = 1.3-1.4$, non-amyloid; basidia 2- or 4-spored; cheilocystidia mostly narrowly utriform (fig. 381B); caulocystidia abundant, very variable, typically clavate, but often bent at right angles or even with a wavy outline. Associated with broadleaved trees, often *Fagus*, usually occurring at the base of trees, often on root buttresses; autumn; common in temp., rare in hemib.; DK (LC), NO, SE. – B&K 3:351, Bres 240.1, C&D 610, FAD 52B (as *gypsea*), M&J 33.
- M. olida* Bres. (*M. minutula* (Peck) Sacc.)
- Cap in shades of brown or grey 8
- 8. Gills arcuate and adnate to decurrent; caulocystidia as fairly simple hairs see *M. speirea* key G 5
- Gills ventricose, ascending and adnate, not decurrent; caulocystidia of various shapes with inflated ends (fig. 381C). Cap 2-10 mm, hemispherical, bell-shaped to low convex, clay buff to dark sepia at the centre, paler outwards; gills arcuate, adnate to decurrent, L = 10-20, white to off white; stem 10-30 x 0.5-1 mm, watery white. Sp 6-10 x 5-7 μm , $Q_{\text{av}} = 1.3-1.4$, non-amyloid; cheilocystidia cylindrical to lageniform; caulocystidia with inflated tips to the diverticulae. Usually at the base of broadleaved trees, also on fallen wood; autumn to winter; common in temp., rare in hemib.-southern bore.; DK (LC), FI (LC), NO (NT), SE (LC). – B&K



Cheilocystidia, caulocystidia and pileipellis elements: A: *Mycena alba*, B: *M. olida*, C: *M. hiemalis*, D: *M. leptcephala*.


3:341, FAD 54A, M&J 2, Rob 365, ☉.

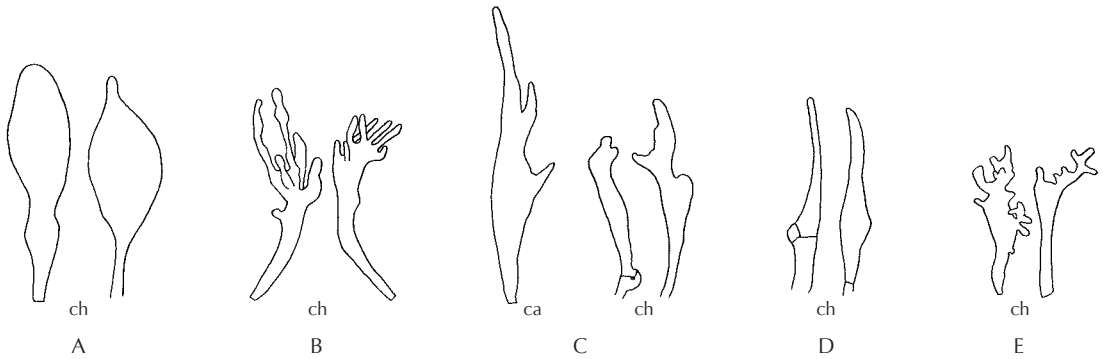
M. hiemalis (Osbeck) Quél.

9. Sp ellipsoid, $Q > 1.3$ 10
 - Sp almost spherical, $Q < 1.3$ 13
10. Cheilocystidia variable, but smooth with narrow tips which are occasionally forked, or with many narrow fingers see *M. erubescens* key C 2
 - Cheilocystidia clavate, ornamented with \pm even diverticulae 11
11. Cheilocystidia balloon-shaped, with even ornamentation, mostly just 1-2 μm high, like fig. 355G. Cap 10-25 mm, hemispherical, convex, bell-shaped to almost plane, sometimes umbonate, hygrophanous, translucently striate, from pale buff to sepia or with olivaceous tones, sometimes darker like date brown at the disc, the outer part being paler often with yellowish tones; gills ventricose or sinuate, adnate, $L = 16-28$, very pale straw to pale sulphur, often with a pinkish tinge; stem 25-70 \times 1-2.5 mm, violaceous grey to vinaceous buff, becoming clay buff to drab, never purely white, attached to substrate by coarse, white, strigose fibres at the base, which sometimes extend half way up the stem. Sp 6.5-9 \times (4.5-)-5-6 μm , ellipsoid, Q_{av} (1.3-)-1.4-1.5(-1.6), amyloid; pleurocystidia sparse, similar to the cheilocystidia. Often caespitose or in troops, on fallen wood, on mossy trees, in *Ribes* shrubberies etc., more rarely on leaf litter; from late summer, but predominantly in autumn to early winter; common in temp., rare in hemib.-suba., with southern distribution in FI; DK (LC), FI (DD), NO (VU), SE (NE). – B&K 3:319, Cou 118, Däh 376, Phil 81f, Rob 147, Svp 20:66, ☉.
M. arcangeliana Bres. (*M. oortiana* Hora)
 - Cheilocystidia similarly ornamented but with diverticulae less regular and up to 7 μm long, being mostly like those in fig. 377B, although some stipitate ones are present 12
12. $L < 16$ see *M. mirata* 16
 - $L > 16$ see *M. filopes* key J 18
13. Frb in smoke-grey tones see *M. pseudocorticola* key H 11
 - Frb with reddish brown or darker grey pigments 14
14. Frb with brown shades, sometimes faint mauve to reddish tones; cap with or without pigmented pustules; gills with or without coloured edge see *M. meliigena* key H 12
 - Frb greyish white with a darker centre, no mauve or purple tones; cap without pigmented pustules; gill edge not coloured. Cap 2-5(-10) mm, hemispherical, bell-shaped to convex, sulcate, translucently striate, dark sepia at the centre, paler sepia outwards; gills ventricose

or plane subhorizontal, adnate often with a decurrent tooth, L = 10-15(-18), grey brown with a paler edge becoming whiter with age; stem 6-20 x 0.5-1 mm, concolorous with the cap, pruinose. Sp 8-10 x 8-11 μm , globose, amyloid; cheilocystidia like fig. 367G, but the diverticulae less than 4 μm long, more like fig. 355G. On bark, often mossy, of broadleaved trees (*Ulmus*), possibly mostly in rich, calcareous sites; autumn to early winter; very rare or overlooked in temp.; DK (DD, EJyl: Mønsted), NO (NE), SE (LC). – FAD 57D, Rob 671.

M. supina (Fr.) P. Kumm.

- 15(1) Frb solitary or in a dispersed troop on various woody substrates 16
 - Frb \pm fasciculate or in close groups on stumps, fallen wood or roots, rarely solitary 27
16. Gills with L < 16; cheilocystidia diverticulate, like fig. 377B, but with slightly longer diverticulae, which are more variable in length. Cap up to 6 mm, hemispherical, later flattening, slightly sulcate, brownish grey or pale grey with whitish margin; gills ventricose, adnate, sometimes sinuate, L = 8-15, off white or with tinge of cap colour; stem 12-30 x < 0.5 mm, greyish brown, paler to white near the top, attached to the substrate by a distinct pad of fine fibrils; smell insignificant. Sp (7-)-8-12(-13) x 4.5-7 μm , $Q_{av} = 1.6-2$, dacryoid to subcylindrical, amyloid; basidia 2- or 1-spored. On small woody debris of conifers and broadleaved trees, in the litter layer; summer to late autumn; common in temp., occasional in hemib.-southern bore.; DK (LC), FI (DD), NO (LC), SE (LC). – FAD 57F (as *filopes*), 57H (as *debilis*).
M. mirata (Peck) Sacc.
- Gills with L > 16 or cheilocystidia smooth, perhaps furcate, but not diverticulate 17
17. Cap cylindrical with margin flaring slightly; gills shorter than broad. Cap 2-6 mm, umbilicate, dark brown with darker radial lines, the margin often rusty brown; gills flat with a decurrent tooth, L = 20-22, cream to pale brown often with a fulvous brown edge, especially at their outer end; stem 15-35 x 0.2-1 mm, wider just below the gills to twice the diam., concolorous with the cap or slightly paler brown, base with whorl of yellowish brown, smooth, strigose hairs. Sp 6.5-8.5(-10) x 3.5-5.5 μm , $Q_{av} = 1.6-1.7(-1.9)$, amyloid; basidia 2-4 spored; cheilocystidia hard to see, being part of a chain of cells with the terminal cells in diverse shapes, diverticulate with diverticulae often densely coralloid; caulocystidia absent. Often solitary, on many substrates in woodland habitats, including woody debris and fallen, strongly decayed conifer or hardwood trunks, e.g. *Alnus* and *Fagus*; summer to autumn; rare in temp.-bore., apparently more common in FI, easily overlooked; DK (NT), FI (LC), NO (DD), SE (LC). – B&K 3:353, Lud 88.1, Sieniop 173, Svp 8:97, .
M. picta (Fr.: Fr.) Harmaja (*Xeromphalina p.* (Fr.: Fr.) A.H. Sm.)
- Frb opening out normally; gills longer than broad 18
18. Sp non-amyloid 19
 - Sp amyloid 20
19. Gills arcuate and adnate to decurrent; caulocystidia as fairly simple hairs
see *M. speirea* key G 5
 - Gills ventricose, ascending and adnate, not decurrent; caulocystidia of various shapes with inflated ends (fig. 381C) see *M. hiemalis* 8
20. On fallen trees, stumps or fallen twigs of coniferous trees 21
 - On fallen trees, stumps or litter of broadleaved trees 24
21. On fallen twigs and thin branches; cap rarely exceeding 30 mm 22
 - On stumps, fallen trees and fallen branches; cap often 30-40 mm 23
22. Caulocystidia inflated distally (fig. 381D); cheilocystidia rarely with abruptly acuminate tip. Cap 5-22 mm, bell-shaped to convex, occasionally umbonate, striate, smooth or somewhat sulcate, from smoke grey through various darker shades of grey, often with clay buff shades to dark drab, sepia or cigar brown, sometimes warmer hazel towards the centre; gills



Cheilocystidia and caulocystidia: A: *Mycena abramsii*, B: *M. vitilis*, C: *M. polygramma*, D: *M. laevigata*, E: *M. maculata*.

ascending, ventricose, adnate usually with a decurrent tooth, L = 14-26; stem 20-80 × 0.5-2 mm, purplish chestnut above, paler to cap colour or paler below; smell usually distinctly nitrous. Sp 7-12 × 4-6 μm, ellipsoid to subcylindrical, Qav = 1.5-1.8, amyloid; basidia typically 4-spored; cheilocystidia clavate to fusiform and lageniform, (fig. 381D). On litter and humose soil in and outside forests, usually attached to wood, occasionally on trunks low down; summer to late autumn; very common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – Cou 118, FAD 51D, Rob 265, Ves 237.

M. leptocephala (Pers.) Gillet (*M. chlorinella* (J.E. Lange) Singer)

Note: *M. arosenii* Maas Geest. (NO) differs only by having diverticulate hyphae of the stem surface. The *M. leptocephala* group is badly in need of revision using both morphological and molecular methods.

- Caulocystidia absent or as simple uninflated terminations; cheilocystidia smooth and variable, some furcate, some with an abruptly acuminate tip, but not very inflated (fig. 383A) see *M. abramsii* 25
- 23. Cap various shades of light brown, often with a dark centre, frequently discoloured with red stains; smell not distinctive; stem markedly pubescent; cheilocystidia inflated with an acuminate tip see *M. zephirus* key J 27
- Cap dark brown; smell often nitrous; stem without distinctive pubescence; cheilocystidia not inflated with an acuminate tip (check for signs of pigment on the outer ends of the gill edge) see *M. viridimarginata* key B 6
- 24. Smell nitrous (may quickly disappear); cheilocystidia smooth and variable, some furcate, some with an abruptly acuminate tip, or with inflated caulocystidia 25
- Smell not notable; cheilocystidia lageniform or digitate, but not usually with an acuminate tip; frb relatively tough 26
- 25. Caulocystidia absent or as simple uninflated terminations; cheilocystidia with acuminate tip, but rarely very inflated; frb rather fragile. Cap 10-30(-35) mm, hemispherical, bell-shaped to convex, sometimes subumbonate, translucently striate, sepia brown to drab at the centre, paler brown outwards, becoming paler; gills sinuate to ventricose, adnate, L = 18-28, white, vinaceous buff or pale grey; stem 30-100 × 1-3 mm, smooth, hollow, fragile, yields watery liquid when damaged, concolorous with the cap or paler especially towards the top sometimes white, sometimes with a vinaceous tone. Sp 7.5-13 × 4-6(-6.5) μm, ellipsoid to subcylindrical, Qav = 1.8-2.1, amyloid; cheilocystidia variable, lageniform and fusiform, with mucronate types (fig. 383A) characteristically present, sometimes furcate; pleurocystidia similar but sparse. Usually solitary and attached to wood rather than soft

litter; late spring to autumn; common in temp.-hemib., rare, but locally occasional in bore.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:311, Bol 19(3):92, GBW 3:413, R&H 364, Rob 219.

M. abramsii (Murrill) Murrill

- Caulocystidia inflated distally; cheilocystidia rarely with abruptly acuminate tip; frb not fragile see *M. leptocephala* 22
26. L < 23; cheilocystidia narrowly digitate. Cap 5-20 mm, bell-shaped when young, becoming convex, often with an umbo, sometimes with a rimose appearance as if finely fibrillose, vinaceous buff to grey brown, darker at the centre sometimes as dark as cigar brown or sepia; gills ventricose to sinuate, narrowly adnate, sometimes with a small decurrent tooth, to adnexed, L = 16-21(-23), whitish to pale grey often with a pink tinge, stem 50-90(-120) x 1-2 mm, glabrescent, shiny when dry, lubricous when wet, fairly firm, splits if twisted beyond 180°, whitish above, vinaceous buff to clay buff below. Sp 7.5-12 x 5-7.5 μm, ellipsoid to subcylindrical, Qav = 1.5-1.7, amyloid; cheilocystidia digitate with long fingers which tangle with others hindering disruption from the gill edge (fig. 383B); basidia 4-spored, lacking clamps in most collections, sometimes 2-spored. On twigs ± buried and often in deep litter, sometimes it appears to be growing on leaf litter, often with *Fagus* and *Quercus*, but also with other broadleaved trees; early summer to early winter; very common in temp.-hemib., occasional in bore.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:371, FAD 52D, Rob 339, Ves 237.

M. vitilis (Fr.) Quél.

- L > 23; cheilocystidia with few fingers which may be broad or with many short irregular diverticulae (fig. 383C). Cap 20-30(->50) mm, conical, sometimes with an umbo, often with revolute margin with age, plicate, ash grey, grey brown to dark sepia, darkest at the centre; gills sinuate or ventricose, narrowly adnate or adnexed, L = 23-35, white to pale grey, sometimes tinged pink; stem 50-150(-180) x 1-5 mm, grey to greyish brown, often with a silvery blue grey sheen, smooth or with shallow longitudinal grooves, finely pubescent, becoming glabrous, tough, can be twisted through 180° with care. Sp 8-10 x 5.5-7 μm, ellipsoid, Qav = 1.4, amyloid; surface hyphae of the stem smooth with only occasional diverticulae, caulocystidia with tapering limbs; clamps abundant. On all kinds of woody debris from broadleaved trees, occasionally rooting to buried substrates; autumn to early winter; very common in temp., occasional in hemib.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 52C (white form), 52F, GBW 3:419, M&J 13, Rob 289, Ves 237, ☉.

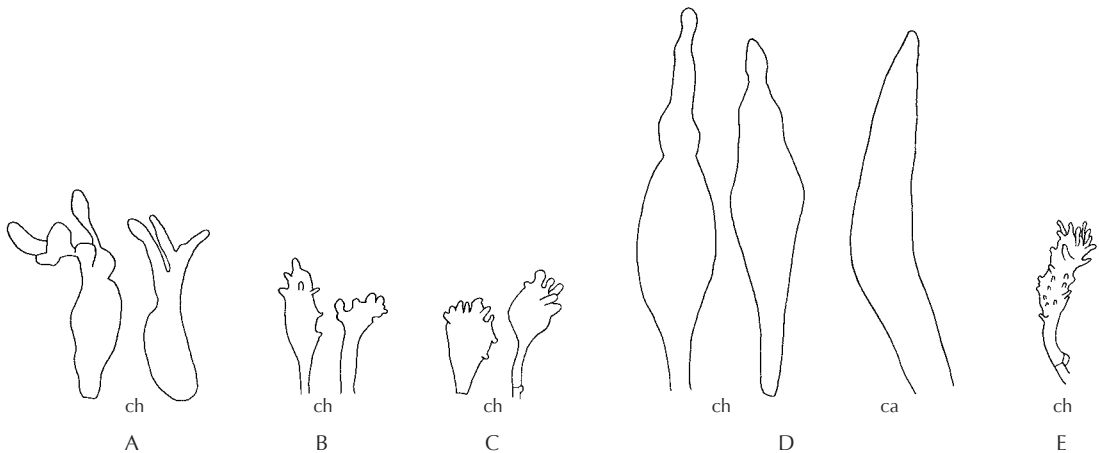
M. polygramma (Bull.: Fr.) Gray

- 27⁽¹⁵⁾ With coniferous trees 28
 - With broadleaved trees 31

28. Cap creamy white, discolouring dirty orange brown; smell not nitrous. Cap 10-30 mm, low convex, convex to bell-shaped, sometimes papillate or slightly umbonate, ivory white to ochraceous or pale buff, especially at the centre, sulcate and translucently striate, slightly viscid; gills sinuate, ventricose or arcuate, adnate to slightly decurrent, L = 25-30(-32), white to cream; stem 30-70(-100) x 1-3 mm, silky white, often with translucent bands and sometimes a faint lilac tone, in the early stages more smoke grey, very tough and fibrous, can be twisted beyond 180° without damage. Sp 6.5-7(-8) x (3-)3.5-4.5(-5) μm, ellipsoid, Qav = 1.7-1.8, amyloid; cheilocystidia smooth and narrowly fusiform (fig. 383D); caulocystidia at the top of the stem like the cheilocystidia, otherwise like hyphal ends with diverticulae up to 6 x 2 μm. On decaying larger conifer trunks; late summer to autumn; common in bore., occasional but locally common in hemib.; FI (LC), NO (LC), SE (LC). – B&K 3:343, C&D 576, M&J 14, R&H 363, Rob 259.

M. laevigata (Lasch) Gillet

- Cap with brown shades; smell nitrous or not 29




Cheilocystidia and caulocystidia: A: *Mycena silvae-nigrae*, B: *M. inclinata*, C: *M. tintinabulum*, D: *M. niveipes*, E: *M. galericulata*.

29. Smell not nitrous; cap and gills may be spotted red; cheilocystidia variable, but clavate with irregular diverticulae (fig. 383E), not smooth. Cap 10-45 mm, obtusely conical to bell-shaped, or convex, various shades of brown, from vinaceous buff to dark sepia, usually darker at the centre, frequently developing brown-vinaceous to dull red spots, but not always evident in fresh fruitings, hygrophanous, sulcate, translucently striate; gills ventricose, adnate, L = 18-25, greyish white; stem 25-85(-100) x 1-4 mm, quite tough, withstands twisting, grey brown to pale sepia below, paler above to almost white. Sp 7-9 x 4.5-6 μ m, Qav = 1.4-1.7; cheilocystidia clavate and mostly distorted, with many coarse diverticulae (fig. 383E), these are discontinuous, with tracts of basidia scattered along the gill edge (this character helps separate this species from dark *M. galericulata*, which has similar cheilocystidia but a sterile gill edge). Fasciculate on *Quercus* trunks and stumps in the south and on *Picea* trunks further north; autumn; occasional in temp.-hemib., occasional in bore., but rarer in northern part; DK (LC), FI (LC), NO (LC), SE (LC). – GBW 3:450, M&J 15, Rob 519.
M. maculata P. Karst.
- Smell usually markedly nitrous; cap and gills lacking any red discoloration; cheilocystidia smooth fusiform, lageniform or clavate, may be simple or with variously forked ends
- 30
30. Basidia 2-spored; clamps absent; pleurocystidia present, like the cheilocystidia. Cap 10-35 mm, paraboloid, often with a flared margin, becoming more bell-shaped, papillate or umbonate, sometimes areolate-rimose, very dark black brown when young, becoming sepia to hazel; gills ventricose, adnate, L = 14-25, white to grey; stem 30-120 x 1-4 mm, usually curved into substrate, shiny, pale brown above, darker below, in young frb with a silvery lilac tinge above. Sp 8-14 x 6-10 μ m, subcylindrical, Qav = 1.5-1.8, amyloid; cheilo- and pleurocystidia fusiform, or clavate with digitate extensions, which might be furcate (fig. 385A). On conifer wood, often on rotten stumps, sometimes in mires, also recorded on *Picea* cones; mainly in spring to early summer; occasional, but possibly overlooked in temp.-hemib.(-bore.?). DK (LC), NO (LC), SE (LC). – B&K 3:365, C&D 582, SMT 29(2):19.
M. silvae-nigrae Maas Geest. & Schwöbel (*M. alcalina* (Fr.: Fr.) P. Kumm. s. auct. p.p.)
- Basidia 4-spored; conspicuous clamps present; pleurocystidia absent. Cap 10-30 mm, paraboloid to bell-shaped, long remaining this shape, lubricous when wet, dark grey brown to sepia, hygrophanous and translucently striate; gills ventricose, adnate, L = 15-24, whitish smoke grey; stem 12-70 x 1-3 mm, concolorous with the cap or paler to milky coffee. Sp 9-11 x 5.5-7 μ m, ellipsoid, Qav = 1.6-1.8, amyloid; cheilocystidia fusiform to lageniform or clavate, some-

times furcate. Typically fasciculate, on conifer wood, often strongly decayed *Picea* or *Pinus* trunks or stumps; late summer to late autumn; very common in hemib., common in bore., rare in temp.; DK (NT), FI (LC), NO (LC), SE (LC). – B&K 3:367, GBW 3:421, R&H 364, Rob 312.

M. stipata Maas Geest. & Schwöbel (*M. alcalina* (Fr.: Fr.) P. Kumm. s. auct. p.p.)

31. Cheilocystidia cylindrical or clavate, evenly ornamented only at the outer end (fig. 373F) see *M. silvae-pristiniae* key J 12
 - Cheilocystidia smooth or ornamentation not restricted to the outer end 32
32. Stem floccose-pruinose, silvery grey to bicoloured, paler above and yellow brown to orange brown below; smell rancid-aromatic, farinaceous or of cucumber, especially when crushed. Cap 10-35(-40) mm, conical, becoming bell-shaped, sometimes with an acute papilla or broad umbo, with a crenulate rim exceeding the gills, may be radially rugulose or fibrillose, viscid when wet, from pale buff through hazel to sepia; gills ventricose, adnexed to adnate with a decurrent tooth, L = (18-)20-25(-28), white at first, becoming greyish sometimes with a pinkish or vinaceous tinge; stem 30-110 x 1.5-4(-6) mm, white floccose when young with a longitudinally grooved appearance, becoming bicoloured, the lower part of the stem developing a chrome yellow to date colour, the base very dark. Sp 8-10 x 5.5-7.5 μ m, Qav = 1.3-1.6; cheilocystidia clavate and very varied, with irregular broad or narrow diverticulae (fig. 385B) some like those in fig. 383B. In fascicles, typically associated with *Quercus*, more rarely on *Fagus*; autumn to early winter; common in temp.-hemib., rare in the eastern parts; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:342, FAD 55E, GBW 3:449, M&J 15, Ves 233, ☉.
M. inclinata (Fr.) Quél.
- Stem with another colour, smooth to pruinose; smell absent, nitrous or farinaceous 33
33. Stem all yellow; cap often lilaceous pink to yellowish red see *M. renati* key B 13
 - Frb with other less vivid colours 34
34. Sp \leq 6 μ m long. Cap rarely exceeding 25 mm, convex, bell-shaped to depressed with incurved margin, with very tough and leathery surface, greasy lubricous, only separable as strips, not as a separate pellicle, removed tissue has tissue from below, blackish brown to sepia to grey brown; gills adnate to decurrent, L = 20-24, whitish to grey; stem 15-40(-100) x 1-3 mm, glabrous and shiny, grey, becoming darker from the base; smell spermatic or as young camembert cheese. Sp 3-6 x 2-3 μ m, ellipsoid, Qav = 1.7-2.0, amyloid; cheilocystidia clavate with inflated or simple obtuse diverticulae (fig. 385C). Densely caespitose, clusters may be 40 cm across, on stumps and trunks from broadleaved trees mainly *Fagus*, but also with other broadleaved trees, e.g. *Betula*, *Populus* and *Quercus*; late autumn throughout winter to early spring; occasional, but locally common in temp., rare in hemib.-bore.; DK (LC), FI (VU), NO (NT), SE (LC). – GBW 3:452, M&J 41, R&H 360, Sienio 177, Ves 236.
M. tintinabulum (Fr.) Quél. ('tintinnabulum')
- Sp longer 35
35. Cheilocystidia smooth 36
 - Cheilocystidia clavate and diverticulate (figs 377C, 385E) 38
36. Frb white. Cap 13-20 mm, low convex to convex, ivory white to ochraceous or pale buff; gills ventricose, adnexed, L = c. 30, coloured as cap; stem up to at least 40 x 2 mm, concolorous. Sp 7-9 x 3.5-4.5 μ m, ellipsoid, Qav = 1.7-2.0, amyloid; cheilocystidia narrowly utriform like fig. 367D; caulocystidia smooth, ending in an acute tip rather like fig. 355E; surface hyphae of stem and cap smooth. In groups on buried hardwood in moist, *Alnus* dominated forest; on calcareous soil; autumn; very rare in bore.; SE (LC, Mpd).
M. sudorella Singer
- Note: this description is based on examination of the collection made in Mpd linked to the description of the type; the Swedish collection was the second recorded.
- Frb with grey or darker colours 37

37. Frb generally fragile; stem very pale to silvery white. Cap 15-60 mm, conical to bell-shaped, becoming almost flat, pale mouse grey to off white, the disc lightly coloured with vinaceous or clay buff or drab; gills ventricose, narrowly adnate L = 22-28(-30), white; stem (25-)35-80(-100) mm, sometimes with shallow longitudinal grooves, pale grey to shiny silky white, sometimes with a blue tone; smell usually nitrous. Sp (7-)8-10(-12) x (5-)5.5-7(-8) μm , Qav = c. 1.6, ellipsoid, amyloid; cheilocystidia, fusiform, with the tip often mucronate or beaked (fig. 385D); pleurocystidia similar; caulocystidia up to 10 μm wide, attenuated to a narrow tip, these may be curved to the shape of a walking stick handle. Scattered or in small fascicles, on wood from broadleaved trees, often in rich calcareous habitats; early summer to autumn; occasional in temp.-bore.; DK (DD), FI (LC), NO (LC), SE (LC). – R&H 363, Rob 275. *M. niveipes* (Murrill) Murrill
- Frb less fragile, with darker colours, grey brown to dark sepia. Cap 10-30 mm, paraboloid, becoming convex to bell-shaped, hygrophanous, \pm sulcate, blackish brown at the centre, shading through sepia to greyish brown; gills ventricose and adnate, L = 20-26, pale grey; stem 30-90 x 1-3 mm, blackish grey with a brownish cast, paler to whitish at the top, sometimes becoming entirely white on drying; usually with a nitrous odour. Sp 7-10 x 4.5-7 μm , Q = c. 1.6, ellipsoid, amyloid; cheilocystidia variable, clavate, sometimes with digital extensions or like the abundant pleurocystidia fusiform like those of *M. plumipes*, fig. 377D. – M&B 2:12. *M. algeriensis* Maire
- Note: the Nordic occurrence of this poorly understood taxon, should be re-evaluated but is currently listed from DK (DD), FI (DD), NO (NE), SE (LC). This description is based on a collection from Finnish Lapland and Kühner's description. The collection did not reveal any clamps in spite of a careful search. Maas Geesteranus suggests that it should have clamps, Kühner does not mention any. It is included in the key to raise awareness.
38. Frb often with reddish markings, especially in lower part of stem, even on fresh material; gill edge partly fertile, with tracts of basidia between cheilocystidia see *M. maculata* 29
- Frb without general reddish markings, although older material may show some red or pink colouration; gill edge sterile, with continuous cheilocystidia 39
39. Cap blackish grey to fuscous black; on roots of ericaceous shrubs or burnt roots of *Ulex*, often radicating to the substrate; cheilocystidia clavate, heads often branched (fig. 377C) (collections in this habitat were formerly referred to *M. uracea* Pearson) see *M. megaspora* key J 20
- Cap with greyish cream to grey brown colours, rarely white, darker when young; cheilocystidia rarely with any branching. Cap 10-45 mm, conical-hemispherical to bell-shaped, often umbonate, sometimes gibbous; gills ventricose emarginate, L = 18-40, off white to grey brown, often pinkish when old; stem 30-200 x 1-6 mm, dark sepia when young becoming pale vinaceous buff to pale greyish cream, tough, can be twisted through 360° and recover, sometimes radicating to buried wood. Sp 9-12 x 6.5-9 μm , Qav = 1.2-1.7, dacryoid, amyloid; basidia 2-spored (early season) or 4-spored (late season); cheilocystidia clavate with irregular short diverticulae (fig. 385E). On stumps, large branches, fallen trunks of broadleaved trees in most habitats where these occur; late spring to early winter; very common in temp.-bore.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:338, FAD 56C, GBW 3:447, Rob 501-502, Ves 235, .
- M. galericulata* (Scop.: Fr.) Gray

Mycenella (J.E. Lange) Singer

THOMAS LÆSSØE & STEEN A. ELBORNE

Frb mycenoid with pubescent stem. Frb somewhat recalling small *Xerula* species, solitary or in scattered groups, rarely fasciculate. Cap 3-30 mm, conical or convex, often umbonate, ± pruinose, dry, ± hygrophanous, pale grey, grey brown, reddish brown or very dark grey brown to sepia. Gills adnexed with a decurrent tooth, medium spaced, whitish to grey. Stem ± cylindrical, densely pubescent, dry, often somewhat rooting, paler than cap. Veil absent. Flesh thin. Smell and taste ± indistinct. Sp deposit whitish.

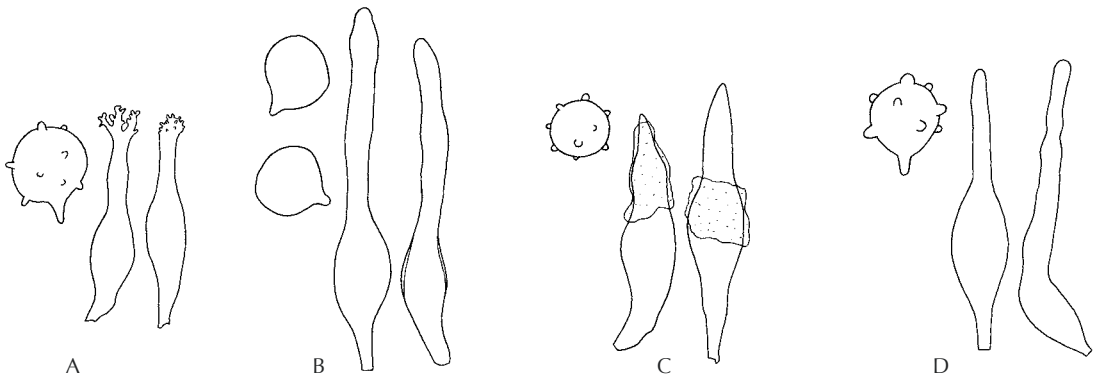
Sp < 10 μm, subglobose to irregularly globose, rather thick-walled, with rounded warts or smooth to angular, with prominent, truncate apiculus, hyaline, without iodine reactions. Basidia 2- or 4-spored. Gill edge fertile. Cheilo-, pleuro- and caulocystidia very prominent, ± lageniform to fusiform with divided or undivided top, sometimes subcapitate or mucronate, thin- to somewhat thick-walled, secretory. Gill trama without iodine reactions. Trama in stem sarcodimitic. Pileipellis a trichoderm or an ixotrichoderm, approaching a clavicutis, with ± distinct coralloid elements ('en brosse'). Pileocystidia absent to well developed, ± resembling hymenial cystidia. Clamps absent in 2-spored forms or present.

Saprotrophic; on ± calcareous soil, on strongly decayed wood or herbaceous litter.

Four species in the Nordic countries.

Xerula kuehneri can be viewed as intermediate between *Xerula* and *Mycenella*. Based on its big sp and pileipellis structures we accept it in *Xerula*. Some authors treat the genera as synonyms. Considering the low number of species in *Mycenella* the confusion over the use of names is considerable. Especially the number of sterigmata on the basidia has been misinterpreted over and over. Based on the Nordic material all taxa would seem to be able to form (1)-2-(3) or 4-spored basidia.

Lit.: Boekhout 1985, Boekhout in Bas et al. 1999, Courtecuisse 1985, Gminder & Krieglsteiner in Krieglsteiner 2001, Gröger 1996, Kühner 1938, 1989, Ludwig 2001, Moreau & al. 1999, Rexer 1994.





Spores and hymenial cystidia: A: *Mycenella lasiosperma*, B: *M. salicina*, C: *M. trachyspora*, D: *M. bryophila*.

1. Pleurocystidia with coralloid apex, lageniform-fusiform (fig. 259A). Cap 3-8(-15) mm, ± conical, ± striate, dry, grey to pale grey or with yellowish grey tones; gills adnexed, pale grey; stem 25-55 × 1-1.5 mm, cylindrical, pale grey, strongly pubescent, ± rooting; smell and taste faint or indistinct. Sp 6-8 × 5.5-8 μm, globose, ± distinctly nodulose-verrucose; basidia 2-4 spored; cheilocystidia with acute or coralloid apex, lageniform, may be covered in resinous material; epicutis densely 'en brosse', with or without distinct pileocystidia; clamps present. On decayed, ± moss covered wood of deciduous trees (*Betula*, *Alnus*, *Fagus*), on rotten bark, on litter under *Juniperus*, on rotten *Carex* and fern tussocks, on *Geranium* litter in dune sand, in alpine meadows, on conifer debris, rarely on soil, calciphilous; late summer to

late autumn; occasional in temp., rare in hemib.-arc./alp.; DK (LC), FI (VU), NO (LC), SE (LC). – FAD 58D, D1, Lud 50.4A,B.

M. lasiosperma (Bres.) Locq. (*M. margaritispota* (J.E. Lange) Singer)

Note: some authors accept *M. margaritispota*, based on characters associated with the original description of *M. lasiosperma* – a mealy smell and fasciculate frb.

- Pleurocystidia lageniform to fusiform without branching at apex 2
- 2. Sp > 10 μm , with prominent conical warts see *Xerula kuehneri* p. 263
- Sp < 10 μm , smooth or verrucose-nodulose 3
- 3. Sp smooth to weakly angular, with one or two projections or with rather few very low warts 4
- Sp distinctly nodulose-verrucose although some \pm smooth sp may be present 5
- 4. Stem distinctly blackish punctate see *Hydropus floccipes* p. 283
- Stem whitish pruinose-floccose. Cap 6-21 mm, bell-shaped, convex to umbonate, finally flattened with upturned margins, rarely with a papilla, smooth to wrinkled-uneven, dry to slightly viscid, mostly striate, densely pale pubescent, blackish brown to dark grey brown or more reddish brown at margin; gills broad, adnexed to adnate to sinuate, often interveined, medium spaced, white to grey; stem 10-40(-60) \times 0.8-2(-3) mm, grey to sooty brown near base, whitish pubescent, base with white hairs; smell and taste indistinct. Sp 5-7 \times 5-6.5 μm , apparently up to 9.5 μm long in alpine Norway, globose to almost rhomboid, rarely with 1-2 projecting warts, with a conical, up to 2 μm long apiculus (fig. 259B), thick-walled; basidia (1-)2-4 spored; cheilo- and pleurocystidia 70-80 \times 10-12 \times 4.5-6 μm , broadly conical to lageniform, often with clavate or slightly attenuated apex, thin- to slightly thick-walled in the median part, with \pm pronounced yellowish resinous material on the apical part; clamps present or absent (2-sp.). On calcareous soil, both clays and sand, under deciduous or coniferous trees, sometimes attached to twigs etc., or in open, grassy places, alpine heathland, often with moss and *Camarophyllopsis* species, more rarely on strongly decayed wood; late summer to late autumn; rare, but overlooked, in temp.-arc./alp.; DK (LC), FI (NT), NO (LC), SE (NE). – C&D 616, Lud 50.3, Myc 7:178, Svp 20:64, .
- M. salicina* (Velen.) Singer (*M. salicina* (Velen.) Singer f. *bispora* Courtec.)
- Note: *M. favreana* E. Horak is listed from NO and SE (Kühner 1989), but it is not certain whether the material correspond to the type from the Alps. The spores are more angular to low verrucose in *M. favreana*. The big spored material from the Arctic is in need of further revision in relation to both *M. salicina* and *M. favreana*.
- 5. Cystidia fusiform and \pm mucronate (fig. 259C); most exsiccata with prominent red dots, especially on the gills. Cap 5-25 mm, conical to convex, umbonate or with a papilla, dry to slightly viscid, \pm striate, pruinose, sooty grey to pale mouse grey; gills adnexed, pale grey, medium spaced with many short gills; stem 30-55 \times 1-2 mm, \pm rooting, densely pubescent, paler than cap, darker towards base; smell insignificant. Sp 4.5-6 \times 4.5-5.5 μm , nodulose-verrucose, thick-walled; basidia 2-or 4-spored; cheilocystidia 45-70 μm long, \pm fusiform to fusiform-mucronate, with conspicuous reddish brown resinous incrustations in exsiccata; caulo- and pileocystidia \pm thick-walled, subfusiform, excretory; stipitipellis with short to long diverticulae. Mostly on calcareous soil, often stiff clays, but also on very strongly decayed wood or rotten roots and bark, often in connection with moss; autumn; rare, but locally occasional in temp.-hemib.; DK (LC), FI (DD), NO (NE, Vestf: Tønsberg, Østf: Fredrikstad). – FAD 58F (as *Mycena lasiosperma*), Lud 50.1A,B, RdM 37:74, .
- M. trachyspora* (Rea) Boekhout (*M. rubropunctata* Boekhout)
- Cystidia \pm lageniform (fig. 259D); exsiccata without distinct red dots. Cap (5-)10-30 mm, conical, bell-shaped to low convex, sometimes umbonate or with a papilla, grey brown to almost dark bluish grey, dry; gills adnate with a tooth, medium spaced, whitish to grey-

ish; stem 35-70(-100) x 1.3-3 mm, cylindrical to widened basally, strongly pruinose-floccose, greyish to blue grey, rooting; smell and taste insignificant. Sp 6-9.5 x 5-8 μm , \pm globose to subglobose, outline very uneven to distinctly nodulose-verrucose; basidia 2- or 4-spored; cheilo- and pleurocystidia lageniform, short- to very long-necked, sometimes with slightly widened top, thin- to slightly thick-walled, with inconspicuous to conspicuous yellow resinous deposits. On rich, often clayey soil with scattered moss cover, more rarely on rotten wood, typically in woodland but also in open grassy habitats; autumn; rare in temp.-arc. / alp.; DK (DD), FI (EN, V: Masku), IS (Ve: Hvalfjörður), NO (LC, Sv), SE (NE). – B&K 3:373, C&D 615, Lud 50.2B.

M. bryophila (Voglino) Singer (*M. bryophila* (Voglino) Singer var. *caesia* (Oort) Boekhout)

Note: *M. bryophila* var. *caesia* is a dark form and part of the material from DK falls in this category.

Mycetinis Earle

MACHIEL NOORDELOOS

Marasmius Fr. s. lato p.p.

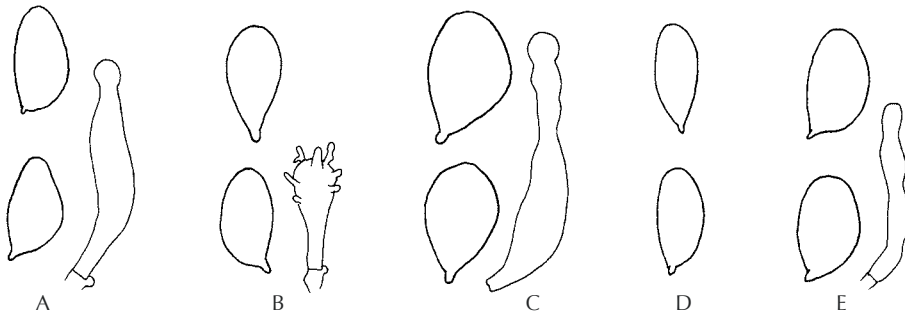
Frb marasmoid to collyboid. Cap up to 50 mm broad, often slightly rugulose, coloured, often hygrophanous. Gills well developed, free to adnate, sometimes attached to a pseudocollarium, thin, distant to moderately crowded. Stem central, not insititious, usually with distinct basal mycelium, often short rooting, glabrous, pubescent or furfuraceous. Flesh thin to fairly thick. Smell none or very distinct, like onion or garlic. Taste mild or unpleasant. Sp deposit white.

Sp narrowly to broadly ellipsoid, amygdaloid, citriform or almost clavate, hyaline, without iodine reactions. Basidia 2- or 4-spored. Cheilocystidia nearly always present, cylindrical, clavate, fusiform, lageniform, sometimes with apical projections. Pleurocystidia present or absent. Caulocystidia present or absent. Pileipellis hymeniform, made up of smooth elements, rarely with a few finger-like apical projections. Pileocystidia usually absent, rarely present. No part of frb dextrinoid. Clamps present.

Saprotrophic or possibly also parasitic, on dead wood, leaves or needles, in humus, or on bark of living trees.

Five species in the Nordic countries. For a discussion of the status of the genus *Mycetinis*, see under *Marasmius*.

Lit.: Antonín & Noordeloos 1993, 2008, Wilson & Desjardin 2005.



Spores and cheilocystidia: A: *Mycetinis epidryas*, B: *M. scorodonius*, C: *M. alliaceus*, D: *M. querceus*, E: *M. kallioneus*, F: *Omphalotus illudens*.

- Smell indistinct. Cap 5-15 mm, convex, yellowish brown; gills broadly adnate, medium spaced, L = 12-15, whitish; stem 10-30 x 1-2 mm, pubescent, brownish black. Sp 8.5-10.5 x 5-7 μm , amygdaloid (fig. 307A); cheilocystidia and pleurocystidia 50-70 x 5-9 μm , fusiform, lageniform or lecythiform; pileipellis hymeniform of smooth cells mixed with thick-walled pileocystidia. In *Dryas* heathland on calcareous soil; summer to autumn; locally occasional in suba.-arc./alp., common in IS; FI (NT, EnL: Saana, Pikku-Malla), IS, NO (LC), SE (LC).
– A&N 93 pl. 6, AAF 1: 21, BCat 836, Lud 47.10, M&J *Marasmius* 4, ⊙.
M. epidryas (Kühner) Antonín & Noordel. (*Marasmius* e. Kühner)
- Smell strong, like garlic

2. Stem smooth, glabrous, polished. Cap 5-20 mm, convex to plane, red brown; gills crowded, L = 16-30, white; stem 10-40 x 0.5-2 mm, red brown. Sp 7-10 x 3-5 μm , oblong to ellipsoid (fig. 307B); cheilocystidia 15-35 x 6-14 μm in form of broom-cells of siccus-type. In heathland, dunes and dry grassland, along paths and in clearings in forests, on sticks and debris; summer to late autumn; very common in temp.-hemib., common in southern-middle bore., rare in northern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 346, GBW 3:344, Lud 47.7, R&H 329, Ves 222, ☉.
M. scorodonius (Fr.: Fr.) Wilson & Desjardin (*Marasmius* s. (Fr.: Fr.) Fr.)
- Stem pruinose or pubescent 3
3. Stem 50-200 x 1-4 mm, blackish brown; on sticks and wood of *Fagus*, rarely also on leaves. Cap 5-40 mm, convex to plane, dark reddish brown to blackish brown, not translucently striate; gills free or adnexed, with irregularly serrate edge, medium spaced, L = 14-25; stem pubescent. Sp 7.5-11 x 6-8 μm , \pm amygdaloid (fig. 307C); cheilocystidia 35-69 x 6-10 μm , irregularly lageniform. Late spring to early winter; very common in temp., rare, but locally occasional in hemib.; DK (LC), NO (LC), SE (LC). – B&K 3:276, Lud 47.9, Phil 118a, R&H 330, Ves 220, ☉.
M. alliaceus (Jacq.: Fr.) Earle (*Marasmius* a. (Jacq.: Fr.) Fr.)
- Stem 20-80(-90) x 1-2 mm, red brown; on other substrates 4
4. Gills crowded, L = 19-28; basidia 4-spored; on leaves of *Quercus*, rarely of other deciduous trees. Cap 10-25 mm, convex to plane, reddish brown to grey brown, translucently striate; stem 20-80 x 1-2 mm. Sp 7-10 x 4-5 μm , ellipsoid to dacryoid (fig. 307D); cheilocystidia absent. Autumn to late autumn; occasional in temp.-hemib., very rare in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 47D, KM 214, Lud 47.30, R&H 330, Rim 5:57.
M. querceus (Britzelm.) Antonín & Noordel. (*M. prasioemus* (Fr.: Fr.) Fr. s. auct.)
- Gills distant L = 12-18; basidia 2-spored; in snow beds in arc./alp. e.g. among grasses, herbs and *Salix herbacea*. Cap up to 20 mm, convex, very dark brown, initially not translucently striate; stem 20-40(-90) x 1-2 mm. Sp (9.5-)10-12(-13) x (6-)7-8 μm , ellipsoid to amygdaloid (fig. 307E); cheilo- and pleurocystidia 30-40 x 3-10 μm , flexuous to lageniform, scattered. Summer; in arc./alp.; NO (NE, SvB).
M. kallioneus (Huhtinen) Antonín & Noordel. (*Marasmius* k. Huhtinen)

Mythicomyces Redhead & A.H. Sm.

GRO GULDEN

Monotypic genus; see description below.

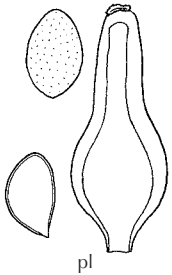
Lit.: Huhtinen & Vauras 1992, Redhead & Smith 1986.

Frb mycenoid with a cartilaginous stem Cap 10-30 mm, obtusely conical to bell-shaped or umbonate, finally convex, initially with inrolled margin, faintly translucently striate almost to umbo, greasy, shiny or slightly viscid, smooth, hygrophanous, when moist bright orange to orange brown, centre more red brown, drying buff. Gills narrowly adnate, rather broad, crowded, whitish to straw-coloured, becoming pale cinnamon to grey brown. Stem 30-70 x 1-2 mm, smooth, cartilaginous, rigid, shiny, at top red brown, dark reddish brown, gradually blackening from base upwards, with tawny basal mycelium. Taste indistinct or faintly bitterish. Smell indistinct. Sp deposit greyish brown.

Sp 6-8.5(-10) x 3.5-6(-6.5) μm , ovoid to ellipsoid, minutely punctate-verruculose, with dorsal suprahilar appplanation (plage?), without germ pore, thick-walled (fig. 909A), faintly brownish, practically hyaline, faintly amyloid, cyanophilous. Basidia 4-spored. Cheilo- and pleurocystidia 40-85 x 10-25 μm , 7-8 μm (apex), metuloid, utriform to lageniform-fusiform with blunt apex, irregularly thick-walled, with crystals at apex, amyloid in apical part. Pileipellis a thin ixocutis of radial, narrow hyphae (1-4 μm), overlaying inflated hyphae with barrel-shaped, 8-15 μm broad segments. Clamps present.

Saprotrophic. On plant debris, mainly wood, in wet, mossy, temporarily flooded, rich habitats, brook ravines; summer to autumn; very rare in hemib.-bore.; FI (vU), NO (NT, NTr: Grong), SE (NE). – Jordst 12(1), Kar 32:9, Lud 51.1, ⊗.

M. corneipes (Fr.) Redhead & A.H. Sm. (*Psilocybe* c. (Fr.) P. Karst.)



Spores and pleurocystidia.

Myxomphalia Hora

MACHIEL NOORDELOOS

Fayodia subgen. *Myxomphalia* (Kühner) Singer, *Mycena* (sect.) *Myxomphalia* Kühner, *Myxomphalia* (Kühner) Bigelow (invalid names)

One species in the Nordic countries, see description below.

Lit. Antonín & Noordeloos 2004, Gröger 2006, Watling & Turnbull in Henderson et al. 1998, Weholt 1988.

Frb omphalinoid or clitocyboid with spermatic or rancid smell. Cap 10-40 mm, umbilicate, smooth, hygrophanous, translucently striate, pale to dark grey brown, sometimes almost black. Gills adnate-decurrent to deeply decurrent, medium spaced, L = 20-35, white to pale brown or grey, strongly contrasting the cap; smell strong, spermatic or rancid. Stem 15-45 x 1.5-5 mm, broadened towards base, finely striate or ribbed lengthwise, coloured like cap or paler. Taste mild. Sp deposit white.

Sp 5.5-7 x 4-5.5(-6) μm , broadly ellipsoid, thick-walled, smooth (fig. 287B), hyaline, amyloid. Cheilocystidia and pleurocystidia 20-90 x 7-23 μm , clavate or sublageniform to utriform, scattered to abundant. Pileipellis and stipitipellis an ixocutis of narrow, gelatinized hyphae. Hyphae of flesh without iodine reactions. Clamps present.

Saprotrophic, in groups, usually on mineralised soil like burnt soil, rarely in wet places, in and outside forests. Summer to autumn; occasional in temp.-arc./alp.; DK (NT), FI (LC), FO, NO (LC), SE (LC). – A&N 04:157, 158, B&K 3:374, Lud 52.1, Phil 78a, R&H 367, ⊙.

M. maura (Fr.: Fr.) Hora (*Fayodia m.* (Fr.: Fr.) Singer)



Spores and cheilocystidia.

Naucoria (Fr.) P. Kumm.

JAN VESTERHOLT & JACOB HEILMANN-CLAUSEN

Alnicola Kühner

Frb mycenoid to collybioid with rusty sp deposit. Cap smooth, tomentose, scurfy or fibrillose, hygrophanous or not, dry, rarely slightly viscid, buff, clay buff, orange brown, reddish brown, greyish brown, umber or sepia, translucently striate or not. Gills emarginate or adnate, buff yellow, greyish brown to umber. Stem fibrillose, pale brown or greyish, in most species discolouring dark brown from base. Universal veil present, mostly very fugacious, but in one species abundant. Smell faint or slightly raphanoid, *Geranium*- or *Pelargonium*-like, in one species fruity. Taste mild to strongly bitter. Sp deposit clay buff to brown.

Sp amygdaloid to citriform or fusiform, almost smooth to verrucose, in few species ± dextrinoid. Basidia 2- or 4-spored. Cheilocystidia urticoid with a ± fusiform body and a long, tapering apical part or obtuse, clavate or capitate. Pleurocystidia mostly absent. Pileipellis a palisadoderm, an ixopalisdoderm, a paraderm or an ixoparaderm. Clamps present or absent.

On soil; most species in damp habitats, forming ectomycorrhiza with deciduous trees and shrubs, especially *Alnus* and *Salix*, or with the herb *Polygonum viviparum*. Two species occur on burnt ground and may not be mycorrhizal.

18 species in the Nordic countries. Both *Naucoria* and *Alnicola* have been commonly used as generic name. We accept Donk's (1962) typification of the genus with *Agaricus escharioides* Fr.: Fr. and consequently use the generic name *Naucoria*, see note p. 912. The genus as delimited here is polyphyletic (Moreau et al. 2006), and *N. pseudoamarescens*, *N. submelinoides* and *N. celluloderma* may need to be removed from the genus. In several species complexes it may often be difficult to achieve a reliable determination, and the separating characters used must be reevaluated in studies involving molecular techniques.

Lit.: Ludwig 2001, Moreau 2005, Moreau et al. 2006, Orton 1960, Reid 1984.

Main key

1. Cheilocystidia urticoid with a narrow and tapering apical part, with or without a small knob (figs 819E,H)
- Cheilocystidia with an obtuse, clavate or capitate apex (fig. 821A-E)

[Key A p. 818](#)

[Key B p. 821](#)

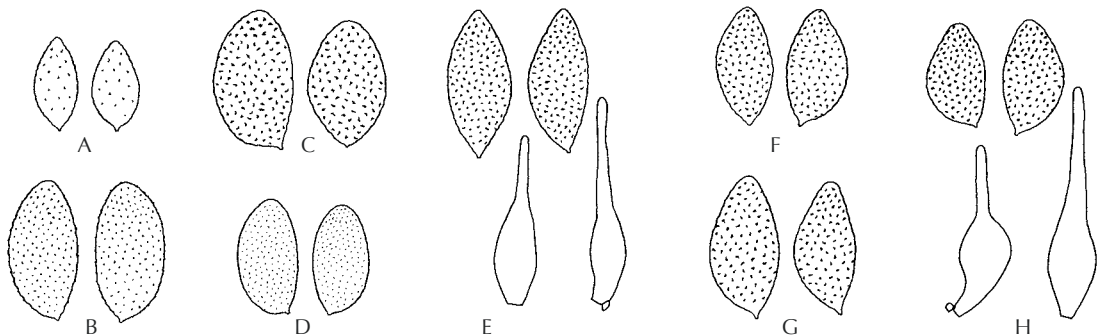


Fig. 819. Spores and cheilocystidia: A: *Naucoria zonata*, B: *N. tantilla*, C: *N. fellea*, D: *N. amarescens*, E: *N. scolecina*, F: *N. luteolofibrillosa*, G: *N. striatula*, H: *N. escharioides*.

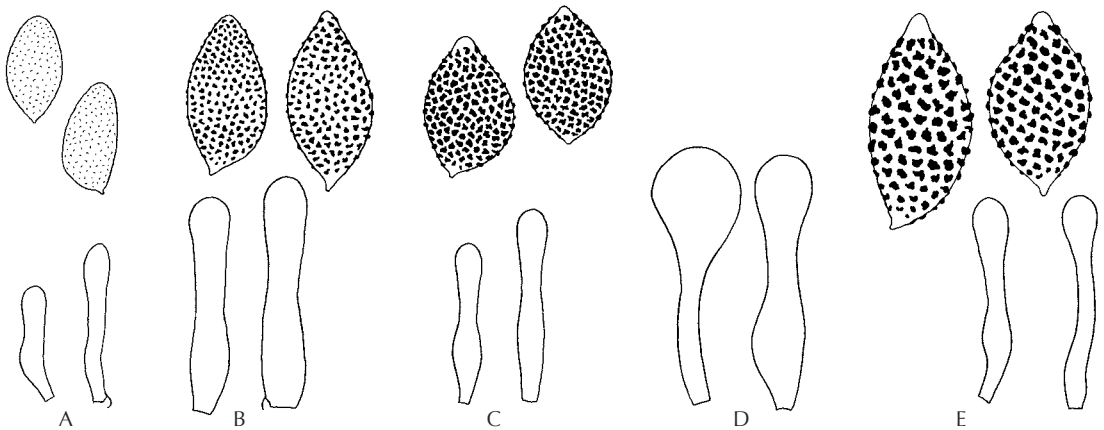


Fig. 821. Spores and cheilocystidia: A: *Naucoria pseudoamarescens*, B: *N. celluloderma*, C: *N. bohémica*, D: *N. badiolateritia*, E: *N. salicis*.

Key A: Cheilocystidia ± urticoid

1. With *Salix*, *Betula* or *Polygonum viviparum* or on burnt ground 2
 - With *Alnus* 6
2. Sp 6.5-8.5 × 3-4.5 μm (fig. 819A); cap zonate. Cap 15-27 mm, convex with a broad umbo, slightly rough, ochraceous brown with a reddish brown centre, not hygrophanous; stem 45-75 × 3-6 mm, cylindrical with a slightly clavate base, buff, turning umber from base; smell strong like *Geranium*; taste bitter. Sp amygdaloid to fusiform, rugulose, very pale; cheilocystidia 18-40 μm long, urticoid. In mixed forests, along roads and in gardens, often on damp ground; autumn; rare in bore.; FI (LC), SE (LC). – Lud 53.19.
N. zonata E. Ludwig & Reil
 - Sp ≥ 8.5 μm long; cap hardly azonate 3
3. Sp on av ≥ 10.5 μm long 4
 - Sp ≤ 10.5 μm long 5
4. Taste mild. Cap 5-20 mm, bell-shaped, smooth to scurfy, dry, dark orange brown to reddish brown, hygrophanous, not translucently striate; stem 15-30 × 1-3 mm, cylindrical, pale brownish with a darker brown base; smell indistinct. Sp 10-13.5 × 5.5-6.5 μm, ellipsoid to amygdaloid, verruculose (fig. 819B); cheilocystidia 25-55 × 6-13 μm, urticoid. With dwarf *Salix* in mountains; summer; occasional in suba.-arc. / alp.; NO (LC, incl. Svb). – AAF 2:43, B&K 5:140, Favre 55:4.5, Lud 53.11, M&J 4.
N. tantilla J. Favre (*Alnicola chamiteae* Kühner)
 - Taste very bitter. Cap 10-24(-40) mm, hemispherical to bell-shaped, dry, velvety, warm reddish brown with blackish brown centre and sometimes yellowish brown margin, not translucently striate; gills adnate to emarginate; stem 38-85 × 2-3 mm, cylindrical, concolorous with cap with darker base. Sp 11.5-13.5(-15) × 5.5-7 μm, amygdaloid to ± citriform, verrucose (fig. 819C); cheilocystidia 37-53 × 5-7.5 μm, ± urticoid, sometimes with a small apical knop. With dwarf *Salix* or *Polygonum viviparum* in mountains and coastal sand dunes, also with *Betula*; summer to early autumn; very rare in temp. and arc. / alp.; DK (DD, EJyl: Skagen), NO (NE, Hord: Finse), SE (LC). – Fav 48:2.14, Lud 53.12, Svp 54:27.
N. fellea (J. Favre) Raithelh. (*Alnicola cholea* Kühner)
5. Taste bitter. Cap 7-25 mm, conical to convex or expanded, mostly with a prominent umbo, hygrophanous, yellowish brown to reddish brown or umber, not translucently striate; stem

25-60 x 1-4 mm, cylindrical, pale buff, soon turning dark grey to blackish from the base; smell indistinct or like *Pelargonium* leaves. Sp 8.5-10.5 x 4.5-5.5 μm , ellipsoid to amygdaloid, rugose (fig. 819D); cheilocystidia urticoid. With *Salix* or on burnt ground, but also in ruderal places; spring to autumn; rare in temp.-arc. / alp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:128, Jordst 22(2), Lud 53.17, RdM 36:11, ZM 46:80.

N. amarescens Quél.

- Taste mild. Cap 5-30 mm, conical to convex or expanded, with or without a small umbo, hygrophanous, yellowish brown to reddish brown, not translucently striate; stem 30-90 x 1-4 mm, cylindrical, sordid cream, soon turning dark grey to blackish from base; smell like *Pelargonium* leaves. Sp 8.5-10.5 x 4.5-5.5 μm , ellipsoid to amygdaloid, rugose; cheilocystidia 30-60 μm long, urticoid. With *Salix* and possibly other hosts; summer to autumn; very rare in temp.-hemib.; NO (NE, Østf: Fredrikstad, Akh: Eidsvoll), SE (LC, Sk). – C&D 981, Lud 53:18.

N. geraniolens (Courtec.) G. Keller

Note: very similar to *N. amarescens* and seemingly only reliably separated by the taste.

6. Smell sweet, like ripe pears or burnt sugar. Cap 10-30 mm, convex to expanded or slightly depressed, scurfy to scaly, buff to olivaceous brown, hygrophanous; stem 25-45 x 0.1-0.3 mm, cylindrical, brown; universal veil pale, leaving remnants on cap and stem. Sp 7.5-10 x 5-6 μm , amygdaloid, rugulose; cheilocystidia 25-55 x 5-11 μm , urticoid, sometimes with a small apical knob. With *Alnus*; summer to autumn; rare, but locally occasional in bore.-suba., north to Finnmark; NO (NE). – B&K 5:137, Bres 802, Lud 53.16, RdM 40:238.

N. suavis Bres.

- Smell indistinct or raphanoid 7
- 7. Cap and gills cinnamon, orange brown or reddish brown, already in young frb 8
 - Gills pale yellow brown to buff; cap whitish, cream, yellowish or honey coloured, sometimes with orange brown spots in old frb 10
- 8. Cap translucently striate almost to centre. Cap 5-30 mm, convex to plane, with or without an umbo, smooth, often slightly velvety at margin, cinnamon to orange brown, often with fugacious veil remnants at margin, hygrophanous; stem 10-50 x 1-3 mm, cylindrical, yellowish brown to orange brown, turning darker brown from base, smooth, sometimes with scattered whitish fibrils in upper part; smell insignificant. Sp 10-14.5 x 5-6.5 μm , \pm fusiform, rugulose (fig. 819E); cheilocystidia 30-60 x 5-10 μm , urticoid, sometimes with subclavate top. Under *Alnus*, especially in bogs inundated in wintertime; summer to autumn; common in temp.-bore., occasional in suba.; DK (LC), FI (DD), NO (LC), SE (LC). – B&K 5:135, C&D 983, FAD 125F,H, Lud 53.13, Ves 380.

N. scolecina (Fr.) Quél.

- Cap not or only slightly translucently striate at margin 9
- 9. Cap deep date brown to umber, becoming paler near margin as the cap expands, entirely pale ochraceous or yellowish, minutely appressed scaly or scurfy-tomentose; sp 8-10.5 x 5-6 μm , ovoid to amygdaloid, rugulose; often in acidic habitats with *Sphagnum* or other mosses. Cap 8-40 mm, convex, sometimes with a low umbo, not translucently striate; gills medium spaced, rather dark brown; stem 35-65 x 1.5-3.5 mm, cylindrical, yellowish brown, becoming dark brown with age. Cheilocystidia 30-56 x 6-14 μm , urticoid. With *Alnus glutinosa*; late summer to autumn; occasional in hemib.-southern bore., rare in temp.; DK (LC), FI (LC), NO (NE, Østf: Moss), SE (LC). – Cet 2238, Lud 53.7, M&J 4.

N. sphagneti P.D. Orton

- Cap reddish date brown or dull reddish brown to almost umber; sp 9.5-12.5 x 5-7 μm , amygdaloid to fusiform, verrucose; hardly in *Sphagnum*. Cap 6-30 mm, convex to expanded, with or without an umbo, scurfy to slightly scaly, especially at margin, hygrophanous, sometimes with white veil remnants at margin; gills crowded, rather pale brown; stem 22-80

x 1-4 mm, cylindrical, dull reddish brown to umber, typically ± covered with silvery fibrils; smell indistinct. Cheilocystidia 30-60 x 4-7 µm, urticoid, sometimes with a small apical knob. Under *Alnus* in bogs; summer to autumn; occasional, but locally common in temp.-hemib., rare in bore.; DK (DD), FI (DD), NO (NE), SE (LC). – Cet 1330, FAD 125G, Lud 53.15.
N. subconspersa P.D. Orton

10. Whitish fibrillose universal veil abundant on cap and stem. Cap 5-25 mm, convex to plane, whitish to pale buff, radially fibrillose to hairy tomentose, at margin typically dentate; stem 20-50 x 0.1-0.3 mm, cylindrical, yellowish brown to reddish brown, ± covered by silvery whitish fibrils; smell indistinct or slightly raphanoid. Sp 8-12 x 5-7 µm, amygdaloid to ± fusiform, rugose (fig. 819F); cheilocystidia 40-50 x 7-12 µm. Under *Alnus* in bogs, especially in permanently wet spots near springs etc. also in coniferous and mixed forests under *Alnus*; summer to autumn; rare, but locally occasional in temp.-bore.; DK (LC), FI (DD), NO (LC), SE. – FND 14:10, Lud 53:9, M&J 3, ☉.

N. luteolofibrillosa (Kühner) Pilát

- Universal veil absent or faintly cobweb-like, only distinct in very young specimens 11

11. Cap translucently striate almost to the centre. Cap 10-25 mm, conical to convex, later expanded with an umbo, yellowish to honey-coloured, smooth or almost smooth, hygrophanous; stem 25-50 x 0.2-0.3 mm, cylindrical, yellowish buff at apex, reddish brown to umber towards base; smell indistinct. Sp 9.5-13 x 5-6.5 µm, amygdaloid to subfusiform, verruculose (fig. 819G); cheilocystidia 30-66 x 7-14 µm. Under *Alnus* in bogs; summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (NE, Akh: Nannestad, Hord: Lindås), SE (LC). – B&K 5:133 (as *Alnicola paludosa*), Lud 53.10, M&J 2.

N. striatula P.D. Orton

- Cap not or only weakly translucently striate. Cap 5-30 mm, convex to plane with or without a small umbo, scurfy, yellowish to honey-coloured, not hygrophanous; stem 15-50 x 1-4 mm, cylindrical, cream to yellowish, turning buff to brown from base; smell raphanoid. Sp 9-12 x 5-6.5 µm, amygdaloid, rugose (fig. 819H); cheilocystidia 30-50 x 4-12 µm, sometimes with a small apical knob. Under *Alnus glutinosa* and *A. incana*, mainly in bogs, but also in forests under *Alnus*; summer to autumn; very common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:132, Lud 53.8, Phil 229e, R&H 481, Ves 381, ☉.

N. escharioides (Fr.: Fr.) P. Kumm. (*N. melinoides* (Bull.: Fr.) Kühner s. auct.)

Key B: Cheilocystidia with an obtuse, clavate or capitate apex

1. Sp ≤ 11 µm long; basidia 4-spored 2
- Sp ≥ 11 µm long; basidia at least partly 2-spored 3

2. Cap slightly viscid; on burnt ground. Cap 8-25 mm convex to expanded with an umbo, hygrophanous, reddish brown, drying buff; stem 20-80 x 1-4 mm, cylindrical, whitish; smell faintly sweetish. Sp 9-11 x 4-5.5 µm, ellipsoid to narrowly amygdaloid, rugulose (fig. 821A), dextrinoid; basidia 4-spored; cheilocystidia 20-36 x 4-6 µm, cylindrical to subclavate. Autumn; very rare in temp.-bore.; DK (RE, Sj), FI (DD, U: Helsinki, PK: Ilomantsi), NO (NE, Østf: Halden), SE (LC). – B&K 5:116, End 374, M&J Hebeloma 3, RdM 42:321, R&H 481.

N. pseudoamarescens (Kühner & Romagn.) Kühner & Romagn. (incl. *Hebeloma funario-philum* M.M. Moser)

Note: the species seems out of place, both in *Naucoria* and in *Hebeloma*, but for the time being, it is placed here.

- Cap dry; with *Alnus glutinosa* and *A. viridis*. Cap 3-25 mm, conical to bell-shaped or convex with an umbo, scurfy, dry, yellowish brown to brown, translucently striate in outer half, hygrophanous; stem 10-40 x 1-2.5 mm, cylindrical, brown; smell faint, sweetish. Sp 8-10 x 5-6.5 µm, amygdaloid, verrucose; basidia 4-spored; cheilocystidia 35-65 x 7-15 µm, clavate

to capitate, sometimes with a widened base. Summer to autumn; rare in temp.-suba.; FI (DD, Kn: Paltamo), NO (NE). – B&K 5:139, Cet 2239, Lud 53:1, M&J 5.

N. submelinoides (Kühner) Maire

3. Clamps present; with *Alnus*. Cap 7-20 mm, conical to convex, later expanded with a low umbo, smooth with a finely scurfy centre, dry, buff, pale yellowish brown to brownish orange, hygrophanous, translucently striate; stem 20-60 x 1-3 mm, cylindrical, buff, turning brown from the base; smell insignificant. Sp 13-14.5 x 7-7.5 μm , \pm fusiform (fig. 821B), without iodine reactions; basidia 2(-4)-spored; cheilocystidia 35-70 x 7-13 μm , cylindrical to subclavate, often slightly widened in lower part. In bogs and in relatively dry sites; summer to autumn; occasional, but locally common in temp.-bore., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:127, Lud 53.2, Ves 380, \odot .

N. celluloderma P.D. Orton (*N. alnetorum* (Maire) Kühner & Romagn. nom. inval.)

- Clamps absent; not restricted to *Alnus* 4
4. Sp 11-13 x 7-8.5 μm (fig. 821C); basidia 2-spored. Cap 6-35 mm, convex to plane, smooth, dry, reddish brown to umber, translucently striate at margin, hygrophanous, drying cream to pale buff; stem 25-70 x 2.5 mm, cylindrical, pale buff with a whitish fibrillose coating, turning buff to brown from the base; smell insignificant. Sp citriform, without iodine reactions; cheilocystidia 40-60 x 5-9 μm , cylindrical to clavate, often slightly widened in lower part; clamps absent. Under *Betula*, *Salix*, *Corylus*, etc.; summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), IS (Na: Akureyri), NO (LC), SE (LC). – C&D 980, FAD 125A, Lud 53.5, Phil 229g, Ves 380.

N. bohémica Velen.

- Sp often > 13 μm long; basidia often in part 4-spored 5
5. Some cheilocystidia strongly capitate, 7-24 μm broad at apex (fig. 821D). Cap 10-35 mm, convex to plane with a small umbo, smooth, dry, reddish brown, translucently striate, hygrophanous, drying buff; stem 20-65 x 1-3.5 mm, cylindrical, dull brown, becoming darker from base; smell insignificant. Sp 12-18 x 7.5-9.5 μm , amygdaloid to citriform, \pm dextrinoid; basidia in majority 2-spored; cheilocystidia partly cylindrical to clavate, 30-55 μm long; clamps absent. In damp habitats, mainly under *Salix*; summer to autumn; very rare or overlooked in temp.; SE. – Lud 53.6.

N. badiolateritia P.D. Orton

- Cheilocystidia cylindrical to clavate or subcapitate, 6-10(-16) μm broad at apex (fig. 821E). Cap 10-50 mm, convex to expanded, smooth, dry, hygrophanous, reddish brown to umber, drying pale buff; stem 25-70 x 2-6 mm, cylindrical, pale buff with a whitish fibrillose coating; smell insignificant. Sp 14-19 x 7-9 μm from 2-spored basidia or 13-14 x 6-7 μm from 4-spored basidia, citriform to fusiform, verrucose, \pm dextrinoid; basidia 2- or 4-spored; cheilocystidia 20-80 μm long, cylindrical to clavate or subcapitate, often slightly widened in lower part; clamps absent. Under *Salix* on moist ground; summer to autumn; common in temp., occasional in hemib.-suba.; DK (LC), FI (LC), IS (Su: Hveragerði), NO (LC), SE (LC). – B&K 5:134, FAD 125B,D, Lud 53.4, Ves 381, Win 93:49, \odot .

N. salicis P.D. Orton (*N. macrospora* J.E. Lange non Pat. & Doass., *N. spadicea* D.A. Reid)

Note: *N. rubriceps* P.D. Orton with cheilocystidia not broader than 8.5 μm , found with various hosts is possibly distinct. NO. – Lud 53.3.

Neolentinus Redhead and Ginns

HENNING KNUDSEN

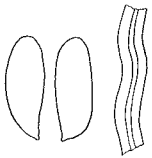
Frb tricholomatoid, with woody texture. Cap 50-150 mm, leathery to woody, smooth or scaly, whitish to ochraceous or brown. Gills sinuate to decurrent, distinctly dentate-serrate, leathery to woody. Stem central to somewhat eccentric, shorter or longer than diam. of cap, smooth or scaly. Smell aromatic or indistinct. Taste not noted. Sp deposit white.

Sp ellipsoid to cylindrical. Basidia 4-spored. Cystidia absent. Clamps and medaillon clamps present. Hyphal system dimitic; generative hyphae hyaline, 3-7 μm broad, thin-walled, with clamps; skeletal hyphae hyaline, 3-6 μm broad, thick-walled.

Saprotrophic making a powerful brown rot on trunks of deciduous and coniferous trees and timber in localities exposed to the sun.

Two species in the Nordic countries.

Lit.: Pegler 1983, Redhead & Ginns 1985.



Spores and skeletal hyphae from trama: *Neolentinus lepideus*.

1. On conifers, very rarely on deciduous wood; cap coarsely scaly, 50-150 mm, convex then somewhat depressed, dry, whitish to ochre, with large, reddish brown to dark brown appressed scales; gills adnate to decurrent, thick, woody, strongly serrate, ochre; stem 20-120 x 10-30 mm, above concolorous with cap, below darker, brownish, coarsely scaly-fibrillose, woody, with a narrow ring; smell strong, aromatic. Sp 8-14 x 3.5-5 μm , cylindrical (fig. 73E). Solitary or few together on sun-exposed trunks and stumps of conifers, especially *Pinus* and *Larix*, also on timber, sleepers, telephone poles, driftwood, etc., in wet and warm rooms in buildings and on timber in mines; when developed in darkness the frb become ramified and without caps, resembling antlers; mostly in warm and dry summers; occasional in temp., common in hemib.-bore. north to 70° N; DK (LC), FI (LC), IS, NO (LC), SE. – B&K 3:238, GBW 3:17, Lud 39.7, Sieniop 289, Ves 124, ⊙.
N. lepideus (Fr.: Fr.) Redhead & Ginns (*Lentinus l.* (Fr.: Fr.) Fr.)
- On sun-exposed trunks of *Populus*; cap finely furfuraceous to finely scaly, 50-150 mm, funnel-shaped, yellowish white, becoming reddish brown; gills at first venose becoming gilled, strongly decurrent, with finely denticulate margin; stem central to slightly eccentric, tomentose-scaly, concolorous with cap; smell and taste indistinct. Sp 10-14 x 3.5-5 μm , ellipsoid. Summer to early autumn; one record from 1948 from DK (Lol.: Høvængeskoven) and a few from SE; DK (NA), SE (NA). – GBW 3:15, Svp 28:8.
N. schaefferi (Weinm.) Redhead & Ginns (*Lentinus s.* (Weinm.) Rauschert, *Agaricus cyathiformis* Schaeff. non Bull.: Fr., *L. cyathiformis* (Schaeff.) Bres.)

Omphalina QuéL.

STEEN A. ELBORNE

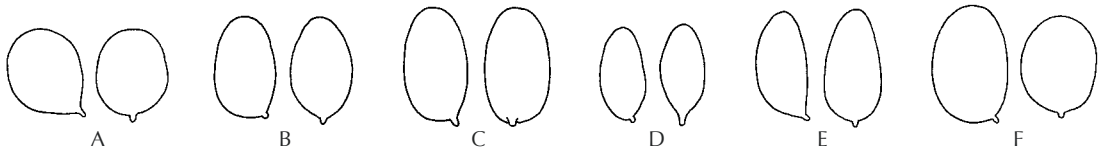
Frb with central to eccentric stem, omphalinoid. Cap 2-40 mm, convex to flat with ± depressed centre to funnel-shaped, with incurved to straight margin, smooth to minutely tomentose, hygrophanous, translucently striate or not striate, white or with ochraceous to brownish colours. Gills broadly adnate to decurrent, thin to thick, distant, white, lilac, pink or pale brownish. Stem 2-60 × 0.5-4 mm, cylindrical to slightly clavate, smooth to minutely pubescent, dry, dull, concolorous with cap, but often paler. Veil absent. Flesh thin. Smell indistinct, fruity or of *Pelargonium*. Taste indistinct or bitter. Sp deposit white to pink.

Sp subglobose, ovoid, ellipsoid, amygdaloid or dacryoid, without iodine reactions, smooth, hyaline, thin-walled. Basidia (2-) and 4-spored. Cheilocystidia absent or simple, cylindrical, narrowly clavate or slightly branched, thin-walled, hyaline. Pileipellis a cutis. Hairs on stem absent or simple, cylindrical. Clamps present.

Saprotrophic, solitary or in groups on soil, often in pioneer plant communities with low mosses.

10 species in the Nordic countries. Recent molecular data have shown that the genus *Omphalina* as previously circumscribed consisted of several lineages, which should be referred to as separate genera (Lutzoni 1997, Redhead, Lutzoni et al. 2002, Redhead, Moncalvo et al. 2002). Some of these genera existed already, e.g. *Arrhenia*, others were described as new, e.g. *Contumyces*, *Loreleia* and *Lichenomphalia*.

Lit.: Cléménçon 1982, Lamoure 1974 & 1982.



Spores: A: *Omphalina lilacinicolor*, B: *O. chionophila*, C: *O. kuehneri*, D: *O. arctica*, E: *O. pyxidata*, F: *O. rivulicola*.

1. Frb entirely white to ivory. Cap 3-40 mm, low convex, shallowly depressed to funnel-shaped, with incurved, later flattened and undulating margin, smooth, hygrophanous, translucently striate; gills broadly adnate to subdecurrent, thin to moderately thick, often forked, distant; stem 2-16 × 2-8 mm, central to eccentric, cylindrical or tapering towards base, minutely tomentose-pubescent over entire length; flesh thin and fragile; smell pleasant or indistinct; taste bitterish; sp deposit white. Sp 6.5-10(-10.5) × (3.5-4-6(-6) μm, ellipsoid, ovoid or dacryoid, cyanophilous; basidia 4-spored; cystidia absent. Solitary or in small groups on poor, naked, humid soil in heathland and marshes with *Calluna*, *Erica* and *Molinia*; summer to autumn; rare in temp.-hemib.; NO (DD), SE. – Cet 4:1485, Lud 55.3.

O. mutila (Fr.) P.D. Orton (*O. josserandii* Singer, *Clitocybe j.* (Singer) Singer)

- Frb with brown colours 2
- 2. Cap pinkish brown to purplish brown 3
- Cap yellowish brown to red brown 4
- 3. Sp (5.5-6-9(-9.5) × (4.5-5-7(-8.5) μm, subglobose, broadly ellipsoid or broadly dacryoid (fig. 235A). Cap 2-20 mm, plane to low convex with slightly depressed centre, with incurved margin, undulate, not striate, smooth, pruinose to minutely tomentose, hygrophanous, pale pinkish brown, drying yellowish to ochre brown; gills decurrent, thick, sometimes forked, distant, pale pinkish clay brown; stem 3-20 × 0.5-3 mm, cylindrical, solid, dull, smooth, concolorous with cap; flesh white; smell and taste indistinct. Basidia 2- and 4-spored; cheilocystidia absent or sparse, cylindrical and flexuose, narrowly clavate with low warts

or lageniform, thin-walled, hyaline. In small groups on sandy soil between low mosses, esp. *Tortula ruraliformis*, in sand dunes; late autumn to early spring; rare or overlooked in temp. and arc./alp.; DK (vu), FO. – C&D 336, Lud 55.18, Svp 33:45, ☉.

O. lilacinicolor Bon

- Sp (7.5-)9-11(-14) x 6-8(-8.5) μm , ellipsoid, pyriform or dacryoid. Cap (4-)6-20 mm, convex with depressed centre, then low convex and subumbilicate, with incurved to straight margin, slightly crenulate, hygrophanous, indistinctly translucently striate, smooth, purplish to pinkish brown; gills strongly decurrent, thick, distant, lilac to pink; stem (10-)15-30 x 1-2(-4) mm, cylindrical, smooth, purple to pinkish brown; flesh thin, colored like surface; smell faintly fruity or of *Pelargonium*; taste unknown; sp deposit pink. Basidia 2-spored; cystidia absent. Solitary or in small groups on naked soil in forests and in mossy grassland, parks and gardens; summer to autumn; very rare in temp.-hemib.; DK (DD), NO (NE, Akh: Ski), SE (LC). – C&D 345, FAD 40A, Lud 55.19.

O. demissa (Fr.: Fr.) Quél. (*Clitocybe sandicina* (Fr.) Sacc.)

- 4. Cap not striate or only at margin 5
- Cap translucently striate 6

- 5. Sp (5.5-)6-8(-8.5) x 4-5(-6.5) μm , broadly ellipsoid, ovoid, pyriform to amygdaloid. Cap 5-25 mm, convex and shallowly depressed, then flat to uplifted, with straight margin, crenulate, not striate or only faintly striate when old, innately radially fibrillose, sometimes minutely scaly at centre, hygrophanous, dark red brown to yellowish brown with darker centre, drying ochre brown to beige; gills strongly decurrent, relatively thick, sometimes forked and anastomosing, distant, concolorous with cap, but paler; stem 10-30 x 1-2 mm, cylindrical, stuffed to hollow, smooth to white fibrillose, minutely pubescent under lens, dull, concolorous with the cap, top often paler; flesh thin, concolorous with surface; smell and taste indistinct. Basidia (2-)4-spored; cystidia absent; hairs on stem cylindrical < 80 μm long. Solitary or in small groups in dry grassland on sandy soil with low mosses, in sand dunes and on alluvial soil in mountains; summer to autumn; occasional in temp., rare in hemib.-arc./alp.; DK (LC), NO (no recent finds), IS, SE (NE). – B&K 3:380, C&D 338, FAD 60F, Lud 55.22.

O. hepatica (Batsch) P.D. Orton


- Sp 8-11 x 5-6 μm , ellipsoid to ovoid (fig. 235B). Cap 8-17 mm, low convex, \pm depressed at centre, with incurved to straight margin, not striate or only striate at margin when old, smooth, under lens minutely rough, hygrophanous, very dark brown; gills decurrent, medium spaced to distant, white then yellowish beige; stem 11-23 x 1-2 mm, cylindrical or tapering towards base, smooth, under lens minutely rough, dark brown, stuffed; flesh thin, pale brown; smell indistinct or faintly fungoid. Basidia 4-spored; cystidia absent. In groups in snow-beds with *Salix herbacea* and on naked solifluction soil.; late summer; rare in arc./alp.; FO, NO (Svb), SE.– C&D 341, Lud 55.39.

O. chionophila Lamoure

- 6. Stem length \pm equal to cap diam.; sp 6-8.5(-9) x 5-7 μm , subglobose, broadly ellipsoid or broadly dacryoid. Cap 7-25 mm, convex to low convex, soon with depressed centre, plane and umbilicate, often papillate, with straight margin, crenulate, translucently striate, hygrophanous, smooth, slightly aeriferous, ochraceous yellowish brown; gills decurrent, thick, often forked, distant, pale Isabella to cream white; stem 7-25 x 0.5-2.5 mm, cylindrical, smooth, concolorous with cap; flesh thin, concolorous with surface; smell and taste indistinct; sp deposit white. Basidia 4-spored; cystidia absent. In small groups between mosses, e.g. *Tortula ruraliformis* and *Ceratodon purpureus*, in dry grasslands, such as sand dunes, and in wet arctic tundra and fens with *Aulacomnium palustre*; late autumn; very rare in temp. and arc./alp.; NO (NE, incl. Svb). – C&D 335, Lud 55.24, OPN 10D.

O. galericolor (Romagn.) Bon (*O. favrei* Watling, *O. brownii* Berk. & Broome s. Dennis, Orton & Hora)

- Stem longer than diam. of cap, or sp ellipsoid, ovoid or amygdaloid 7

7. Cap pale brown without reddish tinge; gills almost white; stem very pale; in wet mosses, in still, acid water 8
 - Cap dark yellowish brown to red brown; gills pale brown; stem dark colour of cap; in dry sandy habitats or along running water on calcareous soil 9
8. Sp (8.5-)9-11.5(-12) x 5.5-6.5(-7) μm , ellipsoid to oblong with obtuse apex (fig. 235C). Cap 12-22(-30) mm, low convex with slightly depressed centre, with incurved margin, smooth, translucently striate, hygrophanous, medium dark yellowish brown; gills arcuate-decurrent to broadly adnate, relatively close to subdistant, whitish to pale beige; stem 15-28 x 1.5-3 mm, cylindrical, stuffed to hollow, smooth, yellowish brown; smell and taste indistinct. Basidia 4-spored; cystidia absent. In groups in wet moss in damp depressions; very rare in arc./alp.; NO (incl. Svb), SE.
O. kuehneri Lamoure
 - Sp (8-)9-10.5(-11) x 5-5.5(-6) μm , narrowly ovoid to amygdaloid with pointed apex (fig. 235D). Cap (9-)13-19(-28) mm, low convex with \pm deeply depressed centre, with incurved margin, smooth, translucently striate, hygrophanous, dull brown, yellowish brown, drying pale beige; gills arcuate-decurrent to broadly adnate, moderately crowded, white to very pale brownish; stem 24-34 x 2-3 mm, cylindrical, smooth, pale yellowish brown to hyaline towards base; smell and taste indistinct. Basidia 4-spored; cystidia absent. In groups in deep wet moss, e.g. *Paludella*; summer; very rare in arc./alp.; SE.
O. arctica Lamoure
9. Sp 7-8(-10) x (4.5-)5-6 μm , ovoid to amygdaloid (fig. 235E); on sandy soil in heathland, sand dunes and on road verges. Cap 5-30 mm, low convex to flat with deeply depressed centre, then funnel-shaped, with incurved, then straight, crenulate margin, smooth, striate, waxy, entirely translucently striate, hygrophanous, red brown, drying ochraceous to pale brown; gills decurrent, thin, sometimes forked, distant, white to cream, later beige; stem 20-60 x 1-4 mm, cylindrical to slightly clavate, sometimes flattened, hollow, minutely pruinose to smooth, concolorous with cap or paler, at base white tomentose; flesh thin, colour of surface or paler; smell and taste indistinct; sp deposit white. Basidia 4-spored; cheilocystidia absent or sparse, cylindrical, capitate or with a few branches; hairs on stem < 50 μm long. Solitary or in small groups; autumn to spring; common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:383, FAD 58E, 60F, GBW 3:486, Lud 55.21, R&H 260, .
O. pyxidata (Bull.: Fr.) Quél.
 - Sp (7.5-)8-10.5(-11) x 5.5-7 μm , ellipsoid with obtuse apex (fig. 235F); on mossy calcareous soil along brooks and springs in mountains. Cap 7-26(-40) mm, low convex and shallowly depressed, then uplifted, funnel-shaped, with incurved to straight margin, crenulate, micaceous when young, then smooth, innately radially fibrillose, hygrophanous, young dark purplish brown to dark greyish brown and not striate, later yellowish brown to red brown and completely translucently striate, drying alutaceous; gills decurrent, thin, sometimes forked and intervenose, medium spaced to distant, buff to pale beige; stem 12-50 x 1-3 mm, cylindrical to clavate, stuffed to hollow, often compressed, smooth, concolorous with cap, at base white tomentose; flesh thin, concolorous with surface; smell and taste indistinct; sp deposit white. Basidia 4-spored; cystidia absent; hairs on stem cylindrical, < 100 μm long. In groups; summer to autumn; occasional, but locally common in bore.-arc./alp.; IS, NO (LC, incl. Svb), SE (LC). – AAF 2:33, B&K 3:385, Bor 47, C&D 340, Lud 55.23.
O. rivulicola (J. Favre) Lamoure

Omphalotus Fayod

HENNING KNUDSEN

One species in the area; see description below.

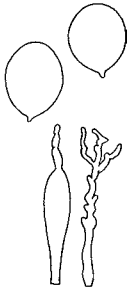
Frb clitocyboid, uniformly yellow orange. Cap 50-120 mm, applanate or soon depressed, sometimes umbonate, with incurved margin, wavy, smooth to radially fibrillose, mat, orange brown, orange to orange yellow. Gills strongly decurrent, narrow, crowded, concolorous with cap. Stem 70-200 x 7-25 mm, central or somewhat eccentric. Flesh tough-fibrillose, with strongly refracting, yellow hyphae. Taste mild. Smell strong, farinaceous-rancid. Sp deposit whitish.

Sp 5-7 x 4-6 μm , subglobose to broadly ellipsoid (fig. 307F), without iodine reactions, cyanophilous. Cheilocystidia scattered, irregular, sometimes with branched apex. Clamps present. Pileipellis a cutis with smooth or incrustated hyphae.

Fasciculate on wood of deciduous trees, mostly on *Quercus* and *Castanea*, rarely on *Fagus* or *Carpinus* in warm habitats; *DE, NL, UK*. – C&D 1610, Däh 109, K&M 292, Lud 56.1, Phil 267f, ⊙.

O. illudens (Schwein.) Bresinsky & Besl

Note: Fresh frb fluorescent at night.



Spores and cheilocystidia.

Ossicaulis Redhead & Ginns

JAN VESTERHOLT

Monotypic genus; see description below.

Lit.: Hausknecht & Kuyper 1992, Ludwig 2001.

Frb with central to eccentric stem, uniformly whitish. Cap 10-120 mm, convex with decurved margin, later plane to depressed, smooth, mat and pruinose, white to cream, hygrophorous, not translucently striate. Gills adnate to slightly decurrent, very crowded, white to cream, sometimes with a pinkish tinge with age. Stem 20-70 x 2-10 mm, cylindrical, often curved, fibrillose, pruinose at the top, white or whitish. Flesh rather tough and elastic. Universal veil absent; partial veil absent. Smell farinaceous to sweetish. Taste slightly farinaceous. Sp deposit white.

Sp 4.5-6 x 3-4 μm , ellipsoid to almost dacryoid, smooth (fig. 505H), hyaline, without iodine reactions. Cheilocystidia 35-45 x 5-7 μm , clavate to diverticulate to coralloid. Pileipellis a cutis, of repent, often diverticulate hyphae. Clamps present.

On deciduous wood, mostly on *Betula*, *Fagus*, *Populus* and *Ulmus*, rarely on *Picea*, in deciduous and mixed forests and parks, often in older forests, causing brown rot, mostly caespitose; autumn; rare in temp.-suba., very rare in suba.; DK (vU), FI (LC), NO (LC), SE (LC). – Lud 58.1, Phil 264b, R&H 273, Sieniop 289, ÖZP 1:12, 📍.

O. lignatilis (Pers.: Fr.) Redhead & Ginns (*Clitocybe l.* (Pers.: Fr.) P. Karst.)



Spores.

Oudemansiella Speg.

JAN VESTERHOLT

One species in the Nordic countries; see description below.

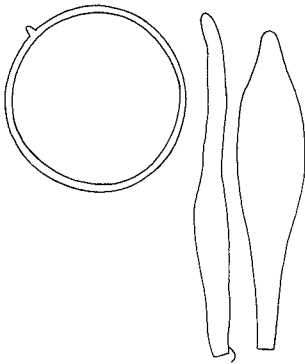
Lit.: Boekhout in Bas et al 1999, Ludwig 2001.

Frb collybioid with slimy cap and stem with a ring. Cap 15-80 mm, convex to expanded, sometimes with a low umbo, smooth or becoming radially wrinkled, slimy, white or whitish, sometimes pale greyish brown, not hygrophanous. Gills emarginate, rather broad, distant, white. Stem 20-130 x 2-12 mm, cylindrical with a widened, up to 18 mm broad base, often curved, with a membranous ring, dry, sometimes furrowed at the top, fibrillose, viscid to slimy under the ring, whitish, buff to greyish brown under the ring, sometimes with brown belts near the base. Ring white on upper side, dark brown on lower side. Smell insignificant. Taste mild. Sp deposit white.

Sp 14-18 x 11-16 μm , globose to subglobose, smooth, very thick-walled (fig. 261A), hyaline, without iodine reactions. Basidia 4-spored. Cheilocystidia 40-100 x 6-18 μm , fusiform to cylindrical or irregular, mostly with narrowed apex. Pleurocystidia absent. Pileipellis an ixohymeniderm. Clamps present.

Saprotrophic on trunks and large branches of *Fagus*, often fasciculate; autumn to late autumn; very common in temp., rare in hemib.; DK (LC), NO (LC), SE (LC). – B&K 3:388, Lud 57.1, Phil 116a, R&H 334, Ves 213, ☉.

O. mucida (Schrad.: Fr.) Höhn.



Spores and cheilocystidia.

Panaeolina Maire

EWALD GERHARDT

Psilocybe Fayod non (Fr.) P. Kumm., *Psalliotina* Velen. nom. inval.

One species in the Nordic countries; see description below. Worldwide three species are known.

Lit.: Gerhardt 1996, Rald 1984.

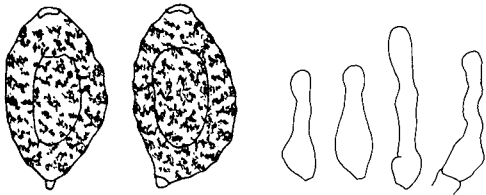
Frb uniformly dark brown, in grassland. Cap 10-40 mm, convex to hemispherical, with or without an umbo, mostly smooth, dry, flesh-coloured, grey brown or dark red brown, translucently striate when moist, hygrophanous, paler when dry, when drying often with a darker zone at margin.

Gills adnexed to adnate, crowded to medium spaced, pale brownish, later dark brown, mottled, edge paler. Stem 30-80 × 1.5-3 mm, cylindrical, fistulose, pruinose to minutely floccose, paler than cap. Veil absent. Smell and taste indistinct. Sp deposit dark brown.

Sp (11.5-)14-17(-22) × 7.5-11 μm, citriform, not flattened (fig. 646B), distinctly rough, often with a big oildrop, with distinctly projecting germ pore, in particular in spores from 2-spored basidia, yellowish brown, translucent, not spontaneously brighter in KOH, unchanged in H₂SO₄. Basidia (1-)2-4-spored. Cheilocystidia 25-50 μm long, lageniform or capitate, hyaline. Pileipellis a hymeniderm. Clamps absent.

Saprotrophic. On soil in manured meadows and lawns, grassy roadsides in forests, also among dune grasses; early summer to autumn; very common in temp.-bore., occasional, but locally common in suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – Ger 01:394, Lud 59.2, Phil 263g, R&H 431, Ves 303, ⊙.

P. foeniseccii (Pers.: Fr.) Maire (*Panaeolus f.* (Pers.: Fr.) J. Schröt., *P. f.* (Pers.: Fr.) J. Schröt. var. *halophilus* Bon)



Spores and cheilocystidia.

Panaeolus (Fr.) Quéł.

EWALD GERHARDT

Anellaria P. Karst., *Chalymmota* P. Karst., *Campanularius* Earle, *Copelandia* Bres., *Coprinarius* (Fr.) P. Kumm. nom. rej.

Frb with central stem and black sp deposit, mostly thin and fragile, more robust in subgen. *Anellaria* (P. Karst.) Ew. Gerhardt (*P. semiovatus* and *P. antillarum*). Cap dry, rarely viscid, hygrophanous or not, margin with or without remnants of veil. Gills adnexed to adnate or ascendent, soon black, mottled, with paler, flocculose edge. Stem 50-150 mm tall, thin, soon fistulose, fragile. Flesh when wounded unchanged, in subgen. *Copelandia* (Bres.) Ew. Gerhardt (not in the area) turning blue. Veil present or absent, in *P. semiovatus* forming a membranous ring on the stem. Smell in wounded stem base like hot oil, like *Cortinarius callisteus*, except in subgen. *Anellaria*. Sp deposit black.

Sp citriform to amygdaloid, mostly distinctly broader in face view than in side view, and in such cases the spore size is given in three dimensions, with distinct germ pore, smooth to asperulate, dark reddish brown, anthracite or olivaceous in *P. olivaceus*, opaque to transparent, sometimes with oil drops, in KOH spontaneously brighter, completely discolouring after some days, in H₂SO₄ unchanged. Basidia 1-4-spored, often constantly 2- or 4-spored, sometimes mixed within one frb. Cheilocystidia always present. Pleurocystidia in some species present as thin-walled chrysocystidia-like sulphidia turning wine red in sulphovanillin, or as thick-walled metuloids in subgenus *Copelandia*. Pileocystidia and caulocystidia similar to those in the hymenium. Pileipellis a hymeniderm. Clamps present.

Saprotrophic. On dung or soil, ± coprophilous or nitrophilous. *P. cinctulus* contains the hallucinogenic psilocybin.

10 species in the Nordic countries, 11 species in the key.

Lit.: Gerhardt 1996, Rald 1984.

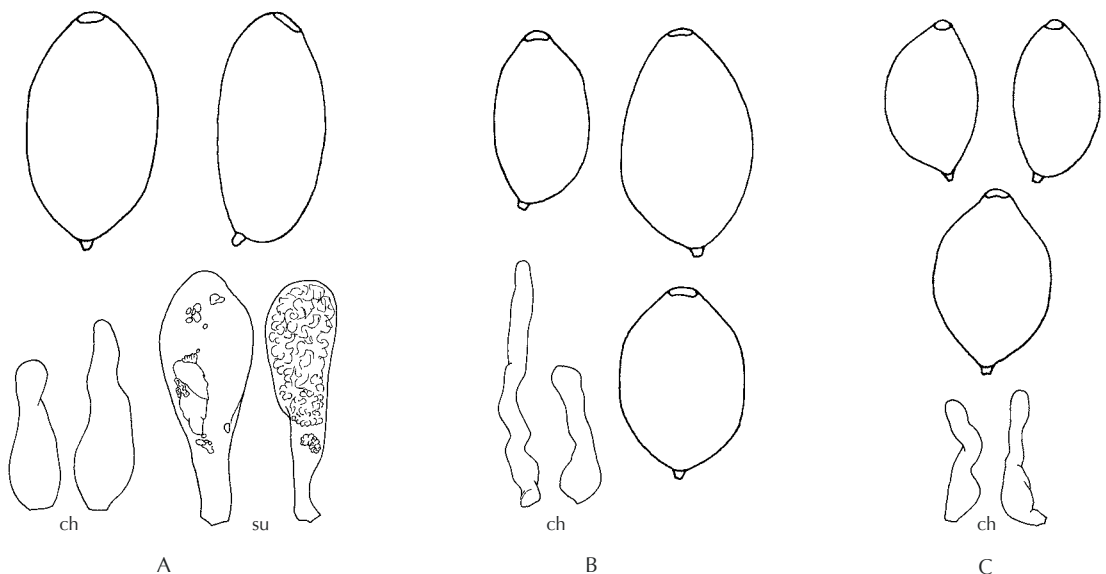


Fig. 647. Spores, cheilocystidia and sulphidia: A: *Panaeolus semiovatus*, B: *P. papilionaceus* var. *papilionaceus*, C: *P. papilionaceus* var. *parvisporus*.

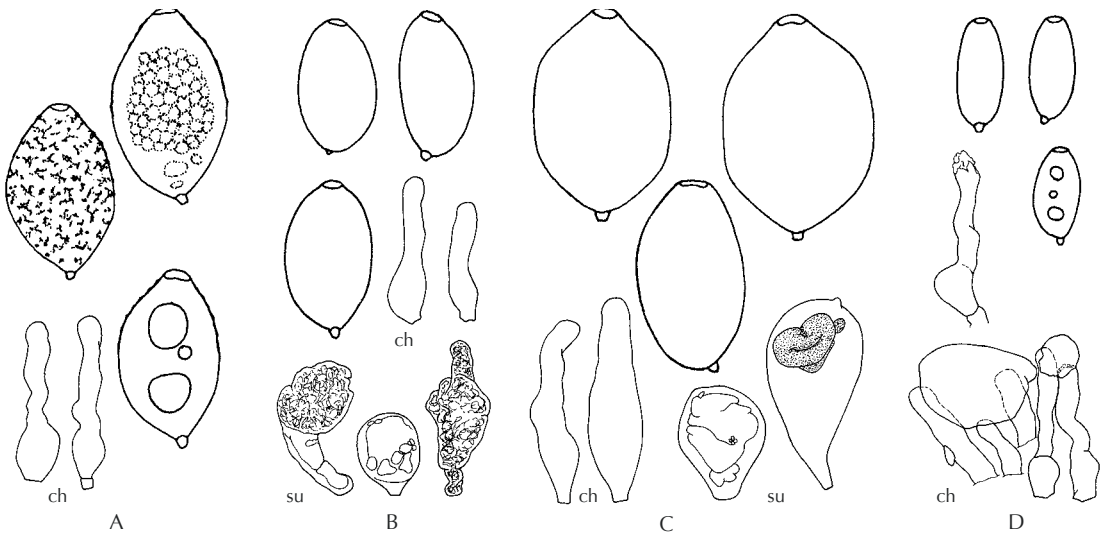


Fig. 549. Spores, cheilocystidia and sulphidia: A: *Panaeolus olivaceus*, B: *P. fimicola*, C: *P. antillarum*, D: *P. guttulatus*.

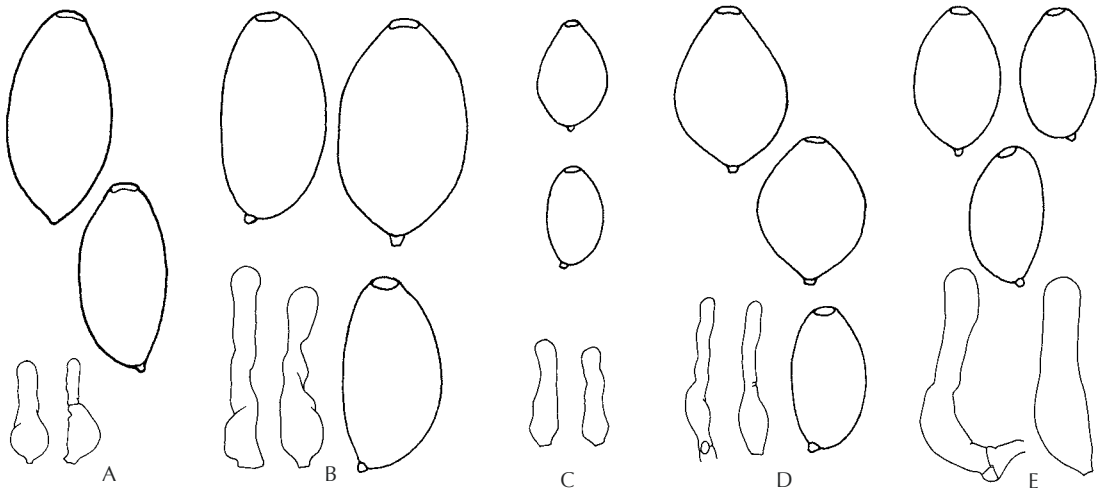


Fig. 650. Spores and cheilocystidia: A: *Panaeolus alcis*, B: *P. subfirmus*, C: *P. reticulatus*, D: *P. acuminatus*, E: *P. cinctulus*.

1. Veil present, remnants present at cap margin or stem surface; cap not or only slightly hygrophanous 2
 - Veil absent; cap often distinctly hygrophanous 3
2. Cap somewhat fleshy, viscid, stropharioid, always pale; sp 18-24 x 10.5-13 x 9.5-11.5 μm , only slightly flattened (fig. 647A). Cap 30-80 mm, \pm fleshy in central part, semiovoid, smooth, wrinkled or reticulate, viscid when moist, ivory or pale grey, rarely brownish; gills adnate, broad, crowded, pale grey to black, with white edge; stem 80-200 x 3-12 mm, slightly rooting; veil forming an ascending ring on the stem. Sp with slightly eccentric germ pore in side view, smooth, opaque to transparent; basidia 4-spored; cheilocystidia 30-45 μm long, lageniform, sometimes forked, hyaline; sulphidia 40-55 μm long, clavate to fusiform.

On dung, especially horse and old cow dung, mainly in unmanured pastures; spring to autumn; common in temp.-arc./alp., in FI nowadays rare, presumably decreasing due to habitat loss; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – Ger 01:396, Lud 59.13, Phil 261f, R&H 431, Ves 303, ☉.

P. semiovatus (Sowerby: Fr.) S. Lundell var. *semiovatus* (*Anellaria* s. (Sowerby: Fr.) A. Pearson & Dennis, *P. separatus* (L.) Gillet, *P. fimiputris* (Bull.: Fr.) Quél. nom. dub.)

var. *phalaenarum* (Fr.) Ew. Gerhardt (*P. phalaenarum* (Fr.) Quél., *P. semiovatus* (Sowerby: Fr.) S. Lundell f. *exannulatus* A. Pearson) differs in having a dentate or bordered cap margin and a ringless, longitudinally striate stem. On horse dung, in manured pastures; rare in temp.; SE. – Cet 2628, Lud 59.15, Men 12, Ri 69.4.

- Cap not fleshy, dry, mycenoid, pale grey, blackish grey or vinaceous brown, rarely whitish; sp 15-18 x 10-12 x 8-9.5 μm , distinctly flattened (fig. 647B). Cap 10-50 mm, conical, bell-shaped to semiovoid, at centre with a papilla or rounded, smooth, reticulate or wrinkled, often cracked or areolate in dry weather, margin dentate from pale, distinct, but fugacious veil remnants; gills crowded, grey olive to black, with paler to whitish edge; stem 30-120 x 2-4 mm, cylindrical, straight, pruinose, grey or brownish. Sp in face view typically angular with nearly parallel sides, smooth, opaque, very dark; basidia 4-spored; cheilocystidia 30-60 μm long, mostly slender; pleurocystidia absent. On manure of all kinds, in pastures, meadows and forests edges; spring to autumn; very common in temp.-hemib., common in bore.-suba.; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – Ger 01:396, Lud 59.10, Phil 263d, R&H 429, Ves 302, ☉.

P. papilionaceus (Bull.: Fr.) Quél. var. *papilionaceus* (*P. campanulatus* (Fr.) Gillet, *P. sphinctrinus* (Fr.) Quél., *P. retirugis* (Fr.) Gillet, *P. carbonarius* Sacc.)

var. *parvisporus* Ew. Gerhardt differs in having sp 13-16 x 8-10 x 6-8 μm (fig. 647C), a smaller cap, a very fugacious, grey or grey brown, dentate veil and cheilocystidia 25-35 μm long. On moderately manured soil; DE. – Ger 96:58.

3. Sp finely asperulate (immersion); cap 10-40 mm, hemispherical to convex, sometimes viscid when young, soon dry, smooth, alveolate or rugose, hygrophanous, grey, brown to brownish black, often with an olive tint, soon pale, with a darker marginal belt; gills adnate, moderately crowded, greyish brown to blackish olive, with whitish edge; stem 30-80 x 1.5-3 mm, cylindrical, sometimes curved, fragile, pruinose in entire length, pale, brownish toward base. Sp 11-16(-18) x 7.5-9.5(-11) x 6.5-9(-10.5) μm (fig. 649A), citriform, only slightly flattened, with central germ pore, with many oil droplets, translucent, in water some sp typically olive greenish; basidia 2- to 4-spored; cheilocystidia 25-35 μm long; pleurocystidia absent. On strongly to moderately manured soil, horse dung, bird dung, in manured meadows and lawns; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE. – B&K 4:315, BKPM 1:32a, Ger 01:398, Lud 59.5, Svp 10:69 (as *fimicola*).

P. olivaceus F.H. Møller (*P. castaneifolius* (Murrill) A.H. Sm. s. Oláh)

- Sp smooth 4
- 4. Sulphidia at side of gills present 5
- Sulphidia at side of gills absent 6
- 5. Sp (9-)11-15 x 7-9 x 6-8 μm , only slightly flattened, often with distinctly eccentric germ pore (fig. 649B); cap 10-25 mm, grey-, red- or blackish brown, when drying with a pale centre and darker margin; in slightly manured soil, in grassy habitats, non-fertilized dry grassland and lawns. Cap hemispherical or convex, dry, smooth, rarely rugose, hygrophanous; gills crowded to medium spaced, \pm adnate, grey to black, with paler edge; stem 20-50 x 1.5-3 mm, cylindrical, straight or curved, in upper part pruinose, paler than cap, brownish towards base. Sp only slightly translucent, always paler than in *P. papilionaceus*; basidia 2- to 4-spored; cheilocystidia 25-32 x 6-8 μm , lageniform; sulphidia always present, inside with distinct crystals or indistinct if crystals have not yet formed. Spring to autumn; occasional in

temp.-arc./alp.; DK (LC), FI (LC), FO, NO (LC, incl. Sv), SE (LC). – Ger 01:398, Lud 59.4, Phil 262c, R&H 430, Ves 302.

P. fimicola (Pers.: Fr.) Gillet (*P. ater* (J.E. Lange) Bon, *P. obliquoporus* Bon)

- Sp 15-20 × 10-14 × 8-10 μm, distinctly flattened, in face view with nearly parallel sides (*papilionaceus*-type) (fig. 649C), with prominent, central germ pore; cap 30-60 mm, whitish, rarely pale grey; on droppings of horse or cow in warm periods. Cap bell-shaped to convex, viscid, smooth or wrinkled, in dry weather often cracked, not hygrophanous; gills adnate, crowded, at first grey, then black, edge whitish; stem 80-150 × 3-8 mm, pruinose and often striate in the upper part, white to pale ochraceous, remaining solid for a long time, sometimes rooting. Sp opaque; cheilocystidia 30-45 μm long; sulphidia 25-30 μm long, stipitate-clavate; basidia 4-spored. DE. – BKPM 3:224a, Lud 59.12, Yok 3a.

P. antillarum (Fr.) Dennis (*P. eburneus* (Cooke & Massee) Sacc., *P. ovatus* (Cooke & Massee) Sacc., *P. sepulchralis* (Berk.) Singer, *P. solidipes* (Peck) Sacc.)

Note: adventive in Europe, common in the tropics and subtropics.

6. Gill edge with yellowish, sticky droplets from cheilocystidia, visible also in dried specimens. Cap 10-30 mm, convex or hemispherical, dry, glabrous, translucently striate when moist, hygrophanous, brown to nearly black, often with an olive tint, drying pale grey or brownish grey; gills adnexed, grey olive to black, with paler whitish or yellowish edge; stem 20-40 × 2-4 mm, cylindrical, straight or curved, pruinose, paler than cap. Sp 7-9(-11) × 4.5-5.5 × 4-5 μm, only very slightly flattened (fig. 649D), with 2 oil drops, germ pore central, not prominent; basidia (2-)4-spored; cheilocystidia 30-35 μm long, hyaline to yellowish, at apex with yellowish droplets; pleurocystidia absent. On soil in frondose and coniferous woods, possibly calciphilous; summer to autumn; very rare in temp.-hemib.; DK (DD), SE (LC). – B&K 4:314, Jordst 21(2), Lud 59.11, Svp 55:37, ZM 50:49, ☉.

P. guttulatus Bres. (*P. fimicoloides* A. Pearson)

- Edge of gills without yellowish droplets 7
7. At least some sp reaching 18-20 μm in length, opaque 8
 - Sp < 16 μm long, ± translucent 9
8. Sp hardly flattened, not angular in face view (fig. 650A); cap 4-10 mm; on droppings of elk, reindeer or deer. Cap hemispherical, bell-shaped or conical, with slightly crenate margin, dry, not hygrophanous, brownish, grey to dark grey, with an olive tint when young; gills crowded, adnexed, dark grey to black, edge whitish; stem 20-90 mm long, brownish towards base, pruinose over entire length, ochraceous grey. Sp (13-)16-22 × 10-11 × 9-10 μm, with central, ± prominent germ pore, opaque; basidia 2- or 4-spored; cheilocystidia 22-35 × 7-11 μm, hyaline; pleurocystidia absent. Summer to autumn; occasional in hemib.-middle bore., rare in temp. and northern bore.-suba.; DK (NA), IS, FI (LC), SE (LC). – Lud 59.7, M&J 3 (as *alcidis*), Sieniop 267.

P. alcis M.M. Moser ('*alcidis*')

- Sp distinctly flattened, in face view typically angular (fig. 650B) like in *P. papilionaceus*; cap 20-75 mm; in grassland, manured by cow or sheep. Cap 20-75 mm, convex to conical, soon plane, dry, smooth, at centre sometimes wrinkled, hygrophanous, honey- to date brown, or grey with darker marginal zone, fading pale grey, ochraceous or cream; gills adnate, crowded to medium spaced, brownish, soon blackish olive, with whitish flocculose edge; stem 70-175 × 2-5 mm, mostly straight, whitish to ochraceous, toward base brownish. Sp 15-18(-20) × 11-12.5 × 8.5-10 μm, with ± prominent, central germ pore, opaque; basidia 4-spored; cheilocystidia 30-50 μm long, cylindrical to lageniform, hyaline; pleurocystidia absent. Summer to autumn; rare in temp.-southern bore.; DK (NA), FI (DD, EH: Tammela), SE (LC). – Jordst 17(1):48, Lud 59.16, Phil 262a.

P. subfirmus P. Karst. (*P. speciosus* P.D. Orton)

9. Sp 8.5-11 x 6.5-8 x 5-6 μm (fig. 650C). Cap 10-30(-60) mm, hemispherical to bell-shaped, dry, smooth, reticulate or wrinkled, translucently striate when young, pale brownish to dark grey or black, when from very moist habitats with whitish zones of crystals; gills adnexed to adnate, crowded, brown to black, with whitish edge, in wet weather with hyaline droplets; stem 30-120 x 1.5-3 mm, fragile, upper part pruinose to flocculose, paler than cap, in wet weather with hyaline tears, at base fibrillose. Sp distinctly flattened, with central germ pore, opaque to moderately transparent; basidia 4-spored; cheilocystidia 18-30 μm long, cylindrical to lageniform; pleurocystidia absent. In calcareous swamp, damp meadows and flower beds, rarely on manured straw; rare in bore.; FI (DD), SE. – B&K 4:317, Lud 59.3, Win 92:144, W&K 89.

P. reticulatus Overh. (*P. fontinalis* A.H. Sm., *P. uliginosus* Jul. Schäff.)

- Sp $\geq 11 \mu\text{m}$ long 10
10. Sp distinctly flattened (fig. 650D); cheilocystidia very slender, sometimes acute, not capitate; stem straight. Cap 5-40 mm, acutely conical to narrowly bell-shaped or acorn-shaped, dry, smooth, rarely wrinkled or pitted, margin translucently striate or not, distinctly hygrophanous, reddish, greyish or blackish brown, soon two-coloured with a darker marginal zone; gills adnexed to adnate, crowded, grey to black, with whitish edge; stem 30-120 x 1.5-3 mm, mostly straight, upper part often with hyaline droplets, pruinose or flocculose over entire length, concolorous or somewhat paler than cap. Sp (11-)13-15(-17) x 9-12 x 6.5-9 μm , typically rhomboid in face view, with central germ pore, only slightly transparent; basidia (2-)4-spored; cheilocystidia 30-45 μm long, numerous; pleurocystidia absent. On dung or manured soil; spring to late autumn; common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – Ger 01:396, Lud 59.18, R&H 429, Svp 10:68, Ves 302, ☉.
- P. acuminatus* (Schaeff.) Gillet (*P. caliginosus* (Jungh.) Gillet, *P. hygrophanus* Velen., *P. queletii* Schulzer, *P. rickenii* Hora)
- Sp only slightly flattened (fig. 650E); cheilocystidia lageniform, broad, often capitate; stem often flexuose. Cap 10-80 mm, hemispherical to low convex, with or without an umbo, dry, smooth, sometimes wrinkled or veined, distinctly hygrophanous, dark red brown or flesh coloured, rarely whitish, fading with darker marginal belt; gills adnexed to adnate, crowded, greyish brown to blackish grey, with whitish edge; stem up to 120 x 6 mm, pruinose in entire length, paler than cap. Sp 11-14(-16) x 7.5-10 x 6-9 μm , amygdaloid to rhomboid in face view, with a non-prominent, central to slightly eccentric germ pore like in *P. fimicola*, smooth, only slightly translucent; basidia 2- to 4-spored; cheilocystidia 30-50 x 8-12 μm ; pleurocystidia absent. On rich manured soil or directly on dung; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC, Finnm: Porsanger), SE (LC). – Ger 01:398, Lud 59.6, Phil 263f, R&H 430, Svp 10:68, ☉.
- P. cinctulus* (Bolton) Sacc. (*P. subbalteatus* Berk. & Broome, *P. dunensis* Bon & Courtec., *P. venenosus* Murrill)

Panellus P. Karst.

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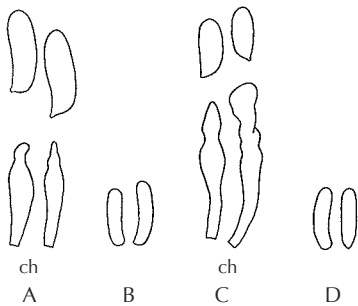
Frb with lateral stem or stem-like base or attached to the substrate on the upper side, shell-shaped, kidney-shaped or spatulate. Cap 5-30 mm, smooth, fibrillose, tomentose or floccose, dry or slightly sticky, not hygrophanous, whitish, cream, buff, lilac or brownish. Gills radiating from a central to eccentric spot or from a lateral stem or stem-like base. Stem absent or reduced, best visible from lower side. Flesh mostly elastic and tough, with or without a gelatinous layer. Veil absent. Smell indistinct or slightly metallic or acidulous. Taste indistinct or bitter. Sp deposit white.

Sp allantoid, cylindrical or ellipsoid, smooth, hyaline, amyloid. Cheilocystidia absent or cylindrical to subclavate, sometimes irregular with lateral outgrowths, sometimes with resinous exudates. Pileipellis a cutis, an ixocutis, a trichoderm or a tomentum. Clamps present.

Saprotrophic or as wound parasites on wood.

Four species in the Nordic countries.

Lit.: Ludwig 2001, Vellinga in Bas et al. 1995, Watling & Gregory 1989.



Spores and cheilocystidia: A: *Panellus violaceofulvus*, B: *P. ringens*, C: *P. stipticus*, D: *P. mitis*.

1. Veil white, covering the gills in young frb see *Tectella patellaris* p. 390
 - Veil absent 2
2. Cap 15-70 mm, with greenish colours; frb thick-fleshed see *Sarcomyxa serotina* p. 240
 - Cap 5-30(-45) mm, without greenish colours; frb rather thin-fleshed 3
3. Cap with violet, purple, purplish brown or vinaceous colours; frb often attached to the substrate on the upper side with gills radiating from a central to eccentric spot 4
 - Cap whitish to buff or ochraceous; gills radiating from a lateral stem or stem-like base 5
4. Sp 6.5-9.5 x 2.5-3.5 μm (fig. 389A); cap violet to purple or purplish brown. Frb attached to the substrate on the upper side or with a lateral stem; cap 5-15 mm, shell-shaped, sometimes becoming wrinkled when old, dry, whitish tomentose in inner part; gills radiating from the stem or from a central to eccentric spot, medium spaced, at first bluish to violet, later pale purplish to flesh-coloured; stem up to 5 mm long, lateral, rudimentary or absent, whitish tomentose; smell indistinct; taste mild. Sp cylindrical, amyloid; cheilocystidia 22-35 x 3-5 μm , cylindrical to subclavate, sometimes irregular with lateral outgrowths. On *Salix*, in central Europe also on conifers; autumn; very rare in hemib.; NO (NE, Vestf: Larvik, Oslo).
 - B&K 3:392, C&D 144, Lud 60.1, M&J 1, Svp 49:47, ☉.
P. violaceofulvus (Batsch: Fr.) Singer
 - Sp 5-7 x 1-2 μm (fig. 389B); cap purplish brown to vinaceous. Frb attached to the substrate on the upper side; cap 5-30 mm, shell-shaped, becoming wrinkled when old; gills radiating from a central to eccentric spot, medium spaced to distant, flesh-coloured to pale vinaceous brown; stem absent; smell indistinct; taste mild. Sp cylindrical to allantoid, amyloid; cheilocystidia absent or inconspicuous. On deciduous wood, often on standing trees or still

attached branches, rarely on conifers; autumn to late autumn; occasional in hemib.-suba., rare in temp.; FI (LC), NO (LC), SE (LC). – B&K 3:390, C&D 143, Lud 60.5, R&H 340, ☉.

P. ringens (Fr.: Fr.) Romagn.

5. Cap floccose; gills abruptly delimited from the stem; on *Quercus*, less often on *Alnus* or other deciduous trees. Frb with lateral stem; cap 5-30(-45) mm, shell- to kidney-shaped, dry to slightly sticky, cream to buff; gills radiating from the stem, crowded, anastomosing, buff; stem 3-20 x 3-7 mm, plane, floccose, cream to pale buff; flesh elastic, smell slightly metallic; taste bitter. Sp 4-5 x 2-2.5 μ m, ellipsoid to cylindrical (fig. 389C), amyloid; cheilocystidia 40-90 x 5-8 μ m, cylindrical to subclavate, sometimes irregular with lateral outgrowths, sometimes with resinous exudates at apex. Often on cut surfaces, often imbricate; all year; very common in temp.-hemib., common in southern bore., occasional in middle-northern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:391, Lud 60.2, Phil 270c, R&H 340, Ves 179, ☉.

P. stipticus (Bull.: Fr.) P. Karst.

- Cap very finely velvety when young, later smooth; gills not abruptly delimited from the stem; on coniferous wood, rarely on *Betula*. Frb with lateral stem; cap 5-25 mm, shell-shaped to spathulate, dry, whitish cream to pale buff, sometimes brownish near the stem; gills radiating from the stem, crowded, cream; stem 2-8(-20) x 2-5 mm, plane, flocculose, cream to pale buff; flesh elastic, with a gelatinous layer; smell slightly acidulous; taste mild. Sp 3.5-6 x 1-1.5 μ m, narrowly allantoid (fig. 389D), amyloid; cheilocystidia absent. On dead twigs and branches; all year, but mainly in late autumn to spring; very common in temp.-bore., very rare in suba. in IS; DK (LC), FI (LC), IS (Ve), NO (LC), SE (LC). – B&K 3:389, C&D 142, Lud 60.4, Phil 270b, Ves 179, ☉.

P. mitis (Pers.: Fr.) Singer

Panus Fr.

HENNING KNUDSEN

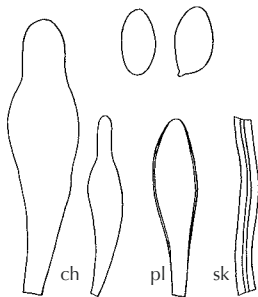
One species in the Nordic countries; see description below.

Frb pleurotoid, tough. Cap 40-80 mm, funnel-shaped or irregularly lobed, with incurved margin, at first faintly purplish lilac but soon fading to wood brown to pale tan; gills deeply decurrent, anastomosing, reddish to wood brown; stem eccentric to lateral, 10-30 x 5-25 mm, at the base tomentose lilac, then pale tan. Smell pleasant. Taste mild or slightly acidulous. Sp deposit white.

Sp 5.5-7 x 2.5-3.5 μm , ellipsoid to \pm cylindrical (fig. 73D), hyaline. Basidia 4-spored. Cheilocystidia 30-60 x 10-16 μm , clavate, mixed with narrower, lageniform-sinuuous elements. Pleurocystidia 30-60 x 6-12 μm , clavate, somewhat sinuous, becoming thick-walled. Hyphal system dimitic; generative hyphae 3-4.5 μm broad, hyaline, with clamps; skeletal hyphae 3-5 μm broad, thick-walled, hyaline. Pileipellis a cutis.

Saprotrophic, solitary or in small clusters on stumps and branches of deciduous trees, especially *Betula*, more rarely *Fagus*, *Populus* a.o.; summer to late autumn; occasional in hemib.-bore., north to 70° N, occasional in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 998, GBW 3:21, Lud 39.2, Phil 267d, R&H 207, ☉.

P. conchatus (Bull.: Fr.) Fr. (*Lentinus c.* (Bull.: Fr.) J. Schröt., *L. torulosus* (Pers.: Fr.) Lloyd)



Spores, cheilocystidia, pleurocystidia and skeletal hyphae from trama: D: *Panus conchatus*

Parasola Redhead, Vilgalys & Hopple

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Coprinus Pers. s. lato p.p.

Frb very thin-fleshed, short lived and fragile, with plicate cap and black sp deposit. Cap almost cylindrical, acorn-shaped, ovoid or ellipsoid, later expanding to convex, bell-shaped or plane, becoming radially grooved, dry, reddish brown to orange brown, in one species with lilac tinges, later paler and more greyish. Gills free, in most species remote from stem, distant, mostly not deliquescent. Stem ± cylindrical, smooth, dry. Veil absent. Smell indistinct. Taste insignificant or unknown. Sp deposit black.

Sp ellipsoid or heart-shaped to angular or circular in face view and ellipsoid in side view, often distinctly broader in face view than in side view, and in such cases the spore size is given in three dimensions, in most species with eccentric germ pore, smooth, dark brown to black. Basidia mostly 4-spored. Cheilocystidia subglobose, ellipsoid, utriform, lageniform or cylindrical. Pleurocystidia present or absent, ellipsoid, utriform, lageniform or cylindrical. Pileocystidia generally absent, but one species with long thick-walled, brown sclerocystidia. Caulocystidia absent. Pileipellis a hymeniderm. Clamps present.

Saprotrophic. On soil, in grass, on wood chips, dung, etc. Spring to autumn.

10 species in the Nordic countries.

Lit.: Orton & Watling 1979, Redhead et al. 2001, Uljé in Noordeloos et al. 2005, Uljé & Bas 1988, Uljé & Bender 1997, Vesterholt et al. 2007.

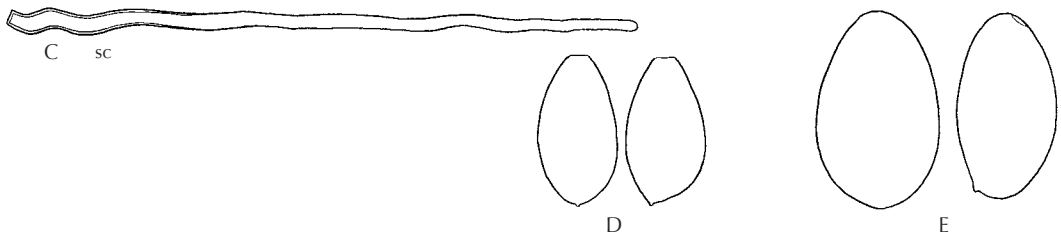


Fig. 585. Spores, cheilocystidia and sclerocystidium: C-D: *Parasola auricoma*, E: *P. megasperma*.

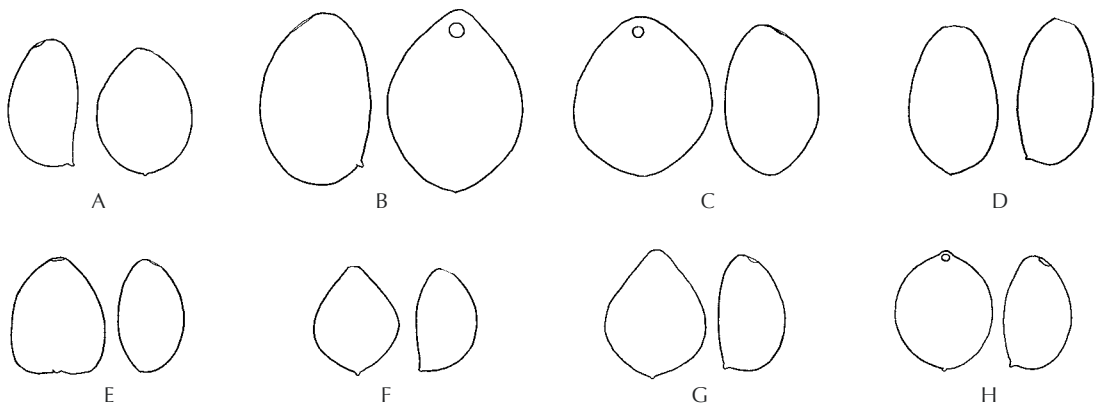






Fig. 587. Sclerocystidium and spores: A: *Parasola lilatincta*, B: *P. hercules*, C: *P. schroeteri*, D: *P. plicatilis*, E: *P. misera*, F: *P. kuehneri*, G: *P. leioccephala*, H: *P. galericuliformis*.

1. Cap with scattered, > 200 μm long, thick-walled, brown sclerocystidia (fig. 585C); sp with central germ pore. Cap 10-15 x 8-12 mm, acorn-shaped to ellipsoid, later expanding, becoming radially grooved, reddish brown to orange brown, later paler and more greyish towards margin; gills free, not or slightly deliquescent; stem 30-120 x 2-4 mm, cylindrical or slightly widened downwards, whitish to yellowish brown. Sp 10-14.5 x 6-8 μm , ellipsoid (fig. 585D). On soil and wood chips, in lawns, at roadsides, etc.; occasional in temp., rare in hemib.-bore.; DK (LC), FI (DD), IS (Au), NO (LC), SE (LC). – B&K 4:266, FAD 160C, Jordst 18(1), Lud 93.19, Svp 56:32, ☉.
P. auricoma (Pat.) Redhead, Vilgalys & Hopple (*Coprinus auricomus* Pat., *C. hansenii* J.E. Lange, *C. hemerobius* Fr. s. auct.)
 - Cap glabrous, without sclerocystidia; sp with eccentric germ pore 2
2. Sp \pm ovoid to ellipsoid 3
 - Sp broadly heart-shaped, rounded angular or circular in face view 4
3. Sp on av \geq 14.3 μm long (fig. 585E). Cap 5-15 x 3-10 mm, ellipsoid to ovoid, later expanding, becoming radially grooved, orange brown to reddish brown; gills slightly remote from stem, not or slightly deliquescent; stem 30-100 x 1-2.5 mm, cylindrical, white to pale greyish brown. Sp 13-18 x 8.5-11.5 x 7.5-10 μm , \pm ellipsoid, with eccentric germ pore. On soil, grass, wood chips or dung; spring to summer; occasional in hemib.-southern bore., rare in temp.; DK (LC), FI (LC). – Lud 93.15.
P. megasperma (P.D. Orton) Redhead, Vilgalys & Hopple (*Coprinus m.* P.D. Orton)
 - Sp on av \leq 12.8 μm long see *P. plicatilis* 7
4. Cap with lilac tinges when young; elements of pileipellis with oily granules. Cap 5-30 x 3-16 mm, narrowly conical to cylindrical, later expanded, becoming radially grooved, with age pale greyish brown; gills free, not or slightly deliquescent; stem up to 100 x 2-3 mm, cylindrical with a widened base, white to greyish white, sometimes tinged lilac at base. Sp 9.5-13.5 x 9-11 x 5.5-8.5 μm , rounded 5-angular in face view, ellipsoid in side view (fig. 587A), with eccentric germ pore. On wood chips, at roadsides, etc.; spring to autumn; very rare in temp.; DK (LC). – Lud 93.17, Pers 14:374.
P. lilatincta (Bender & Uljé) Redhead, Vilgalys & Hopple (*Coprinus l.* Bender & Uljé)
 - Cap without lilac tinges; elements of pileipellis without oily granules 5
5. Sp on av > 11 μm long 6
 - Sp on av < 11 μm long 8
6. Expanded cap 8-14(-18) mm; sp on av \geq 11.8 μm broad in face view. Cap 4-7(-10) x 2-5(-7) mm, bell-shaped to hemispherical, later expanding, becoming radially grooved, orange brown to reddish brown; gills free, not deliquescent; stem 48-70 x 0.5-1.5 mm, cylindrical, white to pale greyish brown. Sp 12.5-17 x 11.5-15 x 8-11 μm , rounded 3-angular to weakly 5(-7)-angular in face view, ellipsoid in side view (fig. 587B), with eccentric germ pore. On naked soil and in lawns; rare in temp.-hemib.; DK (LC), NO (Østf: Fredrikstad). – Lud 93.14, Mic Due 536, Svp 56:33, ☉.
P. hercules (Uljé & Bas) Redhead, Vilgalys & Hopple (*Coprinus h.* Uljé & Bas)
 - Expanded cap up to 30 mm; sp on av < 11.5 μm broad in face view 7
7. Sp on av > 10 μm broad; on soil or dung. Cap 7-15 x 4-8 mm, ellipsoid to ovoid, later expanding, becoming radially grooved, yellowish brown to buff or reddish brown; gills somewhat remote from stem, not deliquescent; stem 30-80 x 0.5-2 mm, cylindrical, white to yellowish or pale brown. Sp 10-15.5 x 9-13 x 8-9.5 μm , broadly heart-shaped in face view, ellipsoid in side view (fig. 587C), with eccentric germ pore. Spring-autumn; common in temp., rare in hemib.-southern bore.; DK (LC), FI (LC), NO (STr: Trondheim), SE (LC). – OPN 5A, Svp 56:37, ZM 54:48, ☉.
P. schroeteri (P. Karst.) Redhead, Vilgalys & Hopple (*Coprinus s.* P. Karst., *C. nudiceps* P.D. Orton)
 - Cap without lilac tinges; elements of pileipellis without oily granules 5

- Sp on av < 10 μm broad; in grass in open places, often in lawns. Cap 5-13 x 4-10 mm, ovoid to ellipsoid, later convex to expanded, becoming radially grooved, sordid yellowish brown to reddish brown, towards margin paler and more grey; gills remote from stem, not deliquescent; stem 30-120 x 1-2.5 mm, cylindrical, sordid whitish to yellowish brown. Sp 10-14.5 x 7-10.5 x 6.5-8 μm , \pm ovoid to ellipsoid (fig. 587D), with or without 5-6 rounded angles in face view, ellipsoid in side view, with eccentric germ pore. In grass in open places, often in lawns; early summer to autumn; very common in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Lud 93.11, Phil 261d, R&H 428, Svp 44:39, 56:36, Ves 294, .
P. plicatilis (Curtis: Fr.) Redhead, Vilgalys & Hopple (*Coprinus p.* (Curtis: Fr.) Fr.)
- 8. On dung; gills reaching the stem. Cap 2-5 x 1-3 mm, ovoid to ellipsoid, later convex to expanded, becoming radially grooved, orange brown, later grey and \pm transparent in outer part; gills free, not or slightly deliquescent; stem 10-50 x 0.1-0.5 mm, cylindrical. Sp 7-10.5 x 6.5-10 x 5-6 μm , heart-shaped in face view, ellipsoid in side view (fig. 587E), with eccentric germ pore. Common in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – C&D 761, FAD 157B, Lud 93.18, M&J *Coprinus* 25, Svp 56:35, .
P. misera (P. Karst.) Redhead, Vilgalys & Hopple (*Coprinus m.* P. Karst.)
- On soil or wood chips; gills remote from the stem 9
- 9. Sp 6.5-11 x 5.5-8 x 5-6 μm (fig. 587F). Cap 5-16 x 4-11 mm, ovoid to ellipsoid, later expanded, becoming radially grooved, sordid reddish brown, towards margin paler and more grey; gills remote from stem, not deliquescent; stem 40-100 x 1-3 mm, cylindrical, sordid whitish to yellowish brown. Sp heart-shaped to rhomboid or 3-4-(5-)angled in face view, ellipsoid in side view, with eccentric germ pore. In shady places under trees, in grass lawns or on rotting plant remains; spring to autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (DD), NO (Tel: Bamble, STR: Trondheim), SE (LC). – B&K 4:285, Lud 93.13, M&J *Coprinus* 18, RdM 48:69, Svp 56:34, .
P. kuehneri (Uljé & Bas) Redhead, Vilgalys & Hopple (*Coprinus k.* Uljé & Bas, *C. plicatilis* (Curtis: Fr.) Fr. var. *microsporus* Kühner)
- Sp on av > 8 μm broad 10
- 10. Sp \pm 5-angled to heart-shaped in face view (fig. 587G). Cap 5-15 x 4-13 mm, ovoid to ellipsoid, later convex to expanded, becoming radially grooved, yellowish buff to reddish brown, towards margin paler and more grey; gills remote from stem, not deliquescent; stem 40-120 x 1-2 (-3) mm, cylindrical, whitish to pale yellowish brown. Sp 8-12 x 7-10.5 x 5.5-7 μm , ellipsoid in side view, with eccentric germ pore. On soil or wood chips in shady places, rarely in grass; common in temp.-hemib., occasional in southern-middle bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:290, End 396, Ger 01:361, Lud 93.12, Svp 56:35, .
P. leiocephala (P.D. Orton) Redhead, Vilgalys & Hopple (*Coprinus l.* P.D. Orton)
- Sp circular without angles in face view (fig. 587H). Cap 5-15 x 3-10 mm, ovoid to ellipsoid, later convex to expanded, becoming radially grooved, yellow buff to reddish brown, towards margin paler and more grey; gills remote from stem, not or slightly deliquescent; stem 25-70 x 0.5-3 mm, cylindrical, sordid whitish to yellowish brown. Sp 10-12 x 8.5-10.5 x 6-7 μm , ellipsoid in side view. On soil in shady places, on rotting twigs and sawdust; occasional in hemib.-middle bore.; rare in temp.; DK (DD), FI (LC), SE (LC). – Lud 93.16.
P. galericuliformis (Watling) Redhead, Vilgalys & Hopple (*Coprinus g.* Watling)

Paxillus Fr.

HENNING KNUDSEN & ANDY TAYLOR

Frb clitocyboid with yellow-brown gills anastomosing near stem. Cap funnel-shaped, with inrolled margin when young, tomentose to velvety, often smooth when old. Gills decurrent, yellowish brown, easily detached from the cap, bruising brown. Stem central, short. Flesh yellowish to yellow. Smell indistinct. Taste mild. Sp deposit rust-coloured.

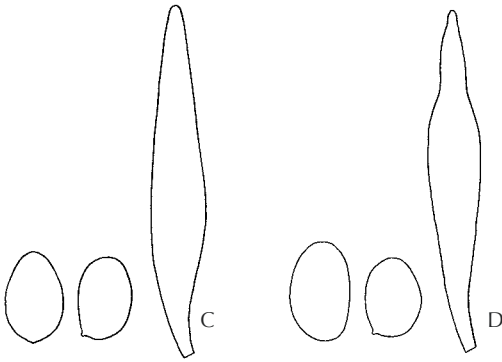
Sp brown, ellipsoid, smooth, without iodine reactions. Cheilo-, pleuro and caulocystidia present. Gill trama bilateral. Pileipellis a cutis or a trichoderm. Clamps present.

Ectomycorrhizal with numerous different hosts in forests, scrubs, parks and gardens.

Five species in the Nordic countries.

Note: the description of some recently described species are taken from Hahn & Agerer 1999.

Litt.: Hahn & Agerer 1999a, b.



Spores and hymental cystidia: C: *Paxillus involutus*, D: *P. validus*.

1. Mycorrhizal with *Alnus*; flesh yellowish, when cut reddish brown. Cap 30-100 mm, at first plane with inrolled margin, but soon expanding and somewhat depressed, regular or undulose-wavy, smooth or ± tomentose, often with an appressed rib-structure and tomentose at margin, yellow or yellow brown, irregularly coloured with brown patches and yellow streaks; gills decurrent, often forked, often forming net-like anastomoses on the stem, cream or pale yellow becoming darker yellow brown, browning when bruised; stem 20-45 x 5-15 mm, slender, tapering at the base, concolorous with cap, basal mycelium pink. Sp 5.5-8.5 x 4-5 μm, ellipsoid; pileipellis an indistinct trichoderm of 5-8 μm broad hyphae. Solitary or a few together, most often on rich soil; common in FI, elsewhere occasional in temp.-bore., rare in coniferous suba., in FI north to SoL, in NO north to Finnm; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 103, Fr 164.2, Mar 237, R&H 233, Ves 154.

P. filamentosus (Scop.) Fr. (*P. leptopus* Fr., *P. rubicundulus* P.D. Orton)

- Mycorrhizal with other hosts 2
- 2. Cap 40-150 mm; sp deposit olive brown, 5D4-6; on acid soil with various hosts. Cap depressed to funnel-shaped with inrolled margin, smooth or tomentose, with tomentose margin, pale ochre brown, yellow brown to rust-coloured; gills pale ochre, brownish when mature, bruising reddish brown; stem 40-100 x 10-25 mm, cylindrical; flesh pale yellowish, reddish brown when cut. Sp 7-11 x 5-6.5 μm, ellipsoid (fig. 161C); cutis of 5-8.5 μm broad hyphae. Mycorrhizal with various hosts on acid, sandy or peaty soil, especially common with *Picea* and *Betula*, in most forest types, also in gardens and parks under solitary trees,

in the north associated with *Betula nana*; summer to autumn; very common in temp.-bore., occasional, but locally common in suba.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:64, Däh 102, Phil 208a, R&H 234, Ves 154, ☉. – Causes allergic reactions.

P. involutus (Batsch : Fr.) Fr.

Note: *P. involutus* s. lato causes a specific allergenic reaction, which may be deadly after repeated consumption. This may apply to any species in the complex, including the species below.

- Cap (50) 70-300 mm; sp deposit dark red brown, 8F7 and/or growing on rich soil with *Tilia*, *Carpinus* or *Populus* 3
- 3. On acid soil; pileipellis a cutis of 3-5 μm broad hyphae, the brown pigmented slightly broader than hyaline ones. Cap 50-200 mm, plane with inrolled margin, then expanded, smooth, yellow but soon browning; gills forked, yellow, when mature with vinaceous reflex; stem 30-100 x 20-40 mm, squat; flesh pale yellowish, reddish brown when cut. Sp 7-9.5 x 5-6.5 μm , ellipsoid. Mycorrhizal with various hosts on acid, sandy soil; recently described and distribution unknown, but a few records from parks and cemeteries in temp. (DK), growing with *Betula*.

P. vernalis Watling

- On rich, clayey soil; pileipellis of up to 8 μm broad hyphae 4
- 4. Sp deposit olive brown, 5D4-E7. Cap 70-200 mm, margin long time inrolled, tomentose and crenate, often appressed scaly or with erect scales, ochre brown, olivaceous brown to rust coloured; gills decurrent, pale buff; stem 10-50 x 10-25 mm, remarkably short and broad; flesh pale yellowish, reddish brown when cut. Sp 7-11 x 5-7 μm , ellipsoid (fig. 161D); pileipellis a cutis with 3-8 μm broad, hyaline or brown hyphae. Mycorrhizal with *Tilia*, *Carpinus* or *Populus* on rich soil in gardens and parks; recently described from DE; distribution unknown but occurring in the area; DK (LC).

P. validus C. Hahn

- Sp deposit dark red brown, 8F7. Cap 70-300 mm, margin long time inrolled, tomentose and crenate, becoming appressed scaly, ochre brown, olivaceous brown to rust-coloured, becoming dark brown; gills decurrent, crowded, pale ochre; stem 30-50 x 15-40 mm, remarkably short and broad; flesh pale yellowish, reddish brown when cut. Sp 7-10.5 x 5-6.5 μm , ellipsoid; pileipellis a cutis with 5-8 μm broad, hyaline or brown hyphae. Mycorrhizal with *Abies*, *Tilia*, *Corylus* or *Quercus* on rich, clayey soil; recently described from DE; distribution unknown but occurring in the area; DK (LC). – ☉.

P. obscurisporus C. Hahn

Pellidiscus Donk

BEATRICE SENN-IRLET

One species in the Nordic countries; see description below.

Note: molecular analysis has recently shown that the species belongs to *Crepidotus* (Petersen, Knudsen & Seberg in press).

Lit.: Donk 1959, Reid 1964, Hjortstam 1985, Senn-Irlet 1991a.

Frb cyphelloid, 0.4-2 mm, dorsally attached, cup-shaped when young, soon flattened-discoid, plane, with an involute, undulating crenate margin. Upper side villose to tomentose, dry, white, pale yellowish. Hymenium smooth to wrinkled, whitish, soon pale cinnamon. Stem absent. Veil absent. Smell indistinct. Sp deposit cinnamon.

Sp 6.5-9 × 3.5-5.5 μm , Q = 1.5-2.2, oblong, ellipsoid, without germ-pore, faintly punctate (fig. 909B), pale brownish, without iodine reactions. Basidia 4-spored. Cystidia absent. Pileipellis a trichodermal cutis, with slightly coiled hyphae at margin hyphae, hyphae thin-walled, smooth, hyaline. Pigment absent. Clamps absent.

Saprotrophic on culm of herbs, ferns and rotten twigs or logs of deciduous trees and conifers, rotting leaves, polypores, etc.; late spring to autumn; occasional or overlooked in temp.-suba.; DK (LC), FI, NO (NE), SE (NE). – M&J 1, ☉.

P. pallidus (Berk. & Broome) Donk



Spores.

Phaeocollybia R. Heim

GRO GULDEN

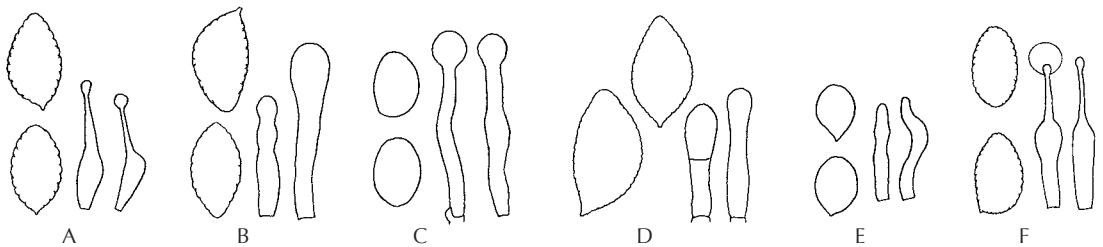
Frb with conical cap and rooting stem. Cap initially acutely conical, later with a papilla or umbo, margin incurved or not, smooth, lubricous, viscid to glutinous and shiny, rarely dry, satiny or mat, ± hygrophanous. Gills narrowly adnate, adnexed to almost free, narrow, ± ventricose, becoming ± reddish spotted with age, finally ochre brown or rusty brown, edge ± white-fringed. Stem tapering in lower part, deeply rooting, continuing into a pseudorrhiza, solid or fistulose, cartilaginous, smooth to slightly fibrillose, ± viscid. Veil present in primordia. Smell and taste distinctive. Sp deposit ochre to rusty brown.

Sp ellipsoid to amygdaloid or citriform, verruculose to almost smooth, plage ± inconspicuous. Basidia 4-spored. Cheilocystidia cylindrical, clavate or capitate, thin-walled, sometimes transverse-septate, in two species tibiiform, with narrow, often thick-walled, refractive necks and 1-2(-3) μm broad heads, often capped by a secretory droplet, occasionally forked. Primordia enclosed in a pellicular (gelatinous) veil with numerous small, tibiiform diverticulae (cystidia), that persist on the pseudorrhiza in all species, in some species developing into elongate caulocystidia, in some also remaining as scattered pileocystidia. Pileipellis a cutis of radially repent hyphae or an ixocutis with a surface layer of gelatinized, narrow hyphae, subpellis of short-celled hyphae. Pigments incrusting. Clamps absent, except in one species.

Mycorrhizal, typically occurring in small groups with *Picea*, occasionally in deciduous forests without conifers, in young as well as in old stands, often more species of the genus occurring together; late summer to autumn.

Six species in the Nordic countries.

Lit.: Bon 1979, Bresinsky 1960, Gulden 1983a, Horak 1977, Jacobsson & Stridvall 1983, Laber 1982 1991, Kühner & Romagnesi 1957.



Spores and cheilocystidia: A: *Phaeocollybia lugubris*, B: *P. festiva*, C: *P. arduennensis*, D: *P. christinae*, E: *P. jennyae*, F: *P. cidaris*.


1. Cap green or olive grey, horn grey to beige, at least when young, later often ± rusty brown spotted 2
- Cap orange, fulvous to blood red or dark brown 3
2. Cap 30-80 mm, typically olive to horn grey, slimy in moist weather; stem 3-15(-19) mm broad; cheilocystidia capitate, tibiiform (fig. 823A). Cap ± fleshy, conical-convex, expanding, becoming obtusely umbonate, margin persistently olive to horn grey, for the rest becoming ± red brown to ochre brown with age and upon drying; gills crowded, whitish to pale beige, becoming ± rusty spotted, finally dark ochre brown; stem 40-100 mm long above the ground, often ± compressed, viscid, cream to olive, becoming red brown from base upwards; flesh whitish; smell radish-like; taste farinaceous to somewhat bitter. Sp 7-9 × 5-5.5 μm, amygdaloid to citriform, verruculose; cheilocystidia 20-45 × 4-6 μm; pleurocystidia present near gill edge, similar; caulocystidia long, narrow, present over entire stem length. In groups in coniferous and mixed forests, with *Picea*, among moss, grass and needles, oc-

asionally with deciduous trees; summer to autumn; occasional in hemib.-middle bore., in FI north to southern bore., very rare in temp.; DK (EN), FI (LC), NO (LC), SE (LC). – B&K 5:402, Däh 830, Lud 62.1, Nyl 523, Sieniop 243.


P. lugubris (Fr.) R. Heim

- Cap 10-40(-60) mm, green to olive fuscous, more red brown with age, lubricous; stem 3-8 mm broad; cheilocystidia cylindrical to clavate-subcapitate (fig. 823B). Cap conical, becoming expanded with acute umbo; gills crowded to very crowded, young pale, with pinkish or occasionally bluish tinge, then rusty brown; stem 30-60 mm long above the ground, lubricous, top pale brown to olive or occasionally bluish, increasingly red brown spotted to red brown towards base; flesh wood-coloured; smell radish-like; taste mild to radish-like. Sp 7-8 x 4.5-5 μ m, amygdaloid, verruculose; cheilocystidia 20-65 x 5-17 μ m. In groups, mostly in young, eutrophic forests, with *Picea*, among moss, grass and need-les, occasionally with deciduous trees; summer to autumn; rare hemib.-middle bore., in FI north to southern bore., very rare in temp.; DK (NA), FI (LC), NO (LC), SE (LC). – B&K 5:400, FRIC 48c, Lud 62.3.

P. festiva (Fr.) R. Heim

3. Cap dark reddish brown to dark brown; stem 1-3 mm broad, \pm flexuous-twisted; clamps present. Cap 10-25 mm, conical, expanding bell-shaped to umbonate, subviscid to dry, drying dull ochre brown, \pm translucently striate at margin when moist; gills crowded, ochre to dark brown; stem 30-60 mm long above the ground, when young ochre to pale reddish brown at the top, becoming entirely dark red brown to blackish brown with age; flesh ochre to dark brown; taste mild to slightly bitter; smell indistinct or earthy. Sp 5-6(-7) x 3.5-4.5 μ m, broadly ellipsoid to amygdaloid, verruculose, with a tiny apical germ pore (fig. 823C), rusty brown in KOH; cheilocystidia 30-75 x 2.5-7 μ m, hyphoid-clavate to sublageniform-capitate. In groups among needles and moss, often in dense *Picea* forests, also in deciduous forests with *Fagus* and *Quercus*, and in sandy-peaty soil with *Alnus*; occasional in hemib.-southern bore., rare in temp. and middle-northern bore.; DK (vU), FI (LC), NO (LC), SE (LC). – C&D 1217, FAD 123A (as *Naucoria jennyae*), Lud 62.2, .

P. arduennensis Bon

- Cap orange to red or brownish red; stem 2-6(-8) mm broad, not flexuous-twisted; clamps absent 4
- 4. Sp 8.5-12(-14) x 4.5-6 μ m (fig. 823D); smell like marzipan. Cap 15-40 mm, initially conical, then acutely umbonate, lubricous, brick red to brown orange or copper red, drying yellow ochre; gills medium spaced to crowded, when young pale yellowish to pale ochre, becoming red spotted and finally rusty brown; stem 20-60 mm long above the ground, 3-6 mm broad, top orange to brick red, downwards brownish orange to vinaceous red; flesh wood-coloured; taste mild to slightly raphanoid. Sp amygdaloid to citriform; cheilocystidia 23-47 x 4-8 μ m, clavate to cylindrical-capitate. In groups, mostly on acid soil in forests with *Picea*, in moss among *Vaccinium myrtillus*, occasionally in deciduous forests; summer to autumn; occasional temp.-middle bore., very rare in DK; DK (vU), FI (LC), NO (LC), SE (LC). – B&K 5:399, Däh 831, FAD 123D, Lud 62.4, Phil 207e, .

P. christinae (Fr.) R. Heim

- Sp 4-9 x 3-5 μ m; smell radish-like or farinaceous 5
- 5. Gills very crowded; smell radish-like; taste radish-like, bitter; sp 4-6.5 x 3-4 μ m, almost smooth, broadly ellipsoid to pip-shaped (fig. 823E), pale in KOH; cheilocystidia hyphoid-cylindrical to subclavate. Cap 10-35 mm, conical, expanding acutely umbonate, silky-satiny to lubricous, fulvous to brownish blood red, drying ochre brown; gills initially yellowish to reddish ochre, \pm as the cap, becoming reddish spotted and ochre brown with age; stem 50-90 mm long above the ground, 1.5-6(-8) mm broad, top pale to fulvous, downwards vinaceous brown to blackish brown; flesh pale brown. Cheilocystidia 18-32 x 2-3.5 μ m. In groups in coniferous and mixed forests, with *Picea*, among moss, grass and needles; summer to autumn;

rare in northern temp.-bore., in FI north to southern bore.; DK (RE), FI (LC), NO (LC), SE (LC).
– B&K 5:401, Lud 62.5.

P. jennyae (P. Karst.) Romagn.

- Gills medium spaced; taste mild, farinaceous; smell farinaceous; sp 6-9 x 4-5 μm , verruculose, ellipsoid-amygdaloid (fig. 823F), rusty brown in KOH; cheilocystidia capitate, tibiiform. Cap 13-30 mm, conical to acutely umbonate, lubricous, fulvous orange to orange brown or red brown, drying orange ochre; gills pale beige when young, becoming reddish \pm as the cap, then rusty brown; stem 40-60 mm long above the ground, 1.5-5 mm broad, concolorous with cap, paler at top; flesh pale. Cheilocystidia 10-50 x 4-7 μm ; caulocystidia present over entire stem length, narrow and elongate, capitate. In groups, mostly in eutrophic forests with *Picea*, among *Vaccinium myrtillus*, moss, grass and needles; autumn; rare in hemib.-southern bore.; FI (NT), NO (LC), SE (NE).

P. cidaris (Fr.) Romagn.

Phaeogalera Kühner

JAN VESTERHOLT

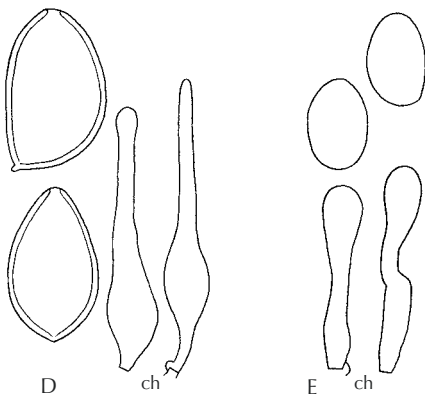
Frb mycenoid to collybioid, with dull brown sp deposit. Cap smooth, greasy to slimy, brown, hygrophanous, with white veil remnants at margin. Gills broadly adnate, reddish brown to greyish brown. Stem cylindrical or with a clavate base, with veil remnants. Smell and taste indistinct. Sp deposit dull brown or dull yellowish brown.

Sp ellipsoid, smooth, ± thick-walled, with or without a germ pore, pale brown, without iodine reactions. Cheilocystidia lageniform to cylindrical or ± tibiiform. Pleurocystidia absent. Pileipellis an ixocutis. Clamps present.

Saprotrophic on mosses, leaf litter or twigs.

Two species in the Nordic countries. The species in the key are apparently not congeneric, the type species *P. stagnina* may be related to *Psilocybe*, but *P. dissimulans* does not seem to be closely related to any known genus.

Lit.: Holec 2003, Kühner 1972b.



Spores and cheilocystidia: D: *Phaeogalera stagnina*, E: *P. dissimulans*.

1. Stem pale reddish brown, becoming blackish brown from the base; sp 12-16 × 7-10 μm (fig. 837D); on *Sphagnum* and other mosses in damp and peaty habitats. Cap 5-25 mm, obtusely conical to convex, later plane, smooth, greasy to viscid, reddish brown, not distinctly translucently striate, hygrophanous, at margin with white remnants of veil; gills broadly adnate, pale reddish brown to greyish brown; stem 30-150 × 1.5-5 mm, ± cylindrical, with a ring-like zone of white veil in the upper part; smell and taste indistinct; sp deposit dull brown. Sp ellipsoid, with a germ pore, smooth; cheilocystidia 45-60 × 8-16 × 3-5 μm, narrowly lageniform. Summer to autumn; occasional in hemib.-arc./alp., very rare in temp.; DK (EN), FI (LC), FO, IS, NO (LC), SE (LC). – AAF 1:37, B&K 5:404, M&J 1, R&H 525, ⊙.
P. stagnina (Fr.: Fr.) Pegler & T.W.K. Young (*Galerina* s. (Fr.: Fr.) Kühner)
- Stem whitish to pale yellowish buff; sp 6.5-9 × 4-6 μm (fig. 837E); in deciduous forests on dead twigs and leaves, often of *Populus*. Cap 5-20 mm, convex to expanded, smooth, viscid to slimy, at first dark brown, later yellowish brown to greyish brown, translucently striate in outer part, hygrophanous, at margin with white remnants of veil; gills broadly adnate, pale greyish brown; stem 15-30 × 3-4 mm, cylindrical or swollen at base, with white veil remnants; smell and taste indistinct; sp deposit dull yellowish brown. Sp ellipsoid, with or without an indistinct germ pore; cheilocystidia 23-65 × 5-11 μm, cylindrical tending to be slightly tibiiform. Autumn to winter; very rare in temp.-hemib.; DK (DD), FI (U: Helsinki), NO (NE, Østf: Fredrikstad). – B&K 4:436, GBW 4:388, M&J 1, Sienil 59(2): cover, Svp 26:5, ⊙.
P. dissimulans (Berk. & Broome) Holec (*P. oedipus* (Cooke) Romagn., *Pholiota o.* (Cooke) P.D. Orton)

Phaeolepiota Konrad & Maubl.

HENNING KNUDSEN

Monotypic genus; see description below.

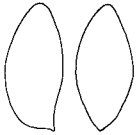
Lit.: Bach 1956.

Frb agaricoid, uniformly yellow brown. Cap 50-150 mm, golden yellow brown, mat, dry, pulverulent. Gills adnexed, first cream then yellow brown. Stem 60-200 x 10-35 mm, clavate, often veined, concolorous with cap, above ring pale yellowish, ring large and conspicuous, membranous, ascending, on the underside brown floccose. Smell strong, cyanic. Taste mild. Sp deposit ochraceous.

Sp 11-12 x 4.5-5.5 μm , narrowly amygdaloid, smooth or slightly rough (fig. 517C), almost hyaline to pale brown, without iodine reactions, cyanophilous. Basidia 4-spored. Cystidia absent. Clamps present. Pileipellis and stipitipellis an epithelium of spherocysts up to 30 μm in diam.

Saprotrophic on rich, humid soil, gregarious in conspicuous groups in forests, parks and gardens, often in similar places as *Urtica dioica*, but also in lawns; autumn to late autumn; occasional but locally common in temp.-suba.; DK (LC), FI (LC), IS (Au), NO (LC), SE (LC). – Däh 540, FAD 105C, Lud 63.1, Phil 139ef, R&H 422, ⊙.

P. aurea (Matt.: Fr.) Konrad & Maubl. (*Pholiota vahlii* (Schumach.: Fr.) S. Petersen)



Spores.

Phaeomarasmius Scherff.

ERIK RALD & JAN VESTERHOLT

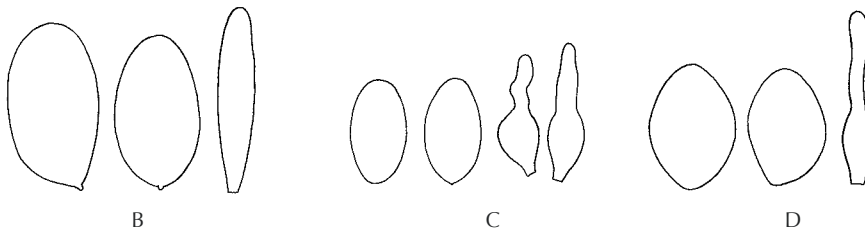
Frb brown, tomentose-scaly, with central to eccentric stem, able to survive drought and resume spore production when re-moistened. Cap 3-15 mm, with an appressed felt-like covering or with erect scales, at least at centre, reddish brown to rust brown. Ring absent. Gills adnate to emarginate, distant to very distant, whitish at first, becoming brown. Stem concolorous with cap. Flesh tough. Smell and taste indistinct. Sp deposit dull brown.

Sp ellipsoid to ovoid, smooth, without germ pore, thin-walled, honey-coloured to brownish, without iodine reactions. Cheilocystidia cylindrical to clavate, fusiform or lageniform. Pleurocystidia absent. Pileipellis a cutis, a trichoderm or a palisadoderm, with coarsely incrustated hyphae. Clamps present.

Saprotrophic on wood of deciduous trees or shrubs.

Three species in the Nordic countries.

Lit.: Ludwig 2001, Watling & Gregory 1993.



Spores and cheilocystidia: B: *Phaeomarasmius rimulincola*, C: *P. borealis*, D: *P. erinaceus*.

1. Cap with an appressed felt-like covering to finely granular-scaly; stem almost smooth. Cap 3-10 mm, rusty brown; gills distant, paler reddish brown; stem 2-10 x 1-2 mm, central to eccentric, brownish with a whitish top. Sp 11-14 x 7.5-8.5 μm , ellipsoid to ovoid (fig. 781B); basidia 4-spored; cheilocystidia 35-60 x 6-10 μm , cylindrical to clavate or fusiform. On bark of deciduous trees; spring to autumn; rare in hemib.; NO (NE, Oslo), SE (LC). – BCat 942, Bres 801.2, Lud 64.2.
P. rimulincola (Rabenh.) P.D. Orton
- Cap with erect and pointed scales; stem hairy to finely scaly 2
2. Sp oblong, (7-)8.5-9.5 x (3.5-)4-5.5 μm (fig. 781C). Cap up to 10 mm, finely scaly, rusty brown to dark brown; gills whitish at first, becoming rusty brown, paler than cap; stem central to eccentric, hairy. Basidia 1-4-spored; cheilocystidia 20-30 x 6-9 μm , lageniform to irregularly tortuose. On dead branches of *Salix*, *Betula*, *Pinus* and *Rosa*; autumn; occasional in temp.-bore.; FI (LC), NO (NE), SE.
P. borealis Rald (*P. erinaceus* (Fr.: Fr.) Kühner. s. Smith & Hesler)
- Sp broadly ellipsoid to ovoid, 9.5-12 x 6-8.5 μm (fig. 781D). Cap 3-15 mm, convex, later expanded, finely scaly, dry, rusty brown; gills distant, whitish at first, becoming rusty brown; stem 3-10(-20) x 0.8-1.5 mm, central to eccentric, finely scaly, rusty brown. Basidia 1-4-spored; cheilocystidia 30-45 x 5-8 μm , cylindrical to lageniform. On dead branches of *Salix* and *Betula*, rarely *Alnus*, *Fraxinus*, *Fagus*, *Quercus* and *Rosa*; spring to early winter; common in temp., occasional in hemib.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 5:435, GBW 4:369, Lud 64.1, R&H 462, Ves 306, ⊙.
P. erinaceus (Fr.: Fr.) Kühner

Pholiota P. Kumm.

STIG JACOBSSON

Frb collybioid to tricholomatoid, often ± yellow and fasciculate. Cap 5-200 mm, exceptionally larger, often scaly, often slimy or viscid, not hygrophanous, yellow to brown, rarely whitish or ± red. Gills adnate or slightly emarginate with a small decurrent tooth, ± crowded. Stem with ± disrupted ring or evanescent ring zone. Smell generally weak. Taste mild or ± bitter. Sp deposit rusty brown.

Sp ellipsoid to ovoid, often phaseoliform in side view, smooth in a light microscope, generally with a germ pore. Cheilocystidia present. Pleurocystidia present except in subgen. *Flavidula*, often as chrysocystidia. Pileipellis an ixocutis, less often a cutis. Clamps present.

Saprotrophic, or sometimes parasitic, on wood, sometimes on soil among litter or on fireplaces.
24 species in the Nordic countries.

Lit.: Holec 2001, Jacobsson 1990, Noordeloos in Bas et al. 1999.

Main key

- | | |
|---|---|
| 1. Pleurocystidia absent | Key A, subgen. <i>Flavidula</i> p. 838 |
| - Pleurocystidia present | 2 |
| 2. Cap ± recurved or appressed scaly or scaly; chrysocystidia present | Key B, subgen. <i>Pholiota</i> p. 838 |
| - Cap not scaly; chrysocystidia absent | Key C, subgen. <i>Flammuloides</i> p 842 |

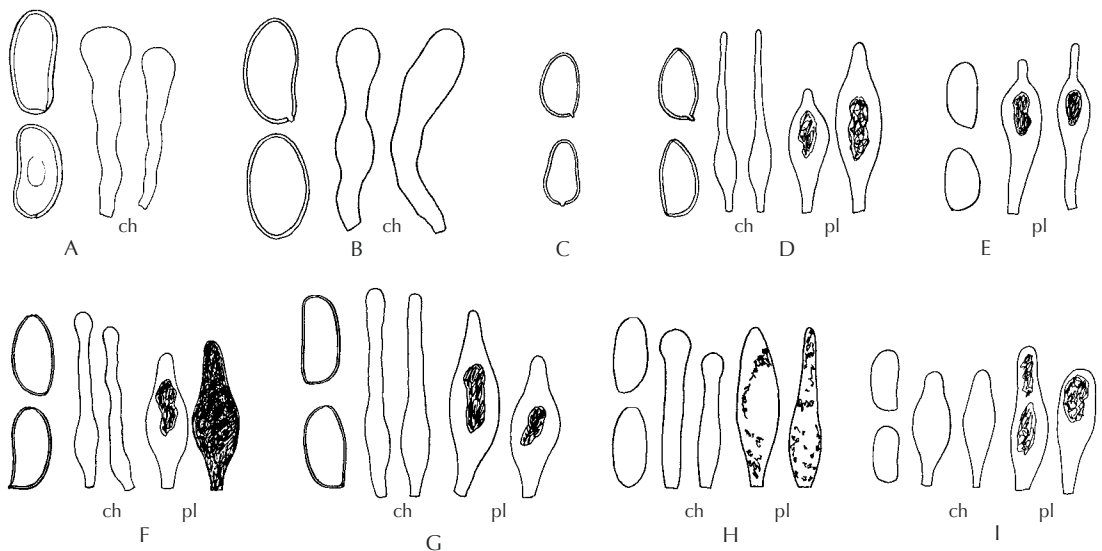


Fig. 839. Spores, cheilocystidia and pleurocystidia: A: *Pholiota tuberculosa*; B: *P. lucifera*, C: *P. mucigera*, D: *P. astragalina*, E: *P. subochracea*, F: *P. gummosa*, G: *P. conissans*, H: *P. pityrodes*, I: *P. flammans*.

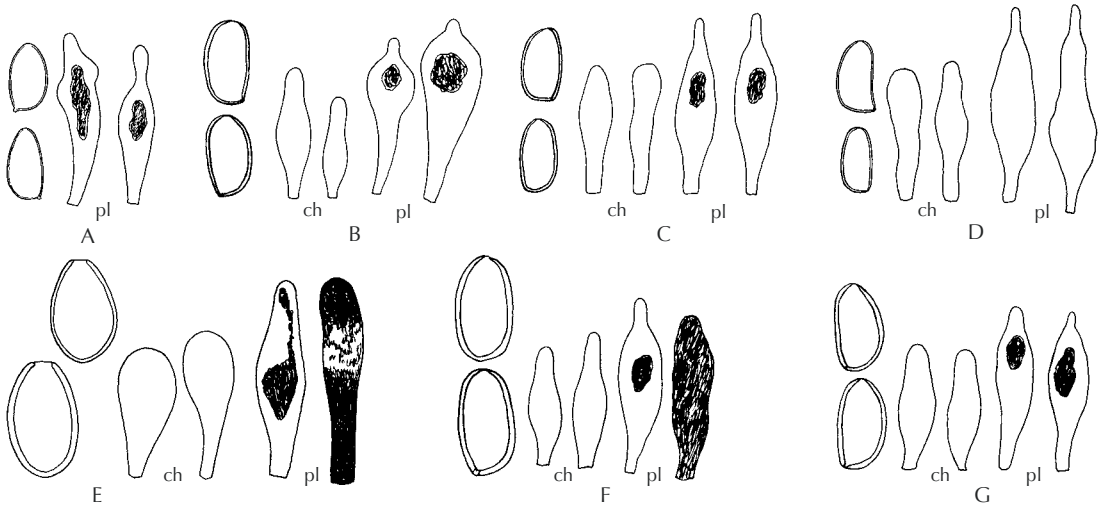


Fig. 841. Spores, pleurocystidia and cheilocystidia: A: *P. lundbergii*, B: *P. squarrosa*, C: *P. jahni*, D: *P. squarrosoides*, E: *P. cerifera*, F: *P. adiposa*, G: *P. limonella*.

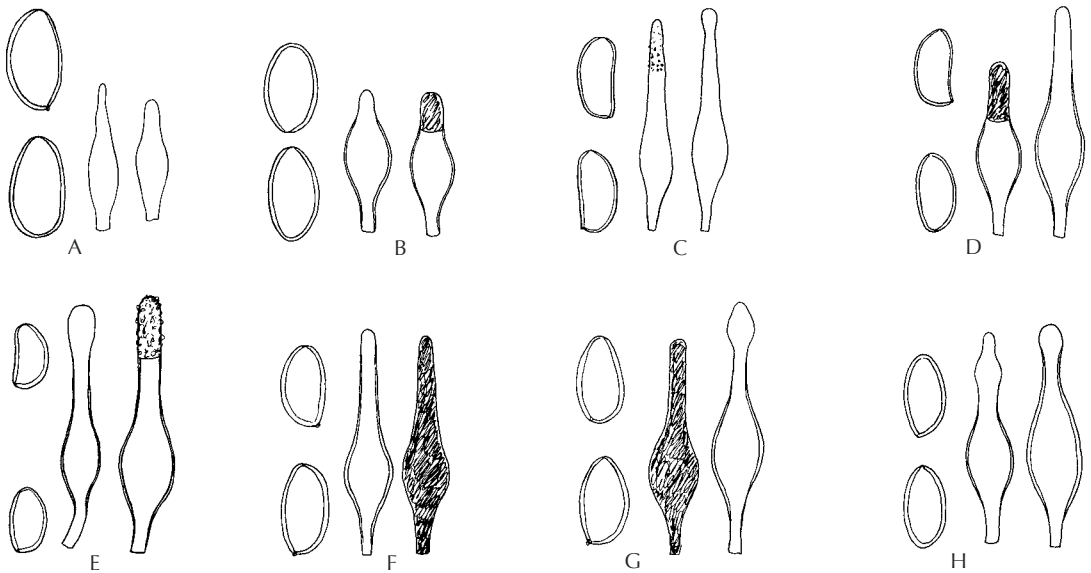


Fig. 843. Spores and pleurocystidia: A: *Pholiota henningsii*, B: *P. scamba*, C: *P. lenta*, D: *P. lubrica*, E: *P. elegans*, F: *P. highlandensis*, G: *P. spumosa*, H: *P. mixta*.

Key A: Subgen. *Flavidula* (Fr.) Singer

1. Cap dry, exceptionally sticky. Cap 10-50 mm, at first sulphur yellow, later orange brown to rusty, at least at the centre, ± fibrillose scaly; gills pale yellow, then rusty; stem 30-50 x 2-6 mm, cylindrical or with a subbulbous base, often curved, sulphur yellow or brown towards the base, with a distinct, but fugacious ring or ring-zone; taste bitter. Sp 7-9 x 4-5.5 µm, slightly phaseoliform, without or with a very indistinct germ pore (fig. 839A); cheilocystidia mostly capitate. On dead wood of various deciduous trees, especially *Tilia* and *Betula*; summer to autumn; occasional in hemib.-suba., rare in temp.; DK (VU), FI (LC), NO (LC), SE (LC). – GBW 4:394, Holec 46-47, Lud 65.11, R&H 355, ☉.
P. tuberculosa (Schaeff.: Fr.) P. Kumm. (*Pleuroflammula t.* (Schaeff.: Fr.) Horak, *P. curvipes* (Pers.) Quél.)
 - Cap sticky to viscid or slimy 2
2. Cap 25-80 mm, sticky to slimy. Cap initially pale yellow, with age becoming orange or rusty brown from centre, covered with small appressed brown scales; gills initially pale yellow; stem 20-70 x 3-8 mm, with a narrow, but distinct ring; taste bitter. Sp 7-9 x 4-5.5 µm, slightly phaseoliform, without or with a very indistinct germ pore (fig. 839B); cheilocystidia variable, ± clavate, exceptionally capitate. On wood or other debris, generally on buried wood in lawns or old rubbish dumps; autumn; rare in temp.-hemib., very rare in southern bore., often misidentified and confused with *P. tuberculosa*, and some records may be misidentifications; DK (VU), FI (DD), NO, SE. – B&K 4:433, Däh 623, Holec 48-49, Lud 65.10.
P. lucifera (Lasch) Quél.)
 - Cap 70-100 mm, very slimy. Cap convex with a low, obtuse umbo, whitish towards the margin, gradually ochraceous yellow at centre, when young with faint, appressed scales; stem up to 80 x 7-10 mm, cylindrical, straw, with minute, floccose scales; taste mild. Sp 5-6.5 x 3.5-4 µm, ovoid to slightly phaseoliform in side view, without germ pore (fig. 839C); cystidia absent. On wood; autumn; only known from the type locality in central FI on a fallen trunk of *Populus* in a virgin forest; FI (CR, EH: Strand). – Holec & Niemelä 2000, ABF 37:80, Sieniop 248.
P. mucigera Holec & Niemelä
Note: the taxonomic position is uncertain, and its placement in subgen. *Flavidula* is preliminary.


Key B: Subgen. *Pholiota*

1. Cap smooth or with thin, appressed scales 2
 - Cap with distinct, ± erect scales 6
2. Cap distinctly red at centre; taste bitter. Cap 20-70 mm, hemispherical to low convex, at first with incurved margin, dry or slightly viscid, ± orange red, but mostly paler yellowish towards the margin, when young covered with a thin, whitish veil; gills pale yellow; stem 30-100 x 4-10 mm, cylindrical, often curved, pale yellow but rusty towards the base, with an indistinct ring-zone; flesh orange red in the cap. Sp 5.5-8 x 3.5-4.5 µm, ovoid-ellipsoid, exceptionally slightly phaseoliform (fig. 839D); cheilocystidia narrowly cylindrical; gill edge sterile; chrysocystidia clavate, numerous. Saprotrophic on decayed wood of conifers, mostly in humid areas; summer to autumn; common in hemib. and southern bore., occasional in temp. and middle to northern bore., in FI north to OP; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 121D, Holec 97, Lud 65.20, Phil 212b, Ves 319, ☉.
P. astragalina (Fr.: Fr.) Singer
 - Cap not distinctly red; taste mild or only slightly bitter 3
3. On coniferous wood in forests. Cap 10-40 mm, at first with incurved margin, then convex, slightly viscid, yellowish brown to apricot with yellowish margin, when young with fibrillose, white veil remnants; gills narrow, pale citrine yellow, later yellowish brown; stem 30-75 x 3-5 mm, cylindrical, but often curved, pale to yellowish brown with floccose veil

remnants; smell indistinct; taste mild or slightly bitter. Sp 5-6 x 3-3.5 μm , ellipsoid-ovoid, at least some slightly phaseoliform (fig. 839E); chrysocystidia mucronate. In small clusters on decaying wood of conifers, mostly *Picea*; summer to autumn; rare, but locally occasional in hemib.-bore., seemingly more common in humid areas; FI (VU), NO (LC, AA: Valle), SE. Montane in central Europe and NW USA. – Holec 93, Jordst 8(3), Lud 65.29.

P. subochracea (A.H. Sm.) A.H. Sm. & Hesler (*P. nematolomoides* (J. Favre) M.M. Moser)

- On the ground or on deciduous, exceptionally coniferous wood 4
- 4. Cap 25-70 mm; on decaying wood of deciduous, rarely coniferous trees, but often on soil in lawns and pastures without visible wood. Cap viscid, pale yellow green or lemon yellow, olive to greenish brown at least with age, covered with thin, appressed, brownish scales that may disappear with age; gills olive brown with paler edge; stem 30-100 x 3-10 mm, cylindrical, dry, whitish to pale yellow, but towards the base gradually brown, scaly like the cap; taste mild; smell indistinct. Sp 5.5-8 x 3.5-4.5 μm , ellipsoid to slightly phaseoliform (fig. 839F); chrysocystidia usually clavate to slightly mucronate, scattered; cheilocystidia cylindrical-subcapitate, numerous. Autumn; common in temp.-hemib., occasional in southern-middle bore., rare in northern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 625, Lud 65.13, Phil 214d, R&H 458, Ves 316, ☉.
P. gummosa (Lasch) Singer
- Cap 5-40 mm; in moist habitats 5
- 5. On wood of *Salix*, rarely on *Populus* or in moist meadows. Cap 8-40 mm, viscid to glutinous, pale yellow, towards centre gradually orange brown, at least with age, without or with small, indistinct scales; gills at first whitish or pale yellow, when mature brown; stem 20-60 x 2-4 mm, often flexuose, pale yellowish in upper part, downwards darkening to brownish with age; smell and taste indistinct. Sp 6-8 x 3-4.5 μm , oblong, slightly phaseoliform in side view (fig. 839G); cheilocystidia cylindrical with \pm capitate apex, numerous; chrysocystidia clavate to mucronate. Generally in wetlands, on decaying wood of *Salix* or on roots of various graminids (*Cyperaceae*, *Poaceae*); autumn; rare in temp.-hemib., very rare in southern bore.; DK (DD), FI (NT), SE (LC). – Bol Bres 38:72, FAD 122C, GBW 4:376, Holec 78, Lud 65.26, ☉.
P. conissans (Fr.) Kuyper & Tjall.-Beuk. (*P. graminis* (Quél.) Singer, *P. inaurata* (W.G. Sm.) M.M. Moser)
Note: *P. graminis*, growing in open habitats, has often been treated as a species of its own, but molecular methods has shown it to be identical with *P. conissans*.
- On *Phragmites*. Cap 5-23 mm, dry, straw yellow to rusty brown, covered with appressed, fibrillose, rusty scales; stem 10-30 x 1-2 mm, cylindrical, pale yellow but towards base gradually brownish, veil remnants thin and evanescent. Sp 5-7 x 2.5-3 μm , subcylindrical (fig. 839H), very pale; cheilocystidia cylindrical with a subcapitate apex; chrysocystidia fusiform-clavate, abundant. On rhizomes and basal parts of stems in wet places; autumn; very rare in temp.; DK (DD). – FAD 124B (as *Naucoria* p.), Lud 65.25.
P. pityrodes (F. Brig.) Holec
- 6. Cap and stem with bright sulphur-yellow scales. Cap 20-80 mm broad, dry or sticky but not glutinous, bright orange yellow to yellow, covered with \pm erect scales; gills sulphur yellow, then rusty; stem 30-90 x 4-10 mm, sulphur yellow, scaly below the thin, evanescent annulus; taste \pm bitter. Sp 4-5 x 2-3 μm , ellipsoid to slightly phaseoliform, thin-walled, without a distinct germ pore (fig. 839I); cheilocystidia numerous, shape rather variable, but usually obtuse and hyaline; pleurocystidia similar, but mostly as chrysocystidia. Saprotrophic on old stumps or other kinds of dead wood, generally from conifers, but sometimes also from deciduous trees, e.g. *Alnus* and *Corylus*, in small clusters or individually; summer-autumn; common in temp.-middle bore., occasional in northern bore., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 619, Lud 65.1, Phil 212a, R&H 456, Ves 316, ☉.
P. flammans (Batsch: Fr.) P. Kumm.
- Scales on cap brownish to almost black 7

7. Terrestrial, single or in small clusters. Cap 30-70 mm, dry or sticky, pale straw at the margin, yellowish brown at the centre or with age, covered with thin, brownish, appressed or somewhat erect scales; gills at first pale, then ochraceous brown; stem 45-85 x 5-10 mm, cylindrical or tapering towards the base, straw-coloured, but \pm browning downwards, scaly like the cap; smell aromatic; taste mild. Sp 5.5-7.5 x 3.5-4.5 μm , ellipsoid to slightly phaseoliform, with a germ pore (fig. 841A); chrysocystidia mostly obtusely fusiform, numerous. In coniferous forests, but also e.g. in parks near *Pinus*, in two cases on old tracks, probably connected to some kind of wood remnants in the soil; summer to autumn; seemingly very rare, hitherto only known from three localities in SE (Dlr, Jmt) and one in FI (U: Tammisaari, PS: Kuopio); FI (DD), SE (LC).
P. lundbergii Jacobsson
- On wood, often in large clusters 8
8. Cap dry. Cap 40-200 mm, exceptionally larger, \pm umbonate, at first yellow, becoming rusty brown, at least at centre, covered with numerous, \pm erect scales; gills at first yellowish with an olive flush; stem 60-250 x 5-20 mm, cylindrical or frequently tapering towards the base, pale yellowish above the fibrillose ring or ring zone, downwards rusty brown and scaly like the cap; taste and smell indistinct. Sp 6-8 x 3.5-5 μm , ellipsoid, with a distinct germ pore (fig. 841B); chrysocystidia clavate or mucronate, numerous. In large clusters at the base of living or recently dead deciduous trees of any kind, often cultivated trees in gardens and parks, rather frequent also on *Picea*, but rarely on other coniferous trees; autumn, often late, sometimes summer; common in temp.-middle bore., occasional in northern bore.-suba.; DK (LC), FI (LC), NO (LC), IS (Ve), SE. – Däh 618, Jordst 24(2):14, Phil 212c, R&H 456, Ves 317, .
P. squarrosa (Weigel: Fr.) P. Kumm.
- Cap viscid to slimy, lustrous when dry 9
9. Sp < 7 x 4 μm 10
- Sp on av > 7 x 4 μm 11
10. Cap very glutinous, scales pointed and blackish. Cap 30-100 mm, lemon to chrome yellow with rather numerous scales, sometimes disappearing in old frb; stem 60-140 x 5-15 mm, equal or tapering downwards, pale yellow but soon becoming brownish from the base, with an evanescent ring, under the ring scaly like the cap. Sp 5-7 x 3-4 μm , ellipsoid to ovoid (fig. 841C); chrysocystidia fusiform, clavate or mucronate. In clusters on roots and stumps or at the base of living or recently dead deciduous trees, most frequent on *Fagus*, but also known from *Quercus* and *Betula* and some records from *Picea*, in central Europe also from *Abies* and *Pinus*; autumn; rare in temp.-hemib., but occasional in DK; DK (LC), NO (NE, Vestf: Tønsberg), SE (LC). – Däh 621, Lud 65.3, R&H 457.
P. jahmii Tjall.-Beuk. & Bas (*P. adiposa* (Batsch: Fr.) P. Kumm. s. Ricken, J.E. Lange, *P. muelleri* (Fr.) P.D. Orton s. auct.)
- Cap viscid, scales small but numerous, fibrillose, conical and upraised, brownish. Cap 40-120 mm, ground colour very pale yellowish, but becoming rusty with age at centre; stem 50-120 x 5-15 mm, cylindrical, whitish to pale yellow, densely covered with erect, tomentose scales below the often indistinct ring; smell pleasant, aromatic. Sp 4.5-6.5 x 2.5-3.5 μm , ellipsoid to slightly phaseoliform in side view (fig. 841D); cystidia lageniform to fusiform and often mucronate, numerous on the edge, scattered elsewhere; chrysocystidia rather rare. Saprotrophic on wood of deciduous trees, e.g. *Betula*, *Populus*, *Sorbus*, *Salix* and *Fagus*, often in virgin forests or on old dead trees in parks; summer to autumn; rare in hemib.-southern bore., very rare in temp.; DK (CR, Sj: Jægersborg Dyrehave), FI (NT), SE (VU). Rare also in central and eastern Europe. – Holec 65, Jordst 24(2):14-15, Lud 65.6, Sieniop 249, Svp 26:4.
P. squarrosoides (Peck) Sacc.

11. Cap viscid, not strongly glutinous; on larger species of *Salix*, e.g. *S. fragilis* and *S. pentandra*; cheilocystidia clavate, often broadly. Cap 50-150 mm, yellow to yellowish rusty, scales often large and triangular; gills pale beige yellow when young; stem 50-150 x 5-25 mm, often curved, pale yellow at top, gradually rusty towards base. Sp 7.5-11 x 5-6.5 μm , ellipsoid, with a distinct germ pore (fig. 841E); cheilocystidia clavate but wider than in *P. adiposa*; chrysocystidia abundant. Fasciculate on living or dead wood, often on banks of rivers and lakes, also in parks; autumn; occasional in temp., rare in hemib.-southern bore.; DK, FI (V: Turku, EH: Tammela), NO, SE. – Holec 49, Lud 65.5.
P. cerifera (P. Karst.) P. Karst. (*P. aurivellus* (Batsch: Fr.) P. Kumm. s. auct. p.p.)
- Cap very glutinous when moist, lustrous when dry; cheilocystidia variable, but not broadly clavate
12. Sp 7.5-10 x 5-6 μm ; mostly on *Fagus*. Cap 50-150 mm broad and rather fleshy, at first hemispherical with involute margin, expanded to convex with or without an umbo, ground colour golden yellow, with age orange brown, at least at centre, with concentrically arranged, rather large, dark brown and mostly appressed scales; stem 50-200 x 8-30 mm, generally cylindrical, often curved, below the ring-zone scaly like the cap; taste and smell indistinct. Sp ellipsoid, rather thick-walled and dark, with a distinct germ pore (fig. 841F); cheilocystidia narrowly clavate; pleurocystidia clavate or rather variable, often as chrysocystidia or completely filled with pigments and deformed. Fasciculate on wood as a parasite on living stems or saprotrophic on stems and fallen trunks, often high above the ground, also on several kinds of tree species, but rarely conifers; autumn; common in temp., occasional in hemib.; DK (LC), FI (DD), NO, SE. – R&H 457, Ves 317, ☉.
P. adiposa (Batsch: Fr.) P. Kumm. (*P. aurivellus* (Batsch: Fr.) P. Kumm. s. auct. p.p.)
- Sp 6.5-9 x 4.5(-5.5) μm ; mostly on *Alnus* and *Betula*. Cap 50-150 mm, rather fleshy, at first hemispherical with involute margin, expanded to convex with or without umbo, ground colour golden yellow, with age orange brown, at least at centre, with concentrically arranged, rather large, dark brown and mostly appressed scales; stem 50-200 x 8-30 mm, generally cylindrical, often curved, below the ring-zone scaly like the cap; taste and smell indistinct. Sp ellipsoid (fig. 841G), slightly more thin-walled and germ pore somewhat less distinct than in *P. adiposa*; pleurocystidia clavate or rather variable, often as chrysocystidia or completely filled with pigments and deformed. Also noted on several other tree species including *Picea*, and outside the *Fagus* region more common than *P. adiposa*; autumn; occasional in temp.-southern bore., rare in middle-northern bore; DK, FI (LC), NO (LC), SE (LC). – Holec 55, Lud 65.4, Sieniop 247.
P. limonella (Peck) Sacc.
Note: macroscopically *P. limonella* is inseparable from *P. adiposa*.

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Key C: Subgen. *Flavidula* (Fr.) Singer

1. On *Sphagnum* or other mosses. Cap 10-50 mm, viscid, yellowish, at centre \pm orange brown, with floccose veil remnants; stem 25-60 x 1-4 mm, whitish to pale yellow, becoming brown towards the base, initially floccose-fibrillose. Sp 8-10 x 4.5-5.5 μm , ellipsoid, thick-walled and strongly brown, with a small germ pore (fig. 843A); cystidia lageniform to fusiform. In (only calcareous?) fens; autumn, exceptionally summer; very rare in temp.-hemib.; DK (CR Sj: Gribskov, Lyngby Åmose), SE (vu, Srm, Upl). – Bres 774, Holec 142, Lud 65.23.
P. henningsii (Bres.) P.D. Orton
- On wood or debris or on soil
2. Cap 5-30 mm, thin, white to pale brownish. Cap viscid, fibrillose when dry; stem 10-35 x 1-4 mm, cylindrical, whitish, but becoming brown towards the base, with an indistinct ring-zone. Sp 7-10 x 4.5-6 μm , ellipsoid to ovoid, with a distinct germ pore (fig. 843B); cystidia clavate with a projecting, obtuse apex or utriform, numerous. On and around stumps and

2

other wood debris from conifers, mostly *Picea*, exceptionally also on deciduous wood or on soil, single or in small fascicles; summer to autumn; occasional in temp.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 4:438, Jordst 22(3):38, Lud 65.9, Phil 214b, R&H 459, ☉.

P. scamba (Fr.: Fr.) M.M. Moser

- Cap larger and more fleshy, usually darker 3
- 3. Sp ± phaseoliform in side view 4
- Sp ellipsoid to ovoid in side view 6

- 4. Cap at first whitish, but with age and especially at the centre pale beige brown. Cap 30-80 mm, strongly glutinous in moist weather, slightly lustrous when dry, when young with distinct, white, triangular veil remnants, especially at the margin; gills at first pale yellowish brown; stem 35-100 x 4-12 mm, often widened towards base, often curved, browning towards the base and with floccose white veil remnants below the ring-zone; smell somewhat aromatic; taste mild. Sp 6-8 x 3-4.5 μm, ± phaseoliform in side view, with a rather indistinct germ pore (fig. 843C); cystidia lageniform to fusiform, sometimes with yellow contents in the neck, numerous. On woody debris, decaying leaves, needles, etc., most frequent in *Fagus* forests, but may be found in all kinds of forests, also coniferous; mostly in late autumn; common in temp.-suba., in FI north to PeP; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 624, Lud 65.14, Phil 214a, R&H 458, ☉.

P. lenta (Pers.: Fr.) Singer

- Cap more vividly coloured 5
- 5. Cap predominantly reddish brown, especially at the centre, paler at margin, at least with age. Cap 30-85 mm, slimy, strongly glutinous, when young with white floccules from veil; gills long pale with a weak yellow tinge; stem 35-90 x 5-12 mm, initially whitish and floccose below the ring-zone, darkening towards base. Sp 6-8 x 3-4.5 μm, ± phaseoliform in side view, with a rather indistinct germ pore (fig. 843D); cystidia lageniform to fusiform, sometimes with yellow contents in the neck, numerous. On dead wood or other debris of deciduous and coniferous trees, e.g. old stumps, strongly decayed fallen trunks, buried wood or old leaves; late summer to autumn; common in bore, occasional in hemib. and suba.; FI (LC), NO (LC), SE (LC). – B&K 4:423, Lud 65.17.

P. lubrica (Pers.: Fr.) Singer (*P. decussata* (Fr.) M.M. Moser)

- Cap predominantly yellow, sometimes almost orange ochre at centre. Cap 40-100 mm, strongly glutinous, with whitish floccules from veil when young; gills pale to lemon or olive yellow; stem 40-100 x 5-10 mm, whitish and floccose below the ring-zone, becoming brown towards base. Sp 5-6.5 x 3-3.5 μm, ± phaseoliform in side view, with a very indistinct germ pore (fig. 843E), thin-walled and pale. On woody debris of deciduous, less often coniferous trees; autumn; rare in hemib.-bore., but may be overlooked being described recently; FI (LC), NO (NE), SE (LC). – Holec 128, Lud 65.18.

P. elegans Jacobsson

- 6. On burnt places. Cap 10-80 mm, glutinous, brownish orange, cinnamon, towards the margin gradually yellow, when young with whitish veil remnants at the margin; gills dull yellowish; stem 20-80 x 2-8 mm, whitish to pale yellow, ± rusty brown towards the base, with an indistinct ring-zone; smell indistinct; taste mild. Sp 6-8 x 4-5 μm, ellipsoid to ovoid in side view, with a small germ pore (fig. 843F), rusty brown; cystidia fusiform-lageniform with a long neck, often with yellowish contents, especially in the neck. On burnt wood of all kinds, bonfires, ashes, etc., usually less than 3 years old; rarely recorded also in open places without visible burnt material; most frequent in spring and autumn but may appear anytime when conditions are favourable; common and widespread in temp.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – Lud 65.32, Phil 214c, R&H 459, Sieniop 246, Ves 319, ☉.

P. highlandensis (Peck) Quadr. (*P. carbonaria* (Fr.) Singer non A.H. Sm.)

- Not on burnt places 7

7. Cap with a distinct yellow hue. Cap 30-80 mm, viscid to glutinous, reddish brown at the centre, but gradually lemon to bright yellow towards margin; gills greenish yellow when young; stem 30-80 x 4-8 mm, distinctly yellow upwards, near the base rusty brown, with an evanescent ring-zone; taste slightly bitter. Sp 6-8.5 x 3.5-4.5 μm , ellipsoid to ovoid in side view, with a small, but distinct germ pore (fig. 843G); cystidia fusiform or lageniform with a long neck, often partly filled with yellowish content, numerous. On woody debris of conifers, but sometimes seemingly on soil, in such cases probably connected to buried and strongly decayed wood chips; summer to autumn; common in hemib.-bore., occasional in temp., rare in arc./alp. and in areas with acid soil; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:439, Däh 628, FAD 121C, Lud 65.24, R&H 460.
P. spumosa (Fr.: Fr.) Singer
- Cap without a distinct yellow hue. Cap 15-60 mm, viscid to glutinous, at centre brown or orange brown, gradually pale beige to whitish towards margin; stem 30-70 x 3-10 mm, pale, whitish or slightly yellowish, but becoming rusty brown towards the base, with an evanescent ring-zone. Sp 6-8.5 x 3.5-4.5 μm , ellipsoid to ovoid in side view, with a small but distinct germ pore (fig. 843H); cystidia fusiform or lageniform with a long neck, often partly with yellowish content, numerous. Mostly terrestrial in coniferous or mixed forests, especially on sandy and acid soils, sometimes on woody debris; summer to autumn; widespread and common in hemib.-bore., occasional in temp., rare in DK; DK (LC), FI (LC), NO (LC), SE (LC). – Holec 107, Lud 65.12, R&H 460.
P. mixta (Fr.) Kuyper & Tjall.-Beuk.

Phlotina Fayod

ANTON HAUSKNECHT & JAN VESTERHOLT

Conocybe s. auct. p.p.

Frb with central stem and vivid brown sp deposit, membranous to thin-fleshed. Cap conical, ovoid, hemispherical, convex, bell-shaped or expanded, dry to slightly sticky, glabrous or pubescent, ochraceous, pale brown, yellowish brown to orange, orange brown or reddish brown, in one species tinged bluish green, hygrophane, often translucently striate. Gills yellow brown to rusty brown. Stem cylindrical, mostly long and slender, white or whitish, often discolouring to brown from the base, in one species turning bluish green. Veil present or absent, may form a membranous, sulcate ring on the stem or leave fibrils or flocks at the stem or on cap margin, white or whitish, rarely yellowish. Smell indistinct, less often *Pelargonium*-like, sourish or spermatial. Taste indistinct or slightly adstringent. Sp deposit yellowish brown to rusty brown.

Sp ellipsoid to ovoid or amygdaloid, rarely phaseoliform, smooth, in one species punctate-warty, with a central germ pore, less often with excentric germ pore or without germ pore, thin-walled to thick-walled, brownish to orange, yellowish or almost hyaline in KOH. Basidia mostly 4-spored, but in some species in majority 2-spored. Cheilocystidia cylindrical, fusiform, lageniform, capitate, utriform or spheropedunculate. Pleurocystidia absent. Gill trama regular, with a well developed mediostratum. Pileipellis a hymeniderm of rounded to clavate elements. Clamps present or absent.

Saprotrophic on soil among leaf or needle litter, under herbs in forests, in grassland or lawns, on dung or on rotten wood.

23 species in the Nordic countries. *P. filaris* is known to be very strongly poisonous containing amanitin, and *P. cyanopus* is known to contain psilocybin.

Lit.: Arnolds in Noordeloos et al. 2005, Hausknecht 2007, Kits van Waveren 1970, Stridvall 1981, Watling 1982.

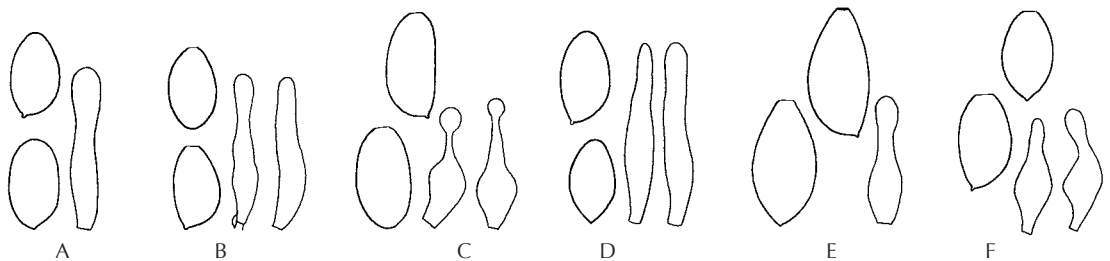


Fig. 653. Spores and cheilocystidia: A: *Phlotina aporos*, B: *P. arrhenii*, C: *P. brunnea*, D: *P. vestita*, E: *P. nemoralis* var. *dentatomarginata*, F: *P. velata*.

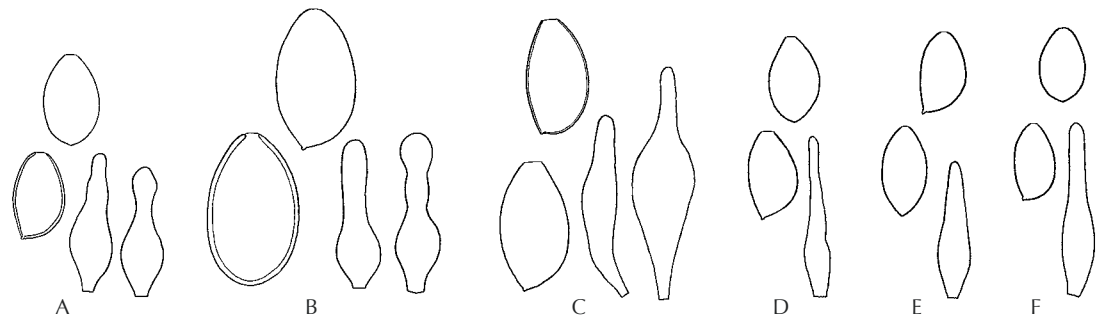


Fig. 657. Spores and cheilocystidia: A: *Phlotina cyanopus*, B: *P. coprophila*, C: *P. pygmaeoaffinis*, D: *P. striipes*, E: *P. mairei*, F: *P. parvula*.

Main key

- | | |
|--|--------------|
| 1. Veil forming a ring on the stem | Key A p. 652 |
| - Veil present or absent, but not forming a ring on the stem | 2 |
| 2. Veil present, at least in young specimens | Key B p. 653 |
| - Veil absent | Key C p. 655 |

Key A: Veil forming a ring on the stem

1. Germ pore absent (fig. 653A); in spring, rarely summer to autumn. Cap 10-40 mm, rounded conical to hemispherical, reddish brown to dark brown at centre, towards margin ochre brown to pale brown, hygrophanous, translucently striate, sometimes with remnants of veil at margin; stem 20-60 x 1.5-5 mm, cylindrical with widened base, at first yellow, then yellow brown, base dark brown; ring collar-like, often torn or lost, white to whitish, sulcate above. Sp (7-)8-10 x 4.5-5.5 μm , ellipsoid to amygdaloid or slightly phaseoliform, yellow to orange yellow in KOH; basidia mostly 4-spored; cheilocystidia 20-60 x 5-11 μm , cylindrical to sub-clavate or lageniform. On soil and litter in deciduous forests and parks on rich soil; common in temp., occasional in bore.; DK (LC), NO (LC), SE (LC). – B&K 4:396, GBW 4:332, FAD 106A (as *Pholiota togularis*), M&J 1, Ves 307, ☉.
P. aporos (Kits van Wav.) Cléménçon (*Conocybe a.* Kits van Wav.)
 - Germ pore present; in spring to autumn 2
2. Cheilocystidia utriform or clavate, mostly with a broadly rounded apex 3
 - Cheilocystidia fusiform-lageniform or narrowly cylindrical 4
3. Basidia in majority 2-spored; sp 10-15 x 5.5-7.5 μm . Cap 5-30(-40) mm, bell-shaped to conical, reddish brown, orange brown to yellow brown, hygrophanous, translucently striate; stem 20-60 x 1-3 mm, \pm cylindrical, ochraceous yellow, turning reddish brown from base; ring up to 10 mm broad, thick, membranous, translucently striate, white to whitish. Sp narrowly ellipsoid, with an up to 2 μm broad germ pore, rather thick-walled, ochraceous to orange yellow in KOH; cheilocystidia 20-55 x 8-16 μm , in majority utriform to spheropedunculate. Among herbs in deciduous forests, rarely in grass or on compost; summer to autumn; rare in temp.-bore.; DK (DD), FI (DD), NO (LC, ST: Oppdal), SE. – B&K 4:403, Däh 583, FAD 106B, Ger 01:389, Phil 225h, ☉.
P. teneroides (J.E. Lange) Singer (*Conocybe t.* (J.E. Lange) Kits van Wav., *P. percincta* (P. D. Orton) Bon)
 - Basidia in majority 4-spored; sp 9-11.5 x 5.5-6.5 μm . Cap 15-40 mm, hemispherical, later convex, orange to cinnamon, hygrophanous, translucently striate; stem 30-60 x 2-5 mm, cylindrical, pale ochraceous in the top, turning darker brown from the base, base to blackish brown; ring striate, thick. Sp ellipsoid to subamygdaloid, with an up to 2 μm broad germ pore, thick-walled, brownish orange in KOH; cheilocystidia 24-42 x 9-17 μm , broadly utriform to capitate. On woody debris, manured soil, in grass, etc.; summer to autumn; rare in bore.; FI (DD). – ZM 63.30 (as spec.).
P. utricystidiata Enderle & H.-J. Hübner
4. Sp on av ≥ 10.5 μm long. Cap 8-25 mm, rounded conical to bell-shaped, smooth or slightly wrinkled, ochraceous brown to orange brown, with paler margin, hygrophanous, translucently striate; stem 30-70 x 1-3(-5) mm, cylindrical or slightly bulbous, cream to pale ochraceous, later yellow brown, \pm striate; ring membranous, rather fugacious, white or whitish, sulcate to striate. Sp (9.5-)10.5-12.5 x 5.5-7 μm , rusty orange in KOH, with a 1.5-2 μm broad germ pore; basidia 4-spored; cheilocystidia 25-55 x 7-15 μm , lageniform with a cylindrical to tapering neck, mixed with some clavate elements. In humus rich forests, at roadsides, often among herbs; spring to autumn; common in bore., occasional in temp.-hemib. and suba.-

arc./alp.; DK (LC), FI (LC), IS, NO (LC, incl. SvB), SE. – B&K 4:399, Cet 1307, Ger 01:389, M&J 1, R&H 436.

P. vexans (P. D. Orton) Bon (*Conocybe v.* P.D. Orton, *P. blattaria* (Fr.) Fayod s. auct.)

- Sp on av < 10 μm long 5
- 5. Sp with an up to 1 μm broad germ pore; cheilocystidia cylindrical to lageniform (fig. 653B), 20-50 \times 2.5-8 μm . Cap 10-30 mm, bell-shaped to convex, then expanded, rather dark brown to reddish brown, margin paler brown, hygrophanous, translucently striate; stem 15-70 \times 1.5-3 mm, cylindrical, base only slightly widened, whitish, turning brownish to dark brown from base; ring membranous, collar-like, whitish, sulcate-striate. Sp 7-8(-9) \times 4-4.5 μm , yellow to ochraceous yellow in KOH; basidia 4-spored. In deciduous forests and parks, in ruderal places, at roadsides; late summer to autumn; common in temp., occasional in bore.; DK (LC), FI (DD), NO (LC), SE (LC, Sk). – B&K 4:398, C&D 1314, GBW 4:334, Jordst 9(3), MVM 6.106, Ⓣ.
P. arrhenii (Fr.) Singer (*Conocybe a.* (Fr.) Kits van Wav.)
- Sp with a 1-1.5 μm broad germ pore; cheilocystidia lageniform, 6-13 μm broad 6
- 6. Cap smooth; stem 0.5-1.5 mm broad. Cap 3-12 mm, bell-shaped with a low umbo, cinnamon to rust-coloured, hygrophanous, translucently striate; stem 10-40 mm long, cylindrical, cream, pale brownish with a darker base; ring delicate, often attached high on the stem. Sp 7-9(-11) \times 4.5-6 μm , with a distinct germ pore, thin-walled, ochraceous yellow to brownish yellow in KOH; basidia 4- or 2-4-spored; cheilocystidia 20-45 \times 5-12 μm , fusiform-lageniform. In deciduous forests and parks, on rich soil, in litter or among herbs, also in flower pots; spring to autumn; occasional in temp.-bore.; DK (LC), FI (DD), NO (LC), SE (LC, Sk). – Chr 71, FAD 106C, GBW 4:338, MVM 9:119, Stam 197. – Very poisonous.
P. filaris (Fr.) Singer (*Conocybe f.* (Fr.) Kühner)
- Cap wrinkled; stem 2-4 mm broad. Cap 10-25 mm, broadly convex to bell-shaped, often strongly wavy, warm yellow, brown, reddish brown to dark reddish brown, hygrophanous, translucently striate; stem 30-45 mm long, cream, brownish, base darker, floccose; ring up to 12 mm in diam., sulcate above, whitish. Sp (7.5-) 8-10(-11) \times 5-6 μm , with a distinct germ pore, slightly thick-walled, orange yellow to orange brownish in KOH; basidia 4-spored; cheilocystidia 20-55 \times 6-10(-14) μm , fusiform-lageniform. In forests and parks, among leaf litter; summer to autumn; rare in hemib.-bore.; FI (DD), NO (STr: Trondheim and Mehus). – B&K 4:401.
P. rugosa (Peck) Singer (*Conocybe r.* (Peck) Watling, *P. filaris* (Fr.) Singer s. auct. p.p.)

Key B: Veil present, at least in young specimens, but not forming a ring

- 1. Sp finely punctate-rough, wrinkled in SEM; veil rarely present as few fibrils at cap margin. Cap 10-25 mm, low convex, mostly slightly sticky, rusty brown, orange brown, yellow brown, hygrophanous, translucently striate; stem 25-70 \times 1-3 mm, cylindrical, with a slightly bulbous base, whitish to pale yellow, turning darker from base. Sp 6.5-10.5 \times 4.5-5.5 μm , ellipsoid to slightly phaseoliform, with a c. 1 μm broad germ pore, yellow to brownish yellow in KOH; cheilocystidia 15-40 \times 4.5-8.5 μm , in majority utriform, but also subcylindrical-capitate or clavate. On rich calcareous soil, on soil among leaf litter, in fens, on rotten pieces of wood, in ruderal places, etc.; summer to autumn; rare in temp.-bore.; DK (DD, Lol: Møns Klinteskov), FI (DD), NO (LC, STr: Trondheim, Østf: Moss), SE. – Bol Bres 36:53, Cet 1748, GBW 4:342, M&J 6, ZM 51:16.
P. dasypus (Romagn.) P.-A. Moreau (*Conocybe utriformis* P.D. Orton, *P. u.* (P.D. Orton) Bon, *P. subnuda* (Kühner & Watling) Bon, *P. subverrucispora* (J. Veselský & Watling) M.M. Moser)
- Sp smooth, also im SEM; veil often stronger developed 2

2. Cheilocystidia lecythiform to tibiiform with a 4-6 μm broad head (fig. 653C). Cap 10-20(-25) mm, rounded conical to low convex, dark brown, reddish- to orange brown or yellow brown, orange yellow, hygrophanous, translucently striate, margin with distinct flocks of veil; stem 25-50 x 1-2.5 mm, cylindrical, pale ochraceous to honey-coloured, turning reddish brown from base; veil absent. Sp 6.5-8 x 3.5-5 μm , ellipsoid, in side view often distinctly phaseoliform, with a 0.5-1 μm broad germ pore, thin-walled, pale yellow to yellow in KOH. On soil or humus in deciduous forests, at roadsides; summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), IS (Au), NO (Tel: Bamble), SE (LC, Sk). – Bol Bres 40:371, C&D 1318, Cet 904 (as *intermedia*), 2229, FAD 129E, M&J 7.
P. brunnea (Watling) Singer (*Conocybe* b. Watling)
- Cheilocystidia not lecythiform or tibiiform 3
3. Sp without germ pore 4
- Sp with germ pore 5
4. Sp 6-9 x 4-5.5 μm ; cheilocystidia subcylindrical, with rounded apex, but not subcapitate (fig. 653D); summer to autumn. Cap 8-30 mm, bell-shaped to hemispherical, later expanding, vivid yellow brown to reddish brown, when dry more orange brownish, hygrophanous, hardly translucently striate, margin with thick, often triangular flocks of veil; stem 15-65 x 1.5-3 mm, cylindrical, with a slightly widened base, whitish, later brownish, often strongly whitish fibrillose, rarely with an almost ring-like veil zone. Sp ellipsoid, slightly thick-walled, without germ pore; yellow to orange yellow in KOH; cheilocystidia 25-60 x 4-10 μm . On humus or rich soil in forests and forest margins; very rare in temp.; DK (DD), SE (LC, Sk). – B&K 4:404, C&D 1316, GBW 4:346, FAD 129F, M&J 2, ☉.
P. vestita (Fr.) Singer (*Conocybe* v. (Fr.) Kühner)
- Sp (7-)8-10 x 4.5-5.5 μm ; cheilocystidia often subcapitate; in spring see *P. aporos* key A 1
5. Stem base turning bluish green when bruised se *P. cyanopus* key C 2
- Stem base not turning bluish green when bruised 6
6. Sp on av \geq 9 μm long 7
- Sp on av \leq 8.5 μm long 8
7. Cheilocystidia lageniform with a long, cylindrical, 3-5 μm broad neck, often subcapitate (fig. 653E). In other characters like the main variety. On humus, soil or wood in forests, grassland, ruderal places, etc.; mostly in spring and early summer, but also in autumn; occasional in temp.-suba.; DK (LC), FI, NO (NE), SE (LC). – Däh 584 (as *appendiculata*), Jordst 15(1), M&J 6,7.
P. nemoralis (Harmaja) Bon var. *dentatmarginata* (Watling) Hauskn. (*Conocybe dentatmarginata* Watling, *P. d.* (Watling) Enderle)
- Cheilocystidia very variable, lageniform, utriform or clavate-subcylindrical. Cap 10-45 mm, conical-convex, at first with inrolled margin, reddish brown to brown, orange brown, drying pale ochraceous orange, only weakly translucently striate, at margin with few fugacious veil fibrils; stem 20-50 x 2-7 mm, \pm cylindrical, at first white, turning brownish from base, base to blackish brown. Sp 8-12 x 5-6 μm , ellipsoid to ovoid-ellipsoid, with a 1-1.3 μm broad germ pore, slightly thick-walled, yellow brown in KOH; cheilocystidia 22-63 x 6.5-14 μm . On soil or pieces of wood, in rich forests; early summer to autumn; rare in bore.; FI. – BKPM 12:81A, ZM 63:16.
P. nemoralis (Harmaja) Bon var. *nemoralis* (*Conocybe* n. Harmaja, *P. mutabilis* (Watling) Bon)
8. Cheilocystidia in majority lageniform with long neck and subcapitate apex (fig. 653F); cap centre mostly rather pale, yellow brown, ochraceous brown, orange brown when fresh. Cap 8-25 mm, rounded conical, then conical-convex, hygrophanous, translucently striate; stem 15-55 x 0.1-0.35 mm, cylindrical, base slightly widened, whitish, turning brownish to dark brown from base, with remnants of veil, rarely forming a ring-like zone. Sp 6.5-8.5 x 3.5-5 μm , ellipsoid, with a c. 1 μm broad germ pore, ochraceous to

orange yellow in KOH; cheilocystidia 25-55 x 5.5-11 μm . On soil or woody debris, mostly in deciduous forests, also in lawns; summer to autumn; common in temp.-southern bore.; DK (LC), FI (DD), NO (LC, Akh: Ski, Oslo). – B&K 4:397, C&D 1317, FAD 129A, Ger 01:387, GBW 4:344, ☉.

P. velata (Velen.) Hauskn. (*Conocybe appendiculata* Watling, *Pholiotina a.* (Watling) Singer)

- Cheilocystidia more variable, lageniform, utriform or clavate-subcylindrical; cap centre mostly darker, reddish brown to rusty brown. Cap 10-32 mm, conical-convex to bell-shaped, hygrophanous, translucently striate, margin with fugacious flocks of veil; stem 20-45 x 1-3 mm, cylindrical, at first whitish, then ochraceous, turning brownish from base, mostly without veil remnants. Sp 6.5-9.5 x 3.5-5 μm , ellipsoid, with a c. 1 μm broad germ pore, thin-walled, ochraceous yellow to brownish yellow in KOH; cheilocystidia 20-45 x 7-10 μm . In deciduous forests and parks, often with *Urtica*; summer to autumn; rare in hemib.-bore.; FI (DD), NO (Tel: Bamble), SE. – BKPM 12:82, M&J 2, MVM 9.121.

P. exannulata (Kühner & Watling) Courtec. (*Conocybe e.* Kühner & Watling)

Key C: Veil absent

1. Cap or stem base with bluish green tinges when bruised or drying out 2
 - Without bluish green tinges on cap and stem base 3
2. Cap bluish green to green, when fresh often only with olivaceous to a weakly bluish tinge, but in exsiccates distinctly bluish green. Cap 8-35 mm, rounded conical, hygrophanous, distinctly translucently striate; stem 25-50 x 1-5 mm, cylindrical, whitish, more sordid at base, finely pruinose. Sp 8.5-11.5 x 4.5-7 μm , ellipsoid to subamygdaloid, with a 1-1.5 μm broad germ pore, yellow to ochraceous yellow in KOH; cheilocystidia to 20-40 x 6.5-10 μm , cylindrical to fusiform, rarely almost lageniform. In damp deciduous forests and in clearings near burnt spots; summer to autumn; very rare in bore.; FI (DD). – B&K 4:395, C&D 1319, GBW 4:332, M&J 3, ZM 62:5, ☉.

P. aeruginosa (Romagn.) M.M. Moser (*Conocybe a.* Romagn.)

 - Cap ochraceous to rust-coloured or reddish brown. Cap 6-15 mm, conical to expanded, hygrophanous, translucently striate; stem 15-40 x 1-1.5 mm, cylindrical, white, greyish white, with fugacious fibrils of veil, base and mycelial chords turning bluish green when bruised. Sp (6.5-)7-8.5(-10) x 4-5(-7) μm , with a c. 1 μm broad germ pore (fig. 657A), orange yellow to brownish yellow in KOH; cheilocystidia 20-40 x 6-11 μm , fusiform to subutriform, often almost capitate. In meadows and grassy clearings, rarely among leaf litter or on sawdust; summer to autumn; rare in temp.-bore.; DK (NA, Loll: Krenkerup), FI (DD), NO (LC, Vestf: Holmestrand), SE (LC, Sk). – Cet 2663, M&J 3, Stam 177, Tin 22:1.

P. cyanopus (G.F. Atk.) Singer (*C. cyanopus* G.F. Atk.)
3. Cap distinctly sulcate in outer half. Cap 6-18 mm, convex, low convex, often with split margin, orange brown to pale reddish brown with darker reddish brown centre, hygrophanous, drying ochraceous to flesh coloured; stem 25-40 x 1-2.5 cm, cylindrical, base slightly widened, pale ochraceous yellow to pale flesh-coloured, finely pruinose; smell *Pelargonium*-like. Sp 7.5-10 x 4-5.5 μm , ellipsoid, with a 1-1.3 mm broad germ pore, slightly thick-walled, ochraceous yellow to orange brown in KOH; cheilocystidia 25-55 x 6.5-14 μm , \pm lageniform. In nutrient rich grassland and sandy-stony field margins; spring to autumn; rare in temp.-hemib.; DK (DD), SE (LC). – M&H 4:217, Rüc 139, Tin 6:34, ☉.

P. sulcata Arnolds & Hauskn. (*Conocybe plicatella* (Peck) Kühner s. auct., *Galerella p.* (Peck) Singer s. auct.)

 - Cap smooth 4

4. Sp finely punctate-rough, wrinkled in SEM, often slightly phaseoliform see *P. dasypus* key B 1
 - Sp smooth, also im SEM, ellipsoid to ovoid or amygdaloid 5
5. Sp 10.5-14 x 6.5-8.5 μm (fig. 657B); on dung. Cap 7-25 mm, hemispherical to low convex, slightly sticky, shiny, cream to pale ochraceous, with age to yellow brown, hygrophanous, translucently striate; stem 10-40 x 1-3 mm, cylindrical, yellowish to ochraceous, pruinose to slightly fibrillose-striate. Sp ellipsoid, with a 1.4-2 μm broad, eccentric germ pore, thick-walled, rusty orange to rusty brown in KOH; cheilocystidia 17-35 x 5-12 μm , lageniform with a short neck and in part capitate apex. On dung of cow, horse, sheep and donkey; summer to autumn; rare, but locally occasional in temp.-suba.; DK (DD, WJyl: Kås), FI (DD, U: Sipoo), IS, NO (LC), SE (LC). – BGB 42:74, B&K 4:400, Dov 23, M&J 4.
P. coprophila (Kühner) Singer (*Conocybe c.* (Kühner) Kühner)
 - Sp on av < 10.5 μm long; on soil 6
6. Cap 15-55 mm; stem 2-7 mm broad, young frb often with distinct droplets on cap and stem 7
 - Cap 3-20 mm; stem 0.5-2 mm broad; rarely with distinct droplets or only under very wet conditions 8
7. Sp on av \geq 9 μm long; cheilocystidia lanceolate-fusiform, mixed with more lageniform to slightly utriform elements (fig. 657C). Cap 15-55 mm, bell-shaped to conical-convex, later expanding, distinctly pubescent, pale ochraceous to ochraceous brown, often greyish tinged at centre, hygrophanous, translucently striate; stem 25-75 x 2-7 mm, white, entirely pruinose, striate; smell sourish-spermatial. Sp 7.5-10.5 x 4.5-6 μm , ellipsoid, thin-walled, with a c. 1 μm broad germ pore, ochraceous yellow, pale brownish yellow in KOH; cheilocystidia 20-50 x 6-11 μm . On soil in grassland, grassy roadsides and parks, rarely in forests; autumn; rare in temp.-hemib.; DK (LC), FI (DD), SE (LC). – End 331, GBW 4:339, M&J 5.
P. pygmaeoaffinis (Fr.) Singer (*Conocybe p.* (Fr.) Kühner, *P. friesii* (S. Lundell) Enderle)
 - Sp on av \leq 8 μm long; cheilocystidia uniformly lanceolate-fusiform (fig. 657D). Cap 15-45 mm, bell-shaped to convex, often with an umbo, mostly wrinkled, ochraceous brown to orange brown, hazel brown, drying pale ochraceous, hygrophanous, weakly translucently striate; stem 35-75 x 2-7 mm, cylindrical, white, entirely pruinose and striate, without veil; smell sourish. Sp 6.5-8.5 x 4-5 μm , narrowly ellipsoid, with a c. 1 μm broad germ pore, ochraceous yellow, orange yellow in KOH; cheilocystidia 18-45 x 5-9 μm . On soil in grassland, gardens, along hedges, hay- and stubblefields, in parks and forests; autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (DD), NO (LC, ST: Trondheim and Vestf: Re: Grette), SE (LC). – B&K 4:402 (as *pygmaeoaffinis*), Cet 2662, FAD 130F (as *Galera pygmaeoaffinis*), GBW 4:341, Ger 01:387, ©.
P. striipes (Cooke) M.M. Moser (*Conocybe s.* (Cooke) S. Lundell)
8. Without or only with few pileocystidia 9
 - With many conspicuous pileocystidia 10
9. Sp 8.5-11.5 x 4.5-6 μm , on av > 9 μm long see *P. nemoralis* key B 7
 - Sp 7-9 x 4.5-5.5 μm , on av < 8.5 μm long see *P. cyanopus* 2
10. Cap 4-20 mm; stem 20-60 mm long; sp 7.5-11 x 4.5-6 μm , on av > 8.2 μm . Cap 4-20 mm, bell-shaped-conical, then convex, not expanding, pruinose, reddish brown, orange brown to yellow brown, hygrophanous, distinctly translucently striate; stem 0.7-2 mm broad, cylindrical, whitish, but soon pale yellow to pale brown or orange brown, especially near base. Sp with an up to 2 μm broad germ pore, slightly thick-walled, ochraceous to brownish yellow in KOH; cheilocystidia 30-60 x 6-14 μm , subcylindrical to elongate lageniform. On leaves and woody remnants, on twigs, needles, etc. in damp, often moss rich places in deciduous and coniferous forests, in parks and at roadsides; summer to autumn; occasional in hemib.-bore.;

FI (DD), NO (NE), SE (LC). – Cet 2228, Chr 71, End 329, M&J 4, ZM 51:16, 63:12.

P. filipes (G.F. Atk.) Singer (*Conocybe f.* (G. F. Atk.) Kühner, *P. aberrans* (Kühner) Singer, *P. sulcatipes* (Peck) Bon s. auct.)

- Cap 3-10 mm; stem 10-30(-35) mm long; sp 6-9 x 3.5-5.5 μm , on av < 8.2 μm long 11
- 11. Cheilocystidia 15-45 x 5-8 μm , lanceolate to fusiform-lageniform, neck 1.5-2(-4) μm thick, with acute apex (fig. 657E). Cap 3-10 mm, conical-convex, later expanding, often wrinkled-uneven, pruinose, honey yellow to pale ochraceous yellow, at centre to brownish orange, hygrophorous, translucently striate; stem 10-30(-35) x 0.5-1 mm, whitish to cream, only to yellow brown at base. Sp 6-8.5 x 3.5-4.5 μm , ellipsoid to ovoid, with c. 1 μm broad germ pore, thin-walled, yellow in KOH. In deciduous forests and parks, in shady places; late summer to autumn; occasional in temp., rare in hemib.-bore.; DK (LC), FI (DD), NO (Østf: Fredrikstad), SE (LC). – Cet 2665, FAD 130G, M&J 5, MMB 35.15.
P. mairei (Watling) Enderle (*Conocybe m.* Watling)
- Cheilocystidia 45-70 x 9-11 μm , subcylindrical to lageniform (fig. 657F). Cap 4-5 mm, conical to bell-shaped, not expanding, pruinose, ochraceous brown at centre, paler outwards; stem 20-25 x 0.5-1 mm, entirely pruinose, whitish to pale ochraceous. Sp 5-7.5 x 3.5-4 μm , ellipsoid or very slightly amygdaloid, with a c. 1 μm broad germ pore, slightly thick-walled, yellow in KOH. Among moss in scrubs, on calcareous soil with *Urtica*, etc.; late summer to autumn; rare in temp.; DK (DD). – Svp 4:75.
P. parvula (Døssing & Watling) Bon (*Conocybe p.* Døssing & Watling)

Phyllotopsis Singer

HENNING KNUDSEN

One species in the Nordic countries; see description below.

Frb pleurotoid, uniformly yellow-orange. Cap 20-80 mm, shell- to kidney-shaped, sessile, hirsute to strigose, hygrophanous, fleshy-elastic, orange yellow to buff. Gills radiating from an eccentric point, crowded, saffron yellow to orange. Smell strong, nauseous, of coal gas. Taste indistinct. Sp deposit salmon pink when fresh, becoming ochre.

Sp 4-6 x 2-3 μm , cylindrical to allantoid, smooth (fig. 245A), without iodine reactions. Basidia clavate, 4-spored. Cheilocystidia inconspicuous. Clamps present. Hyphal system monomitic, with thin-walled and partly thick-walled, hyaline hyphae.

Saprotrophic, on wood of coniferous and deciduous trees, especially on *Picea* and *Betula*; summer to late autumn; common in hemib.-bore., occasional in suba., very rare in temp.; DK (EN), FI (LC), NO (LC), SE (LC). – GBW 3:23, Lud 66.1, R&H 205, Svp 44:52, Ves 124, 📍.

P. nidulans (Pers.: Fr.) Singer



spores.

Physalacria Peck

HENNING KNUDSEN

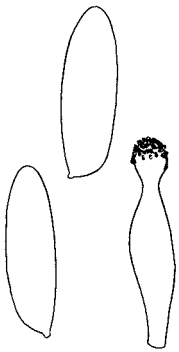
One species in the Nordic countries; see description below.

Lit.: Berthier 1985, Berthier & Rogerson 1980.

Frb < 1 mm with a stem and a globose head. Frb covered by the hymenium, and a short, white, sterile stem, 0.5 x 0.1 mm.

Sp 14-18 x 3.5-5 μm , cylindrical to subfusiform (fig. 261B), non-amyloid, hyaline. Basidia 4-spored, 30-40(-50) x 7-8 μm . Cystidia present on cap and stem, 40-50 x 8-12 μm , rather thick-walled, capitate, excretory.

Saprotrophic; gregarious on fallen or suspended branches/needles of introduced *Cryptomeria japonica*; only found when searched for, but probably occasional; autumn to early winter; DK. – ☉.
P. cryptomeriae Berthier & Rogerson



Spores and hymenial cystidia.

Pleurocybella Singer

JAN VESTERHOLT

One species in the Nordic countries; see description below.

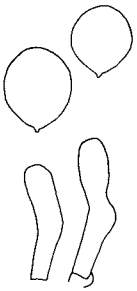
Lit.: Ludwig 2001, Watling & Gregory 1989.

Frb pleurotoid, uniformly white to cream. Cap 15-100 mm, tongue- to ear-shaped, gradually narrowed towards base, for long with decurved margin, finely velvety, especially near the base, becoming smooth, dry, hygrophorous. Gills narrow, crowded, with entire edge. Stem absent or very rudimentary. Veil absent. Flesh elastic, without a gelatinous layer. Smell and taste indistinct. Sp deposit white.

Sp 5-7.5 x 4-6 μm , subglobose to broadly ellipsoid, smooth (fig. 245B), hyaline, without iodine reactions. Cheilocystidia 25-50 x 4-7 μm , cylindrical to subclavate or lageniform, sometimes irregular, sometimes absent. Pileipellis a cutis to a trichoderm. Clamps present.

Saprotrophic on stumps or logs of coniferous wood, less often on wood chips, often imbricate; autumn to late autumn; in FI occasional, with southern distribution, north to PS, in SE very common in southwestern hemib., in NO coastal to southern bore., in DK occasional and spreading in northern part of EJyl, otherwise rare in temp.-hemib.; DK (LC), FI (LC), NO (LC), SE (LC). – Jordst 24(3):27, Lud 67.1, Phil 267e, R&H 315, Svp 20:92, ⊙.

P. porrigens (Pers.: Fr.) Singer (*Phyllotus p.* (Pers.: Fr.) P. Karst.)



Spores and cheilocystidia.

Pleuroflammula Singer

HENNING KNUDSEN

One species in the area; see description below.

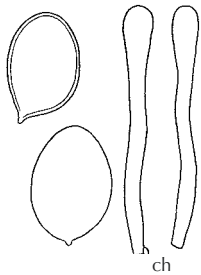
Lit.: Horak 1986.

Frb crepidotoid, uniformly rust-coloured. Cap 5-15 mm, broadly shell-shaped, finely rimose with fine rust-coloured scales, margin with fine remnants of a white veil. Gills narrow, medium spaced to distant, buff, becoming rust-coloured, with fimbriate margin. Stem very reduced, eccentric. Flesh yellow. Taste mild or slightly bitter. Smell insignificant. Sp deposit rust-coloured.

Sp 8-10 x 6-7 μm , broadly ellipsoid, smooth, thick-walled, without germ pore (fig. 909C). Basidia 2-spored. Cheilocystidia up to 60 x 6-7 μm , clavate. Pleurocystidia absent. Clamps present. Pileipellis a cutis of slender hyphae. Frb exuding a yellow pigment when treated with KOH.

On wood of *Tilia*. Very rare and in northern Europe only known from one record from Ireland. – Lud 68.1.

P. ragazziana (Bres.) E. Horak (*P. hiberniana* A. Pearson & Dennis) Singer



Spores and cheilocystidia.

Pleurotus (Fr.) P. Kumm.

STEEN A. ELBORNE

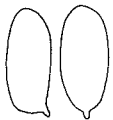
Lentodiopsis Bubák

Frb pleurotoid. Cap (10-)20-150(-350) mm wide, fan-, shell-, kidney-shaped or semicircular, convex to plane or umbilicate, dry to viscid, glabrous to scaly, sometimes tomentose at centre, white, pale brownish to bluish grey. Gills crowded, ± decurrent, white to greyish. Stem absent or 10-110 x 7-35 mm, base often tomentose, whitish. Veil absent or present. Flesh tough, thick. Smell indistinct, farinaceous, fruity or like honey or aniseed. Taste mild, bitter or astringent, acidulous to farinaceous or fungoid. Sp deposit white, cream, yellowish or pale lilac.

Sp 7-15 x 2.5-5.5 μm, cylindrical, smooth, thin-walled, hyaline, without iodine reactions, not cyanophilous. Basidia 4-spored, rarely 2-spored. Cystidia absent, but sometimes with lecythiform cystidia-like basidioles. Hyphal system monomitic or dimitic with skeletal hyphae. Gill trama irregular. Pileipellis a cutis. Clamps present.

Saprotrophic or weakly parasitic, solitary or imbricate in groups, on living and dead deciduous wood, more rarely on conifers, producing a white rot.

Lit.: Boekhout in Bas et al. 1990, Hilber 1985, Pilát 1935, Watling & Gregory 1989.



Spores: *Pleurotus ostreatus*.

1. Partial veil prominent 2
 - Partial veil absent or veil indistinct 4
2. Cap dry, when young covered with grey-brown, fibrillose scales, then smooth and with cracked surface; stem 30-80 x 8-35 mm. Cap 40-130(-180) mm, fan- to kidney-shaped, convex to flat convex, at margin involute with veil remains, white, beige or pale grey brown, discolouring yellow when touched; partial veil membranous, covering gills when young, dry, white; gills adnate to decurrent, rather thin, forked, crowded, white to cream; stem eccentric, rarely central or lateral, cylindrical, sometimes rooting, solid, often with narrow ring-zone of velar remains, hirsute to tomentose, whitish to pale brownish cream; flesh elastic, white; sp deposit white to cream. Sp 8.5-15.5(-17) x (2.5-)3-5(-5.5) μm, oblong ellipsoid to cylindrical; basidia 2- and 4-spored; cystidia absent; hyphal system mono- or dimitic, tramal hyphae thick-walled; pileipellis a cutis. Solitary or in small groups on trunks of deciduous wood, rarely on conifers, saprotrophic or weakly parasitic; summer to autumn; occasional, but locally common in temp.-bore.; DK (LC), FI (LC), NO, SE (LC). – FAD 62G, H, GBW 3:24, Lud 69.5, R&H 206, Ves 125, ⊙.
P. dryinus (Pers.: Fr.) P. Kumm. (*P. corticatus* (Fr.) P. Kumm., *P. spongiosus* (Fr.) Sacc.)
 - Cap viscid, smooth, without scales; stem absent or < 20 x 8 mm 3
3. Stem absent or rudimentary and lateral, concolorous with cap; sp 10.5-15.5 x (3-)4-5(-6) μm. Cap 25-100 mm wide, semicircular, shell- to kidney-shaped, with incurved margin, smooth, silky-fibrillose, slightly viscid, hygrophanous, pale greyish brown, greyish blue, later cream to white, at margin with remains of veil; partial veil membranous, covering gills when young, viscid to sticky, white, discolouring yellow; gills forked, crowded, white to cream, when old yellowish to ochraceous brown; flesh white; smell and taste pleasant, fruity or honey-like, farinaceous or indistinct; sp deposit white, drying cream yellow. Sp narrowly ellipsoid to cylindrical; cystidia absent; hyphal system dimitic; skeletal 2-3.5 μm wide, thick-walled. Solitary or in small groups on logs, stumps and branches of both dead and living *Populus tremula* and *P. alba*; spring to autumn; very rare in hemib.-bore.; FI (EN), NO (VU), SE (CR, Upl). – FRIC 17:120a, Lud 69.1.
P. calyptratus (Lindblad) Sacc.

- Stem 10-20 x 3-8 mm, lateral, white with a ring of veil remains; sp 7.5-10 x 2.5-3.5 μm . Cap 20-50 mm, viscid, slightly hygrophanous, pale lilac, later red-brown spotted; gills elastic, white, then red-brown spotted; taste and smell indistinct; sp deposit white. Sp cylindrical, straight to slightly curved; cystidia absent; hyphal system monomitic, tramal hyphae thick-walled, clamped. In deciduous forests, on rotting trunks of deciduous trees, e.g. of *Salix caprea*; late summer; occasional in eastern hemib.-suba., but only recorded from FI (LC).
P. viscidus Harmaja
- 4. Gills strongly decurrent and continuing as anastomosing ridges and a net, almost to the stem base. Cap 20-150(-300) mm, convex, later depressed to umbilicate, with incurved, then straight margin, smooth, slightly viscid, at centre minutely flocculose, pale yellowish brown, isabelline to grey brown, when young with a very faint veil; gills relatively thin, crowded, white to pale cream, later pale ochre; stem 30-110 x 7-20 mm, central to eccentric, cylindrical, sometimes tapering towards base, solid, fasciculate to connate, covered with anastomosing ridges, slightly pubescent, strigose at base, whitish cream to pale isabelline; flesh white; smell sweet of aniseed, farinaceous when cut; taste acidulous to farinaceous; sp deposit white to lilac. Sp 7-11(-12) x 3.5-5 μm , long ellipsoid to cylindrical; basidia 4-spored; cystidia absent, but with clavate-rostrate to lecythiform basidioles; hyphal system mono- or dimitic, thin- to thick-walled generative hyphae with clamps, sometimes with thick-walled skeletals; pileipellis a cutis. In groups, often imbricate on stumps, logs and larger branches of deciduous wood, saprotrophic or weakly parasitic; spring to late summer; locally occasional in temp.-hemib.; DK (DD), NO (VU). – C&D 149, Cet 688, GBW 3:26, Lud 69.2, Phil 265d, ☉.
P. cornucopiae (Paulet) Rolland
- Gills only slightly decurrent, not or only slightly anastomosing 5
- 5. Cap dark grey, grey brown, bluish grey or greyish yellow brown; smell fungoid; autumn to winter. Cap 50-150(-350) mm, fan-shaped, shell-shaped or spathulate, convex, with incurved margin, slightly viscid, minutely pubescent at centre; gills decurrent, relatively thin, crowded, pale ochraceous to pale grey; stem lateral to eccentric or absent, connate, solid, tomentose at base, whitish; flesh whitish; taste fungoid, astringent; sp deposit whitish to pale lilaceous grey. Sp (7-)-8-12.5 x (2-)-3-4.5(-5.5) μm , cylindrical (fig. 321C); basidia (2-)-4-spored; cystidia absent, but lecythiform basidioles present; hyphal system monomitic, thin- to rather thick-walled generative hyphae with clamps; pileipellis a cutis. Densely imbricate in groups on trunks of both living and dead deciduous woods, rarely on conifers, saprotrophic or weakly parasitic; common in temp.-southern bore., occasional in middle bore.-suba.; DK (LC), FI (LC), NO, SE (LC). – Lud 69.3, Phil 266a, R&H 206, Sieniop 292, Ves 125, ☉. – Edible.
P. ostreatus (Jacq.: Fr.) P. Kumm. (*P. salignus* (Pers.: Fr.) P. Kumm., *P. columbinus* Quél.)
- Cap whitish, pale yellowish or pale greyish brown; smell often like aniseed; summer to autumn. Cap (10-)-30-110(-180) mm, rounded fan-shaped, spathulate or semicircular, convex, later plane to shallowly depressed, with incurved, later straight margin, smooth, with greasy shine, somewhat tomentose near attachment point; gills decurrent, relatively thin, crowded, whitish to pale cream; stem absent or up to 20 x 2-10 mm, eccentric to lateral, connate, solid, tomentose, whitish; flesh whitish; taste fungoid to bitter; sp deposit whitish to cream-ochre. Sp (7.5-)-8-11(-12.5) x 3-4.5 μm , cylindrical; basidia (2-)-4-spored; cystidia absent, but sometimes with lecythiform basidioles; hyphal system monomitic, thin- to rather thick-walled generative hyphae with clamps; pileipellis a cutis. Solitary or in small groups, fasciculate on trunks and stumps of both living and dead deciduous wood, e.g. *Betula*, *Sorbus*, *Alnus* and *Populus*, saprotrophic or weakly parasitic; very common in hemib.-suba., occasional, but locally common in temp.; DK (LC), FI (LC), NO, SE (LC). – Cet 1120, Lud 69.6, Phil 264c, R&H 207, Sieniop 293.
P. pulmonarius (Fr.: Fr.) Quél.

Plicaturopsis D.A. Reid

JAN VESTERHOLT

One species in the Nordic countries; see description below.

Lit.: Eriksson et al. 1981.

Frb fan-shaped or effused-reflexed with folded-dentate hymenophore. Cap 8-20 mm, fan-shaped with ± lobed margin, slightly velvety, soft, at first white, becoming brown in inner parts, remaining paler at margin, zonate. Hymenium with low, radially folded, often dichotomously branched gill-like ribs and lobes, whitish. Smell and taste indistinct. Sp deposit white.

Sp 3-4.5 x c. 1 μm, allantoid, smooth (fig. 189A), somewhat amyloid. Cystidia absent. Clamps present.

Saprotrophic on trunks, branches and twigs of deciduous trees, esp. *Corylus*, *Betula* and *Alnus*, often imbricate; common in hemib., occasional in temp., but rare in DK, rare in bore., in FI north to PS and InL; DK (NT), FI, NO (LC), SE (LC). – B&K 2:183, R&H 86, Svp 30:20, 📍.

P. crispa (Pers.: Fr.) D.A. Reid (*Troglia c.* (Pers.: Fr.) Fr., *Plicatura faginea* (Schrad.) P. Karst.)



Spores.

Pluteus Fr.

JACOB HEILMANN-CLAUSEN

Frb with free, pink gills. Cap 15-150 mm, convex to plane, often with an umbo, glabrous, felty or scaly, in some species venose, dry to slightly viscid, white, yellow, orange, brown or greyish, in some species hygrophanous and translucently striate. Gills free, white or whitish, becoming salmon, pink or pinkish brown with age, in some species with a dark brown edge. Stem smooth or minutely floccose. Smell raphanoid, slightly sweetish or indistinct. Taste indistinct to raphanoid, often somewhat nauseous. Sp deposit pink to pinkish brown.

Sp subglobose to ellipsoid, rarely globose to triangular, smooth, pale pinkish brown, moderately thick-walled (figs 337A-B), cyanophilous, without iodine reactions. Cheilocystidia and often pleurocystidia present, mostly clavate to utriform, in some species with hooks or rostrum at apex. Pileipellis a cutis, trichoderm, trichopalisade or hymeniderm. Clamps absent, more rarely present.

On decaying wood or soil, all species assumed saprotrophic on dead wood, plant debris or humus.

At least 29 species in the Nordic countries and in the key. Several species edible, but none considered delicious, and no species known as poisonous. Several species groups are poorly resolved taxonomically, and especially *P. plautus* s.l. (incl. *P. semibulbosus*), *P. phlebophorus* s.l. and *P. ephebeus* are in need of a critical revision utilizing molecular techniques. Albino-forms and varieties have been described in several taxa, and it is possible that also the white-capped taxa, *P. pellitus* and *P. inquilinus* are albino forms of various species in their respective sections.

Lit.: Orton 1986, Vellinga in Bas et al. 1990.

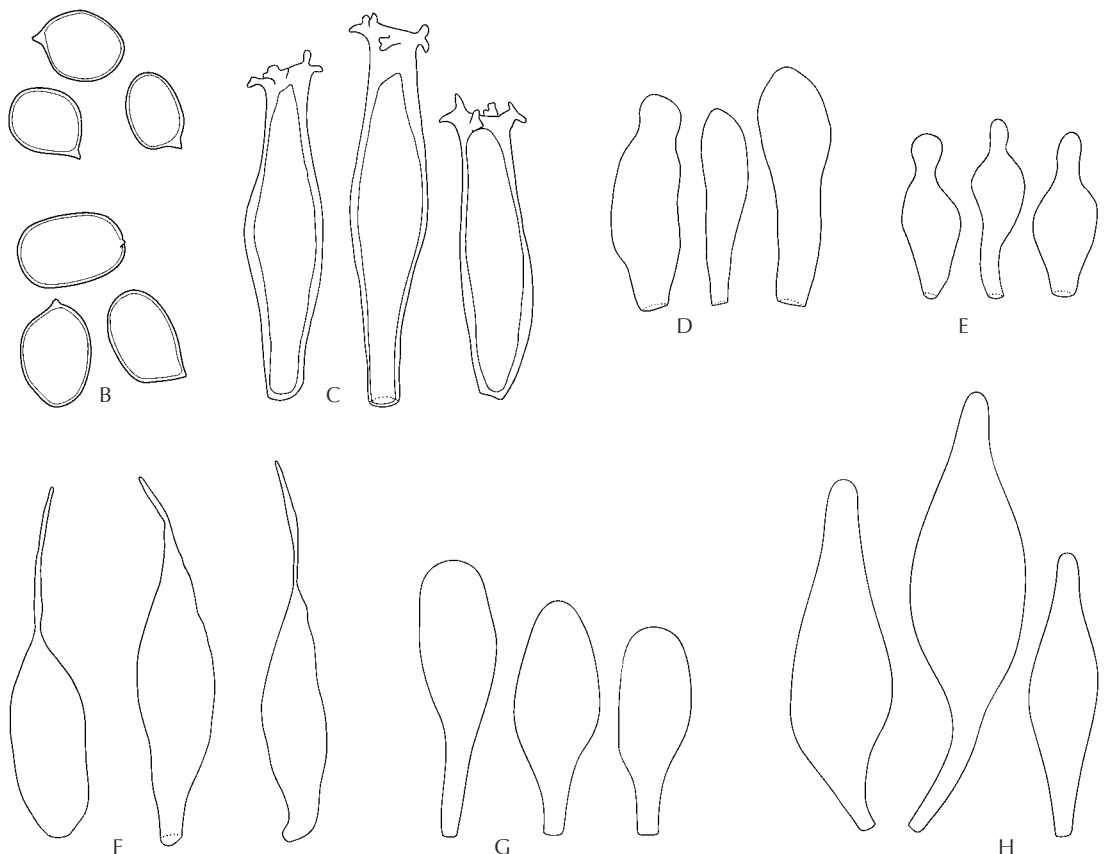


Fig. 337. Spores and cystidia: A: *Pluteus plautus*, B-C: *P. salicinus*, D: *P. hispidulus*, E: *P. exiguus*, F: *P. thomsonii*, G: *P. pallescens*, H: *P. phlebophorus*.

Main key

1. Cap innately radially fibrillose, often shiny, sometimes scaly; pleurocystidia thick-walled, with hooks (fig. 337C); pileipellis a cutis (fig. 339A) Key A p. 336
 - Cap smooth, velvety, hirsute felty or with hairy scales; pleurocystidia thin-walled, without hooks (figs 337D-F) or absent; pileipellis a cutis, a trichoderm, a trichopalisade, a hymeniderm or an epithelium 2
2. Cap distinctly hirsute-felty or hairy-scaly; pileipellis a cutis, trichoderm or trichopalisade exclusively of elongate elements, $Q > 3$ (fig. 339D) Key B p. 338
 - Cap smooth or velvety; pileipellis a hymeniderm of subglobose to pyriform elements, in some species intermixed with elongate elements (figs 339B-C) Key C p. 341

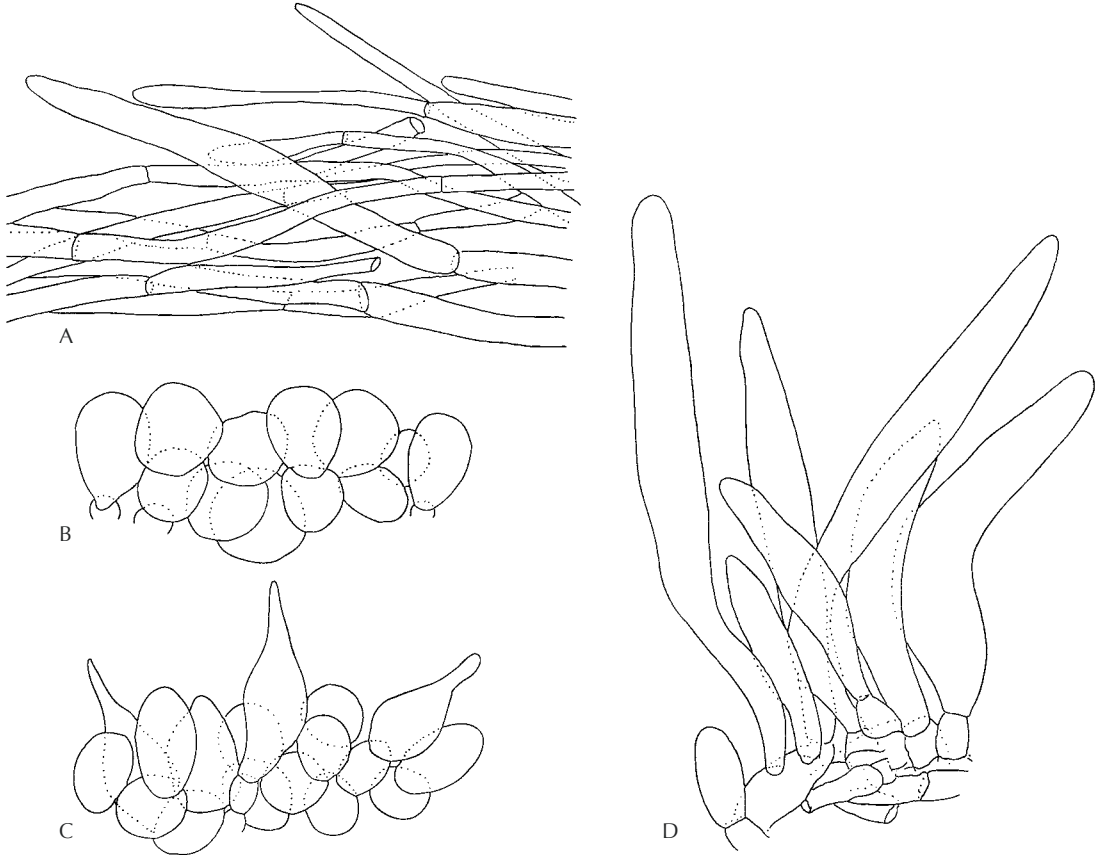


Fig. 339. Types of pileipellis characteristic of *Pluteus* sections and subsections: A: a cutis, sect. *Pluteus* and *Villosi*, B: an epithelium to a hymeniderm, sect. *Celluloderma*, subsection. *Eucelluloderma*, C: an epithelium with transition to a hymeniderm or trichopalisade, sect. *Celluloderma*, subsection. *Mixtini*, D: a trichopalisade, sect. *Celluloderma*, subsection. *Hispidodermi*.

Key A: Sect. *Pluteus*

1. Cap grey brown to date brown 2
 - Cap white to grey 4
2. Gills edge dark brown. Cap 40-100(-120) mm, convex to plane, often with a low, broad umbo, innately radially fibrillose, smooth, often finely scaly in central part, dark grey brown to date brown, more rarely pale brown grey; gills crowded, pale pinkish, becoming pink to brownish pink; stem 40-90(-120) x 5-12 mm, cylindrical, usually with a broadened base,

whitish to pale brownish, with longitudinal brown fibrils, especially in lower part; flesh whitish; smell and taste indistinct, not unpleasant. Sp 6-8 x 4-5.5 μm , broadly ellipsoid to oblong. On decaying coniferous wood, especially after dry periods; summer to autumn; common in hemib.-bore., rare in temp. and coniferous suba.; DK (VU), FI (LC), NO (LC), SE (LC). – B&K 4:113, C&D 859, GBW 4:270, Ger 01:55, Lud 97.2.

P. atromarginatus (Konrad) Kühner (*P. nigrofloccosus* (R. Schulz) J. Favre, *P. tricuspoidatus* Velen.)

- Gill edge concolorous with gills or white 3

3. Smell distinctly raphanoid; hyphae of pileipellis with simple septa. Cap (20-)40-130(-150) mm, hemispherical, becoming convex to plane or slightly depressed, often with a low, broad umbo, innately radially fibrillose, smooth, often finely scaly in central part, dark grey brown to date brown, more rarely pale brown grey; gills crowded, cream, becoming pink to brownish pink; stem 40-100 x (3-)5-15(-20) mm, cylindrical, usually with a broadened base, whitish to pale brownish, often with longitudinal brown fibrils, especially in lower part; flesh whitish; smell distinctly raphanoid, like radish; taste dull, earthy or slightly bitter, unpleasant. Sp (6-)6.5-8(-9.5) x (4-)4.5-6.5 μm , broadly ellipsoid to oblong. On decaying deciduous wood, including wood chips and sawdust, rarely on coniferous wood or on soil; summer to autumn; very common in temp., common in hemib.-bore., rare in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 4:104, C&D 858, GBW 4:268, Phil 165f, Ves 260, ☉.

P. cervinus (Schaeff.) P. Kumm. (*P. atricapillus* (Batsch) Fayod)

- Smell weak, sweetish; hyphae of pileipellis with clamps. Cap 40-90 mm, hemispherical, becoming convex to plane or slightly depressed, sometimes with a low, broad umbo, innately radially fibrillose, smooth, often finely scaly in central part, dark grey brown; gills crowded, pale pinkish, becoming pink to brownish pink; stem 40-100 x 5-15 mm, cylindrical, usually with a broadened base, whitish to pale brownish, often with longitudinal brown fibrils, especially in lower part; flesh whitish; smell indistinct or sweetish, rarely somewhat raphanoid; taste weakly earthy to slightly bitter, unpleasant. Sp (5.5-)6-8 x 4-5.5(-6) μm , broadly ellipsoid to oblong. On decaying coniferous wood, more rarely on needles or soil; summer to autumn; rare to occasional in temp.-bore.; DK (LC), FI (DD), SE. – B&K 4:120, Lud 97.4.

P. pouzarianus Singer

4. Cap grey to brownish grey, often with a bluish or olivaceous tinge. Cap 30-60(-80) mm, hemispherical, becoming convex to plane, often with a low, broad umbo, innately radially fibrillose, smooth, but mostly with small blackish scales in central part; gills crowded, cream becoming pink to brownish pink; stem 30-80 x 3-10 mm, cylindrical, often with a broadened base, whitish, in basal part grey, sometimes bluish or greenish, shiny, innately fibrillose; flesh whitish to grey; smell indistinct or weakly sweetish to raphanoid; taste indistinct. Sp (6.5-)7-9.5(-12) x 4.5-6.5(-9) μm , broadly ellipsoid to oblong (fig. 337B). On decaying deciduous wood, especially of *Alnus*, *Betula*, *Fagus* and *Salix*, often in rather open habitats; summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:125, C&D 860, GBW 4:273, Phil 168b, Ves 261.

P. salicinus (Pers.: Fr.) P. Kumm.

- Cap whitish to cream, sometimes with darker scales 5

5. Cap mostly with distinct scales in central part; frb single or in small clusters; sp 3.5-5 μm broad. Cap 40-130 mm, hemispherical, becoming convex to plane, often with a low, broad umbo, innately radially fibrillose, white, at centre often pale brown to ochraceous, smooth but mostly with appressed fine scales in central part, in dry weather sometimes strongly scaly; gills crowded, white, becoming pink; stem (30-)50-150(-180) x 7-20 mm, cylindrical, often with a broadened base, whitish, in basal part innately brown fibrillose; flesh whitish; smell and taste indistinct to unpleasant sweetish raphanoid. Sp (5-)5.5-8(-9.5) x 3.5-5(-5.5) μm , broadly ellipsoid to oblong. On sawdust, more rarely on stumps and decaying wood

of deciduous trees; summer to autumn; rare in temp.-bore., in the northern part especially *Betula* and *Alnus*, rarely on wood chips of *Picea*, only to hemib. in NO; DK (LC), FI (LC), NO (LC), SE (LC). – Bon 197, Cet 1871-1872, C&D 862, FAD 70C, Ger 01:55.

P. petasatus (Fr.) Gillet (incl. *P. pseudorobertii* M.M. Moser & Stangl)

- Cap smooth; frb mostly single; sp 4.5-5.5(-6.5) μm broad. Cap 30-80 mm, convex, becoming plane to slightly depressed, often with a low, broad umbo, white to pale cream at centre; gills crowded, white, becoming pink; stem 40-100 x 7-20 mm, cylindrical, often with a broadened base, white, innately fibrillose; flesh white; smell and taste indistinct to slightly raphanoid. Sp (6.5-)7-8.5(-9) x 4.5-5.5(-6.5) μm , broadly ellipsoid to oblong. On dead wood of deciduous trees, in the southern part especially *Fagus*, in the northern part especially *Betula* and *Alnus*, mostly in warm, sunexposed microsites, e.g. on high stumps; summer to autumn; occasional in hemib.-suba. in FI, elsewhere rare in temp.-hemib.; DK (VU), FI (LC), NO (NE, Vestf: Re), SE (LC). – C&D 861, FAD 70A, GBW 4:271, Lud 97.5.

P. pellitus (Pers.: Fr.) P. Kumm.

Key B: Sect. *Villosi* Schreurs & Vellinga and sect. *Celluloderma* Fayod, subsect. *Hispidodermini* (Fayod) Vellinga & Schreurs

1. Cap yellow to yellow brown. Cap 30-60(-100) mm, bell-shaped, becoming convex to plane, mostly with a low, broad umbo; velvety or with finely, pointed scales, often venose at centre; gills crowded, white, becoming pink to brownish pink; stem (30-)50-130 x 3-8 mm, cylindrical, often with a broadened base, white, towards base yellowish brown, lengthwise striate, smooth; flesh whitish to pale greyish to yellow; smell and taste weak to slightly sweetish or raphanoid. Sp (5.5-)6-8 x (4.5-)5-6.5(-7) μm , subglobose to oblong. On rotten wood of deciduous trees, also on woodchips and sawdust; summer to autumn; occasional in hemib.-bore., very rare in temp. and suba.; DK (EN), FI (LC), IS (Au, Na), NO (LC), SE (LC). – B&K 4:110, Ger 01:59, Däh 449, GBW 4:259, Phil 168c, ☉.



P. leoninus (Schaeff.: Fr.) P. Kumm.

- Cap white, pale cream, grey or various shades of brown 2
- 2. Gill edge dark brown 3
- Gill edge concolorous with gills or white 4
- 3. Cap 5-15 mm; pleurocystidia absent. Cap bell-shaped, becoming convex to plane, mostly with small umbo, with fine, pointed scales; gills crowded, whitish, becoming pinkish; stem 10-30 x 1-2 mm, cylindrical, often with slightly broadened base, lengthwise striate, whitish; flesh whitish; smell and taste weak. Sp 5.5-6.5 x 5-6 μm , subglobose to broadly ellipsoid. On soil and rotten wood of deciduous trees, in the area only known from *Alnus* swamp forests; summer to autumn; very rare or overlooked in temp.; DK (DD, EJyl. Fussingø, Sj: Jægersborg Dyrehave).

P. pusillulus Romagn.

- Cap 30-80(-110) mm; pleurocystidia present. Cap bell-shaped, becoming convex to plane, mostly with a low, broad umbo, velvety to scaly, often slightly venose at centre; gills crowded, whitish, becoming pink to brownish pink; stem (40-)60-120 x 3-12 mm, cylindrical, often with a broadened base, lengthwise striate and faintly flocculose, white to pale brown, towards base with dark brown fibrils and scales; flesh whitish to pale greyish brown; smell and taste weak to slightly raphanoid. Sp (5-)5.5-6.5(-7) x (3.5-)4-5(-5.5) μm , subglobose to oblong. On rotten wood of deciduous trees, e.g. *Fagus*, *Populus* and *Betula*; summer to autumn; occasional in temp.-hemib., rare in bore.; DK (NT), FI (VU), NO (NE, Akh: Ås, Busk: Lier), SE (LC). – B&K 4:127, GBW 4:263, Nit 351, Phil 167f, Ves 260, ☉.

P. umbrosus (Pers.: Fr.) P. Kumm. var. *umbrosus*

4. Stem with distinct pink tinge, especially at base. Cap 20-60(-90) mm, bell-shaped, becoming convex to plane, mostly with a low, broad umbo; densely velvety, dark greyish brown to reddish brown; gills crowded, white to greyish pink, becoming pink; stem (30-)50-80 x 3-10 mm, cylindrical, often with a broadened base, lengthwise striate and faintly flocculose, white to pale brown, towards base distinctly pinkish; flesh whitish to pale brownish; smell and taste weak to slightly raphanoid. Sp (6-)6.5-8.5(9) x 5.5-7 μm , subglobose to oblong. On dead wood, mostly of coniferous trees in calcareous sites; summer to autumn; very rare in temp.-bore., poorly known; DK (EN, EJyl: Rubjerg), FI (DD, PeP, Ks). – B&K 4:124, C&D 872, Däh 448, GBW 4:262, Lud 97.25 (as *leoninus* var. *roseipes*).
P. roseipes Höhn.
- Stem white or brownish 5
5. Cap 5-25 mm, pileipellis soon disrupting into minute scales showing whitish flesh 6
- Cap mostly broader, tomentose to densely and finely scaly, not breaking up in minute scales, but sometimes radially splitting, showing white flesh between the fibrils 7
6. Cheilocystidia clavate to utriform or subcapitate with 5-15 μm broad apex (fig. 337D); pileipellis a differentiated cutis of appressed to ascending hyphae, with terminal cells of same length as subterminal cells. Cap bell-shaped to hemispherical, becoming convex to plane, often with small umbo, grey brown to dark brown, hirsute scaly; gills crowded, whitish, becoming pink to brownish pink; stem 20-60 x 1-3 mm, cylindrical, often with a broadened base, silvery white, lengthwise striate and faintly flocculose at base; flesh whitish; smell and taste weak. Sp (5.5-)6-8(-8.5) x (4-)5-6 μm , subglobose to ellipsoid. On rich soil or rotten wood in deciduous forests on mull soil; summer to autumn; rare in temp.-hemib.; DK (VU), FI (DD), SE (NE). – FAD 70B, GBW 4:275, Lud 97.29, Nit 351, .
- P. hispidulus* (Fr.: Fr.) Gillet
- Cheilocystidia \pm mucronate to subcapitate with 3.5-5 μm broad apex (fig. 337E); pileipellis a trichoderm of septate hyphae, terminal cells distinctly longer than subterminal cells. Cap bell-shaped to hemispherical, becoming convex to plane, with or without small umbo, pale grey brown to dark brown, with finely pointed scales; gills crowded, whitish, becoming pink to brownish pink; stem (10-)15-30 x 1-2 mm, cylindrical, often with a broadened base, whitish, lengthwise striate, sometimes faintly flocculose at base; flesh whitish; smell and taste indistinct. Sp 6-7.5(-8) x 4.5-5.5(-6) μm , broadly ellipsoid to ellipsoid. On calcareous soil in deciduous forests or in open land; summer to autumn; very rare or overlooked in temp.-hemib.; DK (EN), FI (DD), SE (SK). – B&K 4:108, Lud 97.30.
P. exiguus (Pat.) Sacc.
7. Cap tomentose and radially fibrillose, often splitting to show white flesh between fibrils; pileipellis a differentiated cutis of appressed to ascending, septate hyphae (fig. 339A). Cap 30-80(-110) mm, bell-shaped, becoming convex to plane, mostly with a low, broad umbo, grey brown to dark brown; gills crowded, whitish, becoming pink to brownish pink; stem (30-)50-100 x 3-8(-12) mm, cylindrical, often with a broadened base, lengthwise striate, white to greyish, mostly with darker, grey brown fibrils especially at base; flesh whitish to pale greyish brown; smell indistinct; taste at first weak, then slowly unpleasant astringent. Sp 5.5-8.5 x 4.5-6(-7) μm , subglobose to ellipsoid. Terrestrial or on rotten wood, including wood chips and sawdust in deciduous forests and parks, mostly on clayey or calcareous soil; summer to autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (DD), NO (NE), SE (NE). – Cet 1432, C&D 864-865, Ger 01:57, GBW 4:274, Lud 97.26, .
- P. ephebeus* (Fr.: Fr.) Gillet (*P. villosus* (Bull.) Quél., *P. murinus* Bres.)
- Cap densely tomentose to densely and finely scaly, not radially splitting; pileipellis a trichopalisade of erect, non-septate or sparsely septate hyphae (fig. 339D) 8

8. Cap grey brown to dark brown; stem densely covered with small brown flocculose scales. Cap 15-50 mm, bell-shaped, becoming convex to plane, mostly with a low, broad umbo; gills crowded, whitish, becoming pink to brownish pink; stem 30-70 x 2-5 mm, cylindrical, often with a broadened base, lengthwise striate, white to greyish, with darker scales especially in lower half; flesh whitish to greyish brown; smell indistinct to winy; taste indistinct. Sp 5-7 x 4-6.5 μm , subglobose to ellipsoid (fig. 337A). On rotten deciduous or coniferous wood, especially in regions with high precipitation, also on straw heaps; summer to autumn; occasional in temp.-hemib., rare in bore., in FI north to InL; DK (LC), FI (LC), NO (NE, Busk, Vestf), SE (LC). – C&D 869, Lud 97.22k, 22l.
P. plautus (Weinm.) Gillet (*P. punctipes* P.D. Orton)
- Cap white, greyish, cream, pale brown or yellow brown; stem smooth or whitish flocculose scaly 9
9. Cap cream, greyish olivaceous, grey brown or yellow brown, translucently striate when moist; elements of pileipellis predominantly fusiform, $Q > 6$. Cap 10-60(-100) mm, hemispherical, becoming convex to plane, often with a low, broad umbo, densely velvety, often somewhat scaly and/or venose at centre; gills crowded, whitish, becoming pink to brownish pink; stem 20-70(-110) x 1-5(-10) mm, cylindrical, often with a broadened base, lengthwise striate, white to greyish, often whitish flocculose scaly especially in lower half; flesh whitish to greyish brown; smell indistinct to winy; taste indistinct. Sp 5-8.5(-9.5) x 4-7(-7.5) μm , subglobose to ellipsoid. On rotten deciduous wood, including sawdust, especially in sunexposed microhabitats, in the northern part especially on *Betula* and *Populus*, rarely on burnt wood; summer to autumn; occasional in temp.-bore.; DK (LC), FI (DD), NO, SE (LC). – B&K 4:117 (as *plautus*), C&D 870 & 875, GBW 4:261 (as *plautus*), Lud 97.22a, 22b, 22d, 22e, 22f, 22g, 22m, Phil 167d.
P. semibulbosus (Lasch) Quél. (*P. gracilis* (Bres.) J.E. Lange, *P. hiatulus* Romagn., *P. depauperatus* Romagn., *P. boudieri* P.D. Orton)
- Cap white, not or only weakly translucently striate; elements of pileipellis predominantly short fusiform, $Q < 5$. In other characters as main variety. On rotten deciduous wood, in the area known from wood of *Fagus*; very rare in temp.; DK. – Svp 40:10, ☉.
P. umbrosus (Pers.: Fr.) P. Kumm. var. *albus* Vellinga

Key C: Sect. *Celluloderma* Fayod, subsects *Mixtini* Singer and *Eucellulodermini* Singer

1. Cap orange to orange red. Cap 20-50(-80) mm, bell-shaped, becoming convex to plane, often with a low, broad umbo; smooth, often rugose to venose at centre; gills crowded, white, becoming pink; stem 30-80 x 3-6 mm, cylindrical, often with a broadened base, white to pale yellow, darker yellow towards base, lengthwise striate, smooth; flesh white to yellow; smell and taste weak. Sp (5-)5.5-7(-8) x (3.5-)4-5.5(-6) μm , subglobose to oblong. On rotten wood of deciduous trees, mostly *Acer*, *Fraxinus*, *Populus* and *Ulmus*, sometimes in cavities of living, pollarded trees; summer to autumn; very rare in temp.-hemib.; DK (EN), NO (EN, Akh: Oslo), SE (VU). – C&D 879, FAD 72C, GBW 4:246, Nit 351, RdM 40:124, ☉.
P. aurantiorugosus (Trog) Sacc.
- Cap white, grey, brown or greenish yellow 2
2. Cap at first dark yellow brown, soon striking greenish yellow to golden yellow. Cap (10-)20-40 mm, bell-shaped, becoming convex to plane, often with small umbo, smooth, but often rugose to venose at centre; gills crowded, white to pale yellowish, becoming pink to sordid yellowish puff; stem 30-60 x 2-4 mm, cylindrical, often with a broadened base, cream to pale yellow or buff, lengthwise striate, smooth and shiny; flesh white to yellowish grey; smell and taste weak. Sp (5.5-)6.5-7(-7.5) x (4.5-)5-6(-6.5) μm , subglobose to ellipsoid. On rotten

wood of deciduous trees; summer to autumn; very rare in temp.-bore.; DK (DD), FI (DD), NO (VU, Vest, Akh), SE (DD). – Cet 1875, FAD 72D, Lud 97.17, Phil 168a, ☉.

P. chrysophaeus (Schaeff.) Quél. (*P. luteovirens* Rea)

- Cap white, grey or brown, sometimes yellowish at extreme margin 3
- 3. Cap white to cream. Cap 10-30 mm, hemispherical, becoming convex to plane, smooth, often rugose to venose at centre; gills crowded, white to pale yellowish, becoming pink to pink brown; stem 20-50 x 1-5 mm, cylindrical, often with a broadened base, white, lengthwise striate, smooth and shiny; flesh whitish; smell and taste weak. Sp (6-)6.5-8(-9) x 5.5-6.5(-7) μm , subglobose to ellipsoid. On rotten wood and soil in deciduous forests on rich soil; summer to autumn; very rare in temp.; DK (VU), SE (Sk). – C&D 891, FAD 71C (as *semibulbosus*), GBW 4:251, Lud 97.16.

P. inquilinus Romagn.

- Cap grey or brown, sometimes yellowish at margin 4
- 4. Stem lemon yellow to chrome yellow. Cap 20-50(-80) mm, hemispherical, becoming convex to plane, often umbonate, smooth, mostly strongly rugose to venose around centre; gills crowded, white to pale yellowish, becoming pink to pink brown; stem 25-50(-90) x 2-10 mm, cylindrical, often with a broadened base, lengthwise striate, smooth; flesh whitish to yellow; smell and taste weak. Sp 6-7.5(-8) x (4.5-)5.5-6.5(-7) μm , subglobose to ellipsoid. On deciduous wood, including wood chips and sawdust, often buried, especially in forests on clayey soil; early summer to autumn; occasional, but locally common in temp.-southern bore., rare in middle-northern bore.; DK (LC), FI (LC), NO (NT), SE (LC). – B&K 4:123, GBW 4:257, Lud 97.18, Phil 166a, Sieniop 271, ☉.

P. romellii (Britzelm.) Sacc.

- Stem white, bluish, greyish or pale yellow brown 5
- 5. Stem with greenish or bluish tinges, especially in basal part. Cap 15-40 mm, conical, becoming convex, mostly with a low, broad umbo; grey brown to dark brown, smooth; gills crowded, whitish, becoming pink to brownish pink; stem 30-50 x 2-5 mm, cylindrical, often with a broadened base, lengthwise striate, white to greyish, in lower part greenish to bluish, smooth or faintly flocculose at top; flesh whitish to greyish; smell and taste indistinct. Sp (7-)7.5-9(-10) x (5.5-)6-6.5(-7.5) μm , subglobose to ellipsoid. Terrestrial or on rotten wood in deciduous forests; summer to autumn; very rare or overlooked in temp.; DK (DD), SE (NE, Sk). – Bres 543,2, Lud 97.10.

P. cyanopus Quél.

- Stem white, greyish or pale yellow brown, without bluish tinges 6
- 6. Most cheilocystidia with an up to 50 μm long rostrum (fig. 337F) 7
- Cheilocystidia not rostrate 8
- 7. Cap smooth or minutely venose at the centre; stem white to pale greyish; pileipellis exclusively of pyriform to subglobose elements (fig. 339B). Cap 15-40 mm, hemispherical, becoming convex, mostly with a low, broad umbo, grey brown to dark brown; gills crowded, whitish, becoming pink to brownish pink; stem 30-50 x 2-5 mm, cylindrical, often with slightly broadened base, lengthwise striate, smooth and shiny; flesh whitish to greyish; smell and taste indistinct. Sp (5.5-)6-8(-8.5) x (5-)5.5-7(-7.5) μm , subglobose to ellipsoid. Terrestrial or on rotten wood in deciduous forests, often on damp soil; summer to autumn; very rare or overlooked in temp.-bore.; DK (EN), FI (DD, A: Jomala, Ks: Kuusamo). – B&K 4:109, Lud 97.14.

P. insidiosus Vellinga & Schreurs

- Cap strongly venose, especially around the centre; stem mostly grey to dark grey; pileipellis of both pyriform and elongate, fusiform to cylindrical elements (fig. 339C). Cap 8-30(-40)

mm, hemispherical, becoming convex to depressed, often with a low, broad umbo, grey brown to dark brown; gills crowded, whitish, becoming pink to brownish pink; stem 20-45 x 1-3 mm, cylindrical, often with slightly broadened base, lengthwise striate, with whitish to pale brown floccules, often over entire length; flesh whitish to greyish; smell and taste indistinct. Sp (5.5-)-6-8(-9) x 5-7(-7.5) μm , subglobose to ellipsoid; most cheilocystidia rostrate with an up to 50 μm long rostrum (fig. 337F). Terrestrial or on rotten wood in deciduous forests, especially on loamy to clayey soil; summer to autumn; occasional in temp., rare in hemib.-bore.; DK (LC), FI (DD, V: Lohja), NO (NE), SE (NE). – Däh 452, Ger 01:59, GBW 4:266, Nit 351, Phil 166b, ☉.

P. thomsonii (Berk. & Broome) Dennis

8. Cap cuticle cracking to show white flesh; pleurocystidia absent. Cap 15-50 mm, conical, becoming convex, mostly with a low, broad umbo, grey brown to dark brown; gills crowded, whitish, becoming pink; stem 30-60 x 3-7 mm, cylindrical, often with slightly broadened base, lengthwise striate, white to pale greyish brown, smooth or faintly flocculose at top; flesh whitish to greyish; smell and taste indistinct. Sp (7-)-7.5-9(-10) x (5.5-)-6-6.5(-7.5) μm , subglobose to ellipsoid. Mostly terrestrial in deciduous forests and parks on rich mull soil; summer to autumn; rare in temp.; DK (DD, Sj), SE. – B&K 4:106, C&D 892, GBW 4:250, Lud 97.19, RdM 44:167.

P. dietrichii Bres.

- Cap cuticle not cracking, or weakly cracking at margin in very dry weather; pleurocystidia present 9
9. Cap velvety, date brown; stem minutely date-brown flocculose, especially in lower part; pileipellis of both pyriform and elongate, fusiform to cylindrical elements (fig. 339C). Cap 8-30(-40) mm, conical, becoming convex, mostly with a low, broad umbo; gills crowded, whitish, becoming pink to brownish pink; stem (10-)-20-45 x 1-4 mm, cylindrical, often with slightly broadened base, white to pale grey or cream, lengthwise striate, mostly with date brown floccules or fibrils at least at base or top; flesh whitish to greyish; smell and taste indistinct. Sp 5.5-7.5(-8) x (4-)-4.5-6 μm , subglobose to ellipsoid, a few globose to triangular. Terrestrial or on rotten wood in deciduous forests, especially in somewhat moist microhabitats, often on calcareous soil; summer to autumn; occasional in temp.-southern bore., rare in middle-northern bore.; DK (LC), FI (LC), NO (NE), SE (NE). – B&K 4:118-119, C&D 876-877, GBW 4:265, Lud 97.28, Phil 165e, ☉.

P. podospileus Sacc. & Cub. (*P. minutissimus* Maire, *P. seticeps* (G.F. Atk.) Singer)

- Cap smooth or venose, pale to dark brown; stem smooth or with minute white floccules; pileipellis exclusively of pyriform to subglobose elements (fig. 339B) 10
10. Cap greyish to pale greyish brown, often with olivaceous tinges, translucently striate up to half the radius when moist. Cap 15-50 mm, conical, becoming convex, often with a low, broad umbo, smooth or slightly venose around centre; gills crowded, whitish, becoming pink to brownish pink; stem 35-70 x 2-5 mm, cylindrical, often with slightly broadened base, white to pale grey or cream, lengthwise striate, smooth and shiny; flesh whitish to greyish; smell and taste indistinct to faintly earthy. Sp (6.5-)-7-9(-10.5) x (5-)-5.5-7(-7.5) μm , subglobose to ellipsoid. Terrestrial or on dead wood in deciduous forests and scrubs, especially on light calcareous soil; summer to autumn; occasional in temp.-hemib.; DK (LC), FI (DD, V: Parainen), NO (NE, Østf: Moss, Vestf: Sem), SE (NE). – Cet 1433, FAD 71G (as *godeyi*), GBW 4:248, Lud 97.8a, 8f.

P. cinereofuscus J.E. Lange

- Cap clay buff to fawn or dark grey brown, translucently striate or not 11

11. Cap dull, dark grey brown; stem white, mostly with greyish tinges or entirely grey. Cap (12-)20-60 mm, hemispherical, becoming convex to plane or depressed, mostly with a low, broad umbo; smooth or minutely venose around centre; gills crowded to rather distant, whitish, becoming pink to brownish pink; stem (15-)35-50(-75) × (1-)2-5(-8) mm, cylindrical, often with slightly broadened base, fairly coarsely innately fibrillose, sometimes in addition flocculose, especially at top; flesh whitish to greyish; smell and taste indistinct. Sp (6.5-)7-9(-10) × 5.5-7 μm, broadly ellipsoid to ellipsoid. Mostly terrestrial or on buried twigs in deciduous forests, gardens and parks on mull soil; summer to autumn; occasional, but locally common in temp.-hemib., rare in bore.; DK (LC), FI (LC), NO (NE), SE (LC). – B&K 4:111, C&D 881, FAD 72G, Lud 97.11a, 11b, 11d.
P. nanus (Pers.: Fr.) P. Kumm.
- Cap waxy to shiny, clay buff, fawn or dark greyish brown; stem white or pale yellow brown 12
12. Gill edge ± brown (check carefully!). Cap 20-60 mm, bell-shaped, becoming convex to plane, mostly with an umbo, mostly delicately venose around centre; gills crowded, whitish, becoming pink to brownish pink; stem 40-70(-110) × 2-8 mm, cylindrical, often with slightly broadened base, whitish to pale cream or with some brown fibrils, innately fibrillose, smooth and shiny; flesh whitish to greyish; smell and taste indistinct. Sp (6-)6.5-8(-10) × (4.5-)5-6.5(-7.5) μm, broadly ellipsoid to ellipsoid. On rotten deciduous wood, especially of *Fagus*; summer to autumn; occasional in temp.-hemib.; DK (LC), FI (DD, V), SE (NE). – GBW 4:252.
P. luctuosus Boud.
- Gill edge concolorous with gills, or whitish 13
13. Cap deeply translucently striate when moist; pleurocystidia clavate to subutriform with 8-20 μm broad apex (fig. 337G). Cap 20-60 mm, hemispherical, becoming convex to plane, mostly with a low broad umbo, often venose around centre; gills crowded, whitish, becoming pink to brownish pink; stem 30-70 × 2-8 mm, cylindrical, often with slightly broadened base, whitish to pale cream, innately fibrillose, smooth and shiny; flesh whitish to pale brownish; smell and taste indistinct. Sp (6-)6.5-8(-8.5) × (5-)5.5-6.5(-7) μm, subglobose to broadly ellipsoid. Terrestrial or on dead wood in deciduous forests on ± calcareous soil; very rare or partly overlooked in temp.-hemib.; DK (NA, Lol: Møns Klinteskov), FI (DD, V: Lohja and Parainen), NO (Østf). – B&K 4:114, Lud 97.13.
P. pallescens P.D. Orton
- Cap not or only slightly translucently striate when moist; pleurocystidia lageniform to utriform with 5-11 μm broad apex (fig. 337H). Cap 20-60 mm, bell-shaped to hemispherical, becoming convex to plane, mostly with a low broad umbo, mostly venose to rugose around centre; gills crowded, whitish, becoming pink to brownish pink; stem 30-60(-90) × 2-8 mm, cylindrical, often with slightly broadened base, white to pale cream, becoming pale yellowish brown, distinctly innately fibrillose, smooth; flesh whitish to pale brownish; smell and taste indistinct to slightly raphanoid or acidulous. Sp (5.5-)7-8(-9.5) × (4.5-)5-7 μm, subglobose to ellipsoid. On dead wood, including wood chips in deciduous forests, especially in somewhat moist microhabitats, on ± nutrient rich soil; occasional in temp., rare in hemib.-bore., in FI north to Ks; DK (LC), FI (LC), NO (LC), SE (NE). – C&D 888, Däh 453, GBW 4:255, Lud 97.97a-d, Ves 261 (as *chrysophaeus*).
P. phlebophorus (Ditmar: Fr.) P. Kumm.

Porotheleum Fr. non Eschw. ('*Porothelium*')

HENNING KNUDSEN

Stromatoscypha Donk

One species in the Nordic countries; see description below.

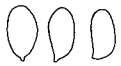
Lit.: Cooke 1957, Donk 1959.

Frb cyphelloid, resembling a resupinate polypore. Frb cup-shaped, 1-2 mm broad, gregarious in large groups on a white subiculum, whitish to cream, crowded at centre more scattered at margin, forming patches up to several cm in diam. Margin of fructification fimbriate.

Sp 5-6.5 × 3-3.5 μm, ellipsoid (fig. 287C). Basidia clavate, 4-spored. Hyphal system dimitic. Generative hyphae 2-3 μm broad. Skeletal/binding hyphae hyaline, thick-walled below, c. 3 μm broad, at apex knobby and sparsely ramified, c. 1.5 μm broad. Clamps present.

On wood of deciduous trees, in the southern part especially *Fagus*, in the northern part on *Populus*, *Betula*, *Corylus*, *Alnus* and rarely *Picea*; occasional in temp.-bore., north to 69°; DK (vu), NO (LC), SE (LC). – B&K 2:232, 📍.

P. fimbriatum (Pers.: Fr.) Fr.



Spores.

Porphyrellus E.-J. Gilbert

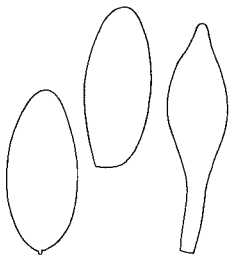
HENNING KNUDSEN & ANDY TAYLOR

One species in the Nordic countries; see description below.

Frb boletoid, uniformly dark purplish brown. Cap 60-150 mm, convex, velvety, hazel, sepia to snuff brown. Tubes and pores vinaceous buff becoming olivaceous buff, when bruised bluish green. Stem 80-120 x 10-30 mm, cylindrical or slightly enlarged below, finely tomentose, concolorous with cap or paler. Flesh white or pale greyish, becoming pale vinaceous and bluish green in places when cut. Taste and smell acidulous. Sp deposit dark brown.

Sp 12-19 x 5-7.5 μm , subfusiform (fig. 173A), brownish. Cheilo- and pleurocystidia present in tubes and pores. Pileipellis a trichoderm with incrustated and brownish pigmented hyphae with differentiated end-cells. Clamps present.

Ectomycorrhizal with *Fagus*, *Quercus*, *Corylus* and *Tilia* in deciduous forests on rich soil, often solitary or a few together; rare in temp.-hemib., in NO occasional in oceanic hemib., north to M&R; autumn; DK (NT), NO (NT), SE (NT). – Däh 18, GBW 2:315, Phil 286a, R&H 209, Ves 128, ☉. *P. porphyrosporus* (Fr.) E.-J. Gilbert (*Tylopilus p.* (Fr.) A.H. Sm. & Thiers, *P. pseudoscaberrimus* Singer)



Spores and hymental cystidia.

Porpoloma Singer

JAN VESTERHOLT

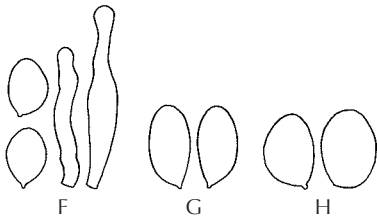
Frb tricholomatoid. Cap 30-120 mm, convex to expanded, smooth, tomentose, fibrillose or scaly, dry or slightly viscid, not hygrophaneous. Gills adnate to emarginate. Stem cylindrical or with tapering base. Flesh unchanged or turning yellow or red. Smell aromatical or farinaceous. Taste mild or slightly bitter. Sp deposit white to cream.

Sp broadly ellipsoid to ellipsoid or slightly phaseoliform, smooth, hyaline, amyloid. Cheilocystidia present or absent. Pileipellis a cutis or a trichoderm. Clamps present.

Saprotrophic in grassland or forests.

Three species in the Nordic countries. Molecular studies are likely to result in a splitting of the genus.

Lit.: Arnolds & Noordeloos in Bas et al. 1999.



Spores and cheilocystidia: F: *Porpoloma spinulosum*, G: *P. metapodium*, H: *P. pes-caprae*.

1. Cap margin with small, pointed scales; frb slowly, but strongly yellowing, especially in stem; smell aromatical, reminiscent of soap and perfume; in rich deciduous forests. Cap 40-120 mm, convex to expanded, slightly viscid, dark grey-brown spotted to finely scaly on a cream to pale buff background; gills crowded, cream, becoming pale yellowish; stem 30-80 x 10-25 mm, cylindrical or with slightly tapering base and ± widened in upper part, smooth, whitish. Sp 4.5-6 x 3-4 μm, broadly ellipsoid (fig. 409F), amyloid; cheilocystidia 25-50 x 4-8 μm, cylindrical to fusiform. Autumn; very rare in temp.; DK (CR). – C&D 466, FAD 24E (as *Tricholoma guttatum*), Knu 83, Mar 968, Svp 55:34, ⊙.
P. spinulosum (Kühner & Romagn.) Singer
 - Cap margin smooth; flesh reddening or unchanged; smell farinaceous; in grassland 2
2. Cap convex, tomentose; flesh slowly reddening; sp 6-8 x 3-4 μm, narrowly ellipsoid or sometimes slightly phaseoliform (fig. 409G). Cap 40-100 mm, often finely cracked with age, pale to dark greyish brown; gills adnate to emarginate, medium spaced, brownish grey; stem 40-70 x 12-20 mm, cylindrical with a tapering base, fibrillose, pale brownish grey; smell farinaceous. Sp amyloid; cheilocystidia absent or cylindrical to ± tortuous. In dry grassland and natural pastures, in FI also in forests; summer to autumn; rare in temp.-bore.; DK (CR), FI (EN, U, PK), FO, NO (VU), SE (EN). – FAD 166G, FE 3:65, Mar 830, M&J 1, Svp 35:52, ⊙.
P. metapodium (Fr.) Singer
 - Cap conical to low conical, expanding with a prominent umbo, radially fibrillose; flesh not reddening; sp 6-8 x 4.5-5.5 μm, broadly ellipsoid (fig. 409H). Cap 30-80 mm, pale greyish brown to yellowish brown; gills narrowly adnate to emarginate or almost free, medium spaced, white to cream or pale grey; stem 40-85 x 5-13 mm, cylindrical with a tapering base, fibrillose, white; smell farinaceous. Sp amyloid; cheilocystidia absent. In dry grassland; late summer to autumn; very rare in hemib.; SE (EN). – BGMB 33:134, B&K 3:398, Cet 1020, C&D 465, M&J 1.
P. pes-caprae (Fr.) Singer

Psathyrella (Fr.) Quél. LEIF ÖRSTADIUS & HENNING KNUDSEN

Frb fragile with even margin and black sp deposit. Cap 1-100 mm, when young often hemispherical to obtusely conical, becoming convex to plane, smooth to innately fibrillose, dry, rarely viscid, often translucently striate and strongly hygrophanous, when moist white, grey, grey brown, ochre brown, brown, red brown, dark red brown, dark red or dark purple brown, often drying to paler colours. Gills adnexed to adnate, ventricose to narrow, distant to very crowded, when young white, grey or very pale brown, becoming grey, dark grey, flesh-coloured, brown, reddish brown, dark reddish brown or purple brown, upper part of edge often white fimbriate, and lower part sometimes red pigmented. Stem central, in most species pulverulent at top, pale, sometimes with a ring. Veil most often present on cap or stem, copious to scanty, persistent or often fugacious. Flesh very fragile to rather firm. Smell usually faint to absent, rarely strong, sweetish, soap-like or nauseous-fetid. Taste mild or rarely bitter. Sp in deposit shades of brown, dark brown, dark reddish brown, dusky red or reddish black.

Sp in front view oblong, ovoid, ellipsoid, subcylindrical or fusiform, in side view flattened on adaxial side, sometimes amygdaloid, phaseoliform or with a suprahilar depression, smooth or rarely very weakly ornamented, with or without germ pore, central or rarely eccentric, almost hyaline, very pale brown, yellow, reddish yellow, yellowish red, red, dark reddish brown, dark red to dusky red. Basidia 4-spored, occasionally 2-spored. Pleurocystidia present or sometimes absent. Cheilocystidia often of two types, one type similar to the pleurocystidia and another type which is ± clavate. Gill edge in a few species covered with drops staining green in a 10 % solution of ammonia especially when fresh. Pileocystidia present in a few species. Sclerocystidia present in one species. Pileipellis a hymeniderm, sometimes with a transition to a paraderm, rarely a cutis. Veil most often present, either as hyphae with cells differing in size, rarely as spherocysts. Clamps present or absent.

Saprotrophic, solitary, gregarious or caespitose, on ± alkaline soils or lignicolous, a number occur on dung, and a few on old bonfires or in swamps. Spring to late autumn.

80 species in the Nordic countries, 82 species in the key.


Lit.: Enderle 2004, Kits van Waveren 1985, 1987, Kühner & Romagnesi 1953, Larsson & Örstadius 2008, Ludwig 2007, Romagnesi 1975, 1982, Smith 1972, Örstadius 2007, Vesterholt & Knudsen in Hansen & Knudsen 1992.

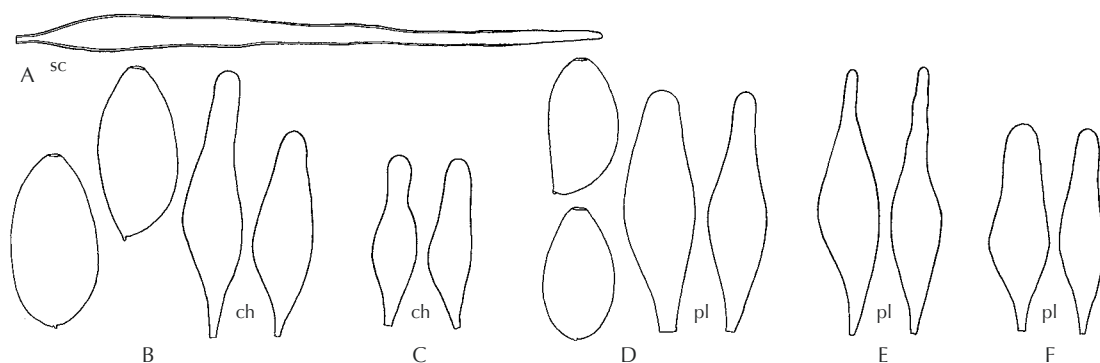
Main key

- | | | |
|----|---|------------------------------|
| 1. | Sp on av > 9 μm long | 2 |
| - | Sp on av < 9 μm long | 4 |
| 2. | Sp on av > 12 μm long | Key A p. 588 |
| - | Sp on av < 12 μm long | 3 |
| 3. | Sp on av > 10.5 μm long | Key B p. 594 |
| - | Sp on av < 10.5 μm long | Key C p. 598 |
| 4. | On dung | Key D p. 606 |
| - | Not on dung | 5 |
| 5. | Pleurocystidia absent | Key E p. 607 |
| - | Pleurocystidia present | 6 |
| 6. | Gill edge and cystidia covered with drops staining green in a solution of ammonia or clamps absent | Key F p. 608 |
| - | Gill edge and cystidia not covered with drops staining green in a solution of ammonia; clamps present | 7 |
| 7. | Sp on av < 6.4 μm long | Key G p. 609 |
| - | Sp on av > 6.4 μm long | 8 |

- | | | |
|-----|---|--------------|
| 8. | Veil absent; pleurocystidia with crystals | Key H p. 610 |
| - | Veil present; pleurocystidia with or without crystals | 9 |
| 9. | Smell sweetish reminding of almond, marzipan or coconut | Key I p. 610 |
| - | Smell not sweetish | 10 |
| 10. | Pleurocystidia lageniform to conical, upper part often acute (figs 613, 615) | Key J p. 611 |
| - | Pleurocystidia (narrowly) utriform to lageniform, upper part often obtuse (figs 619, 621) | Key K p. 617 |

Key A: Sp on av > 12 μm long

- | | | |
|----|------------------------|---|
| 1. | Pleurocystidia absent | 2 |
| - | Pleurocystidia present | 3 |
2. Sp on av > 14 μm long; pileipellis with imbedded sclerocystidia (fig. 589A); veil absent. Cap 20-50 mm, conical, when young dark reddish brown, striate up to 3/4 from margin, strongly hygrophanous, fading without pink; gills crowded, L = 36-52, with white edge; stem 50-170 x 2-6 mm, thickened towards base, extremely fragile, whitish, conspicuously pruinose striate at top. Sp 13.5-17 x 6.5-9 μm , Qav = 1.8-2.1, oblong, subcylindrical, subovoid, in profile sometimes with suprahilar depression (fig. 589B), reddish brown, opaque, with distinct, often eccentric germ pore; cheilocystidia of two types: A: 25-80 x 10-22 μm , utriform, lageniform, abundant, B: small, clavate; pileipellis a hymeniderm; sclerocystidia 35-650 x 4-10 μm , yellow brown, scattered. Under deciduous trees on moist, basic soil, in parks and gardens rich in nitrogen, in grass on lawns, on sticks or debris including rotting sawdust or wood chips, in leaves, on dung outside the area; spring to autumn; common in temp., occasional in hemib.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:326, Däh 566, 567, Jordst 18(1), Lud 98.32, Ves 300, .
- P. conopilea* (Fr.: Fr.) Ulbr. ('*conopilus*', *P. subatrata* (Batsch) Gillet s. auct.)
- Sp on av < 14 μm long; pileipellis without sclerocystidia; veil present. Cap 10-40(-80) mm, conical-convex, reddish brown or more often dried out to grey brown, becoming beige or pale yellow grey, sometimes flesh-coloured or with a pink tinge, hygrophanous, not or faintly striate, veil remnants characteristically as denticulate flocci at margin; gills adnexed, crowded, L = 34-50, reddish grey, brown, with white fimbriate edge; stem 30-70(-150) x 2-6(-12) mm, pulverulent or flocculose from top and downwards, but decreasing in intensity and ceasing at lower half of stem where veil remnants can leave a fibrillose zone or rarely a ring. Sp 10.5-14 x 6-7.5 μm , Qav = 1.6-2, oblong, subcylindrical, ovoid, ellipsoid, hexagonal, in profile sometimes amygdaloid (fig. 589C), reddish brown; cheilocystidia of two types: A: 20-45(-60) x 7-18 μm , narrowly utriform, rarely lageniform or subcylindrical, numerous, B: small, clavate to pyriform; pileipellis a cutis; pileitrama made up of pale pigmented hyphae; veil cells 50-180 x 3-16 μm ; clamps numerous. In rich deciduous forests, parks, gardens or other disturbed places, in nutrient rich grassland, bonfires, lignicolous, terricolous and on wood-chips; spring to autumn; occasional in temp., rare in hemib.; DK (LC), FI (DD), NO (LC), SE (LC). – Bol Bres 36:126, FAD 150A,B, 151F, Lud 98.31, M&J 4, Phil 255i.
- P. marcescibilis* (Britzelm.) Singer (*Psathyra fragillissima* J.E. Lange, *P. lactea* J.E. Lange f. *lactea*, *P. lactea* J.E. Lange f. *virginea* J.E. Lange, *Psathyrella involuta* (Romagn.) M.M. Moser)



Sclerocystidium, spores, cheilocystidia and pleurocystidia: A-B: *Psathyrella conopilea*, C: *P. marcescibilis*, D: *P. ammophila*, E: *P. jacobssonii*, F: *P. saponacea*.

3. In sand dunes. Cap 10-50 mm, convex, becoming \pm plane, hardly striate, dark brown to date brown, hygrophanous, fading on drying, veil when young as fibres close to the margin; gills medium spaced, greyish brown with purple tinges; stem 30-70 \times 2-5 mm, lower part sunk in sand, sometimes with a pseudorrhiza, bulbous or clavate; smell and taste not distinctive. Sp 9-14 \times 5.5-8.5 μm , $Q_{av} = 1.5-1.9$, ellipsoid, oblong, ovoid, obovoid, subrectangular, in profile sometimes amygdaloid or with suprahilar depression, rarely subphaseoliform (fig. 589D), reddish brown, with a distinct, rarely eccentric germ pore; basidia 4(-2)-spored; pleurocystidia 30-70 \times 10-22 μm , utriform, narrowly utriform, clavate, sometimes lageniform, rarely rostrate, scattered; cheilocystidia of two types: A: 25-65 \times 10-18 μm , similar to pleurocystidia, scattered or locally numerous, B: small, clavate, numerous, especially close to cap margin; gill edge sometimes red-brown pigmented; veil cells 20-60 \times 2-16 μm . Spring to autumn; common in western temp., occasional in western hemib., rare in eastern temp. and eastern hemib., very rare in bore.-suba.; DK (LC), IS (Na), NO (NT), SE (NT). – Bol Bres 36:120, FAD 148B (as *Psilocybe a.*), Lud 98.9, Svp 33:45, Ves 301, \odot .

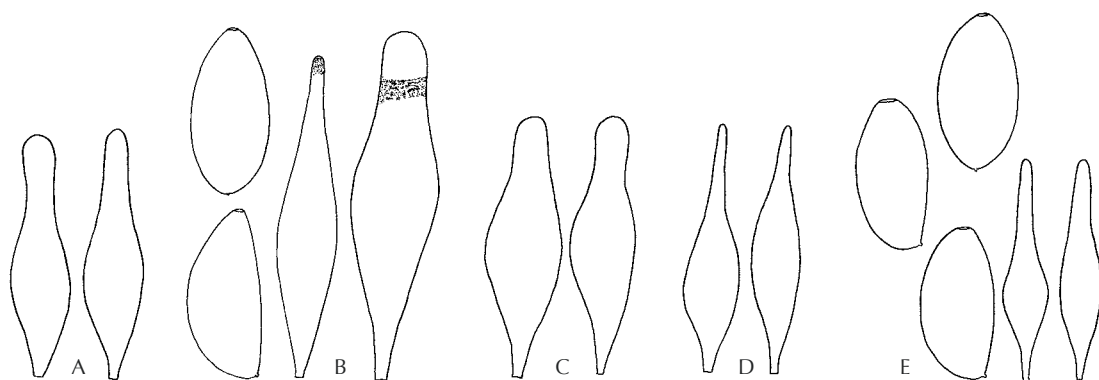
P. ammophila (Durieu & Lév.) P.D. Orton

- Not in sand dunes 4
4. Gill edge and cystidia covered with drops staining green in a solution of ammonia. Cap 15-30 mm, convex with an umbo, at first dark reddish brown, then fading to brown, faintly striate on the marginal area, hygrophanous, drying pale brown; veil flocculose almost to centre; gills medium spaced, dark brown with white edge; stem 50-100 \times 1-3 mm, with an up to 10 mm long pseudorrhiza; smell indistinct to unpleasant. Sp 10.5-13 \times 6-7 μm , $Q_{av} = 1.8-1.9$, oblong, narrowly ovoid, subcylindrical, in profile sometimes narrowly amygdaloid, reddish brown, with distinct germ pore; pleurocystidia 35-70 \times 11-22 μm , lageniform, fusiform, in upper part sometimes rostrate or forked (fig. 589E), with pale or sometimes yellow walls, rather numerous; cheilocystidia of two types: A: 25-70 \times 7-17 μm , lageniform, fusiform, rarely capitate, abundant, B: clavate, not dominating; veil cells 20-130 \times 4-20 μm . In wet or moist, herb-rich forests, on soil, in leaves, in *Sphagnum* or among other mosses, at margin of eutrophic fens, with *Picea abies*, *Betula* and *Salix*; late summer to autumn; rare in hemib.-bore.; FI (DD), SE (DD). – Lud 98.23.

P. jacobssonii Örstadius

- Gill edge and cystidia not covered with drops staining green in a solution of ammonia 5
5. Pleurocystidia (narrowly) utriform to lageniform, often obtuse (figs 589F, 591A-C) 6
- Pleurocystidia lageniform to conical, often acute (figs 591D-E, 593A-E) 10

6. On dung or manured soil. Cap 3-25 mm, convex, dark reddish brown, dark brown, later fading to yellow brown, hygrophanous, when moist striate up to 2/3 from margin, veil rudimentary, as scattered fibrils near margin; gills distant, L = 16-23; stem 15-55 x 1-2.5 mm; smell unpleasant, of soap or not distinctive. Sp 10.5-14.5 x 6-8 μm , Q_{av} = 1.7-1.9, oblong, subcylindrical, sometimes irregular in outline, subhexagonal, in profile flattened on adaxial side, sometimes with a slight suprahilar depression, reddish brown, with indistinct to distinct, central to eccentric germ pore; pleurocystidia 25-60 x 10-16 μm , narrowly utriform, sublageniform (fig. 589F), scattered; cheilocystidia of two types: A: 20-45 x 8-16 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered, rarely numerous; veil cells 10-50 x 2-8 μm . Spring to late autumn; rare in temp.-bore.; DK (DD), FI (EH: Janakkala), FO, NO (NE), SE (LC). – FF 3h, Lud 98.14 (as *coprophila*).
P. saponacea F.H. Møller (*P. coprophila* Watling, *P. fimetaria* Watling, *P. equina* A.H. Sm.)
- Not on dung or manured soil 7
7. Mature and moist cap pale, often greyish ochre; gill edge red pigmented; with habitus like *P. corrugis*. Cap 10-45 mm, convex to plane, in primordia dark reddish brown, when young yellow red, yellow brown, soon fading to greyish ochre, striate halfway to centre, hygrophanous, sometimes drying with pink tinges, veil scanty as fibres close to margin in young stages; gills distant, L = 17-23, mostly with continuously red pigmented edge; stem 40-100 x 1-3 mm, with up to 25 mm long pseudorrhiza, also rudimentary or lacking. Sp 11-16 x 6-7.5 μm , Q_{av} = 1.8-2.2, oblong, subcylindrical, ovoid, in profile faintly to distinctly amygdaloid, reddish brown; pleurocystidia 40-80(-100) x 10-25 μm , often utriform, also lageniform, fusiform, flexuous, forked or subcapitate, numerous to scattered; cheilocystidia of two types: A: 25-60(-75) x 8-20(-24) μm , similar to pleurocystidia, numerous, rarely scattered, B: small, clavate to obpyriform, numerous to scattered; veil cells 40-120 x 2-5 μm . In deciduous forests, parks and shrubs, attached to buried wood, on chips, on sticks and twigs, on dry or moist soil, with preference for nutrient rich soil; summer to autumn; common in temp., rare in hemib.-bore.; DK (LC), FI (DD), FO, NO (LC), SE (LC). – B&K 4:353, End 416, FND 28:29, Lud 98.73, M&J 2.
P. pseudogracilis (Romagn.) M.M. Moser
- Mature and moist cap brown or darker; gill edge not red pigmented; not with habitus like *P. corrugis* 8
8. Sp on av < 6.8 μm broad (fig. 591A); clamps absent. Cap 15-25 mm, convex, deep chocolate brown or vinaceous bay, striate when moist, soon drying tawny ochraceous from centre, then often with bright tawny or vermilion tinge, especially round centre, entirely wine reddish when quite dry, when young covered with white floccules from veil; gills distant, L = 16-18; stem 40-60 x 1-2 mm, pale dirty buff or pale ochraceous, sometimes vinaceous or umber at base. Sp 11-13.5 x 6-7 μm , Q_{av} = 1.9-2, oblong, subcylindrical, narrowly ovoid, in profile sometimes amygdaloid or with a suprahilar depression, reddish brown; pleurocystidia 40-70(-80) x 12-20(-26) μm , utriform, a few lageniform, sometimes capitate, scattered to rather numerous; cheilocystidia of two types: A: 30-60 x 10-18 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered to numerous; veil cells 20-70 x 4-14 μm . With conifers and broadleaved trees, at roadsides, in grass attached to decayed wood, on acid or base-rich soil; summer to early winter; DE, UK. – Bol Bres 36:138, Lud 98.81.
P. vinosofulva P.D. Orton
- Sp on av > 6.8 μm broad; clamps present 9
9. Cap 10-60 mm, often tinged purple; smell particular, e.g. fruity, of peppermint, *Urtica dioica*, *Coprinus narcotica* or cat urine; pleurocystidia 45-100 x 10-24 μm , numerous. Cap expanded to almost plane, purple red, dark red, chestnut, when fresh also yellow brown, hygrophanous, drying vinaceous red, pale red brown, ochre or beige, veil when fresh as flocci or fibres almost to the centre; gills medium spaced, L = 18-35; stem 40-80 x 2-5 mm, whitish with or without purple shades. Sp 11-16.5 x 6.5-8.5(-9.5) μm , Q_{av} = 1.5-2.1, ovoid, oblong,



Spores and pleurocystidia: A: *Psathyrella vinosofulva*, B: *P. odorata*, C: *P. calcarea*, D: *P. stercoraria*, E: *P. longicauda*.

ellipsoid, subcylindrical, sometimes slightly irregular, rarely citriform, in profile sometimes amygdaloid or with a slight suprahilar depression (fig. 591B), reddish brown, with sometimes eccentric germ pore; pleurocystidia narrowly utriform, utriform, lageniform, fusiform, oblong, subconical, subclavate, sometimes rostrate; cheilocystidia of two types: A: 35-80 × 8-24 μm, similar to shape and frequency of pleurocystidia, B: small, clavate, scattered; veil cells 30-150 × 2-14 μm. On wood or attached to buried wood, among herbs in open forests, parks, nutrient rich grasslands or roadsides in *Fagus* forests, often on sandy, sometimes calcareous soil; all year; occasional in western temp., very rare in eastern temp. and hemib.; DK (LC), FI (DD, U: Helsinki), SE (LC). – B&K 4:321, Bol Bres 36:139, End 402, Lud 98.50, M&J 8, ☉.

P. odorata (Peck) Sacc. (*P. bipellis* (Quél.) A.H. Sm.)


- Cap 5-30 mm, not tinged purple; smell indistinct; pleurocystidia 40-70 × 10-22 μm, scattered. Cap conical-convex, young reddish brown, when mature fading to strong brown, striate, hygrophanous, drying pale brown or cream, veil fibrillose halfway towards centre; gills distant, L = 14-22; stem 10-60 × 1-3 mm, rarely with a very short pseudorrhiza. Sp 11.5-16 × 7-9 μm, Qav = 1.6-2, oblong, ovoid, ellipsoid, obovoid, subcylindrical, rarely slightly irregular in outline, in profile sometimes amygdaloid, subphaseoliform, or with a suprahilar depression, reddish brown, with distinct or indistinct germ pore; pleurocystidia narrowly utriform, utriform, lageniform (fig. 591C); cheilocystidia of two types: A: 25-55 × 10-20 μm, similar to pleurocystidia, scattered to rather numerous, B: small, clavate, numerous, especially near cap margin; veil cells 15-40 × 2-6 μm. In xerophilous grassland or sand steppe, on sunny slopes; spring to autumn; very rare in eastern temp.; SE (LC). – Lud 98.68.

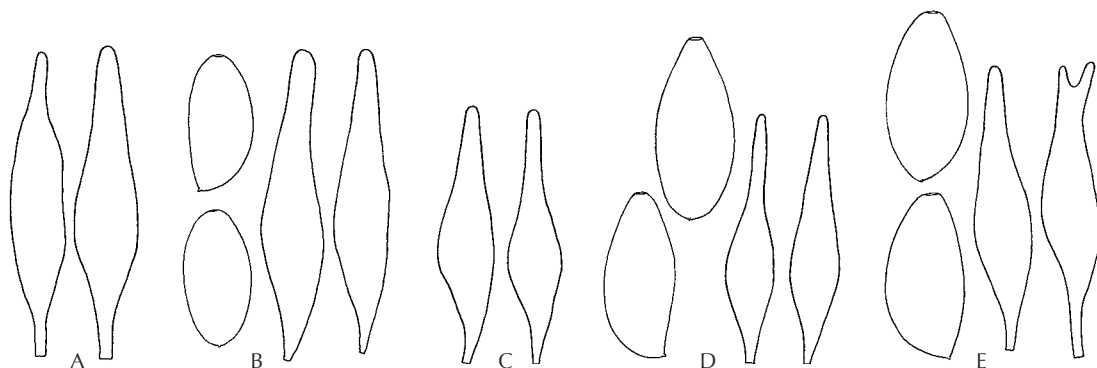
P. calcarea (Romagn.) M.M. Moser

10. Frb often tinged purple; smell particular, e.g. fruity, of peppermint, *Urtica dioica*, *Coprinus narcotica* or cat urine see *P. odorata* 9
 - Frb not tinged purple; smell different or indistinct 11
11. On dung 12
 - Not on dung 14
12. Sp on av < 13 μm long 13
 - Sp on av ≥ 13 μm long see *P. prona* and *P. potteri* 22
13. Sp on av > 12.2 μm long; veil when young as fibrils or flocci halfway to centre; gill edge sometimes red pigmented. Cap 4-10(-13) mm, convex, dark reddish brown, faintly striate up to 2/3 from margin, hygrophanous, drying pale brown, pale ochraceous, sometimes with a pink tinge; gills distant, L = 12-16, brown; stem 15-40 × 0.5-1.5 mm. Sp 11-14.5 × 6-7 μm,


Qav = 1.9, oblong, subcylindrical, subfusiform, narrowly ovoid, in profile sometimes narrowly amygdaloid or with a slight suprahilar depression, reddish brown; basidia 4-spored, rarely mixed with 2-spored; pleurocystidia 35-65 x 8-14(-20) μm , polymorphic, lageniform, lageniform-rostrate, rarely conical, clavate, narrowly utriform, subcylindrical, bent, forked or flexuous (fig. 591D), scattered to numerous; cheilocystidia 20-60(-80) x 6-14(-28) μm , of similar shape and frequency as pleurocystidia; veil cells 10-40 x 3-7 μm . On horse and cow dung, once on soil in a pasture grazed by horses; summer to autumn; very rare in temp.-bore.; FI, SE.

P. stercoraria Örstadius & E. Larss.

- Sp on av < 12.2 μm long; veil when young as flocci to cap centre; gill edge not red pigmented see *P. hirta* key B 9
- 14. Stem with a pseudorrhiza 15
- Stem without a pseudorrhiza 18
- 15. Sp on av 6.7-7.6 μm broad; gill edge not red pigmented. Cap (5-)10-40 mm, conical-convex, when young dark reddish brown, striate up to 2/3, hygrophanous, drying ochraceous brown or pale greyish brown, veil scanty as fibres close to margin; gills medium spaced, L = 19-30; stem 30-110 x 1-4 mm, with a 5-80 mm long pseudorrhiza. Sp 11.5-15 x 6-8 μm , Qav = 1.8-2, oblong, subcylindrical, rarely ovoid, in profile often with a \pm suprahilar depression (fig. 591E), reddish brown, with a central, rarely eccentric germ pore; basidia 4-spored, rarely mixed with 2-spored; pleurocystidia 35-60(-70) x 9-14 μm , narrowly lageniform, fusiform, conical, rarely subcapitate, scattered; cheilocystidia of two types: A: 20-45 x 6-12 μm , similar to pleurocystidia, scattered to numerous, B: clavate to obpyriform, numerous, towards cap margin extremely numerous, often about ten cells deep; veil cells 20-60 x 3-8 μm ; clamps numerous. On decaying leaves or attached to buried wood, wood-chips or compost in rich deciduous forests, groves and gardens, with preference for moist, calcareous soil, sometimes nitrophilous; summer to late autumn; rare in eastern temp., very rare in eastern hemib. and southeastern bore.; FI (DD), SE (LC). – Lud 98.19.
- P. longicauda* P. Karst.
- Sp on av 5.6-6.8 μm broad; gill edge red pigmented 16
- 16. Veil when young as fibrils, often lacking; the red pigmented gill edge often broken by non-pigmented areas; moist mature cap rather pale. Cap 10-45 mm, low convex, at first entirely dark reddish brown, at maturity fading with darkest centre, reddish brown, brown, reddish yellow or light yellowish brown, striate up to halfway, hygrophanous, when drying often with pink tinges, rugose; gills medium spaced, L = 18-34; stem 30-130 x 1.5-4 mm, stiff, with an up to 50 mm long pseudorrhiza. Sp 10-15 x 5.5-7 μm , Qav = 1.8-2.2, oblong, subcylindrical, obovoid, in profile sometimes narrowly amygdaloid or with a slight suprahilar depression, reddish brown, with distinct germ pore; basidia 4-spored, sometimes mixed with 2-spored; pleurocystidia 40-80 x 8-16 μm , versiform, lageniform, fusiform, conical, cylindrical, clavate, often flexuous and with a rostrate apex, rarely forked or capitate (fig. 593A), scattered to numerous; cheilocystidia of two types: A: 25-60 x 6-12 μm , similar to pleurocystidia, scattered, rarely numerous, B: small, irregularly clavate or flexuous cylindrical, often pigmented; veil cells 10-120 x 2-6 μm . In rich deciduous forests, in parks, along roadsides, in grassland, often on nutrient rich soil, usually attached to sticks, twigs or buried wood, among leaves; summer to autumn; common in temp.-hemib., rare in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – End 405, FAD 153B (as *Psathyra gracilis* var. *corrugis*), 154B (as *P. gracilis*), Lud 98.22E, Svp 38:29, Ves 298, .
- P. corrugis* (Pers.: Fr.) Konrad & Maubl. (*P. gracilis* (Fr.) Quéél., *P. polycystis* (Romagn.) Kits van Wav., *P. melanophylloides* Kits van Wav., *P. atrolaminata* Kits van Wav.)
- Veil when young as fibrils or flocci; the red pigmented gill edge hardly broken by non-pigmented areas; moist mature cap moderately coloured 17



Spores and pleurocystidia: A: *Psathyrella corrugis*, B: *P. microrrhiza*, C: *P. orbicularis*, D: *P. prona*, E: *P. potteri*.

17. Cap 10-40 mm, sometimes pink when drying; L = 20-36, the edge moderately red pigmented. Cap conical-convex, when mature and moist reddish brown, ochraceous brown, striate, hygrophanous, fading and drying yellowish grey or very pale brown, veil as white patches of fibrils and flocci, when young reaching almost to the centre; gills medium spaced; stem 35-150 x 1-3(-5) mm, rather stiff, often with a 5-20(-50) mm long pseudorrhiza. Sp 10-14 x 5.5-7 μm , $Q_{av} = 1.7-2.1$, oblong, subcylindrical, sometimes narrowly ovoid, in profile sometimes narrowly amygdaloid, rarely with a suprahilar depression (fig. 593B), reddish brown; basidia 4-spored, rarely mixed with 2-spored; pleurocystidia 40-75(-85) x 8-16 μm , conical, narrowly lageniform with subacute to obtuse apex, sometimes subclavate to subcapitate, rarely forked, scattered to numerous; cheilocystidia of two types: A: 25-50 (-60) x 6-13 μm , similar to pleurocystidia, abundant, rarely rather numerous, B: clavate to spheropedunculate, scattered to numerous, hardly dominating; veil cells 20-120 x 2-16(-20) μm . Usually attached to buried twigs or sticks, also on sawdust and wood chips in deciduous forests, rarely in coniferous forests, in shrubberies, along paths, in parks, in ditches, in nutrient rich gardens or on herb-rich soil, in dry or moist places, sometimes on wet soil with mosses like *Sphagnum*, rarely on bonfires, once found on dung (Austria); late summer to early winter; common in temp.-hemib., rare in bore.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – BSMF 116:344 (opposite), End 411, FAD 154A (as *Psathyra squamifera*), Lud 98.21, Ves 298, .
- P. microrrhiza* (Lasch: Fr.) Konrad & Maubl. ('*microrrhiza*', *P. stellata* (Romagn.) Bon, *P. conata* Kits van Wav.)

- Cap 4-25 mm, not pink when drying; L = 16-22, the edge faintly or not red pigmented. Cap convex, when mature reddish brown, yellowish red, strong and dark brown, striate, hygrophanous, drying pale buff to pale grey brown; gills distant; stem 20-60 x 0.5-2 mm, sometimes with a 5-15 mm long pseudorrhiza. Sp 10-14 x (5-)5.5-6.5(-7) μm , $Q_{av} = 1.8-2.1$, oblong, subcylindrical, subovoid, in profile sometimes narrowly amygdaloid, rarely subphaseoliform, reddish brown; pleurocystidia 35-65 x 8-18 μm , narrowly conical, lageniform or fusiform, obtuse to acute, rarely forked or rostrate (fig. 593C), scattered, sometimes numerous; cheilocystidia of two types: A: 25-60 x 7-18 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered, rarely rather numerous but never dominating; veil cells 20-120 x 3-18 μm . In deciduous or coniferous forests, often attached to buried wood, in dry to moist, acid or rich soil, rarely nitrophilous; summer to autumn; occasional in eastern temp. and suba., rare in hemib.-suba.; FI, FO, IS, NO, SE. – Lud 98.75, M&J 13.
- P. orbicularis* (Romagn.) Kits van Wav.

Note: often misinterpreted and difficult to separate from *P. microrrhiza* and *P. orbicularum*.

18. Sp on av < 13 μm long
- Sp on av > 13 μm long

19
21

19. Sp on av > 6.8 μm broad see *P. odorata* 9
 - Sp on av < 6.8 μm broad 20
20. Cap 4-25 mm, striate; L = 16-22; rarely nitrophilous see *P. orbicularis* 17
 - Cap 4-10(-13) mm, faintly striate; L = 12-16; nitrophilous see *P. stercoraria* 13
21. Cap 10-60 mm, veil when fresh as flocci or fibres almost to the centre; L = 18-35; sp some-
 times with eccentric germ pore see *P. odorata* 9
 - Cap 5-30 mm, veil when fresh as fibrils close to the margin; L = 10-22; sp with central
 germ pore 22
22. Cap when moist dark brown, striate almost to centre, sometimes pink on drying; gill edge
 often red pigmented; sp often with a papilla-like apex or a suprahilar depression; basidia
 mostly 2-spored, 9-13 μm broad. Cap 5-30 mm, convex, when young dark reddish brown,
 becoming brown to reddish brown, hygrophanous; veil rudimentary; gills distant, L = 14-22;
 stem 30-80 x 1-3 mm, lower part rather dark brown. Sp 12.5-17(-20) x 6.5-8 μm , $Q_{av} = 1.9$ -
 2.4, subcylindrical, citriform, oblong, narrowly ovoid or subhexagonal, in profile sometimes
 narrowly amygdaloid (fig. 593D), reddish brown; pleurocystidia 30-70 x 9-16 μm , narrowly
 lageniform to fusiform, often pointed, rarely forked, scattered to numerous; cheilocystidia
 of two types: A: 25-50 x 8-15 μm , similar in shape and frequency to pleurocystidia, B: small,
 clavate, numerous, becoming extremely abundant in the non-pigmented zone close to cap
 margin, forming layers up to ten cells deep; veil cells 30-80 x 2-10 μm . On base-rich soil,
 rotten wood, sticks or twigs, in grass on paths or on manured soil, rarely on dung; spring to
 autumn; common in temp.-hemib., rare in bore., very rare in suba.; DK (LC), FI (DD), FO, IS
 (Na), NO (LC), SE (LC). – Bres 890, End 414, 415, FAD 155C, C¹, Fr 139.3 (as *Agaricus p.*), Lud
 98.78.

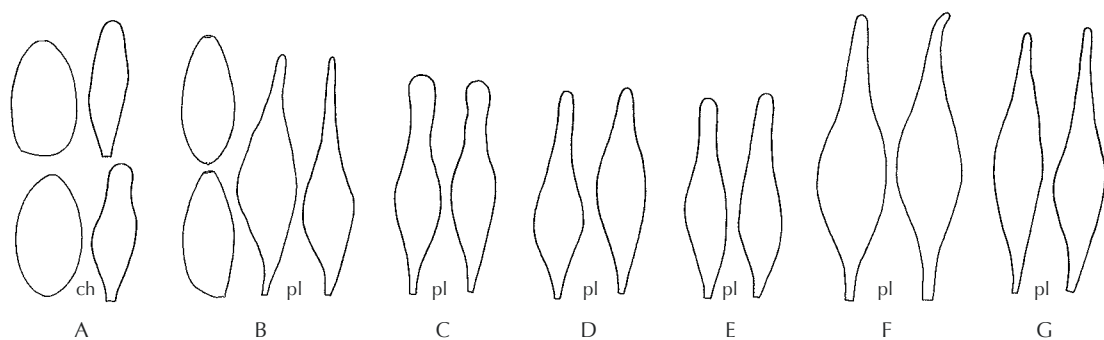
P. prona (Fr.) Gillet

- Cap when moist ochraceous grey to buff, hardly striate, not pink on drying; gill edge
 exceptionally red pigmented close to cap margin; sp rarely with slightly papilla-like apex
 or a slight suprahilar depression; basidia mostly 4-spored, 11-14 μm broad. Cap 5-25 mm,
 convex, when young yellowish brown, often with a grey tinge, when mature fading from
 margin to very pale brown, ochraceous grey or buff, hygrophanous; veil rudimentary; gills
 distant, L = 10-22; stem 20-60 x 0.5-2 mm, whitish. Sp 12-16 x 6.5-8.5 μm , $Q_{av} = 1.8$ -2.1,
 oblong, subcylindrical, sometimes subovoid, in profile sometimes narrowly amygdaloid
 (fig. 593E), reddish brown; pleurocystidia 35-80(-140) x 10-20 μm , narrowly lageniform to
 fusiform, sometimes forked or flexuous, scattered; cheilocystidia of two types: A: 25-65(-80)
 x 8-16 μm , similar to pleurocystidia, scattered to numerous, B: small, clavate, numerous, in-
 creasing in frequency towards cap margin; veil cells 20-100 x 2-8 μm . In grasslands, in fields,
 on manured soil, on rotten straw or mixtures of dung and straw, rarely on fresh dung;
 spring to autumn; occasional in eastern temp., rare in western temp., hemib. and bore.; DK
 (DD), FI, FO, NO, SE (LC). – FAD 153C, 156C (as *Psathyra atomata*), Bol Bres 36:130 (as *prona*),
 Lud 98.79.

P. potteri A.H. Sm. (*Psathyra subatomata* J.E. Lange, *Psathyrella prona* (Fr.) Gillet var. *prona* f. *albidula* (M.M. Moser) Kits van Wav., *P. prona* (Fr.) Gillet var. *prona* f. *cana* Kits van Wav.)

Key B: Sp on av 10.5-12 μm long

1. In sand dunes see *P. ammophila* key A 3
 - Not in sand dunes 2
2. Pleurocystidia absent 3
 - Pleurocystidia present 5
3. Sp on av 4.5-5.5 μm broad; cheilocystidia often lageniform see *P. caniceps* key C 6
 - Sp on av 5.9-7.1 μm broad; cheilocystidia often utriform 4



Spores, cheilocystidia and pleurocystidia: A: *Psathyrella typhae*, B: *P. narcotica*, C: *P. purpureobadia*, D: *P. hirta*, E: *P. romagnesii*, F: *P. dicrani*, G: *P. orbitarum*.

4. Habitat dry or moist; sp dark red see *P. marcescibilis* key A 2
 - On herbaceous debris close to the waterline in fens, bogs, lakes or ponds; sp light yellow to brownish yellow. Cap 5-25 mm, convex to plane, reddish brown or brown with paler margin, when fresh striate almost to centre, hygrophanous, drying beige or pale buff, veil as dispersed flocci or fibres, denticulate at margin, sometimes brown discolouring; gills medium spaced, L = 16-28; stem 5-35 × 0.7-2 mm, pulverulent at top, often with a fibrillose ring zone near base, lower part fibrillose. Sp 9-12.5 × 5.5-8 μm, Qav = 1.6-1.9, oblong, ovoid, ellipsoid, subfusiform, sometimes irregular in outline, in profile sometimes amygdaloid or with a suprahilum depression (fig. 595A), germ pore absent or indistinct; basidia 4-spored; cheilocystidia of two types: A: 15-50 × 7-20 μm, utriform to narrowly utriform, scattered to numerous, B: clavate to subcylindrical, scattered; veil cells 10-70 × 4-18 μm, often brown incrustated. Often in late spring or summer; occasional, but probably overlooked in western temp., rare in eastern temp. and hemib.-bore.; DK (LC), FI (DD, PH: Virrat), NO (LC), SE (LC). – B&K 4:360, Bol Bres 43:35, Lud 98.11, M&J 10, Ves 300.
P. typhae (Kalchbr.) A. Pearson & Dennis
5. Gill edge and cystidia covered with drops staining green in a solution of ammonia 6
 - Gill edge and cystidia not covered with drops staining green in a solution of ammonia 7
6. Sp on av 6.1-6.6 μm broad; veil copious see *P. jacobssonii* key A 4
 - Sp on av 4.8-5.3 μm broad; veil present only in young states as simple fibres close to margin. Cap 5-35 mm, convex to plane, brown, often grey towards margin, hygrophanous, striate almost to centre, in the field often dry and then whitish to pale grey yellow; gills medium spaced, L = 18-42, rarely with red pigmented edge; stem 20-70 × 0.5-2 mm, with a pseudo-rhiza up to 20(-50) mm; smell when collected strong or faint, but then gradually becoming strongly nauseous reminding of *Coprinopsis narcoticus* or *C. trisporus*. Sp 9-12.5 × 4.5-6 μm, Qav = 1.9-2.1, narrowly ovoid, oblong, subcylindrical, in profile sometimes narrowly amygdaloid (fig. 595B), reddish brown, with a distinct germ pore; pleurocystidia 30-65 × 10-16 μm, lageniform, with narrow, acute, rarely bent neck, scattered, rarely numerous; cheilocystidia of two types: A: 30-50(-65) × 7-14 μm, similar to pleurocystidia, numerous, B: small, clavate, variable in frequency. Growing in rich deciduous forests, rarely mixed with coniferous trees, in shrubs, with preference for calcareous soils, on sand or clay, dry or moist, on wood or attached to buried wood; autumn; rare in temp., very rare in hemib.; DK (LC), SE (LC). – Lud 98.18, M&J 13, Myc 2:171, OPN 12A.
P. narcotica Kits van Wav.
7. On dung 8
 - Not on dung 11

8. Clamps absent; cap when young dark reddish brown with a purple tinge. Cap 3-15 mm, convex, when mature fading to rust brown, reddish yellow to hazel brown, hygrophanous, when moist striate, drying reddish yellow, pale brown; veil when young as flocci on entire cap, appendiculate at margin, evanescent; gills distant, L = 10-16, with white fimbriate edge; stem 10-25 x 0.5-1.5 mm, pale brown, darker towards base. Sp 9-11.5 x 5-6 μm , Qav = 1.8-1.9 μm , oblong, rarely ovoid, obovoid, citriform to subfusiform, in profile sometimes with a suprahilar depression, rarely amygdaloid, reddish brown, with distinct germ pore; pleurocystidia 30-65 x 8-18 μm , narrowly utriform to lageniform, rarely with flexuous walls or forked apex (fig. 595C), pale, scattered to rather numerous; cheilocystidia of two types: B: 25-65 x 6-20 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered to numerous; veil cells 10-80 x 5-26 μm . On cow and horse dung in pastures and forest margins; summer to autumn; probably overlooked, occasional in eastern temp., rare in hemib.; FI, SE. – Lud 98.13 (as *pratensis*).
P. purpureobadia Arnolds
- Clamps present; cap without a purple tinge when young 9
9. Cap when young floccose to centre from veil; pleurocystidia lageniform to fusiform (fig. 595D). Cap 5-30 mm, convex, at first dark reddish brown, then brown to yellow brown, hygrophanous, striate when moist, drying pale ochraceous or pale brown; gills broadly adnate, medium spaced, L = 14-26; stem 20-45 x 1-2 mm, lower part with flocci. Sp 10-13 x 5.5-7 μm , Qav = 1.6-1.9, oblong to narrowly ovoid, rarely ellipsoid, in profile sometimes narrowly amygdaloid or with a slight suprahilar depression, reddish brown; pleurocystidia 30-60 x 10-16 μm , lageniform, fusiform, sometimes acute, rarely subcapitate or bent, scattered to numerous; cheilocystidia of two types: A: 25-50 x 7-14 μm , similar to pleurocystidia, numerous, B: small, clavate, numerous close to cap margin and scattered for the rest; veil cells 40-250 x 4-32 μm . On dung of horse and cow, rarely on manured soil; spring to autumn; occasional in temp., rare in hemib., very rare in bore.-suba.; DK (LC), FI (DD), FO, NO (LC), SE (LC). – Bon 267, FAD 152F, Lud 98.16, ZM 58:80bis.
P. hirta Peck (*Psathyra coprobia* J.E. Lange)
- Cap when young with fibrils rarely with flocci close to margin; pleurocystidia narrowly utriform to lageniform (figs 589F, 595E) 10
10. Sp on av 11.7-13.8 x 6.4-7.3 μm ; L = 16-23 see *P. saponacea* key A 6
- Sp on av 10.6-11.7 x 5.3-6.2 μm ; L = 6-13. Cap 2-10 mm, convex, when young dark reddish brown, reddish brown, becoming dark brown to grey brown, hygrophanous, striate to centre, veil at margin as fibrils or rarely as flocci, fugacious; gills broadly adnate, distant; stem 10-40 x 0.3-1.5 mm. Sp Qav = 1.7-2, oblong, ovoid, subcylindrical, rarely citriform, sometimes irregular in outline, in profile sometimes narrowly amygdaloid or with a suprahilar depression, rarely subphaseoliform, reddish brown, with central or rarely eccentric germ pore; pleurocystidia 25-60 x 8-16 μm , narrowly utriform, lageniform, sometimes widened or subcapitate (fig. 595E), scattered to rather numerous; cheilocystidia of two types: A: 20-50 x 6-14 μm , similar to pleurocystidia, scattered to numerous, B: small, \pm clavate, scattered to numerous; veil cells 15-100 x 4-16 μm . In pastures on rotten straw, on mixtures of straw and dung or directly on dung of horse, more seldom cow, once on a burnt spot; autumn; rare in eastern temp., very rare in western temp. and hemib.-suba.; DK (DD), IS (Su), NO (LC), SE (NE). – Arnolds pl. 8d, FND 26:7B, Lud 98.80.
P. romagnesii Kits van Wav. (*P. waverenii* Arnolds)
11. In open land, in wet or moist places on herbaceous plant remnants of *Cirsium*, *Epilobium*, *Phragmites* and *Typha* see *P. almerensis* key C 13
- Habitat dry to moist, on wood, among mosses, on dung, etc. 12
12. Pleurocystidia (narrowly) utriform to lageniform, often obtuse 13
- Pleurocystidia lageniform to conical, often acute 18

13. L = 6-13; cap 2-10 mm see *P. romagnesii* 10
 - L > 13; cap > 10 mm 14
14. Gill edge red; with pseudorrhiza; habitus like *P. corrugis* see *P. pseudogracilis* key A 7
 - Gill edge not red; without pseudorrhiza; habitus not like *P. corrugis* 15
15. Sp on av > 11 μm long; clamps absent; cap 15-25 mm see *P. vinosofulva* key A 8
 - Sp on av < 11 μm long; clamps present; cap 15-90 mm 16
16. Veil breaking up as scales on cap and membranous ring on stem, discolouring to dark brown; smell sweetish; sp without germ pore; often on logs and stumps of *Picea* and *Pinus* see *P. caput-medusae* key C 30
 - Veil breaking up as fibrils on cap and stem, not discolouring to dark brown; smell not sweetish; sp with germ pore; not on logs or stumps of *Picea* and *Pinus* 17
17. Gills reddish brown; usually caespitose, in fascicles of 50-100 frb; veil silky fibrillose, at first covering entire surface; pileipellis a cutis see *P. pannucioides* key C 32
 - Gills grey; not in large fascicles; veil as fibres or flocci at cap margin; pileipellis a hymeniderm see *P. fusca* key C 36
18. L = 6-13; cap 2-10 mm see *P. romagnesii* 10
 - L > 13; cap often > 10 mm 19
19. Veil when young as flocci on entire cap; gill edge not red pigmented see *P. hirta* 9
 - Veil when young not as flocci or fibrils on entire cap; gill edge sometimes red pigmented 20
20. Veil when young as fibrils, often lacking; red pigmented gill edge often broken by non-pigmented areas; moist mature cap rather pale see *P. corrugis* key A 16
 - Veil when young as flocci or fibrils; red pigmented gill edge not broken by non-pigmented areas; moist mature cap \pm brown 21
21. Cap 25-70 mm; in *Fagus* forests see *P. fagetophila* key C 23
 - Cap 4-45 mm; rarely in *Fagus* forests 22
22. On litter or on sand between mosses such as *Dicranum scoparium*, *Pohlia nutans* and *Campylopus flexuosus* in woods of *Quercus* on nutrient and humus poor sandy soils, in *Calluna* heathland with *Agrostis capillaris*, *Campanula rotundifolia*, *Corynephorus canescens*, *Plantago lanceolata* and *Rumex acetosella*. Cap 15-45 mm, obtusely conical to convex, when young dark reddish brown, when mature orange brown to yellow brown, striate 2/3 to centre, hygrophanous, drying pale brown, often with pink or ochraceous brown tinges at centre, veil as fibres or flocci halfway towards centre; gills medium spaced, L = 20-35; gill edge white flocculose, sometimes red pigmented, especially towards cap margin; stem 20-90 x 2-5 mm, rather stiff. Sp 10-12 x 5-6.5 μm , Qav = 1.7-2, oblong, subcylindrical, narrowly ovoid, in profile sometimes narrowly amygdaloid, reddish brown; pleurocystidia 35-70 x 9-16 μm , narrowly lageniform, conical or fusiform, sometimes bent or subcapitate, flexuous (fig. 595F), scattered to numerous; cheilocystidia of two types: A: 25-50 x 8-14 μm , similar in shape and frequency to the pleurocystidia, B: small, clavate, numerous; veil cells 15-80 x 4-15 μm . Spring to autumn; rare in eastern temp., very rare in western temp. and southern hemib.; DK (DD), SE (LC). – Arnolds pl. 5A, Lud 98.74.
P. dicrani (A.E. Jansen) Kits van Wav.
 - Not on litter or on sand between mosses, etc., but attached to buried twigs or sticks, on sawdust, wood chips, herb-rich soil, on path sides, etc. 23
23. Stem without pseudorrhiza; sp on av 10.1-11.4 x 5.1-6 μm ; small clavate cheilocystidia often 5-10 cells deep close to cap margin; habitus like *P. prona*. Cap 4-18 mm, convex, when young rather dark brown, at maturity fading to brown, faintly to distinctly striate, hygrophanous, drying pale brown with or without pink tinges; veil when young with dispersed white

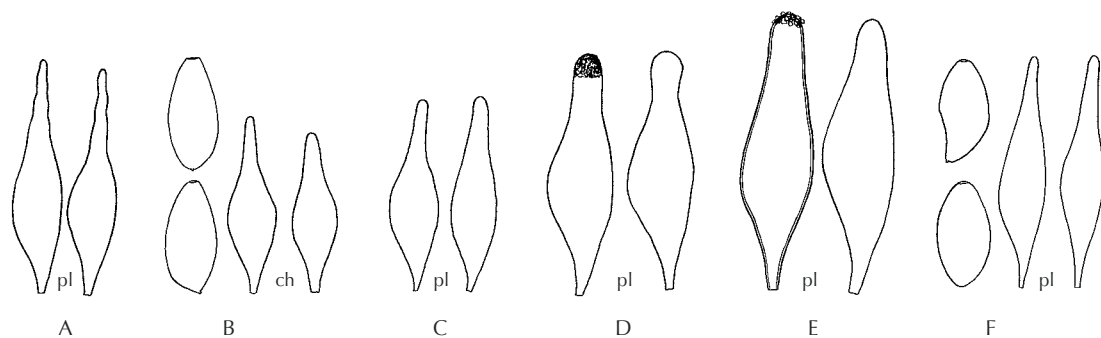
floccules or fibres, denticulate at cap margin, evanescent; gills distant, L = 15-22, with white pruinose edge, sometimes red pigmented; stem 15-50 x 0.8-1.5 mm. Sp 9.5-12.5 x 5-6.5 μm , Qav = 1.8-2.1, oblong, subcylindrical, narrowly ovoid, in profile \pm narrowly amygdaloid, reddish brown; pleurocystidia 30-80 x 8-16 μm , narrowly lageniform, conical or fusiform, often acute (fig. 595G), scattered to rather numerous; cheilocystidia of two types: A: 25-50 x 7-14 μm , similar to pleurocystidia, scattered, sometimes numerous, absent near margin, B: small, clavate to obpyriform, numerous, rarely scattered; veil cells 30-70 x 2-12 μm . Solitary or scattered in moist or dry rich deciduous woods or parks, often on path sides; summer to autumn; very rare in eastern temp. and eastern hemib.; SE (LC). – Lud 98.77.

P. orbitarum (Romagn.) M.M. Moser (*P. prona* (Fr.) Gillet f. *orbitarum* (Romagn.) Kits van Wav.)

- Stem sometimes with a pseudorrhiza; sp on av 10.6-13.3 x 5.6-6.8 μm ; small clavate cheilocystidia not 5-10 cells deep close to cap margin; habitus hardly like in *P. prona*, but expanded-convex 24
- 24. Cap 10-40 mm, sometimes pink when drying; L = 20-36; the red pigmented gill edge moderately pigmented see *P. microrrhiza* key A 17
- Cap 4-25 mm, not pink when drying; L = 16-22; the red pigmented gill edge often faint when present see *P. orbicularis* key A 17

Key C: Sp on av 9-10.5 μm long

1. On dung 2
 - Not on dung 4
2. Pleurocystidia often narrowly utriform; clamps absent see *P. purpureobadia* key B 8
 - Pleurocystidia often lageniform; clamps present 3
3. Sp on av 5.9-6.6 μm broad; cystidia moderately acute see *P. hirta* key B 9
 - Sp on av 4.7-5.5 μm broad; cystidia pronouncedly acute (fig. 599A). Cap 5-20 mm, convex, reddish brown, reddish yellow, when mature fading to brown, hygrophanous, striate up to halfway from margin, drying pale brown, veil as floccules to centre, at margin appendiculate; gills distant to medium spaced, L = 11-25; stem 20-60 x 1-2.5 mm. Sp 8.5-10.5 x 4.5-5.5 μm , Qav = 1.8-2, oblong, subcylindrical, sometimes narrowly ovoid, in profile sometimes narrowly amygdaloid, reddish brown; pleurocystidia 30-60 x 7-16 μm , narrowly fusiform, lageniform, sometimes flexuous or with yellow thickened wall, rarely bent or provided with crystals or incrustations, numerous; cheilocystidia of two types: A: 20-45 x 7-16 μm , similar in shape and frequency to pleurocystidia, B: small, clavate, scattered; edge rarely pigmented; veil cells 30-300 x 5-35 μm . On dung of horse, cow, elk and badger; late summer to early autumn; very rare in temp. and the eastern parts of bore.; FI (PH: Toivakka), SE.
P. scatophila Örstadius & E. Larss.
4. Pleurocystidia absent 5
 - Pleurocystidia present 7
5. Sp on av 5.9-6.8 μm broad, yellow; habitat wet see *P. typhae* key B 4
 - Sp on av 4.4-5.5 μm broad, reddish brown; habitat dry to moist 6
6. Veil covering the entire cap surface with fibrils or floccules, appendiculate at margin; clamps present; veil cells 30-180 x 4-24 μm . Cap 8-25 mm, conical-convex, brown, striate up to halfway from margin, hygrophanous, drying pale brown or dirty yellow; gills adnate, narrow, medium spaced, L = 26-32, with white edge; stem 30-55 x 1-2.5 mm. Sp 8-11 x 4.5-6 μm , Qav = 1.7-2, oblong, subcylindrical, ellipsoid, narrowly ovoid or subfusiform, in profile narrowly amygdaloid with a suprahilar depression or phaseoliform (fig. 599B), reddish brown, with distinct germ pore; cheilocystidia of two types: A: 25-50 x 8-16 μm , narrowly lageniform to conical, sometimes rostrate, pale, numerous, B: clavate to ellipsoid, 8-14 μm wide, scattered.



Spores, pleurocystidia and cheilocystidia : A: *Psathyrella scatophila*, B: *P. canoiceps*, C: *P. effibulata*, D: *P. lutensis*, E: *P. olympiana*, F: *P. flexispora*.

On rich soil with deciduous trees, *Alnus*, *Betula*, *Corylus*, *Fagus*, *Fraxinus* and *Quercus*, with preference for calcareous soil, sometimes attached to decayed wood, in moist, rarely dry places; summer to autumn; rare in temp., very rare in hemib. and suba.; DK (LC), IS (Ve), NO (NE), SE (LC). – B&K 4:323, FAD 151C, E (as *Psathyra pennata* and *P. gordonii* f. *minor*), Lud 98.30, M&J 14, ZM 66:5.

P. canoiceps (Kauffman) A.H. Sm.

- Veil as scattered white fibrils or flocci, especially close to the cap margin; clamps absent; veil cells $10\text{--}60 \times 2\text{--}8 \mu\text{m}$. Cap 5-20 mm, convex to plane, at first dark reddish brown, then cinnamon brown with paler margin, at maturity fading to brown, grey brown or ochraceous brown, when moist striate almost to centre, hygrophanous, drying pale ochre or cream, not pink; gills distant to medium spaced, L = 11-28, edge sometimes red pigmented; stem 15-45 \times 0.5-1.5 mm. Sp 8-11 \times 4-5.5 μm , Qav = 1.6-2, oblong, subcylindrical, narrowly ovoid, in profile sometimes narrowly amygdaloid, reddish brown; pleurocystidia 25-50 \times 8-16 μm , narrowly fusiform, lageniform, subutriform or clavate, sometimes rostrate or forked (fig. 599C), scattered or absent; cheilocystidia of two types: A: 15-45(-55) \times 6-16(-20) μm , similar to pleurocystidia, numerous, B: small, clavate to obpyriform, scattered. On soil or attached to buried wood, in ruderal places, fields, parks, or shrubberies, *Urtica* often present suggesting preference for nutrient rich places; spring to early autumn; rare in eastern temp., very rare in bore.; SE (LC). – End 407, Lud 98.83.

P. effibulata Örstadius & E. Ludw.

7. Gill edge and cystidia covered with drops staining green in a solution of ammonia 8
- Gill edge and cystidia not covered with drops staining green in a solution of ammonia 9
8. Smell nauseous or becoming strongly nauseous, reminding of *Coprinopsis narcoticus*; pleurocystidia acute; stem with a pseudorrhiza see *P. narcotica* key B 6
- Smell not nauseous like *C. narcoticus*; pleurocystidia obtuse; stem without a pseudorrhiza. Cap 10-50 mm, convex, when very young dark reddish brown, then dark brown to reddish brown, when mature fading to yellowish brown, when moist striate almost to centre, hygrophanous, drying pale brown or whitish, veil as fibres or flocci more than halfway towards centre; gills medium spaced, L = 18-35; stem 30-80 \times 1.5-6 mm. Sp 8-11 \times 4.5-6 μm , Qav 1.8-2, oblong, subcylindrical, ovoid, in profile sometimes amygdaloid, rarely subphaseoliform or with a suprahilar depression, reddish brown; pleurocystidia 35-70 \times 10-20 μm , utriform, lageniform, obtusely fusiform (fig. 599D), numerous to scattered; cheilocystidia of two types: A: 30-70 \times 8-20 μm , similar to pleurocystidia, numerous or rarely scattered, B: small, clavate, often scattered; veil cells 20-100 \times 4-14 μm . On muddy or loamy soil, on sticks or twigs, sometimes attached to buried wood, on moss, often in damp places in deciduous forests, rarely mixed with coniferous trees, on paths, by brooks, at lake shores and in cart

when drying often bicoloured with brown-orange centre and darker marginal zone, striate when moist, veil denticulate at margin or as fibres or flocci near margin; gills distant to medium spaced, L = 14-30; stem 15-40 x 1-3 mm. Sp 8.5-11.5 x 4.5-6 μm , $Q_{av} = 1.8-2.1$, oblong, subcylindrical, in profile rarely amygdaloid, subphaseoliform (fig. 599F), reddish brown; pleurocystidia 35-65 x 8-14 μm , narrowly conical, fusiform or lageniform, sometimes flexuous or bent at apex, with slightly yellow walls, numerous; cheilocystidia of two types: A: 25-40 x 8-14 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered; veil cells 15-80 x 3-14 μm . In sand dunes amongst *Ammophila*, *Carex arenaria* or *Festuca*, on acid sandy soil with *Calluna vulgaris*, *Corynephorus canescens* and *Polytrichum piliferum*, also found on woody remnants and among *Pinus* needles; late summer to autumn; very rare in temp.-hemib.; DK (DD), SE (LC). – Lud 98.76.

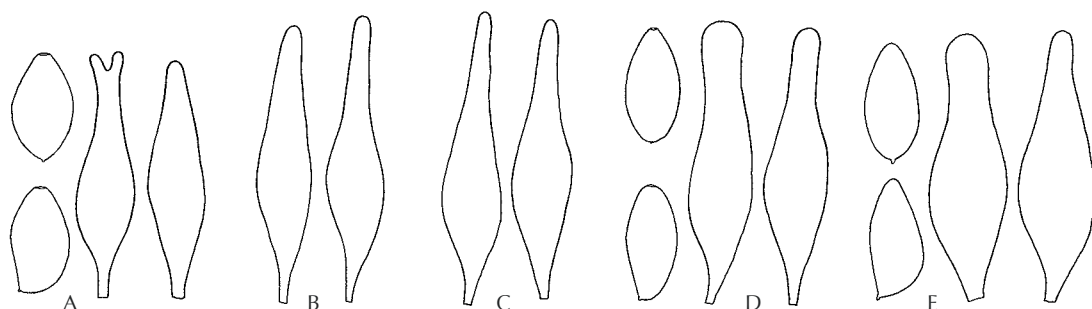
P. flexispora T.J. Wallace & P.D. Orton

- Sp on av 5.4-6.2 μm broad, not with suprahilar depression or subfusiform; cap 15-45 mm see *P. dicrani* key B 22
- 18. Cap 25-70 mm; L = 26-40; in *Fagus* forests see *P. fagetophila* 23
- Cap 4-30 mm; L = 15-26; on manured soil, in rich deciduous woods or in parks 19
- 19. Sp on av 5.1-6 μm broad; in rich deciduous woods or in parks; veil cells 30-70 x 2-12 μm see *P. orbitarum* key B 23
- Sp on av 5.9-6.6 μm broad; on manured soil; veil cells 40-250 x 4-32 μm see *P. hirta* key B 9
- 20. Clamps absent 21
- Clamps present 22
- 21. Nitrophilous; sp on av 4.4-5.3 μm broad, not subfusiform; gill edge sometimes red pigmented see *P. effibulata* 6
- Lignicolous; sp on av 5.5-5.9 μm broad, sometimes subfusiform; gill edge not red pigmented. Cap 8-25 mm, convex, dark reddish brown, when mature dark brown, strong brown, yellowish red, striate up to 2/3 from margin, hygrophanous, drying ochraceous brown or cream, veil whitish to cream, strongly developed as a fibrillose-woolly covering close to the margin, sometimes reminding of *Tubaria conspersa*, appendiculate, also as single fibres or floccules towards centre; gills crowded, L = 27-35; stem 25-90 x 2-4 mm; smell not distinctive or like aniseed, reminding of *Clitocybe fragrans*. Sp 8.5-10.5 x 5-6 μm , $Q_{av} = 1.6-1.7$, ovoid, subfusiform, oblong, ellipsoid, in profile sometimes amygdaloid or with a slight suprahilar depression (fig. 603A), brownish orange, with indistinct germ pore; pleurocystidia 40-70 x 10-16 μm , narrowly utriform, fusiform, lageniform, subcylindrical, often forked, numerous; cheilocystidia of two types: A: 30-60 x 8-18 μm , similar to pleurocystidia but less commonly forked, very numerous; B: small, clavate, scattered; veil cells 20-100 x 2-16 μm . On rotten stumps or cavities of *Fagus* in rich forests; autumn; very rare in eastern temp. and southern hemib.; SE. – Agar 27:81.
- P. romellii* Örstadius
- 22. On acid sandy soil, sometimes attached to woody debris, not on trunks, stumps or among leaves in forests see *P. flexispora* 17
- On trunks or stumps or among leaves in forests, rarely attached to debris on acid sandy soil 23
- 23. In *Fagus* forests; gill edge sometimes red pigmented; veil rather scanty, when young present in a few mm narrow zone at cap margin and as scattered flocci or fibres halfway up. Cap 25-70 mm, convex, when young reddish brown, then rather dark brown, translucently striate up to 2/3 from margin, hygrophanous, fading on drying pale ochraceous, cream or alutaceous; gills crowded, L = 26-40; stem 30-120 x 3-11 mm, often with a fugacious fibrillose zone at lower part. Sp 8.5-12 x 4.5-6.5 μm , $Q_{av} = 1.7-1.9$, oblong, subcylindrical, ellipsoid, in profile narrowly amygdaloid, with a slight suprahilar depression or subphaseoliform, reddish brown; pleurocystidia 40-70 x 10-18 μm , obtusely fusiform to lageniform, some-

times rostrate or forked (fig. 603B), scattered to numerous; cheilocystidia of two types: A: 25-50 x 8-16 μm , similar to pleurocystidia, numerous, rarely scattered, B: small, clavate to vesiculose, numerous, close to margin sometimes several cells deep; veil cells 10-100 x 2-10 μm . Among leaves or attached to fallen branches, on humus rich soil, often late in season; common in eastern temp., occasional in western temp. and hemib.; DK (LC), SE (LC). – B&K 4:338 (as *murcida*), End 407, FND 26:6B, FAD 154C (as *Psathyra fusca*), Lud 98.82.

P. fagetophila Örstadius & Enderle (*P. murcida* (Fr.) Kits van Wav. s. auct.)

- In deciduous or coniferous forests; gill edge not red pigmented; veil when young scanty to copious 24
- 24. Veil scanty, when young as fibres or scattered floccules close to cap margin, soon disappearing; small clavate to obpyriform cheilocystidia numerous, especially towards cap margin, sometimes mucronate see *P. obtusata* key J 9
 - Veil copious, when young as fibrils, floccules or scales, sometimes to cap centre, persistent or evanescent; small clavate to obpyriform cheilocystidia scattered to numerous hardly increasing in number towards cap margin, not mucronate 25
- 25. Sp without or with an indistinct germ pore; L = 32-60; pleurocystidia often bent or forked; sp pale, often slightly irregular in outline see *P. rostellata* key J 16
 - Sp with a distinct germ pore; L = 22-38; pleurocystidia rarely bent or forked; sp moderately dark, hardly irregular in outline 26
- 26. Pleurocystidial walls below apex often yellow and thickened in a solution of ammonia; in coniferous and deciduous forests, with *Betula*, *Fagus*, *Picea*, *Pinus* and *Quercus*, on sticks and debris, on rotten wood, in leaves, in moss, with preference for acid soils see *P. fibrillosa* key J 18
 - Pleurocystidial walls below apex not yellow and thickened in a solution of ammonia; in rich deciduous forests especially of *Fagus*, on soil, among leaves or mosses or attached to wood. Cap 15-45 mm, convex to plane, dark reddish brown, when mature ochraceous brown to brown, faintly to distinctly striate to 2/3 from margin, hygrophanous, drying pink or pale ochre, veil when young as flocci towards centre, appendiculate at margin; gills medium spaced, L = 22-34; stem 30-80 x 2-5 mm. Sp 8-10.5 x 4.5-5.5 μm , Qav = 1.8-2.1, oblong, subcylindrical, narrowly ovoid, obovoid, subfusiform, in profile sometimes with a suprahilar depression or phaseoliform, rarely narrowly amygdaloid, reddish brown; pleurocystidia 35-70 x 9-18 μm , narrowly lageniform, fusiform or conical, sometimes acute, rarely bent or subcapitate, flexuous (fig. 603C), numerous or scattered; cheilocystidia of two types: A: 25-60 x 8-15 μm , similar to pleurocystidia, numerous, B: small, clavate to spheropedunculate, scattered to numerous; veil cells 30-150 x 4-25 μm . Summer to autumn; common in eastern temp., rare in western temp.; DK (DD), SE (LC). – Bon 267, Cet 2203, End 408, Lud 98.57, M&J 17.
P. impexa (Romagn.) Bon
- 27. Dominating type of cheilocystidia similar to pleurocystidia 28
 - Dominating type of cheilocystidia small, clavate to spheropedunculate 37
- 28. Clamps absent 29
 - Clamps present 30
- 29. Cap when moist dark reddish brown; pleurocystidia often forked; sp subfusiform see *P. romellii* 21
 - Cap when moist ochraceous yellow to pale buff; pleurocystidia hardly forked; sp not subfusiform. Cap 10-35 mm, convex to plane, not or only faintly striate, hygrophanous, drying from margin to greyish white or white, veil copious, as scales, flocci or fibres to centre, appendiculate at margin; gills medium spaced, L = 28-34; stem 30-80 x 2-6 mm, entirely floccose below, sometimes with a ring zone; smell faint, pleasant or sweetish. Sp 8-11.5 x 4.5-6 μm , Qav = 1.7-2.2, oblong, ovoid, subcylindrical, sometimes irregular in outline or conspicuously obtuse at base, in profile sometimes amygdaloid or with a slight suprahilar



Spores and pleurocystidia: A: *Psathyrella romellii*, B: *P. fagetophila*, C: *P. impexa*, D: *P. gordonii*, E: *P. caput-medusae*.

depression (fig. 603D), reddish brown; pleurocystidia 35-75 × 8-18 μm, mostly narrowly to broadly utriform, also lageniform, fusiform or subcylindrical, often flexuous, rather numerous; cheilocystidia of two types: A: 25-60 × 7-14 μm, similar to pleurocystidia, numerous, B: small, clavate, scattered to numerous; veil cells 25-150 × 5-24 μm; pseudoclamps rarely seen on stem hyphae. In deciduous forests, in shrubberies, in grasslands, on debris of wood or directly on soil, dry to moist, probably with preference for calcareous soil; summer to autumn; rare in eastern temp., very rare in hemib.-bore.; FI (PS: Virtasalmi), SE (LC). – End 420, Lud 98.69, M&J 21, Myc 15(4):157.

P. gordonii (Berk. & Broome) A. Pearson & Dennis (*P. vestita* (Peck) A.H. Sm., *P. pervelata* Kits van Wav.)

30. Veil discolouring to dark brown; smell sweetish; often caespitose to gregarious on wood of *Picea* and *Pinus*, rarely *Betula* and *Fagus*. Cap 15-90 mm, convex, at first dark brown, then ochraceous brown or grey brown, faintly striate and hygrophanous, drying buff or pale brown, in young stages covered with a white or rarely brown pigmented veil later breaking up as scales and then often discoloured to dark brown; gills medium spaced; stem 50-100 × 5-12 mm, whitish, often with a membranous ring in upper part, below ring with white scales often discolouring to brown. Sp 8.5-11(-12.5) × 4.5-5.5(-6.5) μm, $Q_{av} = 1.9-2.1$, fusiform, subcylindrical, narrowly ovoid or oblong, in profile narrowly amygdaloid, with a suprahilar depression, with a large conspicuous apiculus (fig. 603E), brown, without germ pore; pleurocystidia 40-70 × 12-26 μm, utriform, fusiform, lageniform, cylindrical or clavate, rarely rostrate, sometimes with flexuous or yellow pigmented walls, scattered to rather numerous; cheilocystidia of two types: A: 40-70 × 8-24 μm, similar to pleurocystidia, numerous, B: small, clavate, scattered or absent; edge sometimes yellow pigmented; veil cells 30-140 × 4-30 μm. On logs and stumps; late summer to autumn; occasional in western hemib., western bore., rare in temp., eastern hemib., eastern bore.; DK (CR), FI (LC), NO (LC), SE (LC). – Dah 576, End 403, FAD 143G (as *Stropharia* c.), Jordstj 13(3), Lud 98.1.

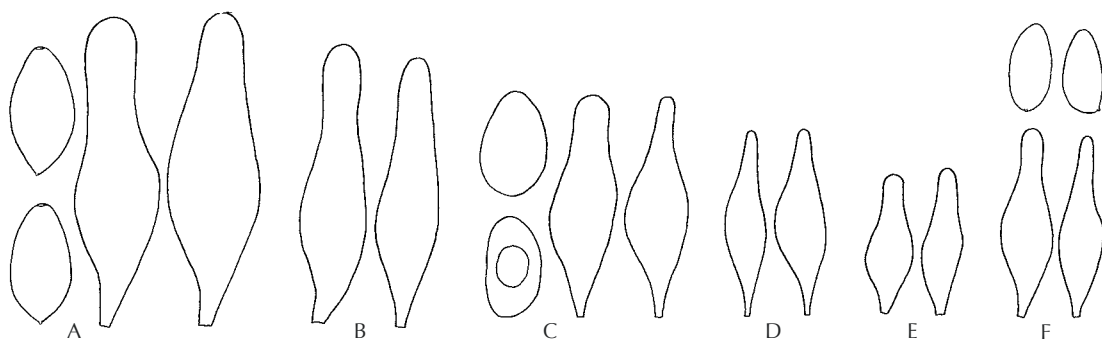
P. caput-medusae (Fr.) Konrad & Maubl.

- Veil not discolouring to dark brown; smell strong to absent, not sweetish; hardly caespitose to gregarious on wood of *Picea* and *Pinus* 31
- 31. On *Sphagnum* or other wet mosses in forests of conifers or *Betula*; stem often with a membranous ring see *P. sphagnicola* key K 19
- Not on *Sphagnum* or other wet mosses in forests of conifers or *Betula*; stem without a membranous ring 32
- 32. Cap entirely silky fibrillose from veil remnants when fresh; pileipellis a cutis; usually caespitose, in fascicles of up to 50-100 frb; cap umbonate. Cap 15-40 mm, often becoming convex to almost plane, when young brown, then pale greyish brown or pale yellowish

brown, darkest towards centre, not or faintly striate, hygrophanous, drying pale brown or pale yellow; gills crowded, L = 25-42; stem 30-60 x 2-6 mm. Sp 9-11.5 x 5-6.5 μm , Qav = 1.7-1.9, subfusiform, ovoid, oblong, in profile amygdaloid to subcitriform (fig. 605A), brown; pleurocystidia 35-90 x 12-24 μm , mostly utriform, also lageniform, clavate, obtusely conical or fusiform, numerous or rarely scattered; cheilocystidia of two types: A: 30-80 x 11-25 μm , similar in shape and frequency to pleurocystidia, B: small, clavate, in a variable number; veil cells 30-200 x 6-22 μm . In forests, on logs or stumps or living trunks of deciduous trees or attached to buried wood, also directly on loamy, base-rich soil, sometimes calcareous, in park lawns, dry to moist; all year; rare in temp.-hemib.; DK (EN), FI (DD), NO (LC), SE (LC). – FAD 200H (as *Hypholoma pannuicioides*), Lud 98.24, OPN 12B.

P. pannuicioides (J.E. Lange) M.M. Moser

- Cap not entirely silky fibrillose from veil remnants when fresh; pileipellis a hymeniderm to a paraderm; gregarious or caespitose, in fascicles of up to 10 frb; cap umbonate or not 33
- 33. Veil granulose, with subglobose to ellipsoid cells. Cap 5-25 mm, low convex, when young white, mature very pale brown with pinkish shades, not striate; veil in primordia of thick, conical to pyramidal white spines, when mature typically lacking spines but covered overall with granulose to sacchariferous remains, being easily removed when touched; gills free to almost free, distant, L = c. 15, white to beige, becoming dark brown, with a white edge; stem 30-80 x 0.5-1.5 mm, cylindrical with a small basal bulb, white, entirely floccose to fibrillose; smell and taste absent. Sp 8.5-11 x 4.5-5.5 μm , Qav = 1.9, ovoid, in profile sometimes amygdaloid, subcitriform to subphaseoliform, brownish orange, germ pore indistinct or absent; pleurocystidia 35-50(-60) x 10-15 μm , narrowly utriform to lageniform, sometimes with slightly yellow pigmented walls, rather numerous; cheilocystidia 20-40 x 8-14 μm , similar to the pleurocystidia, numerous; veil cells 15-30 μm wide, pale, sometimes in chains; clamps seen at stem hyphae. Solitary to gregarious, a single record from the Nordic countries in an open pasture on remnants of *Deschampsia*, 200 m below the *Betula* tree-line, outside the area in a manured garden, on soil among grass; autumn; very rare in bore., only known from NO (Troms: Kvalvikdalen).
P. albofloccosa Arenal, M. Villarreal & Esteve-Rav.
- Veil fibrillose to flocculose, with hyphae 34
- 34. Veil as fibrils or flocci up to halfway from cap margin see *P. olympiana* 12
- Veil as fibrils or flocci close to cap margin 35
- 35. Cap 7-30 mm; pleurocystidia 20-60 μm long; L = 20-30 see *P. panaeoloides* key K 12
- Cap 20-90 mm; pleurocystidia 35-85 μm long; L = 30-60 36
- 36. Sp on av 8-9.6 x 4.7-5.8 μm , in profile phaseoliform, rather pale; gills reddish brown; in deciduous or coniferous forests see *P. larga* key K 15
- Sp on av 9.4-10.9 x 5.3-6.2 μm , in profile amygdaloid or with a slight suprahilar depression, dark; gills grey; in wooded pastures or in rich deciduous woods. Cap 20-75 mm, conical-convex to plane, dark reddish brown, soon fading to brown or yellowish, when moist striate halfway from margin, hygrophanous, drying ochraceous or very pale brown, but typically the reddish brown or yellow-brown colour remains for a long time at margin or to a less degree at centre, veil as fibres or flocci at the margin; gills crowded, L = 34-62; stem 40-100 x 2-10 mm, white, pulverulent striate from top and downwards but decreasing in intensity and ceasing at lower half of stem, where veil remnants can leave a fibrillose zone. Sp 9-11.5(-13.5) x 5-6.5 μm , Qav = 1.6-1.9, oblong, ovoid, obovoid, ellipsoid, subhexagonal, subpentagonal or subcylindrical, reddish brown; pleurocystidia 35-80 x 10-22 μm , utriform to lageniform (fig. 605B), numerous; cheilocystidia of two types: A: 25-70 x 7-18 μm , similar in shape and frequency to pleurocystidia, B: small, clavate, scattered, rarely numerous; gill edge often covered with drops not staining green in a solution of ammonia; veil cells 20-70 x



Spores and pleurocystidia: A: *Psathyrella pannucioides*, B: *P. fusca*, C: *P. clivensis*, D: *P. fimiseda*, E: *P. sphaerocystis*, F: *P. merdicola*.

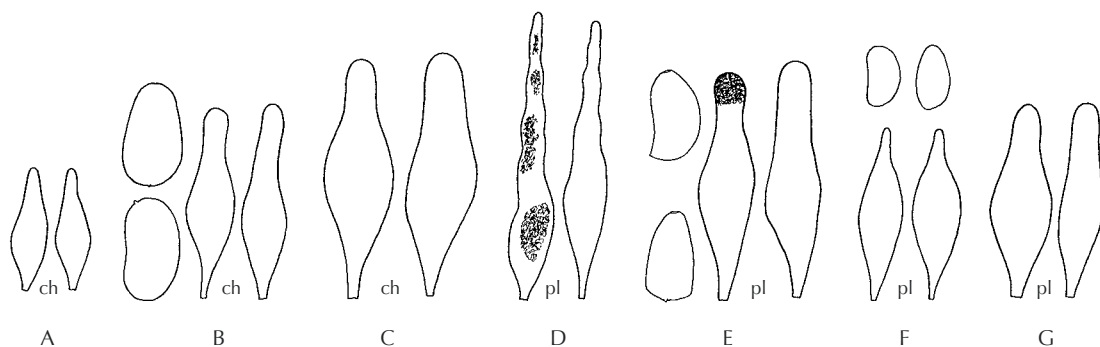
2-8 μm . Solitary to gregarious, on soil or debris incl. wood-chips in wooded pastures, in rich deciduous woods and in parks, often in calcareous areas, sometimes nitrophilous; spring to autumn; common in temp., rare in hemib.; DK (LC), FI, NO (LC), SE (LC). – B&K 4:359, BKPM 9:73, BSMF 116:362 (opposite), Lud 98.71, M&J 15.

P. fusca (Schumach.) A. Pearson (*P. tephrophylla* (Romagn.) Bon)

37. Cap 30-90 mm; pleurocystidia 40-85 \times 10-24 μm ; basidia or other cells in hymenium with brown intracellular pigmentation; in deciduous or coniferous forests see *P. larga* key K 15
- Cap 10-50(-70) mm; pleurocystidia 30-65 \times 8-20 μm ; basidia and other cells in hymenium without brown intracellular pigmentation; in open grassland, in deciduous forests, occasionally in coniferous forests 38
38. Small clavate to obpyriform cheilocystidia sometimes mucronate; in forests on decayed wood or on mossy logs, rarely directly on soil see *P. obtusata* key J 9
- Small clavate to obpyriform cheilocystidia not mucronate; in open grassland, in forests on soil or attached to buried sticks or twigs 39
39. Sp on av 5.2-6 μm broad, germ pore absent to indistinct; in dry open grassland, along paths in forests or in inner parts of sand dunes. Cap 10-40 mm, convex to plane, at first rather dark reddish brown, but soon dark brown to ochraceous brown, hygrophanous, faintly translucently striate halfway from margin, often drying ochraceous at centre and pale grey brown towards margin, veil as white fibres or rarely flocci close to the margin; gills medium spaced, L = 20-40; stem 25-70 \times 2-5 mm. Sp 8-11 \times 5-6.5 μm , Qav = 1.5-1.8, oblong, ellipsoid, ovoid, rarely subfusiform, sometimes irregular in outline, in profile sometimes subphaseoliform (fig. 605C), brownish orange; pleurocystidia 35-60 \times 10-18 μm , utriform, lageniform, obtusely fusiform, rarely forked, scattered to numerous; cheilocystidia of two types: A: 25-50 \times 10-20 μm , similar to pleurocystidia, scattered, rarely rather numerous, especially towards stem, B: small, clavate, abundant, often 1-2(-3) cells deep; veil cells 20-100 \times 2-12 μm . Spring to autumn; occasional in temp., very rare in hemib.; DK (LC), NO (NE), SE (LC). – Bol Bres 43:41, BKPM 3:352 (opposite), BSMF 116:356 (opposite), End 404, Ves 300.
- P. clivensis* (Berk. & Broome) P.D. Orton
- Sp on av 4.2-5.2 μm broad, with a distinct germ pore; in wooded pastures, parks and deciduous forests attached to buried sticks or twigs 40
40. Cap 20-70 mm, when mature dark to pale; pleurocystidia sometimes yellow brown pigmented or incrustated at apex and forked see *P. spadiceogrisea* key K 33
- Cap 15-45 mm, when mature pale; pleurocystidia not yellow brown pigmented or incrustated at apex, hardly forked see *P. fatua* key K 33

Key D: Growing on dung

1. Sp 4.5-5.5 μm broad 2
 - Sp 3-4.5 μm broad 3
2. Cap 3-6 mm, fulvous, striate almost to centre; clamps absent; veil of hyphae. Cap convex, hygrophanous, drying pale brown, veil when young as flocci to the centre; gills broadly adnate, distant, L = 11-13; stem 10-20 x 0.5-1 mm. Sp 8-9 x 4.5-5.5 μm , Qav = 1.7, ovoid, oblong, ellipsoid, in profile sometimes amygdaloid, reddish brown; pleurocystidia 25-45(-60) x 8-14 μm , obtusely conical, lageniform, rarely forked (fig. 605D), scattered; cheilocystidia of two types: A: 25-40 x 9-14 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered; veil cells 20-120 x 4-20 μm . On cow dung in a non-fertilised pasture with *Crataegus* and *Rosa* on calcareous soil; summer; very rare in temp.; SE (Sk: Ivö).
P. fimiseda Örstadius & E. Larss.
- Cap 4-10 mm, pale ochraceous buff or clay ochraceous, then darkening to clay buff, faintly striate when moist; clamps present; veil of spherocysts. Cap convex, entirely granulose mealy-scaly or furfuraceous, becoming mat and atomate when veil is washed off, edge of cap joined to stem by pale buff or ochraceous cortinate veil when young; gills distant, L = 14-18; stem 15-24 x 0.5-1.5 mm. Sp 7.5-9 x 5-5.5 x 4-5 μm , Qav = 1.5-1.7 in front view, 1.8 in side view, ovoid, oblong, ellipsoid, in side view sometimes amygdaloid, but not pronounced, rarely subphaseoliform, reddish brown; pleurocystidia 20-35 x 8-12 μm , narrowly lageniform to subutriform (fig. 605E), scattered to rather numerous; cheilocystidia of two types: A: 20-30 x 6-12 μm , similar to pleurocystidia, scattered to numerous, B: small, clavate, scattered; veil cells (spherocysts) on cap surface single or in chains, 10-35 μm broad, subglobose, ellipsoid, subcylindrical, often brown pigmented, sometimes incrustated. On dung of horse or cow on dry, sandy soil; autumn; very rare in temp.; SE (Sk: Landön). – FND 26:7E.
P. phaerocystis P.D. Orton
3. Cap surface not pubescent; veil forming flocci on entire cap. Cap 5-15(-20) mm, convex to plane, dark reddish brown, becoming brown, hygrophanous, faintly striate at margin, fading to pale yellow brown, veil appendiculate at margin; gills distant to medium spaced, L = 15-24; stem 15-35 x 0.5-2 mm. Sp 6.5-8 x 3.5-4.5 μm , Qav = 1.7-1.8, oblong, narrowly ovoid, in profile sometimes narrowly amygdaloid, rarely subphaseoliform (fig. 605F), reddish brown; pleurocystidia 25-50 x 8-15 μm , conical, lageniform, subutriform, sometimes rostrate or swollen at apex, numerous to rather numerous; cheilocystidia of two types: A: 20-40 x 6-13 μm , similar to pleurocystidia, scattered to rather numerous, B: small, clavate, most frequent towards cap margin; veil cells 20-180 x 6-40 μm . On moderately old cow dung in open pastures or in copses with *Quercus robur*, *Larix decidua*, *Rosa* and *Crataegus*; summer; very rare in temp.; SE.
P. merdicola Örstadius & E. Larss.
- Cap surface pubescent; veil forming granules on entire cap. Cap 2-12 mm, convex to almost plane, ochraceous buff, striate when moist, hygrophanous, fading on drying; gills distant, L = 10-18; stem 20-60 x 0.2-1.5 mm, when moist entirely pubescent (lens). Sp 6.5-8.5 x 3-4 μm , Qav = 1.8-2.2, subcylindrical, oblong, in profile slightly flattened on adaxial side, sometimes narrowly amygdaloid or with a suprahilar depression, rarely subphaseoliform, reddish brown; pleurocystidia 20-40 x 6-10 μm , lageniform to conical, pale, scattered; cheilocystidia of two types: A: 15-30 x 5-10 μm , similar to pleurocystidia (fig. 607A), numerous or sometimes scattered, B: small, clavate, scattered; pileocystidia and caulocystidia similar to pleurocystidia or widened at base; veil cells 10-40 μm wide, subglobose, sometimes yellow brown pigmented, smooth or delicately warty; clamps only found in mycelium of stem base. On dung, humus rich soil and decaying plant remains; early spring to autumn; very rare in eastern temp. and southernmost hemib.; FI (DD, EH: Tammela), SE (LC). – Lud 98.15.
P. tenuicula (P. Karst.) Örstadius & Huhtinen



Spores, cheilocystidia and pleurocystidia: A: *Psathyrella tenuicula*, B: *P. leucotephra*, C: *P. candolleana*, D: *P. multipedata*, E: *P. sylvestris*, F: *P. maculata*, G: *P. piluliformis*.

Key E: Pleurocystidia absent; sp < 9 μ m

1. Most cheilocystidia narrowly utriform to lageniform (figs 607B-C) 2
- Most cheilocystidia narrowly lageniform to fusiform 3

2. Sp without germ pore, on av 8.5-8.8 x 5.5-5.8 μ m; stem often with a ring. Cap 30-90 mm, convex to plane, pale ochre buff or pale brown, not or slightly striate when moist, hygrophanous, drying pale dirty buff or whitish without a pink tinge, veil as fugacious fibres or flocci close to the margin; gills very crowded, L = c. 45-75, dark grey-brown; stem 60-160 x 4-15 mm. Sp 8-10 x 5-6.5 μ m, Qav = 1.5-1.6, subtriangular, ellipsoid, ovoid, subrectangular or oblong, sometimes irregular in outline, in profile phaseoliform (fig. 607B), reddish brown; cheilocystidia of two types: A: 25-50 x 8-14 μ m, narrowly utriform, rarely lageniform, pale, numerous, B: small, clavate, scattered; veil cells 30-130 x 4-22 μ m. Usually caespitose in large clusters at the base of deciduous trees of *Crataegus*, *Fagus*, *Fraxinus*, *Quercus* or *Ulmus* on base rich soil; summer to autumn; rare in western temp., very rare in western hemib.; DK (VU), SE (DD). – BKPM 14:54bis, FAD 144D (as *Stropharia hypsipoda*), FND 26:8A, Lud 98.28, Ves 297.

P. leucotephra (Berk. & Broome) P.D. Orton

- Sp with germ pore, on av 7-8.3 x 4.1-5 μ m; stem rarely with a ring. Cap 20-100 mm, low convex, dark reddish brown, becoming ochraceous brown, at maturity fading to ochre with yellow, grey, purple or violet tinges, striate up to halfway from margin, hygrophanous, drying sordid white or grey; universal veil on cap as dispersed white or brown floccules; partial veil at cap margin white appendiculate; gills crowded to very crowded, L = 35-70, brown with pink tinges; stem 40-100 x 3-10 mm. Sp 6.5-10 x 4-5.5 μ m, Qav = 1.5-1.9, oblong, ovoid, ellipsoid or subcylindrical, in profile rarely subphaseoliform or subamygdaloid, brown; cheilocystidia of two types: A: 35-70(-140) x 8-20 μ m, utriform, narrowly utriform, lageniform to subcylindrical, sometimes clavate (fig. 607C), pale, abundant, B: small, clavate, scattered; veil cells 15-120 x 2-25 μ m. In rich deciduous forests, parks and gardens on or around stumps or decayed wood, on dry or moist soil; spring to autumn; very common in temp., common in hemib.-bore., very rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:322, C&D 803, Däh 573, R&H 433, Ves 297, ☉.

P. candolleana (Fr.: Fr.) Maire

3. Densely caespitose, often with 25-100(-200) frb; apex and walls of cheilocystidia covered with drops turning green in a solution of ammonia see *P. multipedata* key F 3
- Solitary, gregarious to subcaespitose; apex and walls of cheilocystidia not covered with drops turning green in a solution of ammonia 4

4. Veil covering entire cap as fibrils or floccules, appendiculate at margin; clamps present; veil cells 30-180 x 4-24 μm see *P. caniceps* key C 6
- Veil as scattered white fibrils or flocci, especially close to cap margin; clamps absent; veil cells 10-60 x 2-8 μm see *P. effibulata* key C 6

Key F: Gill edge and cystidia covered with drops staining green in a solution of ammonia or clamps absent; sp < 9 μm

1. Gill edge and cystidia covered with drops staining green in a solution of ammonia; clamps present 2
- Gill edge and cystidia not covered with drops staining green in a solution of ammonia; clamps absent 4
2. Sp on av > 8.7 μm long see *P. lutensis* key C 8
- Sp on av < 8.7 μm long 3
3. Densely caespitose, often with 25-100(-200) frb; pleurocystidia lageniform to narrowly conical, acute (fig. 607D). Cap 10-40 mm, convex to almost plane, reddish brown, yellowish red, becoming dark brown or paler, faintly striate halfway towards centre when moist, hygrophanous, often shiny, drying sordid brown or pale yellow, veil as scattered fibrils near the margin or appendiculate; gills crowded, L = 32-46; stem 30-100 x 2-5 mm, often with a fibrillose zone near base, with a thick pseudorrhiza. Sp 6.5-9 x 4-5 μm , Qav = 1.7-1.9, oblong, narrowly ovoid, in profile sometimes subphaseoliform, rarely narrowly amygdaloid, brown; pleurocystidia 40-60 x 9-12 μm , scattered to absent; cheilocystidia of two types: A: 25-70 x 7-12 μm , similar to pleurocystidia, upper part often with a yellow intracellular content, apex and walls covered with drops turning green in a solution of ammonia, numerous, B: small, clavate, scattered; veil cells 15-60 x 3-7 μm . On soil, usually attached to buried wood, on stumps, in forests or parks, with *Alnus*, *Carpinus*, *Corylus*, *Fagus*, *Picea*, *Pinus*, *Quercus* and *Tilia*, on calcareous or nutrient rich soil, in grass lawns and on sawdust; spring to early winter, mostly in late autumn; occasional in temp., rare in hemib.-bore., in FI only north to southern bore.; DK (LC), FI (DD), NO (LC), SE (LC). – FAD 153E (as *Psathyra stipatissima*), L&D 151, Lud 98.25, R&H 433, Ves 299, ☉.
- P. multipedata* (Peck) A.H. Sm.
- Solitary to gregarious, hardly caespitose; pleurocystidia utriform, obtuse (fig. 607E). Cap 20-70 mm, convex to plane, brown, ochraceous yellow or olivaceous, not striate or hygrophanous, covered with appressed fibrillose or triangular, ochraceous brown, dark brown or olivaceous scales, similar to an *Inocybe*, towards margin sometimes velvety; gills crowded, L = 38-60; stem 35-100 x 3-10 mm, below brown fibrillose from veil remnants; taste mild to bitter. Sp 7-10 x 4.5-5.5 μm , Qav = 1.5-1.7, subrectangular to subtriangular, ovoid, oblong to ellipsoid, in profile often distinctly phaseoliform, sometimes with a nodule at base, brownish orange; pleurocystidia 35-60 x 9-15 μm , upper part of cystidia sometimes yellow refringent, numerous or rather numerous; cheilocystidia of two types: A: 30-55 x 8-16 μm , similar in shape, frequency, etc. to pleurocystidia, B: small, clavate, scattered; veil cells 20-150 x 4-30 μm , with brown intracellular pigmentation. On deciduous wood, *Betula*, *Fagus*, *Fraxinus*, *Populus* and *Salix* or directly on soil in rich forests; spring to autumn; rare in temp., very rare in hemib.; DK (EN), SE (NT). – BKPM 5:64 (opposite), Bon 269, Bres 850, Lud 98.4, M&H 4:291.
- P. sylvestris* (Gillet) Konrad & Maubl. (*P. populina* (Britzelm.) Kits van Wav., *Hypholoma lepidotum* Bres.)
4. Cap and stem surface pubescent; sp on av < 8.5 μm long see *P. tenuicula* key D 3
- Cap and stem surface not pubescent; sp on av > 8.5 μm long 5
5. Cap when moist dark reddish brown, veil scanty as fibrils or flocci, especially close to the margin see *P. effibulata* key C 6
- Cap when moist ochraceous yellow to pale buff, veil copious as scales, flocci or fibres to the centre see *P. gordonii* key C 29

Key G: Sp on av < 6.4 μm long

1. Pleurocystidia with crystals see *P. pygmaea* key K 3
 - Pleurocystidia without crystals 2
2. Veil when mature becoming brown to black 3
 - Veil when mature not becoming brown to black 4
3. Sp 4.5-6 x 3-3.5 μm ; clavate cystidia often with a rostrum (fig. 607F). Cap 20-65 mm, convex to plane, when young covered with a white veil of fibrillose scales, appendiculate at margin, soon breaking up and then exposing the sordid white to pale greyish brown cap surface; gills very crowded, L = 60-75; stem 40-90(-150) x 3-10 mm, when young white, soon discolouring, in upper part with a fibrillose zone, below the zone with fibrils or scales becoming black at centre. Sp Qav = 1.5-1.7, oblong, ellipsoid, ovoid, sometimes irregular, in profile sometimes subphaseoliform, brownish orange, germ pore absent or indistinct; pleurocystidia 25-55 x 10-16 μm , clavate or lageniform, numerous to scattered; cheilocystidia of two types: A: 20-45 x 6-16 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered rarely numerous; veil cells 30-250 x 4-20 μm , with brown intracellular or parietal pigmentation. Caespitose or subcaespitose on stumps or logs in rich forests of *Alnus*, *Betula*, *Fagus*, *Quercus*, *Picea*, *Pinus*, *Populus*, *Salix* and *Tilia*, sometimes in moist places; autumn; occasional in temp., very rare in hemib.-bore.; DK (LC), FI (DD, OP: Oulunsalo), NO (NE), SE. – B&K 334, End 410, FAD 146D, D¹ (as *Hypholoma melanthinum*), Lud 98.3, M&H 4:290.
P. maculata (C.S. Parker) A.H. Sm. (*P. scobinacea* (Fr.) Konrad & Maubl. s. Konrad & Maublanc)
 - Sp 6-7.5 μm long; cystidia without a rostrum see *P. hirtosquamulosa* key K 2
4. Pleurocystidia with a rostrum; cap 10-40 mm, veil when young not appendiculate as a membrane at the margin. Cap convex to plane, dark reddish brown, then dark brown, sepia brown or ochraceous brown, with paler margin, hygrophanous, striate, drying pale brown with ochraceous tinges at centre, veil in young stages as fibres near the margin, evanescent; gills crowded, L = 24-46; stem 15-50 x 1-3 mm; smell faintly agreeable to strongly sweetish; taste mild or like radish. Sp 5-6 x 3-4 μm , Qav = 1.7, oblong, ellipsoid to ovoid, in profile rarely subphaseoliform, brownish orange, with a rather distinct germ pore; pleurocystidia 20-45 x 10-16 μm , numerous, faintly pigmented, fusiform, utriform to clavate, the rostrum 2-10 x 1.5-5 μm ; cheilocystidia of two types: A: 20-32 x 9-12 μm , similar to pleurocystidia, scattered, B: 7-18 μm broad, clavate to spheropedunculate, often many cells deep, especially close to cap margin; veil cells 2-6 μm broad. Solitary, gregarious like *Coprinellus disseminatus* or caespitose in deciduous forests, on sticks, logs, wood chips or stumps; all year; very rare in temp.; DK (EJyl: Læsø).
P. laevissima (Romagn.) Singer
 - Pleurocystidia without a rostrum; cap 20-80 mm, veil when young appendiculate as a membrane at the margin. Cap convex to plane, dark reddish brown, dark dark brown, soon fading to reddish brown, hardly translucently striate, hygrophanous, drying pale yellow brown, pale buff, veil sometimes as small flocci or fibrils halfway up; gills crowded to very crowded, L = 36-75; stem 40-90 x 4-9 mm, sometimes with a fibrillose zone; smell sometimes fragrant. Sp 4.5-6.5 x 3-4 μm , Qav = 1.5-1.8, ovoid, oblong or ellipsoid, slightly irregular in outline, in profile sometimes phaseoliform, brownish orange, germ pore distinct to almost absent; pleurocystidia 25-50 x 9-16(-20) μm , narrowly utriform, obtusely fusiform, clavate, sublageniform or subcylindrical (fig. 607G), scattered to numerous; cheilocystidia of two types, but sometimes intermediate forms occur: A: 20-45 x 7-14 μm , similar in shape and frequency to pleurocystidia, B: small, clavate, scattered to numerous; veil cells 20-140 x 2-12(-20) μm . Usually caespitose, rarely solitary, around stumps or debris of deciduous trees, often *Fagus*, rarely of conifers; all year; very common in temp., occasional in hemib., rare in bore., in FI north to southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 347, Däh 571,

Lud 98.26A, R&H 434, Ves 299, ☉.

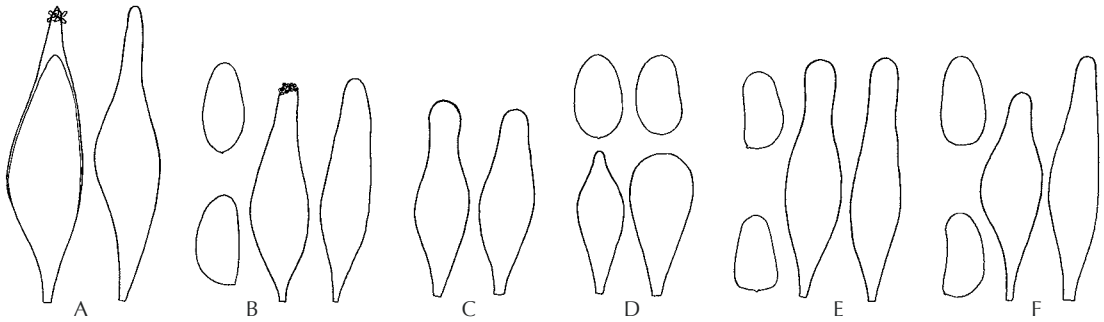
P. piluliformis (Bull.: Fr.) P.D. Orton (*P. hydrophila* (Bull.) Maire, *P. subpapillata* (P. Karst.) Romagn., *P. hydrophiloides* Kits van Wav.)

Key H: Veil absent; pleurocystidia with crystals; sp < 9 μm

1. Pleurocystidia acute (fig. 611A); gills very crowded, L = 60-82; sp pale. Cap 25-120 mm, convex to plane, dark reddish brown, red brown, sometimes striate at margin, faintly hygrophanous, at maturity or when drying fading to pale ochraceous brown, flesh-coloured or pink, at margin covered with minute hairs (lens); veil absent; stem 25-100 x 3-12 mm, rigid. Sp 6.5-11 x 4-5.5 μm, Qav = 1.7-1.9, ovoid, oblong or subcylindrical, sometimes irregular in outline, in profile sometimes phaseoliform, rarely amygdaloid, very pale brown, germ pore absent or rarely indistinct; pleurocystidia 30-80 x 10-24 μm, lageniform, fusiform to conical, often rostrate with apex covered with crystals, abundant, rarely rather scattered, wall up to 3 μm thick near apex, yellow or not; cheilocystidia of two types: A: 40-85 x 8-22 μm, similar to pleurocystidia, scattered to abundant, B: 30-90 x 6-28 μm, clavate, utriform or cylindrical, scattered or rarely numerous; hairs at cap margin originating from globose cells of pileipellis, septate or not; terminal cells of the hairs 40-180 x 6-18 μm, versiform, cylindrical, clavate, lageniform, etc., rarely similar to pleurocystidia. Usually caespitose around deciduous trees and conifers, both stumps and at the base of living trees; spring to early winter; occasional, but locally common in temp., common in hemib.-bore., very rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:356, Bol Bres 36:134, Däh 569, FAD 148E, F, Lud 98.42, ☉.
P. spadicea (P. Kumm.) Singer (*P. sarcocephala* (Fr.) Singer, *P. variata* A.H. Sm.)
- Pleurocystidia obtuse (fig. 611B); gills crowded, L = 28-44; sp moderately pigmented. Cap 20-70 mm, convex, brown, striate halfway from margin when moist, hygrophanous, soon fading to pale brown, greyish yellow, whitish, when young sometimes pruinose at margin; veil absent; gills becoming dark reddish brown; stem 15-50 x 2-13 mm, rather firm. Sp 6-9 x 3.5-5 μm, Qav = 1.6-1.9, oblong, ovoid, ellipsoid, subcylindrical to subfusiform, in profile sometimes phaseoliform or amygdaloid, brown, germ pore rather distinct to seemingly absent; pleurocystidia 30-60(-70) x 8-20 μm, narrowly utriform, conical to subcylindrical, often covered with crystals or incrustations, numerous to scattered; cheilocystidia of two types: A: 30-70 x 8-20 μm, similar to pleurocystidia, numerous, B: small, clavate, scattered; subhymenium and basidia often with brown, partly intracellular pigment. Caespitose or gregarious on or around stumps or bases of living deciduous trees in forests, parks or gardens; often late in the season; occasional in temp.-southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:324, FAD 147B (as *Psilocybe papyracea*), FD 1008.1 (as *Agaricus c.*), Lud 98.40.
P. cernua (Vahl: Fr.) G. Hirsch (*P. ivoënsis* Örstadius)

Key I: Smell sweetish reminding of almonds, marzipan or coconuts

1. Veil cells 30-450 x 5-50 μm; gills crowded, L = 30-40; sp with a distinct germ pore. Cap 10-50 mm, convex to plane, ochraceous brown, yellow brown to reddish brown, striate at margin, hygrophanous, drying ochraceous, pale ochraceous brown to grey brown, veil strongly developed as scales or flocci to the centre, appendiculate at margin; stem 35-60 x 2-7 mm, rarely with a ring; smell sweetish. Sp 6.5-9 x 4-5 μm, Qav = 1.7-2.1, oblong, rarely narrowly ovoid, in profile sometimes with a suprahilar depression, narrowly amygdaloid to phaseoliform, brown; pleurocystidia 30-55 x 10-17 μm, narrowly to broadly utriform, sometimes capitate, rarely lageniform or forked (fig. 611C), scattered, rarely numerous; cheilocystidia of two types: A: 25-55 x 7-16 μm, similar to pleurocystidia, numerous to very numerous, B: small, clavate, variable in frequency. In forests of *Fagus* and *Picea*, on rotten wood chips or woody debris, rarely in grass lawns; spring to autumn; very rare in temp.-suba.; DK (vu), FI (DD), IS (Ve), NO (LC), SE (LC). – Bol Bres 40:199, End 417, Lud 98.17, M&J 15, Svp 37:25.
P. suavissima Ayer (*P. sacchariolens* Enderle)




Spores and pleurocystidia: A: *Psathyrella spadicea*, B: *P. cernua*, C: *P. suavissima*, D: *P. mucrocystis*, E: *P. pertinax*, F: *P. cotonea*.

- Veil cells 15-100 x 2-12 μm ; gills very crowded, L = 45-70; sp with or without an indistinct germ pore 2
- 2. Pleurocystidia 20-40 x 9-14 μm , clavate or clavate-mucronate with a 2-10 μm long protuberance (fig. 611D). Cap 30-90 mm, bell-shaped to convex, becoming plane with a low umbo, dark reddish brown to brown, not striate, hygrophanous, fading to bright ochraceous tawny; veil as fibrils halfway from margin and connecting stem and margin in young stages; stem 30-90 x 6-13 mm, when young with an evanescent fibrillose zone; smell sweetish. Sp 6.5-8 x 4-5 μm , $Q_{av} = 1.5-1.6$, ovoid, ellipsoid, oblong, in profile sometimes phaseoliform or amygdaloid, brownish orange; pleurocystidia scattered; cheilocystidia 20-40 x 8-14 μm , similar to pleurocystidia, clavate ones numerous, mucronate ones scattered. Caespitose to solitary on stumps of coniferous or deciduous trees; spring to autumn; very rare in eastern temp. and southern bore.; FI (NT), SE (LC). – Pers 11:496.
P. mucrocystis A.H. Sm.
- Pleurocystidia 25-65 x 8-16 μm , polymorphic, narrowly utriform, lageniform, fusiform, clavate to conical, rarely mucronate (fig. 611E). Cap 20-75 mm, conical-convex to plane, when young chestnut to dark reddish brown, then often fading to reddish brown, ochraceous brown or yellow brown, dull, almost velvety, often becoming radially rugose or veined, reticulate or not, not or hardly hygrophanous, not striate, veil as white floccules or scales near the margin, sometimes brown discoloured; stem 30-90 x 5-12 mm, flocculose from veil remnants, sometimes brown discoloured; smell sweetish; taste mild, once recorded as slightly peppery. Sp 6-8.5 x 3.5-5 μm , $Q_{av} = 1.5-1.8$, subrectangular to ovoid, oblong or ellipsoid, sometimes irregular in outline or phaseoliform, brownish orange; pleurocystidia numerous to scattered; cheilocystidia of two types: A: similar in size, shape and frequency to pleurocystidia, B: small, clavate, often dominating. On decayed wood of *Picea*, rarely *Pinus* or *Betula*; summer to autumn; rare in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – End 403, FAD 147C, FND 26:2B, Lud 98.64, M&J 6.
P. pertinax (Fr.) Örstadius (*P. chondroderma* (Berk. & Broome) A.H. Sm.)

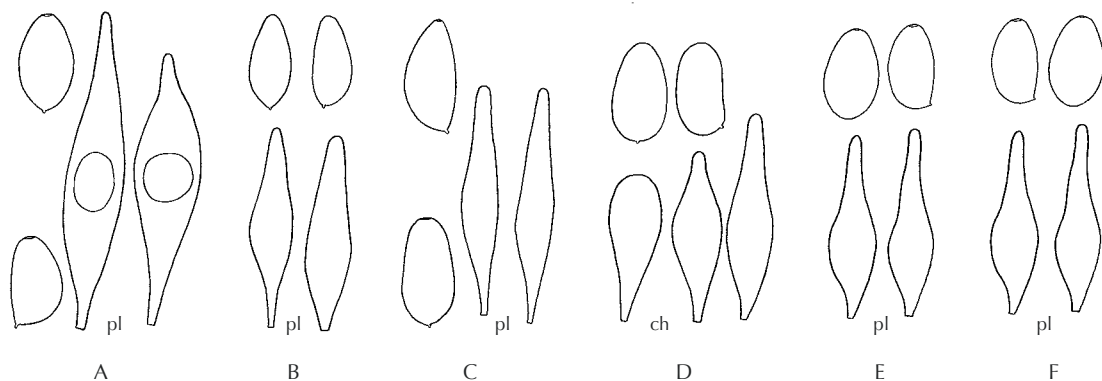
Key J: Pleurocystidia lageniform to conical, upper part often acute

1. Cap whitish, alutaceous to buff, not striate; veil white, becoming sordid or discolouring to brown or black with age. Cap 30-80 mm, convex to almost plane, sometimes with a violet tinge, not or very slightly hygrophanous, covered with a dense coating of white fibrils and scales, appendiculate at margin; gills narrowly adnate, crowded to very crowded, L = 45-65; stem 40-120 x 5-12 mm, whitish, white fibrillose scaly, firm, at base sometimes with yellow mycelium. Sp 6-9 x 3-4.5 μm , $Q_{av} = 1.7-2$, oblong, subcylindrical to subrectangular, sometimes irregular, in profile often phaseoliform (fig. 611F), brownish orange; pleurocystidia 25-

60 x 10-16 μm , utriform, lageniform, obtusely fusiform or conical, pale, scattered to rather numerous; cheilocystidia of two types: A: 25-60 x 6-15 μm , similar to pleurocystidia, numerous, B: small, clavate to obpyriform, scattered; veil cells 30-150 x 4-20 μm , often brown pigmented. In deciduous or coniferous forests, in parks, often around stumps or on debris of *Fagus*, sometimes *Betula*, *Quercus* or *Picea* on slightly acid to base-rich soil; late summer to autumn, occasional in temp., rare in hemib.; DK (LC), NO (LC), SE (LC). – B&K 4:327, Bon 269, FAD 146C, 147E (as *Hypholoma c.*), Lud 98.2, M&J 5, .

P. cotonea (Quél.) Konrad & Maubl.

- Cap \pm brown, striate or not; veil hardly discolouring 2
- 2. Pleurocystidia with one, rarely two large internal globules, often with a long rostrum (fig. 613A). Cap 10-70 mm, convex to plane, when young dark brown, dark reddish brown, striate at margin, hygrophanous, drying pale ochraceous brown, veil as fibres or flocci near the margin, appendiculate at margin; gills medium spaced, L = 30-38; stem 25-100 x 3-10 mm, with fibrils and flocci from veil remnants below, sometimes with a fugacious, hanging, striate ring. Sp 7-9 x 5-6 x 4.5-5.5 μm , Qav = 1.4-1.6 and 1.5-1.7, ovoid, subfusiform, ellipsoid to oblong, in profile often amygdaloid or with a suprahilar depression, sometimes subphaseoliform, reddish brown; pleurocystidia 35-80 x 10-18 μm , fusiform to conical, rarely clavate, numerous; cheilocystidia of two types: A: similar in size, shape and frequency to pleurocystidia, B: small, clavate, scattered to numerous; veil cells 25-120 x 4-10(-20) μm . In deciduous or coniferous forests with *Betula*, *Fagus*, *Quercus*, *Picea* or *Pinus*, on logs, twigs, wood chips and fireplaces; all year; rare in western temp., very rare in hemib.-bore.; DK (LC), FI (DD, SoL: Sodankylä), NO (LC), SE (LC). – Cke 612 (as *Agaricus g.*), FAD 152G, FND 26:5B, Lud 98.49, M&J 19.
P. gossypina (Bull.: Fr.) A. Pearson & Dennis (*P. xanthocystis* P.D. Orton)
- Pleurocystidia without globules, without or with a short rostrum 3
- 3. On burnt soil. Cap 10-55 mm, convex to plane, dark reddish brown, at maturity fading to reddish brown, striate to 3/4 from margin, hygrophanous, drying reddish yellow, pale grey brown or pink, veil when young as flocci or scales to the centre, when mature often denticulate at margin; gills crowded, L = 36-44; stem 20-60 x 2-5 mm, sometimes with a fibrillose zone of veil remnants. Sp 6.5-8.5 x 3.5-4.5 μm , Qav = 1.8-2, oblong to fusiform, in profile sometimes narrowly amygdaloid or with a slight suprahilar depression (fig. 613B), reddish brown, germ pore absent or sometimes indistinct; pleurocystidia 30-60 x 8-16 μm , fusiform, usually acute, rarely capitate, numerous to scattered; cheilocystidia of two types: A: 25-55 x 7-14 μm , similar to pleurocystidia, numerous, B: small, clavate to obpyriform, scattered to numerous; veil cells 25-150 x 4-20 μm . In coniferous or deciduous forests with *Alnus*, *Betula* or *Pinus*, also in open places; spring to early winter; occasional in temp.-hemib., rare in bore.-suba.; DK (NT), FI (DD), FO, NO (LC), SE (LC). – BKPM 14:56 (opposite), B&K 4:344, Dah 571, Lud 98.45, Myc 5:170.
P. pennata (Fr.) A. Pearson & Dennis
- Not on burnt soil 4
- 4. Dominating type of cheilocystidia small, clavate to spheropedunculate 5
- Dominating type of cheilocystidia similar to pleurocystidia 10
- 5. Veil as patches close to cap margin; cap 20-70 mm; L = 32-60 see *P. rostellata* 16
- Veil as flocci or fibres close to margin; cap 8-40 mm; L = 16-34 6
- 6. Sp on av 6.4-7.6 μm long; pleurocystidia sometimes or rarely mucronate, rostrate or bent; sp smooth to granulose see *P. umbrina* 14
- Sp on av 7.2-9.2 μm long; pleurocystidia not or rarely mucronate, rostrate or bent; sp smooth 7
- 7. Cap 8-20 mm; sp with a distinct to indistinct germ pore, moderately to



Spores, pleurocystidia and cheilocystidia: A: *Psathyrella gossypina*, B: *P. pennata*, C: *P. dunensis*, D: *P. obtusata*, E: *P. seymourensis*, F: *P. spintrigeroides*.

- rather dark; on sandy soil 8
- Cap 10-40 mm; sp without or with an indistinct germ pore, pale; on wood or attached to buried wood 9
8. Gill edge red pigmented; veil absent or as rudimentary fibres at cap margin. Cap convex to bell-shaped, when moist dark brown, dark greyish brown, umber grey, hygrophanous, striate to 3/4 from margin, drying pale brownish grey, ochraceous beige or alutaceous, with traces of pink, sometimes slightly sulcate becoming more pronounced when drying; gills broadly adnate, distant; stem 20-65 x 1-2 mm. Sp 7-9.5 x 4.5-5.5 μm , Qav 1.6-1.8, oblong, ovoid to ellipsoid, in profile sometimes amygdaloid or subphaseoliform (fig. 613C), reddish brown, with a distinct germ pore; pleurocystidia 35-65 x 8-14 μm , narrowly fusiform, lageniform to subcylindrical, rarely bent or subcapitate, flexuous, numerous or rather numerous; cheilocystidia of two types: A: 25-50 x 8-13 μm , similar to pleurocystidia, scattered to rather numerous, B: 8-12 μm broad, clavate, 1-2 cells deep; veil cells 20-60 x 4-6 μm . On a grassy verge of path through sand dunes, in grassland within a forest of *Quercus rotundifolia* on basic soil, in a deciduous forest dominated by *Fraxinus*; spring to autumn; very rare in eastern temp.; SE (Sk: Bjärsjölagård). – Lud 98.62.
P. dunensis Kits van Wav.
- Gill edge not red pigmented; veil as flocci halfway from margin see *P. seymourensis* 10
9. Sp on av 7.6-9.2 x 4.7-5.5 μm ; pleurocystidial walls not distinctly yellow below apex; clavate cheilocystidia sometimes mucronate. Cap 10-40 mm, conical-convex to plane, dark reddish brown to brown, when moist striate to 3/4 from margin, hygrophanous, drying ochraceous, cream or pale brown; veil when young as fibres or scattered floccules; gills medium spaced, L = 17-34; stem 20-80 x 1-5 mm, rarely with a pseudorrhiza, a ring or an evanescent fibrillose zone. Sp 7.5-10 x 4.5-6 μm , Qav = 1.5-1.8, oblong, ovoid to ellipsoid, often irregular in outline, in profile sometimes phaseoliform (fig. 613D), brownish orange, with indistinct germ pore; pleurocystidia 35-70 x 8-16 μm , narrowly lageniform, obtusely fusiform to conical, rarely cylindrical, utriform, flexuous or forked, numerous, sometimes scattered; cheilocystidia of two types: A: 25-50 x 8-16 μm , similar to pleurocystidia, often scattered near cap margin and increasing in number towards stem, B: clavate to obpyriform, sometimes mucronate, dominating the gill edge, especially abundant towards the cap margin; veil cells 10-120 x 4-20 μm . In rich deciduous forests, occasionally in coniferous forests, on decayed wood, mossy logs or soil, rarely nitrophilous, dry to moist; all year; common in temp., occasional in hemib., rare in bore.; DK (LC), FI, NO (LC), SE (LC). – B&K 4:329 (as aff. *friesii*), End

420, FAD 152A, Lud 98.37, M&J 20 (as *senex*).

P. obtusata (Pers.: Fr.) A.H. Sm. (*P. senex* (Peck) A.H. Sm. s. Kits van Waveren, *P. vrynwyensis* Kits van Wav.)

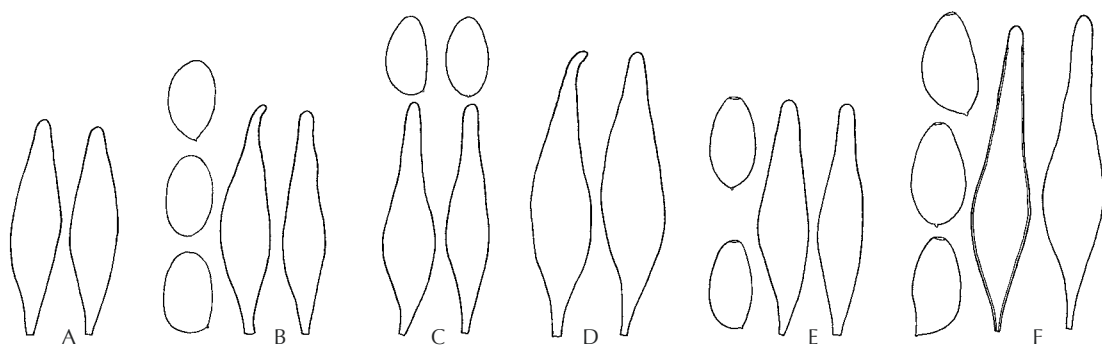
- Sp on av 7.2-8 x 4.1-4.6 μm ; pleurocystidial walls often distinctly yellow below apex; clavate cheilocystidia not mucronate see *P. cortinarioides* key K 25

- 10. On sandy soil, in sand dunes, in grasslands or at roadsides; cap 8-20 mm; some sp subtriangular, reminding of the sp of *P. panaeoloides*. Cap convex, dark reddish brown, striate to half-way from margin, hygrophanous, drying from centre to ochraceous or pale grey brown, veil present as flocci halfway from the margin, sometimes appendiculate; gills distant, L = 16-20; stem 20-45 x 1-2 mm. Sp 7-9 x 4-5.5 μm , Qav = 1.5-1.7, ovoid, oblong to ellipsoid, in profile sometimes amygdaloid or subphaseoliform (fig. 613E), reddish brown; pleurocystidia 30-50 x 10-16 μm , lageniform, sometimes acute, flexuous, numerous to scattered; cheilocystidia of two types: A: lageniform, 25-40 x 8-15 μm , numerous to scattered, B: small, clavate, numerous; veil cells 15-60 x 4-14 μm . Spring to autumn; very rare in temp.; DK (DD), SE (LC). – Lud 98.61.
P. seymourensis A.H. Sm.
 - Often on remnants of wood; cap 10-70 mm; sp ovoid, ellipsoid, oblong, subcylindrical, amygdaloid or phaseoliform 11

- 11. Sp on av < 8 μm long 12
 - Sp on av \geq 8 μm long 16

- 12. Cap 30-70 mm; pleurocystidia 40-80 x 9-20 μm , extremely numerous; veil as large scales on cap. Cap convex or plane, umbonate, dark reddish brown to dark brown, when mature reddish brown to brown, rarely striate to 1/3 from margin, hygrophanous, drying brown ochraceous or pale yellow, veil well developed, dentate at cap margin; gills crowded, L = 30-50; stem 30-90 x 3-8 mm, veil remnants leaving scales or flocci in lower part or rarely a membranous ring. Sp 7-8.5 x 4-5 μm , Qav = 1.7-1.9, oblong to ovoid, in profile sometimes phaseoliform or amygdaloid (fig. 613F), brownish orange, often with an indistinct germ pore; pleurocystidia fusiform to lageniform, often acute and bent, with up to 1 μm thick, yellow walls; cheilocystidia of two types: A: 30-70 x 8-18 μm , similar to pleurocystidia, numerous, B: 10-20 μm wide, clavate, scattered to numerous; veil cells 20-150 x 4-24 μm . Often gregarious on decayed stumps, mossy logs or other debris in rich *Fagus* forests, also in rich (once acid) forests with *Alnus*, *Betula*, *Corylus*, *Dryopteris carthusiana*, *Fraxinus*, *Lycopodium clavatum*, *Quercus*, *Picea*, *Pinus*, *Salix*, *Ulmus* and *Vaccinium myrtillus*; summer to autumn; occasional in eastern temp., very rare in western temp. and eastern hemib.; DK (vu), NO, SE (LC). – BKPM 5:64bis, Lud 98.46.
P. spintrigeroides P.D. Orton
 - Cap 10-40 mm; pleurocystidia 30-65 μm long, numerous to scattered; veil as flocci 13

- 13. Sp on av 3.8-4.2 μm broad; veil cells 30-300 x 6-35 μm . Cap 10-40 mm, convex, brown, when moist striate at margin, hygrophanous, drying pale yellow brown or alutaceous, veil white to cream, copious as floccules to the centre, appendiculate at margin; gills medium spaced; stem 25-70 x 2-4 mm, sometimes with a fugacious ring zone. Sp 6-8 x 3.5-4.5 μm , Qav = 1.7-1.9, oblong, ovoid to ellipsoid, in profile sometimes amygdaloid, phaseoliform or with a suprahilar depression, smooth to minutely rough, brownish orange; pleurocystidia 30-60 x 8-16 μm , narrowly conical, fusiform, subutriform to lageniform, sometimes flexuous, rarely bent, forked or capitata (fig. 615A), numerous; cheilocystidia of two types: A: 20-60 x 6-14 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered, rather numerous. In deciduous forests, on paths, on wood chips, once on stump of *Salix*, in leaves, probably with preference for rich soil, noted with *Acer*, *Aconitum lycotonum*, *Aegopodium*, *Betula*, *Chrysosplenium alternifolium*, *Populus tremula*, *Prunus padus*, *Salix caprea*, *Sorbus* and *Urtica*, in dry or moist places; late summer to early autumn; rare in hemib.-



Spores and pleurocystidia: A: *Psathyrella squamosa*, B: *P. umbrina*, C: *P. atomatoides*, D: *P. rostellata*, E: *P. senex*, F: *P. fibrillosa*.

bore.; FI (DD), NO (LC), SE (LC). – Lud 98.65.

P. squamosa (P. Karst.) A.H. Sm. (*P. stigmatospora* Clemençon s. Kytövuori et al. 2005)

- Sp on av 3.9-5 μm broad; veil cells 15-140 \times 2-20 μm 14

14. Pleurocystidia sometimes to rarely mucronate, rostrate or bent; sp Qav = 1.4-1.6, smooth to granulose, pale, without or with an indistinct germ pore. Cap 10-35 mm, conical-convex, rarely plane, dark reddish brown, reddish brown, soon brown, striate to 2/3 from margin, hygrophanous, drying pale yellow brown or ochraceous, veil well developed, as flocci or fibrils to the centre, appendiculate at margin; gills medium spaced, L = 17-34; stem 25-60 \times 1.5-4 mm. Sp 6-8 \times 4-5 μm , Qav = 1.4-1.6, ellipsoid, oblong, ovoid to obovoid, with conspicuously obtuse poles, in profile sometimes amygdaloid (fig. 615B), brownish orange; pleurocystidia 30-65 \times 8-18 μm , narrowly fusiform to subutriform, scattered to numerous; cheilocystidia of two types: A: 25-50 \times 7-15 μm , similar to pleurocystidia, numerous to scattered, B: small, clavate, numerous close to cap margin; veil cells 15-140 \times 4-20 μm . On both rich calcareous and acid soils, in deciduous and coniferous forests, in *Salix* thickets, in grassland, attached to remnants of wood or directly on soil; late summer to autumn; rare but locally occasional in temp.-suba.; FI, IS, NO (LC), SE (LC). – Lud 98.48.

P. umbrina Kits van Wav. (*P. subumbrina* Kits van Wav. & Örstadius)

- Pleurocystidia rarely mucronate or rostrate, not bent; sp Qav = 1.6-1.9, smooth, moderately pigmented, with an indistinct to distinct germ pore 15

15. Sp on av 6.7-7.7 \times 3.9-4.6 μm ; with an indistinct germ pore; pleurocystidia often conical. Cap 10-40 mm, convex to almost plane, dark reddish brown, fading to date brown or ochre brown, when moist faintly striate at margin, hygrophanous, drying pale brown, veil as white or cream floccules 1/3 from the margin, appendiculate; gills distant, L = 10-22; stem 30-90 \times 2-6 mm, sometimes with a fugacious ring zone. Sp 6.5-8 \times 3.5-5 μm , Qav = 1.6-1.8, ovoid, oblong to ellipsoid, in profile sometimes amygdaloid, subphaseoliform (fig. 615C), reddish brown; pleurocystidia 30-60 \times 9-15 μm , narrowly conical, fusiform to lageniform, rarely clavate, numerous, rarely scattered; cheilocystidia of two types: A: 25-45 \times 8-14 μm , similar to pleurocystidia, numerous, B: small, clavate, in variable numbers; veil cells 20-100 \times 3-14 μm . Often in moist to wet habitats with *Alnus*, *Betula*, *Picea*, *Pinus*, *Populus* or *Salix*, with *Sphagnum*, close to alluvial marshes or thickets, in dried ponds, usually attached to decayed wood, also on sawdust or directly on soil, oligotrophic; spring to autumn; occasional in eastern bore., very rare in temp., hemib. and western bore.; DK (DD), FI (LC), NO (LC), SE (LC). – Lud 98.58.

P. atomatoides (Peck) A.H. Sm. (*P. solitaria* (P. Karst.) Örstadius & Huhtinen, nom. illeg., *P. caespitosa* Weholt, *P. rannochii* Kits van Wav.)


- Sp on av 7.5-8.8 x 4.2-5 μm ; with a distinct germ pore; pleurocystidia lageniform, fusiform, narrowly utriform or cylindrical see *P. senex* 17
- 16. Pleurocystidia mucronate, rostrate, forked or bent (fig. 615D); L = 32-60; sp without or with an indistinct germ pore. Cap 20-70 mm, convex to plane, when moist dark reddish brown to yellowish red, striate up to 1/2-2/3 from margin, shiny or not, hygrophanous, drying ochraceous grey or cream, veil as larger patches close to or appendiculate at the margin, also as floccules or fibrils towards centre; gills crowded; stem 35-100 x 2-10 mm, rarely with a membranous ring in upper part. Sp 7.5-10 x 4.5-5.5 μm , Qav = 1.6-1.9, ovoid, oblong to ellipsoid, often slightly irregular in outline, in profile sometimes amygdaloid or phaseoliform, brownish orange; pleurocystidia 45-80 x 9-20 μm , abundant, fusiform, lageniform or subutriform, with obtuse or acute apex; cheilocystidia of two types: A: 25-60 x 8-18 μm , similar to pleurocystidia, scattered to numerous, B: small, clavate to obpyriform, numerous; veil cells 15-130 x 3-20 μm . In rich deciduous or coniferous forests with *Alnus*, *Betula*, *Fagus*, *Picea*, *Pinus*, *Populus*, *Quercus* and *Ulmus*, on mossy stumps or branches or attached to decaying leaves and wood; late summer to autumn; occasional in temp.-bore., very rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – BKPM 10:51 (as *kauffmanii*), FAD 143A, B (as *Stropharia spintrigera* and *S. spintrigera* var. *semivestita*), Lud 98.47.
P. rostellata Örstadius
- Pleurocystidia not or rarely mucronate, rostrate, forked or bent; L = 20-38; sp with a distinct germ pore 17
- 17. Veil rather scanty, as evanescent fibres or flocci near the cap margin; sp without a suprahilar depression. Cap 7-40(-60) mm, conical-convex, then expanded plane, dark reddish brown, when mature reddish brown, dark brown to brown, striate when moist, hygrophanous, fading to very pale brown, sometimes with brown-orange tinges remaining at centre; gills medium spaced, L = 20-34; stem 20-100 x 2-6 mm. Sp 7-9.5 x 4-5(-5.5) μm , Qav = 1.6-1.9, oblong, ovoid to ellipsoid, in profile sometimes amygdaloid, but not pronounced, rarely subphaseoliform (fig. 615E), reddish brown; pleurocystidia 30-60 x 9-16 μm , narrowly utriform, fusiform, lageniform to cylindrical, rarely subcapitate or rostrate, scattered or more seldom numerous; cheilocystidia of two types: A: 20-50 x 8-16 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered; veil cells 20-100 x 2-20 μm . On debris of wood or among fallen leaves, also terricolous, in deciduous or coniferous forests, sometimes nitrophilous, rarely in open grassland, dry or moist; spring to autumn; very common in temp. and western suba., common in hemib. and eastern bore., rare in western bore. and eastern suba.; DK (LC), FI (DD), IS, NO (LC), SE (LC). – Bol Bres 40:197 (as *fusca*), End 408 (as *fusca*), FND 26:3C, Lud 98.63, M&J 18 (as *fulvescens* var. *brevicystis*).
P. senex (Peck) A.H. Sm. (*P. ocellata* (Romagn.) M.M. Moser, *P. friesii* Kits van Wav., *P. badia* Kits van Wav., *P. capitatocystis* Kits van Wav., *P. ploddensis* Kits van Wav., *P. twickelensis* Kits van Wav., *P. fulvescens* (Romagn.) A.H. Sm. var. *brevicystis* Kits van Wav., *P. fusca* (Schumach.) A. Pearson s. auct.)
- Veil copious, as flocci or scales at least halfway to cap centre; sp with a suprahilar depression 18
- 18. Pleurocystidia with yellow, thickened walls below apex in ammonia solution; with preference for acid coniferous and deciduous forests. Cap 15-50(-70) mm, convex to plane, dark reddish brown, when mature fading to reddish brown, sometimes in young stages fading to brown or grey brown, the amount of grey components variable, when moist striate up to 3/4 from margin, hygrophanous, drying cream or alutaceous, veil with radial fibrils or with scattered flocci or scales, especially close to the margin; gills medium spaced to crowded, L = 28-38; stem 30-70 x 2-7 mm, sometimes with a ring zone in upper part. Sp 7.5-10 x 4-5.5 μm , Qav = 1.7-2, ovoid, oblong to subcylindrical, in profile amygdaloid, with a suprahilar depression or subphaseoliform (fig. 615F), reddish brown; pleurocystidia 35-80 x 10-20 μm , numerous, rarely scattered, fusiform, narrowly conical, lageniform, cylindrical to subutri-


form, with acute or obtuse apex, which rarely is forked or incrusting; cheilocystidia of two types: A: 25-65 x 8-16 μm , similar in shape and frequency to pleurocystidia, B: 7-20 μm wide, clavate, scattered to numerous; veil cells 15-100(-150) x 4-20(-24) μm . With *Betula*, *Fagus*, *Picea*, *Pinus* and *Quercus*, on sticks and debris, rotten wood and leaves, in moss, in dry, moist or wet places; summer to autumn; common in temp.-suba.; DK (LC), FI (DD), FO, IS, NO (LC), SE (LC). – End 402, FAD 145C, 152D, Lud 98.43, Phil 256c, Ves 298.

P. fibrillosa (Pers.: Fr.) Maire (*P. artemisiae* (Pass.) Konrad & Maubl. s. auct.)

- Pleurocystidia without yellow, thickened walls below apex in ammonia solution; with preference for base rich deciduous forests see *P. impexa* key C 26

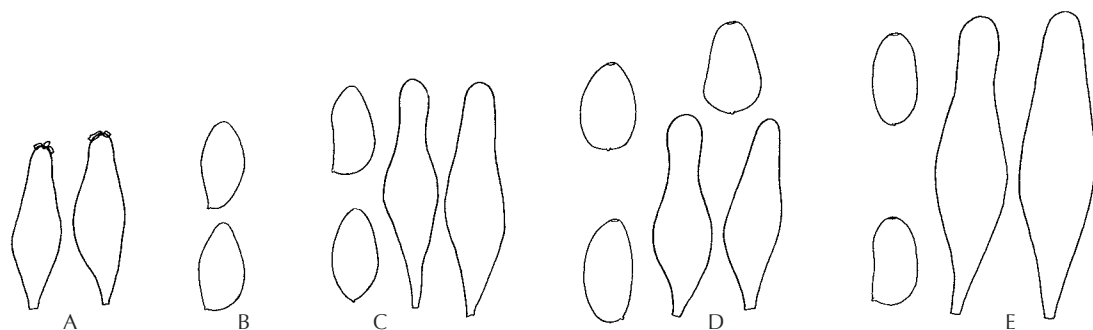
Key K: Pleurocystidia (narrowly) utriform to lageniform, upper part often obtuse

1. Veil at maturity becoming brown to black 2
 - Veil not becoming brown to black at maturity 3
2. Cap 15-35 mm; sp on av $\leq 7 \mu\text{m}$ long, Qav = 1.2-1.3 in front view. Cap convex to nearly plane, when moist greyish buff, avellaneous or dark drab, a sparse to copious, innate fibrillose covering breaking up into erect to somewhat decumbent, fine, dark-coloured scales especially around the disc, with dark brown to blackish brown fibrils; gills adnate, crowded, pallid at first, but soon drab, finally dark purplish brown, with white fimbriate edge; stem 20-40 x 1.5-2 mm, fragile, ground colour white or pallid, but this obscured by coarse appressed dark fibrils similar to those on the cap, pruinose at top. Sp 6-7.5 x 5-5.5 x 4-5 μm , irregularly ellipsoid, ovoid, broadly ellipsoid, subtriangular, in profile sometimes phaseoliform, reddish yellow, germ pore indistinct to absent; basidia 4-spored; pleurocystidia 25-40 x 10-17 μm , utriform to clavate, sometimes with red-brown intracellular pigmentation, numerous; cheilocystidia 20-35 x 10-16 μm , similar in shape and frequency to the pleurocystidia; veil cells 35-90 x 6-14 μm . Solitary to gregarious on logs and debris of deciduous trees, particularly on *Fraxinus*; late summer to early autumn; very rare in eastern hemib.; FI (A: Jomala, Ramsholm).
P. hirtosquamulosa (Peck) A.H. Sm.
 - Cap 30-80 mm; sp on av $\geq 7 \mu\text{m}$ long, Qav = 1.7-2 see *P. cotonea* key J 1
3. Sp on av 6-6.6 μm long; stem \pm entirely white pulverulent; pleurocystidia often with crystals. Cap 5-20 mm, convex to plane, brown, at maturity slightly paler, striate up to 2/3 from margin, hygrophanous, drying pale buff or whitish, veil in early stages as small, fibrillose scales, erect or appressed, at centre ochraceous to brown, towards margin white; gills distant, L = 14-21; stem 10-30 x 1-2 mm; taste mild to bitter. Sp 6-7.5 x 3.5-4 μm , Qav = 1.6-1.7, ovoid, oblong to ellipsoid, in profile sometimes amygdaloid or phaseoliform, brownish orange; pleurocystidia 25-40 x 10-18 μm , mostly utriform, scattered clavate, sometimes slightly thick-walled (fig. 619A), numerous; cheilocystidia of two types: A: 20-40 x 8-17 μm , similar in shape and frequency to pleurocystidia, B: small, clavate, scattered; caulocystidia present over entire length of stem; veil cells 40-120 x 4-22 μm , brown incrusting. On decayed stumps or twigs of deciduous trees, e.g. *Alnus*, *Fagus*, *Fraxinus*, *Populus*, *Salix* and *Ulmus* or directly on soil, sometimes with *Coprinellus disseminatus*, dry to moist; spring to autumn; occasional in western temp., rare in eastern temp. and hemib.; DK (LC), FI, SE (LC). – B&K 4:354, End 417, FAD 151B (as *Psathyra consimilis*), Lud 98.39, M&J 9, .
P. pygmaea (Bull.: Fr.) Singer
 - Sp on av 6.4-9.6 μm long; stem not entirely white pulverulent; pleurocystidia with or without crystals 4
4. Veil as granules, made up of globose to ellipsoid cells 5
 - Veil as fibrils or flocci, made up of hyphae 6
5. Sp 7-8.5 x 3.5-4.5 μm . Cap 5-20 mm, convex, whitish, yellow, ochraceous or pinkish buff, later developing grey tones, not striate; gills medium spaced; stem 20-40 x 1-2.5 mm, \pm

equal, concolorous with cap, at top pulverulent, downwards flocculose from the veil. Sp Qav = 1.8-1.9 μm , oblong, narrowly ovoid to subcylindrical, sometimes irregular, in profile sometimes (narrowly) amygdaloid to subphaseoliform or with a suprahilar depression (fig. 619B), reddish yellow, germ pore lacking or indistinct; pleurocystidia 25-60 x 10-20 μm , polymorphic, often utriform to lageniform, rarely with bent or forked upper part, \pm numerous; cheilocystidia of two types: A: 20-55 x 9-20 μm , utriform to lageniform, scattered to numerous, B: small, clavate, scattered; spherocysts on cap of 10-60 μm wide, globose to ellipsoid cells similar to the cells of pileipellis and difficult to distinguish from them. In rich to slightly acid deciduous forests, on rotten wood, moist to wet, often on remnants of *Agaricales*, forming sclerotia-like structures; autumn; DE, NL. – Lud 98.6, ZM 64:221, .

P. globosivelata Gröger

- Sp 8.5-11 x 4.5-5.5 μm see *P. albofloccosa* key C 33
- 6. Dominating type of cheilocystidia similar to pleurocystidia 7
- Dominating type of cheilocystidia small, clavate to spheropedunculate 20
- 7. Sp on av < 8 μm long 8
- Sp on av > 8 μm long 14
- 8. Gill edge often pink; cap 20-70 mm. Cap convex to nearly plane, dark brown, umber, date brown, dark reddish brown, striate to 1/3 from margin, hygrophanous, drying pale ochraceous, sometimes with pink or vinaceous tinges, veil rudimentary as fibrils at the margin; gills crowded, L = 28-42, with pruinose edge; stem 35-105 x 3-10 mm. Sp 6.5-8 x 4-5 μm , Qav = 1.6-1.8, ovoid, oblong to ellipsoid, in profile often \pm phaseoliform, sometimes amygdaloid, brown, with a distinct or indistinct germ pore; pleurocystidia 35-55 x 10-18 μm , utriform, narrowly utriform to lageniform, numerous to scattered; cheilocystidia of two types: A: 25-55 x 8-17 μm , similar to pleurocystidia, \pm numerous, B: small, clavate, often with yellow refringent walls, scattered to numerous; veil cells 20-80 x 3-10 μm . On leaves, decayed branches or on grass in deciduous forests; summer to autumn; very rare in southeastern temp. and hemib.; FI (U: Porvoo), SE (LC).
P. pseudocorrugis (Romagn.) Bon (*P. borgensis* Kits van Wav.)
- Gill edge not pink; cap 7-40 mm 9
- 9. Sp without or with an indistinct germ pore, obovoid, dacryoid or subfusiform. Cap 10-30(-40) mm, conical-convex, brown, striate almost to centre, hygrophanous, drying pale brown; veil well developed as flocci or fibres to centre, appendiculate at margin; gills distant to medium spaced, L = 17-28; stem 20-50 x 2-4 mm. Sp 6.5-8 x 3.5-5 μm , Qav = 1.5-1.8, ellipsoid, oblong, ovoid, dacryoid to subfusiform, in profile sometimes amygdaloid or with a suprahilar depression (fig. 619C), brownish orange; pleurocystidia 35-65 x 10-16 μm , narrowly utriform, obtusely fusiform, sublageniform, scattered to numerous; cheilocystidia of two types: A: 25-45 x 8-16 μm , similar to pleurocystidia, numerous or rarely scattered, B: small, clavate to obpyriform, variable in number; veil cells 10-160 x 5-40 μm . In deciduous or coniferous forests, with *Fagus sylvatica*, *Quercus robur*, *Oxalis acetosella* and *Urtica dioica*, on logs or attached to wood in base rich soil; late summer to autumn; very rare in eastern temp. and southernmost hemib.; FO, SE (LC). – Lud 98.51.
P. kitsiana Örstadius
- Sp with a pore distinct to absent germ pore, ellipsoid, oblong, ovoid, subcylindrical, subtriangular, amygdaloid or phaseoliform 10
- 10. Sp on av 3.9-4.1 μm broad 11
- Sp on av 4.2-6.1 μm broad 12
- 11. Veil copious, as floccules to centre of cap, of 6-35 μm broad cells see *P. squamosa* key J 13
- Veil scanty, as floccules at cap margin, of 2-6 μm broad cells see *P. rubiginosa* 13
- 12. Sp on av 5.4-6.1 μm broad, sometimes irregular in outline (fig. 619D); cap striate to halfway



Spores and pleurocystidia: A: *Psathyrella pygmaea*, B: *P. globosivelata*, C: *P. kitsiana*, D: *P. panaeoloides*, E: *P. noli-tangere*.

from margin, but often non-striate. Cap 7-30 mm, convex to nearly plane, dark reddish brown to dark brown, fading to brown, ochraceous brown or grey brown, hygrophanous, drying pale buff or pale brown, sometimes tinged vinaceous, veil remnants rudimentary, when fresh as fibrils close to the margin; gills medium spaced, L = 20-30; stem 20-60 x 1-5 mm. Sp 7-10.5 x 5-6.5 x 4.5-6 μm , $Q_{\text{av}} = 1.3-1.6$ in front view, 1.5-1.8 in side view, ovoid, ellipsoid, subtriangular to broadly ellipsoid, sometimes irregular in outline, in profile oblong to ellipsoid, sometimes phaseoliform, reddish brown; pleurocystidia 20-60 x 8-20 μm , narrowly utriform, obtusely conical or fusiform, lageniform to subcylindrical, numerous, rarely scattered; cheilocystidia of two types: A: 20-50 x 6-18 μm , similar to pleurocystidia, numerous to scattered, B: small, clavate to obpyriform, scattered to numerous; veil cells 20-80 x 2-10 μm . In open grassland, on the great alvar of ÖL, on calcareous soil, sometimes on disturbed soil or sand-dunes, in dry to wet places, sometimes among leaves or attached to sticks or twigs; spring to autumn; occasional in temp., rare in hemib.-bore.; DK (LC), FI (DD), NO (NE), SE (LC). – Lud 98.70, M&J 19, Ves 300.

P. panaeoloides (Maire) Arnolds

- Sp on av 4.4-5.3 μm broad, rarely irregular in outline; cap distinctly striate 13
- 13. Cap 10-40 mm; L = 26-36; pleurocystidia 40-75 x 10-22 μm . Cap convex to nearly plane, dark reddish brown, fading to brown from margin, when moist striate almost to centre, hygrophanous, drying pale brown or dirty yellow; gills medium spaced; stem 20-60 x 1-4 mm. Sp 7-9 x 4-5 μm , $Q_{\text{av}} = 1.6-1.9$, oblong, ovoid to ellipsoid, rarely slightly irregular in outline, in profile often phaseoliform, rarely subamygdaloid (fig. 619E), brown; pleurocystidia narrowly utriform to lageniform, rarely forked, numerous, sometimes scattered; cheilocystidia of two types: A: 30-70 x 10-22 μm , similar to pleurocystidia, numerous, B: small, clavate, scattered to numerous; veil cells 30-90 x 2-10 μm . On wet or moist habitats in deciduous woods, often with *Fagus* on basic or acid soil, also with *Alnus*, *Betula*, *Populus tremula*, *Quercus* and *Rhamnus*, on loamy paths, among leaves, on stumps or logs; spring to autumn; very rare in temp.-hemib.; DK (DD), NO (LC), SE (LC). – Lud 98.67, M&J 16.

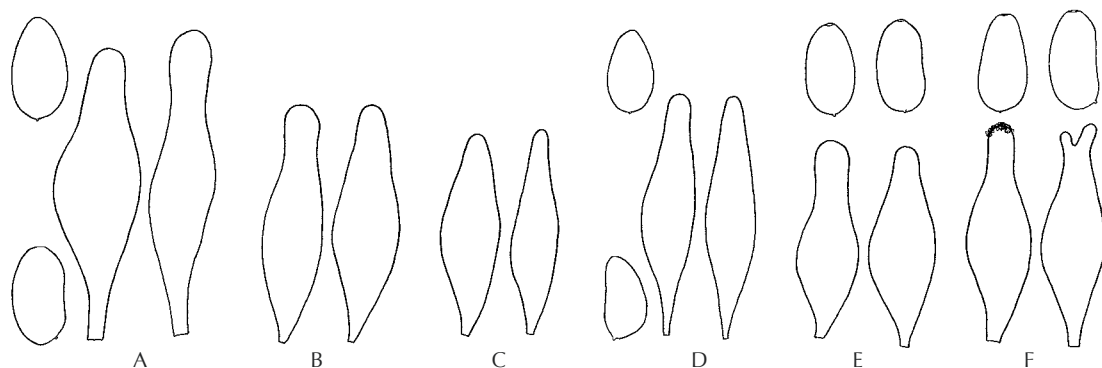
P. noli-tangere (Fr.) A. Pearson & Dennis

- Cap 5-20 mm; L = 18-22; pleurocystidia 25-45 x 7-14 μm . Cap convex, at first dark brown to reddish brown, paler towards margin, shining, hygrophanous, drying pale ochre, reddish yellow, rarely pink tinged, veil as flocci at the margin and dispersed fibrils towards centre, rarely glabrous; gills distant; stem 15-50 x 1-2.5 mm, pale brown, darker towards base; smell faint or absent; taste mild. Sp 6.5-9 x 3.5-5 μm , $Q_{\text{av}} = 1.6-2$, ovoid, oblong, ellipsoid, in profile sometimes amygdaloid or subphaseoliform, reddish brown; germ pore absent to distinct; pleurocystidia utriform, lageniform, obtusely fusiform, rarely rostrate at apex, scattered to rather numerous; cheilocystidia of two types: A: 15-40 x 6-13 μm , similar to pleuro-

cystidia, numerous, B: small, clavate, scattered, rarely numerous; veil cells 20-60 × 2-6 μm. In moist or wet places, in deciduous forests with *Alnus*, in fens outside forests, on muddy soil, among plants or remnants of plants, spring to autumn; occasional in temp., rare in hemib., very rare in bore.; DK (LC), FI, NO, SE. – Lud 98.52 (as spec. 6).

P. rubiginosa A.H. Sm.

14. Pleurocystidia with crystals see *P. olympiana* key C 12
 - Pleurocystidia without crystals 15
15. Cap 30-90 mm; sp without or with an indistinct germ pore; veil scanty. Cap convex to plane, dark reddish brown, dark brown, at maturity cinnamon, dark yellow brown to yellowish red, sometimes glossy, when moist striate up to halfway from margin, hygrophanous, drying pale buff or cream, veil as white fibrils at margin, connecting to the stem in young frb; gills crowded, L = 30-40; stem 40-110 × 4-15 mm; smell faint, sometimes like tomato leaves. Sp 7.5-10 × 4.5-6.5 μm, Qav = 1.5-1.7, ellipsoid, oblong to ovoid, sometimes slightly irregular in outline, in profile sometimes phaseoliform (fig. 621A), brownish orange; basidia or other cells in hymenium sometimes in part with brown intracellular pigmentation; pleurocystidia 40-90 × 10-24 μm, mostly utriform, sometimes obtusely fusiform, lageniform to clavate, rarely forked or rostrate, numerous, walls yellow; cheilocystidia of two types: A: 35-90 × 10-22 μm, similar to pleurocystidia, numerous to scattered, B: small, clavate, scattered to numerous; veil cells 20-150 × 2-10 μm. In deciduous or coniferous forests on rotten wood, wood chips, sticks or twigs or directly on soil, in dry or moist places, on acid or base rich soil; summer to autumn; rare in temp.-hemib., occasional in bore.-suba., in FI with northern distribution; DK (DD), FI, IS (Au), NO (LC), SE.
P. larga (Kauffman) A.H. Sm.
- Cap 7-50 mm; sp without or with a distinct germ pore; veil copious to scanty 16
16. Sp on av 5.4-6.1 μm broad, sometimes irregular in outline; cap often non-striate see *P. panaeoloides* 12
 - Sp on av 3.9-5.3 μm broad; not or rarely irregular in outline; cap striate 17
17. Sp on av 6.9-8.3 μm long; veil moderately developed, as fibrils or flocci on the cap 18
 - Sp on av 8.1-9.4 μm long; veil copious as patches on cap or a ring on the stem 19
18. Cap 10-40 mm; L = 26-36; pleurocystidia 40-75 × 10-22 μm see *P. noli-tangere* 13
 - Cap 5-20 mm; L = 18-22; pleurocystidia 25-45 × 7-14 μm see *P. rubiginosa* 13
19. Stem often with a membranous ring in upper part, sometimes reduced to a ring-like zone; pleurocystidia with faintly yellow walls; often on *Sphagnum* or other wet mosses like *Polytrichum*, in forests of conifers or *Betula*. Cap 10-40 mm, conical-convex, when moist reddish brown, striate halfway from margin, hygrophanous, drying alutaceous or pale buff, veil forming fibrils or floccules near the margin; gills medium spaced, L = 22-30, edge rarely faintly red; stem 50-100 × 2-5 mm. Sp 8-10 × 4.5-5.5 μm, Qav = 1.8-2, oblong, ovoid to subcylindrical, in profile sometimes amygdaloid or with a suprahilar depression, hardly phaseoliform, reddish brown; pleurocystidia 40-60 × 10-18 μm, mostly utriform, rarely obtusely fusiform or sublageniform (fig. 621B), numerous; cheilocystidia of two types: A: 25-45 × 8-16 μm, similar in shape and frequency to pleurocystidia, B: small, clavate to obpyriform, numerous; veil cells 20-90 × 4-16 μm. Summer to autumn; occasional in central hemib., rare in the rest of hemib.-bore., very rare in temp.; DK (RE), FI (DD), FO (Tórshavn), NO (NE), SE (LC). – B&K 4:358, C&D 811, FAD 144A (as *Stropharia psathyroides*), M&J 4.
P. sphagnicola (Maire) J. Favre
- Stem sometimes with a ring zone; pleurocystidia with yellow walls; habitat variable see *P. fibrillosa* key J 18
20. Sp on av < 8 μm long 21
 - Sp on av ≥ 8 μm long 26



Spores and pleurocystidia: A: *Psathyrella larga*, B: *P. sphagnicola*, C: *P. pseudocasca*, D: *P. cortinarioides*, E: *P. fatua*, F: *P. spadiceogrisea*.

21. Sp on av 5.4-6.1 μm broad in front view, subtriangular or broadly ellipsoid
 - see *P. panaeoloides* 12
 - Sp on av 3.9-5.5 μm broad in front view, not subtriangular or broadly ellipsoid 22
22. Sp with a distinct germ pore; L = 24-50; cap 10-70 mm 23
 - Sp without or with an indistinct germ pore; L = 17-34; cap 10-40 mm 24
23. Sp on av 4-4.2 μm broad, smooth, granulose to verruculose, rarely phaseoliform; veil as flocci almost to centre of cap. Cap 10-70 mm, conical-convex to plane, when moist dark reddish brown to dark yellow brown, striate halfway from margin, drying cinnamon brown, reddish yellow to pale brown; gills crowded, L = 30-48; stem 30-80 \times 3-8 mm, sometimes with a fibrillose ring zone in upper part. Sp 6.5-8.5 \times 3.5-4.5 μm , Qav = 1.7-2, oblong, ovoid to subcylindrical, in profile sometimes amygdaloid, brownish orange; pleurocystidia 25-60 \times 8-14 μm , narrowly utriform, fusiform to lageniform (fig. 621C), scattered to numerous; cheilocystidia of two types: A: 30-40 \times 8-12 μm , similar to pleurocystidia, scattered, B: 15-35 \times 8-20 μm , clavate, abundant, 1-3 cells deep; veil cells 10-100 \times 5-25 μm . In rich deciduous forests, rarely coniferous forests, on stumps or on soil attached to decaying wood, with herbs like *Lamiaeum galeobdolon*, *Galium odoratum*, *Mercurialis perennis* or *Allium ursinum*; spring to autumn; very rare in temp.; DK (DD), SE (LC). – FAD 147A (as *Hypholoma cascum*), Lud 98.29, Mych 1:409, BSMF 116:376.
P. pseudocasca (Romagn.) Kits van Wav. (*P. stigmatospora* Clemençon)
 - Sp on av 4.2-5.2 μm broad, smooth, often phaseoliform; veil as fibres or flocci near the cap margin see *P. spadiceogrisea* 33
24. Sp on av 7.6-9.2 μm long; veil as flocci near cap margin see *P. obtusata* key J 9
 - Sp on av 7.2-8 μm long; veil as flocci to halfway from margin or to centre of cap 25
25. Sp without a suprahilar depression, often phaseoliform; pleurocystidia often yellow below apex. Cap 15-40 mm, convex to plane, date brown to umber, becoming ochre brown or grey brown, hygrophanous, when moist not striate or striate halfway from margin, drying pale ochraceous brown to beige; veil at first as scales or flocci to halfway from margin or to centre; gills medium spaced, L = 24-32; stem 20-60 \times 2-5 mm, sometimes leaving a fibrillose ring zone. Sp 6.5-9 \times 4-5 μm , Qav = 1.6-1.9, oblong, ovoid to ellipsoid, sometimes irregular in outline, in profile rarely amygdaloid (fig. 621D), brownish orange, germ pore indistinct or absent; pleurocystidia 35-70 \times 10-18 μm , narrowly utriform, lageniform, subcylindrical to obtusely fusiform-conical, rarely clavate or forked, numerous; cheilocystidia of two types: A: 20-45 \times 8-18 μm , similar to pleurocystidia, scattered to numerous, B: small, clavate, numerous and dominating; veil cells 20-100(-160) \times 2-14(-18) μm . Lignicolous or terricolous, in

deciduous or coniferous forests, wooded pastures, along path sides, often on calcareous soil, dry or moist; spring to autumn; rare in temp., very rare in eastern bore.; DK (LC), FI (KP: Haapajärvi), FO, SE (LC). – C&D 805 (as *frustulenta*), End 406, Lud 98.56.

P. cortinarioides P.D. Orton (*P. multicystidiata* Kits van Wav., *P. frustulenta* (Fr.) A.H. Sm. s. auct.)

- Sp sometimes with a suprahilar depression, not phaseoliform; pleurocystidia hardly yellow below apex see *P. kitsiana* 9
- 26. On *Sphagnum* or other wet mosses in forests of conifers or *Betula*; stem often with a membranous ring; sp hardly phaseoliform see *P. sphagnicola* 19
 - Not on *Sphagnum* or other wet mosses in forests of conifers or *Betula*; stem very occasionally with a membranous ring; sp often phaseoliform 27
- 27. Sp without or with an indistinct germ pore 28
 - Sp with a distinct germ pore 31
- 28. Cap 30-90 mm; pleurocystidia 10-24 μm broad; basidia or other cells in hymenium with brown, intracellular pigment see *P. larga* 15
 - Cap 10-40 mm; pleurocystidia 8-18 μm broad; basidia and other cells in hymenium without brown, intracellular pigment 29
- 29. In dry, open grassland, along paths in forests or behind sand dunes; sp on av 5.2-6 μm broad in front view see *P. clivensis* key C 39
 - In rich deciduous forests or occasionally in coniferous forests on decayed wood, mossy logs or soil; sp on av 4.1-5.5 μm broad in front view 30
- 30. Sp on av 4.1-4.6 μm broad in front view; clavate cheilocystidia not mucronate; pleurocystidial walls often yellow see *P. cortinarioides* 25
 - Sp on av 4.7-5.5 μm broad in front view; clavate cheilocystidia sometimes mucronate; pleurocystidial walls pale yellow see *P. obtusata* key J 9
- 31. Sp on av 5.4-6.1 μm broad in front view, subtriangular or broadly ellipsoid; L = 20-30; cap often non-striate see *P. panaeoloides* 12
 - Sp on av 4-5.5 μm broad in front view, not subtriangular or broadly ellipsoid; L = 24-50; cap often striate 32
- 32. Sp on av 4-4.2 μm broad in front view, smooth, granulose to verruculose; veil strongly developed, as flocci almost to cap centre see *P. pseudocasca* 23
 - Sp on av 4.2-5.2 μm broad in front view, smooth; veil present as fibres or flocci near cap margin 33
- 33. Cap 15-45 mm, when mature pale; pleurocystidia not yellow brown pigmented or incrustated at apex, hardly forked. Cap convex to plane, in primordium reddish brown, then yellow red to ochraceous brown, at maturity fading from margin to pale grey ochraceous, sometimes shiny or sticky, hygrophanous, when moist striate, drying cream or alutaceous, veil as flocci or scattered fibrils near the margin; gills medium spaced to crowded, L = 24-39; stem 20-100 \times 1.5-5 mm, rather stiff. Sp 7.5-9.5(-10.5) \times 4-5.5 μm , Qav = 1.6-2, oblong, ovoid, ellipsoid to subcylindrical, sometimes irregular in outline, in profile sometimes phaseoliform (fig. 621E), brown; pleurocystidia 30-60 \times 10-19 μm , utriform, lageniform, fusiform to conical, sometimes capitate, scattered to numerous; cheilocystidia of two types: A: 20-45 \times 8-18 μm , similar to pleurocystidia, scattered, sometimes rather numerous, B: 8-20 μm wide, clavate to obpyriform, numerous; veil cells 20-120 \times 2-10 μm , hyaline. In deciduous woods, in parks, along paths, in grass lawns, in leaves, attached to buried sticks or twigs, on calcareous, disturbed and nitrophilous soil; spring to autumn; rare in eastern temp., very rare in western temp.-western bore.; NO (LC), SE (LC). – Lud 98.36A,C, M&J 8 (as *pseudocorrugis*).
P. fatua (Fr.) Konrad & Maubl.

- Cap 20-70 mm, when mature dark to pale brown; pleurocystidia sometimes yellow brown pigmented or incrustated at apex or forked. Cap conical-convex to plane, dark reddish brown, fading to yellow red, yellow brown, ochraceous brown, brown, grey brown, pale grey brown, sometimes with olivaceous tinges, faintly striate to halfway from margin, hygrophorous, sometimes shiny or sticky, drying from margin to cream or alutaceous with \pm grey tinges, veil present as fibres or flocci on the marginal area; gills crowded, L = 24-50; stem 30-120 x 2-10 mm, near base sometimes with an evanescent fibrillose zone. Sp 7-9.5(-10.5) x 4-5.5 μ m, Qav = 1.6-2, oblong, ovoid, subcylindrical to ellipsoid, in profile often \pm phaseoliform, rarely amygdaloid (fig. 621F), reddish brown; pleurocystidia 30-60 x 10-20 μ m, mostly utriform, sometimes fusiform or lageniform, rarely acute, numerous, rarely scattered; cheilocystidia of two types: A: 25-45 x 10-16 μ m, similar to pleurocystidia, scattered, rarely rather numerous, B: small, clavate to obpyriform, one or several cells deep; veil cells 20-140 x 3-12 μ m. In rich deciduous woods, with *Alnus*, *Betula*, *Fagus*, *Fraxinus*, *Populus*, *Quercus*, *Tilia* or *Ulmus*, sometimes mixed with conifers, in parks, along path sides, attached to sticks or twigs, in leaves, sometimes on nutrient rich soil, dry to moist; mainly in spring, but also in summer to autumn; common in temp., occasional in hemib., very rare in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Bol Bres 36:135, FAD 153A (as *Psathyra obtusata* var. *vernalis*), D, M&J 22, Ves 301, ZM 66:17.

P. spadiceogrisea (Schaeff.) Maire (*P. vernalis* (J.E. Lange) M.M. Moser, *P. casca* (Fr.) Konrad & Maubl. s. Kits van Waveren)

Note: often misinterpreted and difficult to separate from *P. fatua* and related taxa.

Pseudobaeospora Singer emend. Bas

THOMAS LÆSSØE

Frb mycenoid to collybioid. Cap 1-15 mm, conical to convex, may have an umbo or papilla, silky fibrillose, dry, white, pale brownish or greyish to lilac. Gills adnexed, ventricose, sometimes sinuate with a decurrent tooth, medium spaced, whitish, greyish, brownish or lilac. Stem 10-40 x 1-2 mm, ± cylindrical, sometimes rooting, pruinose to slightly fibrillose, coloured as cap or paler. Veils apparently absent. Flesh thin to rather thin. Smell and taste insignificant. Sp deposit white to whitish.

Sp 3.5-5 x 2.5-4.5 μm, globose to ellipsoid, dextrinoid or without iodine reactions, without germ pore, smooth, thin- to slightly thick-walled after liberation, hyaline. Hymenial cystidia absent or present in the form of cheilocystidia. Pileocystidia absent or present. Pileipellis variable from a cutis to a hymeniderm. Caulocystidia in tufts at top of stem. Pigments in pileipellis may change colour in KOH. Clamps absent or present.

Saprotrophic; on ± calcareous, often sandy soil, more rarely on peaty soil or on debris.

Three species in the Nordic countries, four species in the key, but further unnamed species are present, and at least six further species have been described from neighbouring countries.

Lit.: Bas 2002, 2003, Ludwig 2001, Ronikier & Moreau 2007.



Spores: *Pseudobaeospora celluloderma*.

1. Pileipellis a celluloderm; frb ± violaceous. Cap 1-4.5 mm, conical-convex to low convex, striate, smooth, paler with age; gills distant, adnate, sinuate with a decurrent tooth; stem 10-35 x 0.1-0.8 mm, top whitish pruinose-pubescent; smell insignificant. Sp (3-)3.5-4.5 x 2.5-3.5 μm, Qav = c. 1.3, subglobose to broadly ellipsoid (fig. 517D), becoming thick-walled and dextrinoid after liberation; basidia 4-spored; cheilocystidia absent; pileipellis with 10-38 x 6-29 μm, erect cells, greyish to brownish in 5% KOH; clamps present. On loose, ± calcareous soil, also in more damp situations, under *Fagus*, *Fraxinus*, *Alnus*, *Picea* and often among tall herbs such as *Epilobium*; summer to early autumn, very rare, but more likely overlooked in bore.; FI (DD, PK: Ilomantsi), SE (Mpd). – ⊙.
P. celluloderma Bas
 - Pileipellis a cutis, with or without cystidioid elements; frb strongly pigmented or pale 2
2. Frb pale buff. Cap 6-10 mm, conical-convex, whitish with pale buff centre, not striate, slightly felty; gills nearly free, crowded to medium spaced, cream buff; stem 11-15 x 0.7-1 mm, almost cylindrical, pale brownish buff, slightly fibrillose and felty at base; smell slightly unpleasant. Sp 4-4.5 x 3-3.5(-4) μm, Qav = c. 1.3, becoming thick-walled and dextrinoid after shedding; basidia 4-spored; cheilocystidia absent; pileipellis of very thin, intervoven, repent hyphae, yellow in KOH 5%; caulocystidia 26-55 x 4-7.5 μm, very densely packed at stem top; clamps present. On soil and needle-beds under *Juniperus communis*; autumn; only known from the holotype in temp., DK (DD, Ejl: Mols, Strandkær).
P. paulochroma Bas
 - Frb ± violaceous 3
3. Clamps absent; frb solitary. Cap 1.5-13 mm, conical to conical-convex, umbonate or not, not striate, silvery fibrillose, colours variable, but always with some purple or lilac, paler outwards; gills adnexed to free, medium spaced to crowded, violaceous or with some brown intermixed; stem 18-55 x 0.2-1 mm; smell insignificant or aromatic. Sp (3-)3.5-4.5(-5) x (2.5-)3-3.5 μm, Qav = c. 1.2, thin-walled, but becoming thick-walled and weakly dextrinoid after shedding; cheilocystidia absent; pileipellis when young with some cystidioid, clavate elements, later only of repent hyphae. On ± calcareous soil or attached to small pieces in the

litter, both with broadleaved trees and under conifers and *Salix* shrubs in alpine tall-herb meadows; summer to autumn; very rare in hemib.-arc./alp.; NO (NT).

P. pillodii (Quél.) Wasser (*P. oligophylla* (Singer) Singer)

- Clamps present; frb sometimes fasciculate: cap 8-15 mm, obtusely conical to convex with a broad umbo, not striate, appressed felty, purple to lilac; gills adnate with a decurrent tooth, adnexed to almost free, distant to medium spaced, violaceous; stem 13-45 x 0.5-1 mm, concolorous with cap, pruinose-pubescent at the top; smell insignificant or aromatic. Sp 3.5-5(-6) x 2.5-4 μm , $Q_{av} = c. 1.3$, broadly ellipsoid to ellipsoid, thin-walled but becoming thick-walled and weakly dextrinoid after shedding; basidia (1-2-)4-spored; cheilocystidia absent; pileipellis of inflated, repent hyphae, (14-)40-87(-200) x (4-)18-34(-45) μm ; sordid yellow in KOH. On damp turf in mixed *Alnus*, *Salix*, *Frangula*, *Betula* bog; late summer; very rare in temp.; DK (DD, Sj: Sorø Sønderskov).

P. ellipticospora Bas

Pseudoclitocybe Singer

HENNING KNUDSEN

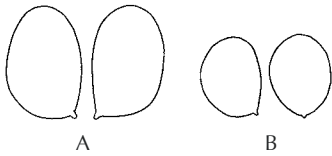
Frb clitocyboid with a long stem. Cap umbilicate, brown to grey, hygrophanous, finely striate or not. Gills decurrent, ± forked, medium spaced, whitish. Stem cylindrical or gradually thicker below. Smell indistinct. Taste mild. Sp deposit white.

Sp ellipsoid, hyaline, amyloid. Cystidia absent. Pileipellis a cutis with incrusting or intercellular pigment. Clamps absent.

Saprotrophic; on soil among mosses or grasses, or on needles, leaves or wood; autumn to late autumn.

Two species in the Nordic countries.

Lit.: Harmaja 1974.



Spores: A: *Pseudoclitocybe cyathiformis*, B: *P. expallens*.

1. Cap 30-100 mm; in forests or clearings in forests, along forests paths, sometimes also on trunks. Cap dark coffee brown, drying yellow brown, margin not or only faintly translucently striate, shiny, becoming funnel-shaped, with incurved margin; gills decurrent, rounded at stem, somewhat paler than cap and stem; stem 50-100 x 5-12 mm, clavate, concolorous with cap and with a thin, pale reticulate-fibrillose coating, base white tomentose; smell faint, pleasant. Sp 8-12 x 5-6.5 μm , ellipsoid-oblong (fig. 239A); pileipellis a cutis of smooth hyphae. In the southern area mostly in *Fagus* forests, in the northern part in various deciduous forests, meadows and parks, more rare in coniferous forests; late autumn to early winter; common in temp.-bore., rare in suba., north to 69°30' N, in FI with a southern distribution; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 290, Lud 71.1, Phil 95d, R&H 308, Ves 187, ⊗.

P. cyathiformis (Bull.: Fr.) Singer

- Cap 15-45 mm; in open land on neutral, alkaline meadows influenced by cattle, calcareous coastal meadows, dry meadows, etc. Cap umbilicate, olive blackish to bluish grey, first silky shiny, discolouring grey brown, margin striate half-way to 1/3; gills decurrent, pale grey with a bluish tinge; stem 40-60 x 2-10 mm, concolorous but paler than cap, smooth, broader towards the hairy base; smell faint, of cyanic acid or bitter almonds. Sp 7-10 x 5-7 μm , ellipsoid (fig. 239B); pileipellis a cutis of repent, smooth hyphae, with scattered short branches. Late autumn; rare in temp.-bore.; DK (EN), FI (DD), NO (NE, Nordl, NTr), SE (LC). – Däh 291. Lud 71.2, ⊗.

P. expallens (Pers.: Fr.) M.M. Moser (*P. obbata* (Fr.) Singer, *P. atra* (Velen.) Harmaja)

Pseudoomphalina (Singer) Singer

HENNING KNUDSEN

Frb omphalinoid with whitish gills. Cap 10-60 mm, convex with involute margin, then plane with umbilicate centre, dry, smooth to very finely scaly, dirty yellow to greyish ochraceous, slightly hygrophanous, striate or not. Gills decurrent or emarginate to uncinatae, rather thick, distant, whitish to dirty cream. Stem 15-70 x 1-12 mm, cylindrical or partly compressed above and tapering below, often flexuous, concolorous with cap or paler, cartilaginous, hollow above. Taste farinaceous to bitter. Smell farinaceous or insignificant. Sp deposit white.

Sp broadly ellipsoid to ovoid or slightly reniform, amyloid. Cystidia absent. Pileipellis a cutis of repent, ± incrustated hyphae. Clamps abundant.

Saprotrophic in conifer forests along paths and in clearings, among mosses or on exposed sandy soil, gregarious. Autumn.

Two species in the Nordic countries.

Lit.: Knudsen & Hansen 1991, Kotlaba & Pouzar 1995.



Spores: *Pseudoomphalina pachyphylla*.

1. Taste farinaceous; sp distinctly but not strongly amyloid. Cap 15-50 mm, umbilicate, ochre to pale fulvous; gills decurrent, somewhat arcuate, rather thick; stem 20-50 x 2-5 mm, cylindrical or compressed, cartilaginous, concolorous with cap; smell farinaceous. Sp 6.5-9.5 x 3.5-5 µm, ellipsoid; pileipellis a cutis of smooth or slightly incrustated hyphae. Saprotrophic in coniferous forests, grassland and meadows on calcareous soil; rare in temp.-southern bore.; DK (DD), NO (LC, incl. SvB), SE (DD). – Däh 289, FAD 59I, R&H 307.
P. kalchbrenneri (Bres.) Singer (*P. compressipes* (Peck) Singer var. *kalchbrenneri* (Bres.) Gminder, *P. graveolens* (S. Petersen) Singer)
 - Taste slightly bitter; sp weakly amyloid, often difficult to see (greying). Cap 10-30 mm, flattened to slightly umbilicate, smooth or finely floccose scaly, pale ochre to greyish ochre; gills emarginate or slightly decurrent, rather thick and distant, often irregular, white; stem 15-40 x 1-4 mm, smooth, concolorous with cap or paler, shiny, slightly cartilaginous, cylindrical or compressed; smell indistinct or farinaceous. Sp 6.5-9 x 4.5-6 µm, ellipsoid (fig. 239C); pileipellis a cutis of incrustated hyphae. Saprotrophic in low vegetation on acid or bare, sandy soil, in coniferous forests, grassland and cemeteries; probably occasional in temp.-bore., north to KP in FI, to NTr in NO; DK (LC), FI (LC), NO (NE), SE (NE). – FAD 36 G, K&M 207.1 (as *Collybia clusilis*), Sieniop 136, Ves 180.
P. pachyphylla (Fr.: Fr.) Knudsen (*P. absinthiata* (Lasch: Fr.) Knudsen, *Clitocybe pachyphylla* (Fr.) Gillet, *Collybia incomis* P. Karst., *Omphalia clusiliformis* Kühner & Romagn. nom. inval.)

Psilocybe (Fr.) P. Kumm.

JAN VESTERHOLT

Deconica (W.G. Sm.) P. Karst., *Melanotus* Pat.

Frb mycenoid, collybioid to crepidotoid, with dull brown to black sp deposit. Cap 2-60 mm, smooth, rarely slightly velvety, mostly viscid to slimy, mostly hygrophanous, mostly with brown colours, sometimes tinged blue. Gills adnate to adnexed or emarginate, distant to crowded, mostly broad, becoming reddish brown to dull brown or almost black, sometimes tinged purplish. Stem mostly cylindrical. Veil in some species abundant, both on cap and stem, sometimes appendiculate at cap margin, sometimes forming a ring zone on the stem, in other species very fugacious or seemingly absent. Smell indistinct or farinaceous, in some species sweetish. Taste indistinct or farinaceous, rarely bitter. Sp deposit dull brown, blackish brown or black, sometimes tinged purple.

Sp ellipsoid to ovoid, rhomboid or hexagonal in face view, smooth, mostly with a distinct germ pore, rather thin-walled to distinctly thick-walled, honey-coloured to brown, without iodine reactions. Cheilocystidia mostly ± lageniform. Pleurocystidia absent. Pileipellis a cutis or an ixocutis. Clamps present or absent.

Saprotrophic on wood, dung, moss, soil, wood and herbaceous litter.

22 species in the Nordic countries, 24 species in the key. Blueing species are hallucinogenic, often powerful. Phylogenetic studies have shown that the genus as presented here is polyphyletic, but it is decided here not to split the genus before the lectotypification with *P. montana*, a species not containing psilocybin, has been reconsidered. With *P. montana* as type, the species containing psilocybin should be excluded from *Psilocybe*.

Lit.: Guzman 1983, Ludwig 2001, Noordeloos 1998, Noordeloos in Bas et al. 1999, Watling & Gregory 1987.

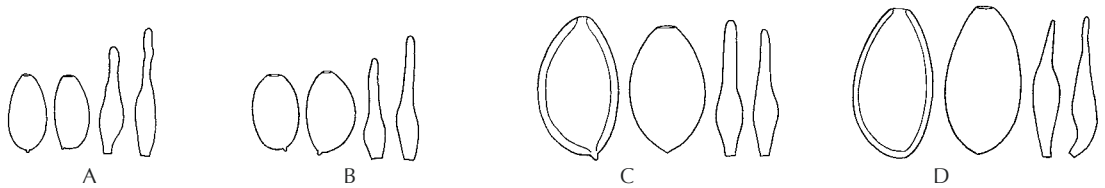


Fig. 845. Spores and cheilocystidia: A: *Psilocybe phillipsii*, B: *P. horizontalis*, C: *P. cyanescens*, D: *P. semilanceata*.

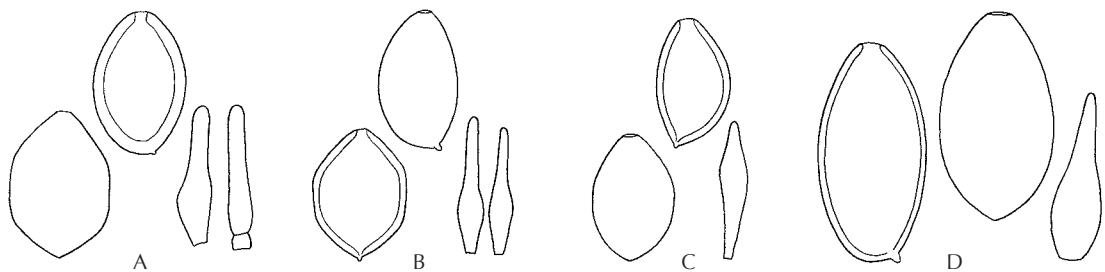


Fig. 847. Spores and cheilocystidia: A: *Psilocybe merdaria*, B: *P. coprophila*, C: *P. turficola*, D: *P. subcoprophila*.

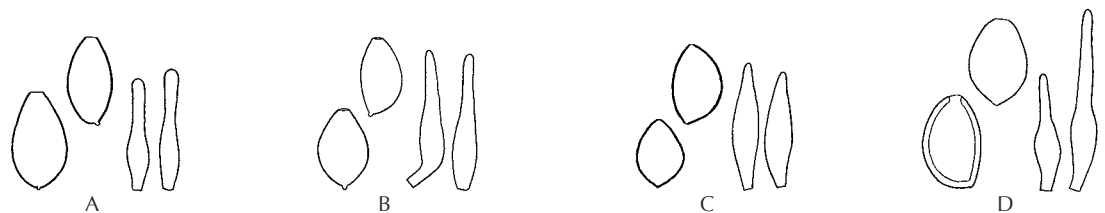


Fig. 849. Spores and cheilocystidia: A: *Psilocybe inquilinus*, B: *P. crobulus*, C: *P. micropora*, D: *P. montana*.

1. Expanded frb with eccentric stem 2
 - Frb with central stem 3
2. Cap translucently striate, with a gelatinous layer; mainly on grasses, but also on *Carex*, *Juncus*, etc. Cap 2-11 mm, circular to kidney-shaped seen from above, convex to plane, often wavy, viscid to slimy, yellowish buff to pinkish brown, hygrophanous; gills adnate, becoming pale brown; stem first central, then strongly eccentric, 1-3 x 0.5-1 mm, concolorous with cap or reddish brown. Sp 5-7 x 3-4 μ m, ellipsoid to ovoid, slightly thick-walled, with a distinct germ pore (fig. 845A); cheilocystidia lageniform. Spring to autumn; very common in temp., rarely recorded but likely to be overlooked in hemib.-suba.; DK (LC), FI (DD), FO, IS (Su), NO (NE), SE (LC). – B&K 4:418, C&D 1278, FAD 65C (as *Pleurotus roseolus*), Lud 72.25.
P. phillipsii (Berk. & Broome) Vellinga & Noordel. (*Melanotus p.* (Berk. & Broome) Singer, *M. caricicola* (P.D. Orton) Guzmán)
- Cap not translucently striate, without a gelatinous layer; on wood, rarely on textiles. Cap 2-17 mm, circular to ellipsoid or kidney-shaped seen from above, convex to plane, smooth to velvety, dry, dull brown to orange brown, not distinctly hygrophanous, at margin sometimes with appendiculate veil; gills adnate, becoming greyish brown; stem first central, then strongly eccentric, 2-7 x 0.5-2 mm, cylindrical, concolorous with cap or darker; taste mild to bitter. Sp 6-8 x 4-5 μ m, ellipsoid to ovoid, slightly thick-walled, with a distinct germ pore (fig. 845B); cheilocystidia lageniform. In NO only found on an old hemp rope and a door mat; summer to winter; rare in temp.; DK (LC), NO (NE), SE (NE). – Bol Bres 48:16, Lud 72.27, ZM 76:19.
P. horizontalis (Bull.) Vellinga & Noordel. (*Melanotus h.* (Bull.) P.D. Orton, *M. proteus* (Kalchbr.) Singer s. auct.)
3. Stem base turning \pm blue 4
 - Stem base not turning blue 9
4. Gill edge gelatinous, separable. Cap 4-35 mm, convex to expanded, sometimes umbonate, viscid, reddish brown to olivaceous brown, hygrophanous, not translucently striate; gills adnexed, ventricose, dark clay-coloured, becoming purplish brown; stem 15-30 x 1-2 mm, cylindrical or with base widened to 4 mm, white, turning bluish near the base; smell aromatic, strong. Sp 13-14.5 x 7.5-10 μ m, ovoid to amygdaloid, thick-walled, with a distinct germ pore; cheilocystidia lageniform with narrow neck, sometimes forked. On horse dung; late summer to autumn; very rare in temp.-hemib.; SE (Sk, Gtl). – FND 4: pl. 9.
P. liniformans Guzmán & Bas
- Gill edge not gelatinous 5
5. Young frb with distinct veil on cap and stem top; on dung of cow and horse. Cap 10-25 mm, bell-shaped, later convex, mostly with an umbo, viscid, dark brown to sepia, later yellowish brown, hygrophanous, not or only slightly translucently striate near margin; gills adnexed to adnate, becoming dark brown with an olive tinge; stem 20-100 x 1-4 mm, cylindrical or with slightly widened base, white, turning yellowish brown and bluish near the base; smell farinaceous. Sp 12.5-15 x 7.5-8.5 x 7-8 μ m, ellipsoid to ovoid, thick-walled, with distinct germ pore; cheilocystidia lageniform with a narrow neck, sometimes forked. Autumn; rare in temp.-southern bore.; DK (DD, Sj: Dronningmølle), FI (DD), SE (LC). – FND 4: pl. 8, Lud 72.12, OPN 13B, Svp 30:24. – Hallucinogenic.
P. fimetaria (P.D. Orton) Watling
- Veil absent or indistinct; not directly on dung 6
6. On wood chips or garbage heaps; stem 2.5-10 mm broad. Cap 15-60 mm, bell-shaped to expanded, with or without a low umbo, viscid, yellowish brown to sordid brown, sometimes turning bluish, especially at margin, translucently striate in outer part, hygropha-

nous, drying ochraceous; gills adnexed to adnate or emarginate, becoming greyish brown to purplish brown; stem 25-90 mm long, cylindrical with a slightly widened base, whitish fibrillose on a yellow brown background, often turning bluish, especially when bruised; veil fugacious. Sp 9.5-14 x 6.5-8 μm , ellipsoid, thick-walled, with a distinct germ pore (fig. 845C); cheilocystidia lageniform. Autumn; very rare in temp.; DK (NA, Sj: Malmmosen), NO (NE, VA: Kristiansand). – Lud 72.13, OPN 13A, Phil 252d, RdM 45:267, Svp 29:37, ☉. – Strongly hallucinogenic.

P. cyanescens Wakef.

- In grass; stem 1-3.5 mm broad 7

7. Cap dry; with pileocystidia or cystidioid terminal elements in pileipellis. Cap 40-50 mm, conical, later expanded with an umbo, smooth, yellowish brown to greyish brown or dark brown, hygrophanous, drying ochraceous buff; gills narrowly adnate to almost free, becoming dark grey brown with a violaceous tinge; stem 20-70 x 1-3.5 mm, cylindrical, pale buff at top, downwards ochraceous buff to dark brown, slowly turning blue green from the base; veil absent. Sp 10-11.5(-12) x 7-8 x 6-7 μm , ellipsoid to ovoid or mitriform, thick-walled, with a distinct germ pore. In grass; autumn; NL. – FND 4: pl. 11. – Probably hallucinogenic.

P. puberula Bas & Noordel.

- Cap slightly to distinctly viscid; without pileocystidia.


8. Cap acutely conical to acutely bell-shaped, not fully expanding; sp 10.5-15 x 6.5-8.5 μm (fig. 845D). Cap 5-30 mm, viscid, greyish brown, translucently striate in outer part, hygrophanous, drying cream to pale yellowish; gills adnexed, becoming greyish brown to purplish brown; stem 50-120 x 1-3.5 mm, cylindrical or with a slightly widened base, whitish to pale buff, often bluish near the base; veil fugacious, but sometimes leaving a cortina zone at stem top. Sp ellipsoid, thick-walled, with a distinct germ pore; cheilocystidia lageniform to fusiform, with acute apex. In grassland, often in pastures and coastal meadows and manured soil, in open areas in forests, often with *Deschampsia caespitosa*; summer to late autumn; common in temp.-suba.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:451, Lud 72.8, Phil 251f, R&H 451, Ves 315, ☉. – Hallucinogenic.


P. semilanceata (Fr.) P. Kumm.

- Cap conical, later low convex, sometimes with a small papilla; sp 10-13 x 5.5-7 μm . Cap 5-20(-30) mm, viscid, sometimes greenish blue when young, then sordid brown, translucently striate in outer half, hygrophanous, drying greenish grey; gills adnexed, becoming very dark greyish grey; stem 40-85 x 1-3 mm, cylindrical or with widened base, whitish, turning yellowish brown from base, bluish in lower part, especially when bruised; veil fugacious. Sp ellipsoid, thick-walled, with a distinct germ pore; cheilocystidia lageniform to fusiform, with acute apex. In deciduous forests, outside the area also among mosses in grassland and at roadsides; autumn; very rare in temp.; NO (VA: Lyngdal). – FND 4: pl. 10, Lud 72.10, M&J 5. – Hallucinogenic.

P. strictipes Singer & A.H. Sm. (*P. callosa* (Fr.: Fr.) Quél. s. auct. p.p.)

- | | | |
|-----|---|----|
| 9. | Sp on av > 10 μm long; thick-walled | 10 |
| - | Sp on av < 10 μm long, thin- or thick-walled | 19 |
| 10. | Sp \pm hexagonal in front view; \pm flattened | 11 |
| - | Sp ellipsoid to ovoid in front view, not distinctly flattened | 14 |
| 11. | Veil forming a fibrillose or membranous ring zone on the stem | 12 |
| - | Veil rather fugacious not forming a distinct ring zone | 13 |

12. Sp 13-17 x 8.5-11 x 7.5-9.5 μm . Cap 12-50 mm, convex to low convex with or without an umbo, strongly viscid, yellowish brown to sordid brown, slightly hygrophanous, translucently striate at margin or not, at margin often with appendiculate veil; gills broadly adnate, becoming purplish grey brown; stem 25-70 x 2-6 mm, cylindrical, often with widened base, white to pale yellowish buff, with a membranous to fibrillose ring zone of veil, floccose below; smell sweetish. Sp hexagonal in front view, thick-walled, with a distinct germ pore; cheilocystidia \pm lageniform. On dung of cow and horse; summer to autumn; rare in suba.; FO, IS. – FND 4: pl. 5.
P. moelleri Guzmán (*Stropharia merdaria* f. *macrospora* F.H. Møller)
- Sp 11-13 x 7.5-9 x 7-8 μm (fig. 847A). Cap 10-40 mm, hemispherical to convex, viscid, buff to yellowish brown, hygrophanous, not translucently striate, at margin often with appendiculate veil; gills broadly adnate, becoming blackish brown; stem 30-90 x 1-6 mm, cylindrical, yellowish brown, whitish fibrillose. Sp hexagonal in front view, thick-walled, with a distinct germ pore; cheilocystidia \pm lageniform. On dung of herbivores, e.g. horse, cow, elk, sheep and rabbit; summer to autumn; occasional in temp.-suba., but possibly decreasing; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:447, FAD 143C, FND 4: pl. 6, Phil 252a, R&H 451.
P. merdaria (Fr.: Fr.) Ricken
13. Cap vivid yellow orange; on soil, in the area known from dune grassland. Cap 7-25 mm, hemispherical to convex, umbonate, viscid; gills broadly adnate, becoming dark purplish brown; stem 30-60 x 1-4 mm, cylindrical or with slightly widened base, pale yellow. Sp 10-14 x 7-9 x 6-8 μm , hexagonal in front view, thick-walled, with a distinct germ pore; cheilocystidia \pm lageniform. Summer to autumn; very rare in temp.-hemib.; DK (NA, Sj: Asserbo Plt.), NO (Østf: Fredrikstad), SE (Gtl, Sk). – Lud 72.14.
P. laetissima Hauskn. & Singer (*P. callosa* (Fr.: Fr.) Quél. s. auct. p.p.)
- Cap yellowish brown to reddish brown; on dung of herbivores. Cap 2-25 mm, hemispherical to convex, viscid, hygrophanous, translucently striate in outer half; gills broadly adnate, becoming dark purplish brown; stem 6-40 x 0.5-2 mm, cylindrical, often with widened base, white to pale yellowish buff. Sp 10-14 x 6-9 x 5.5-8.5 μm , hexagonal in front view, thick-walled, with a distinct germ pore (fig. 847B); cheilocystidia \pm lageniform. Recorded from e.g. cow, horse, deer, sheep, rabbit and hare; spring to autumn; occasional in temp.-arc./alp.; DK (LC), IS, NO (LC), SE (LC). – B&K 4:444, Däh 613, Lud 72.22, M&J 1, Phil 251e.
P. coprophila (Bull.: Fr.) P. Kumm.
14. Cap acutely conical to acutely bell-shaped, not fully expanding see *P. semilanceata* 8
 - Cap hemispherical to convex or bell-shaped, not acute 15
15. On peat and among living *Sphagnum*, *Polytrichum*, etc. 16
 - On dung 17
16. Sp 12-16 x 7-10 μm ; stem with a \pm distinct ring zone of white veil
 see *Phaeogalera stagnina* p. 837
- Sp 10-13.5 x 6.5-8 x 6-7 μm ; stem without a distinct ring zone. Cap 10-30 mm, hemispherical to bell-shaped, later expanded with or without an umbo, viscid, reddish brown to greyish brown, hygrophanous, translucently striate in outer part, drying greyish buff; gills adnexed to emarginate, becoming dark greyish brown with purple tinge; stem 30-130 x 1.5-3 mm, cylindrical, pale brown, turning sordid brown from the base. Sp \pm ovoid, thick-walled, with a distinct germ pore (fig. 847C); cheilocystidia lageniform to tibiiform. On peat and among living *Sphagnum*, *Polytrichum*; summer to autumn; occasional in hemib.-middle bore., very rare in temp.; DK, FI (LC), NO, SE (LC). – GBW 4:406, Lud 72.4, Phil 252b, .
P. turficola J. Favre (*P. atrobrunnea* (Lasch) Gillet s. auct.)


17. Veil fugacious, appendiculate at cap margin when young; stem 10-30 x 1-2 mm. Cap 3-15 mm, hemispherical to convex, viscid, yellowish brown to sordid reddish brown, hygrophanous, translucently striate in outer part; gills broadly adnate, becoming dark purplish brown; stem cylindrical, pale yellowish buff with a darker reddish brown base. Sp 15-19.5 x 8-10 μm , ellipsoid to narrowly ovoid, thick-walled, with a distinct germ pore (fig. 847D); cheilocystidia \pm lageniform. On dung of herbivores, e.g. horse and sheep, less often of cow, donkey and hare; spring to autumn; occasional in temp.-arc./alp.; DK (EN), FI (LC), FO, IS, NO (LC, incl. Sv), SE (LC, Sk). – B&K 4:452, FND 4: pl. 7, Lud 72.24, R&H 452, .
- P. subcoprophila* (Britzelm.) Sacc.
- Veil distinct and more persistent at cap margin and/or at stem top; stem mostly longer and broader 18
18. Cap greyish brown to dark brown see *P. fimetaria* 5
- Cap yellowish brown, sometimes with an olive tinge. Cap 8-45 mm, conical to convex, later low convex with or without an umbo, viscid, yellowish to yellowish brown, hygrophanous, not translucently striate, at margin often with appendiculate patches of veil; gills broadly adnate, becoming purplish brown; stem 55-110 x 3-5 mm, cylindrical, pale yellowish, becoming brownish towards base, whitish woolly fibrillose and often with a ring-like zone near the top. Sp 12-18.5 x 7.5-10 μm , ellipsoid to narrowly ovoid, thick-walled, with a distinct germ pore; cheilocystidia cylindrical to lageniform. On dung of horse and cow; summer to autumn; *LT, NL*. – BCat 1091.

P. merdicola Huijsman


 - 19. Sp thin-walled to slightly thick-walled 20
 - Sp distinctly thick-walled 25

20. Cap viscid, cuticle gelatinous and peeling off entirely 21

 - Cap dry to slightly viscid, not peeling 22

21. Sp 7-9(-10) x 4.5-6(-7) x 4-5(-6) μm (fig. 849A); veil scarce. Cap 4-20 mm, low conical to expanded, often with a small umbo, viscid, reddish brown, hygrophanous; gills broadly adnate or emarginate, becoming dull reddish brown; stem 8-20 x 1-1.5 mm, cylindrical, reddish brown with darker base. Sp ovoid to \pm rhomboid, rather thin-walled, with a distinct germ pore; cheilocystidia \pm lageniform. On dead leaves of grasses, less often on wood; spring to autumn; very common in temp.-suba., occasional in arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 4:446, Lud 72.21, M&J 6, Phil 251a, R&H 453, .

P. inquilinus (Fr.: Fr.) Bres. (incl. *P. muscorum* (P.D. Orton) M.M. Moser)

 - Sp 5.5-8 x 4-6 x 3.5-5.5 μm (fig. 849B); veil mostly abundant in young frb. Cap 4-20(-30) mm, low conical to expanded, often with a small umbo, viscid, yellowish brown to reddish brown, hygrophanous; gills broadly adnate or emarginate, becoming dull reddish brown; stem 15-35 x 1-2 mm, cylindrical, reddish brown with paler top and darker base. Sp ovoid to \pm rhomboid, thin-walled, with a distinct germ pore; cheilocystidia \pm lageniform with tapering apex. On woody and herbaceous debris, rarely on dung; spring to autumn; very common in temp., occasional in hemib.-suba.; DK (LC), IS, NO, SE (LC). – B&K 4:445, Däh 613, GBW 4:398, Lud 72.18, Phil 251d, .

P. crobulus (Fr.) Singer (*P. inquilinus* (Fr.: Fr.) Bres. var. *crobulus* (Fr.) Høil.)

 - 22. Veil finely fibrillose, sometimes covering the cap or appendiculate; sp not distinctly flattened 23
 - Veil absent or very scanty; sp \pm distinctly flattened 24

23. Sp 9-11(-12) × 4.5-5.5 μm, ellipsoid to narrowly amygdaloid. Cap 10-15(-20) mm, low conical to convex, dry, not peeling, ochraceous brown to ochraceous yellow, hygrophanous, with remnants of finely fibrillose, white veil at margin; gills broadly adnate; stem 15-30 × 1-2.5 mm, cylindrical, finely fibrillose to flocculose, reddish brown towards base. Sp not distinctly flattened, with a ± distinct germ pore, thin-walled; cheilocystidia ± lageniform. On paety soil; summer; very rare or overlooked in suba.; FO (Göte). – FND 4: pl. 3, Lud 72.17.
P. subfusispora (F.H. Møller) E. Horak (*Naematoloma* s. F.H. Møller, *Galerina* s. (F.H. Møller) E. Horak, *Phaeogalera* s. (F.H. Møller) Bon)
- Sp 6.5-8 × 4-5 μm, ellipsoid to ovoid. Cap 3-12 mm, hemispherical to convex, later plane, usually with a small umbo, dry, not peeling, reddish brown, hygrophanous, veil finely fibrillose, covering the cap and sometimes appendiculate; gills broadly adnate to short decurrent, becoming deep brown; stem 8-50 × 1-2 mm, cylindrical, finely fibrillose to flocculose, yellow brown at top, darker reddish brown towards base. Sp not distinctly flattened, with a small, but distinct germ pore, thin-walled to slightly thick-walled; cheilocystidia ± lageniform. On herbaceous debris or soil in meadows, rarely on dung; spring to autumn; rare in bore.; NO (STr: Trondheim), SE. – FND 4: pl. 3, Lud 72.17.
P. apelliculosa P.D. Orton
24. Sp with a distinct, up to 1(-1.5) μm broad germ pore. Cap 3-25 mm, hemispherical to convex, later plane, often with a small umbo, dry to slightly viscid, not peeling, dark reddish brown to reddish brown, translucently striate in outer part, hygrophanous, with or without scanty veil; gills broadly adnate, becoming dull reddish brown; stem 10-30 × 1-2 mm, cylindrical, yellowish brown in upper part, with darker base. Sp 6-8.5 × 4-5.5 × 4-5 μm, ovoid to ± rhomboid, thin-walled; cheilocystidia ± lageniform. On dead leaves of grasses and litter in grassland, at roadsides, and in places influenced by dung; spring to autumn; occasional in temp.; DK (Lc), SE. – Lud 72.23.
P. subviscida (Peck) Kauffman var. *subviscida*
var. *velata* Noordel. (*P. bullacea* (Bull.: Fr.) P. Kumm. s. auct.) differs in having fibrillose and denticulate patches of veil on the cap and more thick-walled spores. Rare in temp. and arc./alp.; DK, NO (Hord: Ulvik, Nordl: Rana). – B&K 4:442, GBW 4:405, M&J 3.
- Sp with a very small or indistinct germ pore see *P. micropora* 26
25. Sp strongly rhomboid in front view. Cap 5-25 mm, bell-shaped, later plane, mostly with an umbo, dark reddish brown, hygrophanous, at margin often with appendiculate veil; gills adnate to emarginate, sordid yellowish brown to violaceous grey; stem 20-60 × 1-3 mm, cylindrical, yellowish brown in upper part, reddish brown to blackish brown towards base, silvery fibrillose. Sp 6-7.5 × 5-6.5 × 4-4.5 μm, thick-walled, with a distinct germ pore; cheilocystidia lageniform to fusiform. On remnants of deciduous and coniferous wood, including sawdust in forests, often on damp ground; spring to autumn; occasional in bore.-arc./alp., rare in temp.-hemib.; FI (Lc), NO (Lc), SE (Lc). – B&K 4:450, C&D 1284 (as *modesta*), GBW 4:402, Lud 72.20, R&H 452, ☉.
P. phyllogena (Sacc.) Peck (*P. rhombispora* (Britzelm.) Sacc.)
- Sp not distinctly rhomboid in front view 26
26. Sp with a small or indistinct germ pore. Cap 5-16 mm, low conical, later convex to low convex with an umbo, dry, not peeling, reddish brown, slightly translucently striate at margin, hygrophanous, at margin often with arachnoid-fibrillose veil remnants; gills broadly adnate, rarely short decurrent, becoming reddish brown; stem 10-25 × 1-2 mm, cylindrical or with widened base, yellowish brown in upper part, reddish brown towards base. Sp 5.5-7.5 × 4.5-6 × 4-5.5 μm, slightly thick-walled, ovoid to almost mitriform in face view (fig. 849C); cheilocystidia ± lageniform. On soil or mosses, among grasses or on strongly decayed dung; summer; rare or overlooked in temp.-southern bore.; DK (EJyl: Randers), FI (DD, U: Helsinki, EH: Juupajoki).
P. micropora Noordel. & Verduin
- Sp with a distinct, often rather large germ pore 27

27. Veil leaving fibrillose and denticulate patches on the cap see *P. subviscida* var. *velata* 23
 - Veil very gurgacious 28
28. Gills adnate to short decurrent; stem 10-40 × 1-2.5 mm. Cap 5-15 mm, hemispherical to low convex with or without an umbo, viscid, reddish brown, translucently striate at margin, hygrophanous, drying pale buff; gills brown to blackish brown; stem cylindrical, fibrillose, yellowish brown to reddish brown. Sp 7-9 × 5-6 × 4.5-6 μm, ovoid, thick-walled, with a distinct germ pore (fig. 849D); cheilocystidia lageniform with a tapering neck. Among mosses, often *Polytrichum*, among *Empetrum*, etc. in forests and open land, often at roadsides, often on sandy soil; all year; very common in temp.-arc./alp.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – GBW 4:401, Lud 72.16, Phil 252c, R&H 453, Ves 315, ☉.
- P. montana* (Pers.: Fr.) P. Kumm. (*P. physaloides* (Bull.: Fr.) Quéf. s. auct. p.p.)
- Note: *P. chionophila* Lamoure, a parasite on *Polytrichum* with slightly more flattened sp, is common in alpine habitats and is possibly distinct. NO – AAF 1:29.
- Gills adnexed; stem 50-90 × 1-2 mm. Cap 10-20 mm, conical, later bell-shaped to expanded, viscid, dull yellowish brown to sepia, hygrophanous, translucently striate in outer part, with remnants of veil; gills adnexed, becoming sordid brown; stem cylindrical buff to brownish, whitish fibrillose. Sp 8-10.5 × 4.5-6 μm, ellipsoid, thick-walled, with distinct germ pore; cheilocystidia lageniform with acute apex. In coniferous forests on litter or pieces of rotting wood, but also on wood chips; summer to autumn; occasional but locally common in hemib.-bore., rare in temp.; FI (LC), NO (LC, AA: Grimstad), SE. – GBW 4:405, Lud 72.19, M&J 4.
- P. silvatica* (Peck) Singer & A.H. Sm. (*Phaeogalera medullosa* (Bres.) M.M. Moser, *P. tenax* (Fr.) Kühner & Romagn. s. auct.)

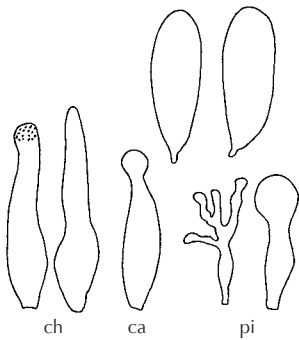
Resinomyцена Redhead & Singer THOMAS LÆSSØE & STEEN A. ELBORNE

One species in the Nordic countries; see description below.

Lit.: Antonín & Noordeloos 2004, Kühner 1985.

Frb mycenoid, white, discolouring slightly yellowish brown. Cap 1-3(-5) mm, hemispherical to convex, with inrolled to straight or crenulate margin, ± striate and sulcate, minutely granulate-pubescent. Gills slightly decurrent, broad, distant, often without lamellules. Stem 1-3(-5) x 0.1-0.2(-0.3) mm, cylindrical, pubescent, with hairy, clavate base. Smell and taste indistinct. Sp deposit whitish.

Sp 8.5-14(-16.5) x 4-6(-6.5) μm , narrowly dacryoid or fusiform, smooth, thin-walled, without germ pore (fig. 389E), amyloid, but often rather weakly so. Basidia (2-)4-spored. Cheilocystidia lageniform or lageniform-capitate, up to 9.5 μm wide at apex; pleurocystidia rare or absent; caulocystidia and pileocystidia lageniform-capitate, occasionally branched apically or lageniform; all cystidia with apical exudate. Pileipellis a trichoderm to a tomentum, with coarsely diverticulate end-cells. Clamps present in all tissues. Context dextrinoid. In wet habitats, saprotrophic on e.g. *Poaceae*, *Carex*, *Juncus*, *Eriophorum*, *Cladium*, more rarely in drier habitats, e.g. on *Rubus canes*; late spring to autumn; common in temp.-hemib., but easily overlooked; DK (LC), FI (DD, U: Helsinki), NO (LC), SE (LC). – A&N 97:45, 04:165, C&D 614, Myc 7:179 (top row), SZP 8(6): 237 (left), 240, ⊙. *R. saccharifera* (Berk. & Broome) Redhead (*Mycena* s. (Berk. & Broome) Gillet, *M. quisquiliaris* (Joss.) Kühner nom. inval., *M. pudica* Hora, *Marasmiellus ornatissimus* Barkman & Noordel.)



Spores, cheilocystidia, caulocystidia and pileipellis elements.

Resupinatus Gray

STEEN A. ELBORNE

Phyllotus P. Karst., *Stigmatolemma* Kalchbr., *Calathinus* Quél., *Asterotus* Singer

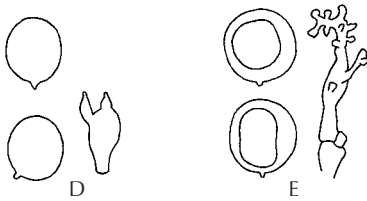
Frb cyphelloid, poroid or crepidotoid, greyish, sometimes seated in a subiculum. Cap 0.2-15 mm, cup- to bell-shaped, convex to plane, non-striate or faintly striate at margin, dry, dull, smooth or pruinose to tomentose, pale grey to grey brown. Gills absent, reduced or well developed, distant to crowded, grey brown with paler edge. Flesh soft, flexible, partly gelatinized. Taste and smell indistinct. Sp deposit white.

Sp subglobose to globose, thin-walled, smooth to angular with low warts, hyaline, without iodine reactions. Cheilocystidia present or absent, branched, dendrophysoid, often covered with crystals. Pileipellis a cutis or a trichoderm. Cap trama with a thick gelatinous layer, which often extends into the gill trama. Clamps present.

Saprotrophic, on decaying wood of mainly deciduous trees and bushes, rarely on conifers; spring to winter.

Four species in the Nordic countries.

Lit.: Donk 1962, Gilbertson & Blackwell 1987, Thorn & Barron 1986, Watling & Gregory 1989.



Spores and dendrohyphidia from margin: D: *Resupinatus applicatus*, E: *R. poriaeformis*.

- | | | |
|----|-------------------|---|
| 1. | Frb with gills | 2 |
| - | Frb without gills | 3 |
2. Cap glabrous or with whitish to pale grey brown tomentum all over. Cap 2-8 mm, dorsally to laterally attached, cup- to kidney-shaped, convex to low convex, with incurved to straight margin, pruinose to tomentose, grey to grey brown; gills radiating from a central, eccentric or lateral point, thin to rather thick, distant, concolorous with cap or paler, with paler entire edge. Sp (3.5-)4-6 x (3-)3.5-5 μ m, subglobose to globose, smooth (fig. 321D); basidia 4-spored; cheilocystidia 15-27 x 4-8 μ m, clavate-diverticulate with thin needle-like projections, often covered with crystals; pileipellis a cutis or a trichoderm, diverticulate, often covered with crystals; trama gelatinous. In dense groups on wood of stumps, fallen logs and branches of deciduous trees and bushes; spring to winter; occasional in temp.-bore.; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – C&D 163, FAD 66B, GBW 3:506, Lud 73.1B, D, Ves 178, ⊙.
- R. applicatus*** (Batsch: Fr) Gray (*R. kavinii* (Pilát) M.M. Moser, *Pleurotus striatulus* (Pers.: Fr.) Quél.)
- Cap with a dense black strigose tomentum at point of attachment. Cap 5-12 mm, laterally or dorsally attached, cup-shaped to rounded fan-shaped, convex, with incurved to straight margin, pruinose to smooth, greyish brown to almost black; gills radiating from an eccentric or lateral point, thin to rather thick, crowded to medium spaced, grey to grey brown, with minutely whitish floccose edge; flesh gelatinous. Sp 4.5-6 x 4-5.5 μ m, globose to subglobose, smooth; basidia 4-spored; cheilocystidia 25-30 x 5-6.5 μ m, clavate to lageniform with

branched finger-like projections; pileipellis a cutis or a trichoderm with up to 700 μm long, erect brown hyphal ends; trama gelatinized. In groups on stumps, fallen logs and branches of deciduous trees and bushes; spring to autumn; occasional in temp.-bore.; DK (LC), FO, NO (LC), SE (LC). – B&K 3:400, FAD 66A, Lud 73.1A, R&H 339, Sieniop 293.

R. trichotis (Pers.) Singer (*Pleurotus rhacodium* (Berk. & M.A. Curtis) Sacc.)

3. Frb cup- to urn-shaped, in dense groups seated in a whitish cottony subiculum. Cap 0.2-1.2 mm broad and high, with incurved margin, micaceous to farinaceous, hairy, whitish to dark grey brown; hymenium on inside smooth, greyish; flesh tough, somewhat gelatinous. Sp (4.5-)5-6(-8) \times 4.5-5.5(-6) μm , subglobose, with a short apiculus, smooth (fig. 321E), hyaline; basidia (2-)4-spored; hymenial cystidia absent; hyphae narrow, thin-walled, hyaline to brownish, gelatinized in trama; cap margin with branched dendrohyphidia. On bark of fallen logs and branches of deciduous trees, mainly on the underside; rare in temp.-southern bore; DK (LC), FI (DD), NO (NE), SE (LC). – B&K 2:235.

R. poriaeformis (Pers.) Thorn, Moncalvo & Redhead (*Stigmatolemma p.* (Pers.) W.B. Cooke, *S. urceolatum* (Fr.: Fr.) Donk, *Resupinatus u.* (Fr.: Fr.) Thorn, Moncalvo & Redhead)

Note: *R. urceolatum* is by some authors kept as a separate taxon, only separated from *R. poriaeformis* by the lack of a subiculum.

- Frb cup-shaped, solitary or in small groups, not seated in a subiculum. Cap 0.5-1.5 mm wide, 0.5-1 mm high, with incurved to straight, slightly wavy, entire margin, micaceous, pale grey; hymenium on inside smooth, dark grey brown; flesh tough, somewhat gelatinous. Sp 5-5.5 \times 4.5-5 μm , subglobose, slightly angular in outline from 3-4 low warts, apiculus short, hyaline; basidia (2-)4-spored; hymenial cystidia absent; hyphae narrow, thin-walled; cap surface with branched dendrohyphidia covered with pale yellowish crystals. Scattered on bark of *Juniperus*, *Taxus*, *Syringa*, *Lonicera*, *Vitis*, *Clematis*, *Populus* and *Quercus*; autumn to spring; rare in temp., or possibly overlooked; DK (DD). – Svp 55:28.

R. griseopallidus (Weinm.) Knudsen & Elborne, see p. 913 (*Cyphella g.* Weinm., *Chaetocypha g.* (Weinm.) Kuntze, *Cellypha g.* (Weinm.) W.B. Cooke, *Cyphella taxi* Lév., *Stigmatolemma t.* (Lév.) Donk, *Resupinatus t.* (Lév.) Thorn, Moncalvo & Redhead, *Lachnella myceliosa* W.B. Cooke s. Cooke non s. the replaced name *Peziza cinereofusca* Schwein. [probably an ascomycete])

Note: the description by Cooke (1961) is not correct, the spores given as ellipsoid to suballantoid, 7-8.4 \times 3.5-4.2 μm . However, he has correctly confirmed some of the specimens in Stockholm (S) referred to in connection with his description: On *Populus* by Jaap (F55236), no. F55233 on *Quercus* by Bresadola and F55231 on *Cupressus* (no collector).

Rhizomarasmius R.H. Petersen

MACHIEL NOORDELOOS

Marasmius sect. *Chordales* Fr.

Lit.: Antonín & Noordeloos 2008, Petersen 2000.

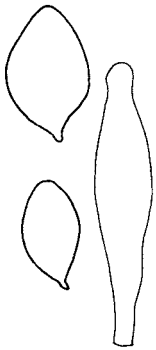
One species in the Nordic countries; see description below.

Frb marasmiod to collybioid. Cap 8-25 mm, convex to hemispherical or plane, finely pruinose or smooth, dry, brownish grey. Gills broadly adnate, medium spaced to distant, L =15-18, white to yellowish brown. Stem (60-)80-120(-150) × 1.5-3 mm, whitish at top, blackish brown below, finely pubescent with white hairs, rigid, rooting. Flesh thin. Smell and taste indistinct.

Sp 8-12 × 4-6 μm, citriform to fusiform (fig. 261C). Cheilocystidia 40-70 × 8-15 μm, lageniform or fusiform. Pleurocystidia absent. Pileipellis hymeniderm of smooth cells intermixed with lageniform pileocystidia. Flesh monomitic. Clamps present.

Saprotrophic, in association with and often on rhizomes of *Pteridium aquilinum* in fertile forests; autumn; occasional in hemib.-southern bore., very rare in temp.; DK (EN), FI (LC), NO (LC), SE (LC). – A&N 93 pl. 7, Lud 47.2, R&H 331, Phil 116c, M&J *Marasmius* 3, ☉.

R. undatus (Berk.) Antonín & Noordel. (*Marasmius u.* (Berk.) Fr., *M. chordalis* Fr.)



Spores and cheilocystidia.

Rhodocollybia Singer

MACHIEL NOORDELOOS

Collybia (Fr.) Staude s. lato p.p.

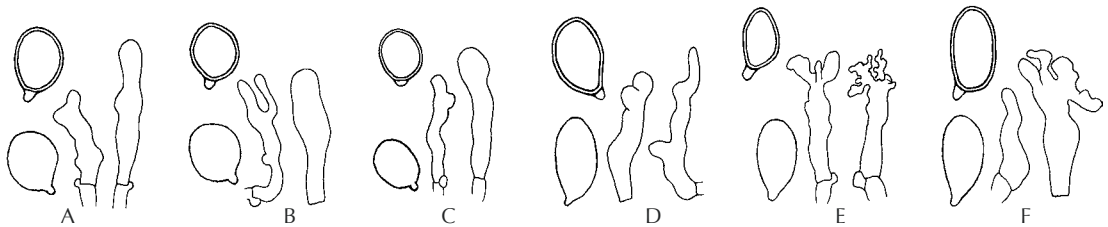
Frb collybioid, with yellowish to pinkish sp deposit. Cap slightly viscid, greasy or dry. Gills free to adnate-emarginate, usually white. Stem surface fibrous. Smell indistinct, slightly fruity or spicy. Taste indistinct or bitter. Sp deposit pinkish yellow to cream or pale pinkish brown.

Sp subglobose, ellipsoid to oblong, sometimes dacryoid, hyaline, cyanophilous, dextrinoid, at least in a certain percentage. Cheilocystidia usually present, sometimes scarce and inconspicuous, varying from simple cylindrical, fusiform or clavate to coralloid or with irregular, finger-like apical projections. Pleurocystidia absent. Pileipellis a cutis or an ixocutis of ± cylindrical hyphae, rarely slightly coralloid. Clamps abundant.

Saprotrophic or possibly mycorrhizal, on humose soil, usually in groups, among litter in forests.

Five species in the Nordic countries.

Lit.: Antonín & Noordeloos 1997, 2008, Gröger 2006.



Spores and cheilocystidia: A: *Rhodocollybia maculata* var. *maculata*, B: *R. prolixa* var. *prolixa*, C: *R. prolixa* var. *distorta*, D: *R. fodiens*, E: *R. butyracea* var. *butyracea*, F: *R. filamentosa*.

1. Sp globose to subglobose, Q = 1.0-1.4 2
 - Sp ellipsoid to oblong or dacryoid, Q > 1.5 5

2. Gills yellow; cap brown with paler margin. Cap 35-120 mm, convex to plane, often with irregular margin, subviscid, hygrophanous, with rusty brown spots; gills with eroded, concolorous edge, crowded, often with rusty spots; stem 40-150 x 6-30 mm, tapering downwards, fibrillose-striate to ribbed, finely pruinose, glabrescent with age, pale brown, often tinged yellow; smell often faintly fruity; taste slightly bitter. Sp 5.5-7 x 4.5-6 μm, globose to subglobose, 50-90 % dextrinoid. On raw humus in deciduous and coniferous woods, also in heathland, preferably on poor, sandy soil; widespread; FI, SE.
R. maculata (Alb. & Schwein.: Fr.) Singer var. *scorzonerea* (Fr.) Lennox 3
 - Gills white, cream or with reddish brown spots

3. Cap white or pale, often with an irregular pattern of rusty spots; gill edge not or slightly serrate. Cap 30-110 mm, broadly convex with low umbo, dull, dry, smooth, glabrous; gills free or emarginate-adnate, narrowly segmentiform, 3-6 mm broad, crowded; stem 50-150 (-200) x 5-20 mm, with tapering base or rooting, fibrillose to finely ribbed, often twisted, same colour as cap with red brown spots; smell sweetish, sometimes spicy or unpleasant; taste mild to weakly bitter; sp deposit cream to pink. Sp (5-)5.5-6.5(-7.5) x (3.5-)4.5-5.5(-7) μm, globose to subglobose (fig. 309A), thick-walled, 1-10 % dextrinoid; cheilocystidia 18-42

x 4-8 μm , cylindrical, subfusiform to clavate, often irregular subcoralloid; pleurocystidia absent; pileipellis an ixocutis. On litter in deciduous and coniferous woods; summer to autumn; common in temp., occasional in hemib.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – A&N 97:118, B&K 3:221, M&J Collybia 5, R&H 323, Ves 225, ☉.

R. maculata (Alb. & Schwein.: Fr.) Singer var. *maculata* (*Collybia m.* (Alb. & Schwein.: Fr.) P. Kumm.)

- Cap \pm uniformly red brown or orange brown, not spotted; gill edge coarsely serrate 4
- 4. Cap and stem with about the same dark reddish brown colour. Cap 20-90 mm, conical-convex to convex with a low umbo, expanding with age, smooth, glabrous, not hygrophanous; gills adnate-emarginate, with strongly serrate edge, crowded, whitish then with yellow tinges; stem 30-80 x 4-10 mm, cylindrical or compressed, tapering downwards or rooting, strongly fibrillose to finely ribbed, pale reddish orange at top, downwards concolorous with cap; smell indistinct. Sp 4.5-6(-6.5) x 4-5 μm , globose to subglobose, thick-walled (fig. 309B), dextrinoid sp scarce to abundant; gill edge heterogeneous; cheilocystidia 19-33 x 3.5-7 μm , irregularly shaped; pileipellis an ixocutis. On humus and on rotten wood of coniferous trees; autumn; occasional in eastern temp. and hemib., very rare in western temp.; DK (vU), NO (LC), SE (LC). – A&N 97:123, B&K 3:199, Jordst 15(1).
R. proluxa (Hornem.: Fr.) Antonín & Noordel. var. *proluxa* (*Collybia p.* (Hornem.: Fr.) Gillet)
- Stem distinctly paler than cap, white or whitish, then with reddish brown tinges. Cap 30-135 mm, conical-convex to convex with a low umbo, expanding with age, smooth, glabrous or finely innately radially fibrillose, dry, not or weakly hygrophanous, orange brown to red brown; gills emarginate-adnate, narrow, very crowded, white, then cream to brown with darker rust-coloured spots, with coarsely serrate, concolorous edge; stem 50-160 x 5-14 mm, cylindrical, with tapering, rooting base, finely sulcate lengthwise, at top white pruinose, downwards glabrous; smell and taste indistinct. Sp 4-6 x 3-4.5(-5) μm , ellipsoid to subglobose (fig. 309C), thick-walled, dextrinoid sp scarce; gill edge fertile, heterogeneous; cheilocystidia 15-30 x 4-10 μm , cylindrical-clavate, irregularly lobate or almost coralloid, often sparse, indistinct. On soil in forest litter in deciduous and coniferous woods (e.g. *Fagus*, *Quercus*, *Fraxinus*), also on conifer stumps; common in eastern temp. and hemib.-bore., very rare in western temp.; DK (NT), FI (LC), NO (LC), SE (LC). – A&N 97:126, B&K 3:188, Däh 327, 328, Phil 122b, R&H 324.
R. proluxa (Hornem.: Fr.) Antonín & Noordel. var. *distorta* (Fr.) Antonín, Halling & Noordel. (*Collybia d.* (Fr.) Quél.)
- 5. Cap distinctly hygrophanous, usually pale grey, yellow grey or pale grey brown with darker brown centre. Cap 20-80, convex to plane, often with a low umbo; gills with \pm entire edge, pallid; stem 34-90 x 4-13 mm, often irregularly broadened towards base, pale. Sp 6.5-10(-11) x (3.5-)4-4.5 μm . In other characters like the main variety. On humus or litter in deciduous, mixed and coniferous woods; autumn to late autumn; very common in temp.-bore., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – A&N 97:134 (as f. *butyracea*), Bon 179, B&K 3:185, R&H 323, Ves 227, ☉.
R. butyracea (Bull.: Fr.) Lennox f. *asema* (Fr.: Fr.) Antonín, Halling & Noordel. (*Collybia a.* (Fr.: Fr.) Gillet)
- Cap not or indistinctly hygrophanous, pinkish brown with paler margin, dark reddish brown or yellow brown 6
- 6. Cap pinkish brown with paler margin; stem rooting; gill edge sterile with abundant cheilocystidia. Cap 40-70 mm, convex to low convex, expanding with age, smooth, glabrous; gills adnate-emarginate, medium spaced, cream to pale ochre with concolorous, entire or slightly eroded edge; stem 60-100(-120) x 3-8 mm, finely pruinose in upper part, fibrillose-striate in lower part, whitish at top, tinged pinkish brown like centre of cap in lower part; smell indistinct, sweetish; taste slightly to distinctly bitter. Sp 6.5-9.5 x 4-5 μm , ellipsoid or oblong

or subdactyoid (fig. 309D), thick-walled, dextrinoid sp scarce to abundant; cheilocystidia 17-38 x 3.5-8 μm , irregularly shaped, \pm coralloid; pileipellis an ixocutis. On raw humus or buried wood in coniferous forests; autumn; occasional, but locally common in hemib.-bore., occasional in eastern temp., rare in western temp.; DK (DD), FI (LC), NO (LC), SE (LC). – A&N 97:128, Cet 1037, Jordst 15(1).

R. fodiens (Kalchbr.) Antonín & Noordel. (*Collybia f.* (Kalchbr.) Sacc.)

- Cap uniformly dark reddish brown or yellow brown; stem usually broadened towards base not rooting; gill edge fertile, heterogeneous 7
- 7. Cap greasy, smooth, dark reddish brown or yellow brown; gill edge \pm entire or at most eroded; sp 6.5-8.5(-9) x 3-4(-5) μm (fig. 309E). Cap 30-80 mm, convex to low convex, usually with a low umbo; gills free or narrowly adnate to emarginate with a decurrent tooth, crowded, white to sordid cream; stem 40-90 x 4-12 mm, cylindrical with broadened, clavate base, pruinose at top, glabrous below, pinkish brown or yellow brown when young then sepia to red brown; smell indistinct or fruity; taste mild, rarely bitter or like radish. Sp oblong, thick-walled, dextrinoid sp scarce to abundant; gill edge fertile, heterogeneous; cheilocystidia 15-35 x 3-10 μm , inconspicuous, clavate or subcylindrical, often irregular and coralloid, sparse to fairly abundant; pileipellis an ixocutis. Solitary or gregarious on humus in mixed or coniferous forests; autumn; very common in hemib.-suba., common in eastern temp., rare in western temp. and arc./alp.; DK, FI (LC), NO (LC), SE (LC). – A&N 97:137 (as f. *asema*), B&K 3:186, Cet 109, Däh 324, R&H 322.

R. butyracea (Bull.: Fr.) Lennox f. *butyracea* (*Collybia b.* (Bull.: Fr.) P. Kumm.)

- Cap dry, distinctly radially fibrous, red brown with a tinge of purple; gill edge coarsely serrate; sp 6.5-10(-11) x (3.5-)4-4.5 μm (fig. 309F). Cap 20-65 mm, conical-convex to convex, not hygrophanous; gills very crowded, white to cream or pinkish; stem 25-90 x 5-10 mm, clavate with 15-25 mm broad base, rather coarsely fibrillose-striate or ribbed, whitish at top, downwards brownish to red brown at base, finely white pruinose to finely subtomentose all over, with white tomentose base; smell indistinct; taste mild to acidulous-astringent. Sp ellipsoid to oblong, thick-walled, dextrinoid spores scarce to abundant; gill edge heterogeneous; cheilocystidia 19-40 x 4-9 μm , irregularly shaped, coralloid or clavate; pileipellis a dry cutis. In groups in litter, sometimes among *Sphagnum* in coniferous forests (*Picea*, *Pinus*); very rare in temp.; DK (DD). – A&N 97:131, Cet 2387, M&J *Collybia* 12.
- R. filamentosa* (Velen.) Antonín

Rhodocybe Maire

MACHIEL NOORDELOOS

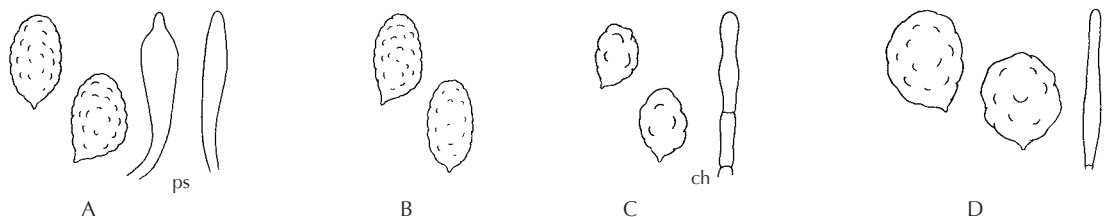
Frb with central stem, sometimes eccentric or lacking, tricholomatoid, collybioid, clitocyboid, omphalinoid or pleurotoid. Cap 5-100 mm, convex to depressed or funnel-shaped, smooth, tomentose or scaly, dry. Gills adnexed, adnate, adnate-emarginate or decurrent, white to grey, with a pink tinge when mature. Stem usually well-developed, central. Smell farinaceous, fruity or indistinct. Taste mild. Farinaceous or bitter. Sp deposit pinkish brown or grey brown.

Sp subglobose to ellipsoid, weakly to distinctly pustulate or verrucose, thin-walled, pale yellow to pale brown in water, ± cyanophilous. Hymenial cystidia often absent, in section *Rhodocybe* present as pseudocystidia. Cheilocystidia present or absent. Pileipellis a cutis or a trichoderm of cylindrical to slightly inflated hyphae, sometimes with a distinct subpellis of inflated hyphae, clearly separated from pileitrama. Pigment incrusting. Clamps normally absent, present only in sect. *Rhodophana* (Kühner) Singer.

Saprotrophic, terrestrial or on plant debris, or parasitic on other fungi.

13 species in the Nordic countries.

Lit.: Baroni 1981, Noordeloos in Bas et al. 1988.



Spores, pseudocystidia and cheilocystidia: A: *Rhodocybe caelata*, B: *R. nitellina*, C: *R. gemina*, D: *R. obscura*.

- Parasitic, probably on *Lyophyllum* species; stem arising from a firm bulb formed by the parasitized host. Frb white to ivory, when old with reddish brown spots; cap 12-30 mm, convex with a low umbo, white with sordid pinkish-reddish tinges; gills adnate, distant, white then pale pink; stem 40-70 x 3-9 mm, with a basal bulb, white with pinkish-reddish stains and spots; smell and taste farinaceous. Sp 5-7 x 3.5-5 μm, subglobose, pustulate, thin-walled. In coniferous forests on calcareous soil; autumn; very rare in temp.-bore.; DK (CR, EJyl: Hov Skov), FI (DD, PeP: Tervola), NO (VU), SE (Vg: Österplana). – B&K 4:102, Lud 74.4, Svp 22:25, ⊙.

R. stangliana (Bresinsky & Pfaff) Rioussset & Joss. (*Squamanita* s. Bresinsky & Pfaff)

- Saprotrophic; stem not arising from a basal bulb 2
- 2. Hymenial pseudocystidia present (fig. 493A) 3
- Hymenial pseudocystidia absent, but cheilocystidia may be present 4
- 3. Sp (5.5)-6-9 x (3-)-3.5-4(-4.5) μm; ellipsoid in outline (fig. 493A), pustulate; pseudocystidia 4-12 mm wide, with yellow-grey to orange content when mounted in KOH. Cap 5-30 mm, convex, then expanding with depressed centre, grey brown to red brown; gills broadly adnate to decurrent, medium spaced, cream, then pinkish brown; stem 20-50 x 2-4 mm, coloured like cap, minutely pruinose, glabrescent; smell indistinct. Mainly in coniferous forests on sandy soil, often at roadsides, less often in deciduous forests and in grassland; autumn; common in hemib.-bore., occasional in temp. and suba.-arc. / alp.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 4:97, FAD 198D, Lud 74.8, R&H 372, Sieniop 181, ⊙.

R. caelata (Fr.) Maire (*R. arenicola* (Fr.) M. Lange & Sivertsen)

- Sp 7-9 x (5.5)-6-7 μm, broadly ellipsoid in outline, pustulate; pseudocystidia 2-5 mm wide, hyaline in KOH. Cap 7-20 mm, convex with a small umbo, dark grey brown or blackish

brown; gills adnate-decurrent, crowded, reddish pink; stem 7-22 x 2.5-6 mm, sordid white, finely fibrillose-striate; smell farinaceous. Among dwarf shrubs in tundra; late summer; very rare in arc./alp.; NO (NE, Finnm: Alta).

R. finnmarchiae Noordel.

4. Clamps present; frb mycenoid or collybioid with adnexed to adnate gills, rather vividly coloured, dark chocolate brown, reddish brown, yellow or orange 5
- Clamps absent; frb tricholomatoid, clitocyboid or omphalinoid with adnate-decurrent or emarginate gills, white, cream, pinkish brown or some shade of dull grey brown or red brown 7
5. Sp (4-)4.5-7 x 3-4(-4.5) μm ; frb pale yellow brown. Cap 10-30 mm, conical-convex, expanding with age, glabrous, translucently striate; gills adnate, medium spaced, brownish yellow; stem 20-40 x 1.5-4 mm, glabrous; smell farinaceous; taste oily-rancid. Sp ellipsoid or dacryoid, thin-walled, weakly pustulate. Among humus in deciduous and coniferous forests; autumn; rare in temp., very rare or overlooked in hemib.-bore.; DK (EN), FI (DD, EH, Ks), NO (NE, Akh: Frogne), SE (NE, Sk).
R. melleopallens P.D. Orton
- Sp $\geq 6 \mu\text{m}$ long; frb orange, reddish brown or dark brown 6
6. Cap and stem vivid orange to red brown; sp 6.5-8.5(-9) x (3.5-)4-5(-5.5) μm (fig. 493B). Cap 10-25 mm, conical-convex, expanding to plane, translucently striate, glabrous; gills adnate, medium spaced, pale brownish yellow to brownish; stem 20-45 x 0.5-3 mm, concolorous with cap or paler; smell strong, farinaceous with a sweet component; taste farinaceous-rancid. Sp ellipsoid to dacryoid, distinctly undulate-pustulate. In small groups in litter and raw humus of rich deciduous and coniferous forests, up into the alpine zone; autumn; occasional in hemib.-bore., rare in temp.; DK (VU), FI (LC), NO (LC), SE (LC). – B&K 4:101, FAD 44B, Lud 74.6, R&H 372, Sieniop 183, ☉.
R. nitellina (Fr.) Singer
- Cap and stem dark brown; sp 6-8 x 4.5-5 μm . Cap 10-30 mm, convex then plane, slightly translucently striate at margin only; gills adnate, medium spaced to distant, pale brown with sordid pink tinge; stem 20-40 x 2-6 mm, concolorous or slightly paler than cap, glabrous. Sp narrowly ellipsoid to dacryoid, thin-walled, pustulate. On humus in a deciduous forest; autumn; only known from type locality in southern bore.; FI (DD, EH: Kangasala). – ÖZP 8: pl.33.
R. fuscofarinacea Kosonen & Noordel.
7. Frb white, rarely with a cream or ochre tinge at centre of cap. Cap 10-40 mm, convex, then flattened, depressed at centre; gills long decurrent, crowded, sordid white, then yellowish pink; stem 10-50 x 2-7 mm, cylindrical, tomentose, white to dirty white; taste bitter. Sp 5-7 x 3-4 μm , ellipsoid to amygdaloid, verrucose-angular. In deciduous woods and scrubs and in calcareous sand dunes, in litter under *Syringa*, *Alnus*, etc.; autumn; rare, but locally common in temp., very rare in hemib.-bore.; DK (DD), FI (DD), NO (NE), SE (LC, Sk). – BCat 944, B&K 4:98, Bol Bres 39:59, Knu 207, Lud 74.11, ☉.
R. fallax (Quél.) Singer
- Frb distinctly coloured 8
8. Frb tricholomatoid with broadly adnate to subdecurrent gills, pinkish, flesh-coloured, ochre brown or reddish brown, without a grey hue. Cap 30-100 mm broad, thick-fleshed; gills whitish to cream, then with pink tinge; stem 30-70 x 10-35 mm, white-yellowish to ochraceous pink; smell aromatic-pleasant; taste farinaceous. Sp 4.5-7 x 3-4.5 μm , subglobose to broadly ellipsoid (fig. 493C). On soil in deciduous and coniferous woods, parks and gardens, less often on compost or in grassland, calciphilous; summer to autumn; occasional in temp.-hemib., rare in southern bore.; DK (LC), FI (NT), NO (NT), SE (LC). – Lud 74.3, Phil 159e, Ves 241, ☉.
R. gemina (Fr.) Kuyper & Noordel. (*R. truncata* (Schaeff.) Singer s. auct.)

- Frb omphalinoid to clitocyboid with (deeply) decurrent gills, pale to dark grey or grey brown, rarely sordid greyish white or dull reddish brown 9
- 9. Taste mild; frb omphalinoid to clitocyboid; cap up to 35 mm, thin-fleshed 10
- Taste bitter; frb clitocyboid, relatively robust; cap up to 100 mm, thick-fleshed 11
- 10. Cheilocystidia 30-50 x 4-10 mm, cylindrical, septate; cap mouse grey, finely felty; stem concolorous, finely felty all over. Cap 5-20 mm, convex, sometimes slightly depressed at centre; gills medium spaced, grey; stem 20-50 x 2-6 mm; smell none. Sp 5.5-7.5(-8) x 4-5.5(-6) μm , rounded-angular, hardly pustulate, thin-walled. Saprotrophic in or near coniferous forests, often in open areas e.g. at roadsides, also in grassland, often on sandy soil; late summer to autumn; occasional in hemib.-bore., rare in temp.; DK (EN), FI (LC), NO (LC), SE (LC). – Lud 74.10, Phil 159g, R&H 373.
R. hirneola (Fr.: Fr.) P.D. Orton
- Cheilocystidia absent; cap grey with ochre tinge at centre, almost glabrous; stem brown grey with a paler fibrillose covering. Cap 12-25 mm, convex, then plane; gills very crowded, pink with a grey tinge; stem 15-20 x 2-4 mm; smell indistinct. Sp 5-6.5(-7) x 3.5-4.5 μm , ellipsoid, distinctly pustulate. Terrestrial on poor sandy or peaty soil; autumn; very rare in temp.; SE (NE, Sk). – Bol Bres 39:61, Lud 74.13, OPN 3B.
R. parilis (Fr.: Fr.) Singer
- 11. Cheilocystidia 30-60 x 2-6 mm, filiform to cylindrical-flexuous, non-septate (fig. 493D); sp 6.5-9 x 6-7.5 μm . Frb dark grey, often with slight olivaceous or reddish brown tinge; cap 40-100 mm, convex to plane with slightly depressed centre; gills deeply decurrent, crowded to medium spaced, grey with a pink tinge; stem 20-35 x 10-15 mm, finely furfureaceous or \pm finely scaly; smell farinaceous. Sp subglobose to broadly ellipsoid, distinctly pustulate. Terrestrial in coniferous forests on calcareous soil; autumn; very rare in hemib.; SE (NE, Gtl, Vgtl). – Lud 74.1.
R. obscura (Pilát) M.M. Moser
- Cheilocystidia absent; sp \leq 6.5(-7) μm long 12
- 12. Cap grey, often with concentric darker spots, pruinose to subtomentose, glabrescent, slightly to distinctly blackening when bruised or with age; sp (4.5-)5-6.5(-7) x (3.5-)4.5-5 μm , weakly pustulate to almost smooth. Cap 10-90 mm broad, convex, often irregularly shaped, slightly depressed at centre; gills decurrent, crowded, grey brown; stem 15-40 x 2-10 mm, grey brown, fibrillose; smell strongly farinaceous-rancid; taste rancid-bitter. Sp subglobose to broadly ellipsoid. In groups in litter of coniferous and deciduous forests and open, grassy spots, forming fairy rings in lawns and other types of grassland, calciphilous; late summer to late autumn; occasional in temp.-hemib., rare in bore., in FI north to InL; DK (LC), FI (DD), IS (Nm: Hindisvík Vatnsnesi), NO (DD), SE (LC). – FAD 134A, Lud 74.15A,B, Ves 241, ☉.
R. popinalis (Fr.: Fr.) Singer
- Cap sordid pale yellow brown, often slightly tinged grey, not blackening, felty to almost glabrous; sp 4.5-6 x 4-5.5 μm , distinctly pustulate. Cap 20-70 mm; gills decurrent, crowded, grey; stem 20-40 x 2-6 mm, ochraceous grey. Sp subglobose to broadly ellipsoid. In groups in deciduous and coniferous woods or open, grassy spots, calciphilous; autumn; rare in hemib.-suba.; FI (DD), NO (NE, Oppl: Østre Toten, Troms: Storfjord), SE. – Lud 74.15E.
R. mundula (Lasch) Singer

Rhodotus Maire

JAN VESTERHOLT

Monotypic genus; see description below.

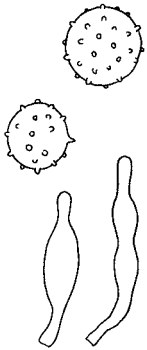
Lit.: Appelquist & Hallingbäck 1986, Gulden 1983b, Ludwig 2001.

Frb collybioid, pink, with eccentric and sometimes reduced stem. Cap 35-150 mm, convex with incurved margin, smooth, but with age wrinkled in a reticulate pattern, salmon pink to peach, fading with age, sometimes exuding red drops when young. Gills almost free to emarginate, rather thick, interconnected at stem, medium spaced, pale salmon pink. Stem 10-70 x 4-15 mm, central to eccentric, ± curved, whitish to pale salmon pink. Veil absent. Flesh rather tough, with a gelatinous layer under the cap surface. Smell fruity. Taste bitter. Sp deposit creamy pink.

Sp 5.5-7 x 5-7 μm, ± globose, coarsely verrucose to echinulate (fig. 261D), hyaline, without iodine reactions. Cheilocystidia 20-42 x 4-10 μm, ± lageniform. Pileipellis a hymeniderm, of erect, vesiculose to ampullaceous, pedicellate and thick-walled cells emerging from a gelatinized layer of narrow, repent hyphae. Pigment parietal. Clamps present, often as medallion clamps.

Saprotrophic on dead deciduous wood, especially *Ulmus*, ± caespitose or imbricate; spring to autumn; very rare in temp.-hemib.; DK (NA, EJyl: Vejle Nørreskov), NO (CR), SE (CR). – GBW 3:508, Lud 75.1, M&H 3:78, Phil 268a, Svp 55:32-33, ⊙.

R. palmatus (Bull.: Fr.) Maire



Spores and cheilocystidia.

Rickenella Raithelh.

STEEN A. ELBORNE

Frb omphalinoid or mycenoid with hygrophanous cap. Cap 2-20(-30) mm, convex, bell-shaped, plane, umbonate, depressed or with a papilla, minutely pubescent, hygrophanous, translucently striate. Gills decurrent, broadly adnate or emarginate with a decurrent tooth, distant. Stem minutely pubescent. Smell and taste indistinct. Sp deposit white.

Sp ellipsoid to cylindrical, smooth, hyaline, without iodine reactions. Basidia 4-spored. Cheilo-, pleuro-, caulo- and pileocystidia present. Hymenophoral trama of inflated elements, without iodine reactions. Pileipellis a cutis. Clamps present.

Biotrophic, parasitising mosses.

Three species in the Nordic countries.

Lit.: Antonín & Noordeloos 2004, Cléménçon 1982, Kost 1984.



Spores and cheilocystidia: *Rickenella fibula*.

1. Centre of cap and stem top dark purplish to violaceous black or grey brown. Cap 4-15 mm, convex, low convex to plane, centre often depressed, with straight margin, hygrophanous, translucently striate to centre, dry, dull, minutely pubescent, grey brown to ochre yellow towards margin and between the striae; gills broadly adnate to arcuate-decurrent, distant, slightly intervenose, with minutely pubescent edge, white to pale cream; stem 20-50 x 0.5-2 mm, cylindrical, hollow, dry, dull, minutely pubescent over entire length, white strigose at base, below top pale yellowish brown to almost white; flesh thin, coloured like surface. Sp (4.5-)5-7 x 2-3 μm , long ellipsoid to cylindrical, smooth, thin-walled; cheilo- and pleurocystidia 30-60 x 6-15 μm , fusiform, lageniform to utriform, subcapitate, thin- to slightly thick-walled; pileo- and caulocystidia 50-100 x 10-25 μm , similar to cheilocystidia. Single or in groups in moist moss, in forests, open grassland, heathland and on lake shores; spring to autumn; very common in temp., common in hemib.-suba., occasional in arc./alp., rare in IS; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – A&N 2004:46, 47, B&K 3:402, Phil 88b, R&H 264, Ves 177, ⊙.

R. swartzii (Fr.: Fr.) Kuyper (*R. setipes* (Fr.: Fr.) Raithelh.)

- Centre of cap and stem top orange, yellow, yellowish or olivaceous brown 2
2. Cap bright orange, yellow or reddish brown. Cap 3-15(-20) mm, convex, low convex with papilla to umbilicate, with straight, undulating or crisped margin, hygrophanous, translucently striate halfway to centre, dry, dull, minutely pubescent (lens), centre deeply coloured, paler towards margin and between the striae; gills arcuate-decurrent, distant, sometimes forked, slightly intervenose, with minutely pubescent edge, white to pale orange; stem 10-50 x 0.5-1.5(-2) mm, cylindrical, hollow, dry, dull to shiny, minutely pubescent over entire length, base white strigose, orange, pale yellow to hyaline white; flesh thin coloured like surface. Sp (4-)5.5-7(-7.5) x 2-3(-4) μm , long ellipsoid to cylindrical, smooth (fig. 67J), thin-

walled; cheilo- and pleurocystidia 30-60 x (4-)6-9(-13) μm , fusiform to narrowly lageniform, often subcapitate, thin-walled, smooth, hyaline; pileocystidia 40-80 x 10-15 μm , similar to cheilocystidia.; caulocystidia 30-100 x 8-15 μm , similar to cheilocystidia, but often slightly thick-walled. Single or in groups in moist moss, in forests, open grassland, heathland and on lake shores; spring to autumn; very common in temp.-arc./alp., occasional in IS; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – A&N 2004:45, FAD 61G, Phil 88a, R&H 264, Ves 177, ☉.

R. fibula (Bull.: Fr.) Raithelh. (*R. aulacomniophila* G. Kost)

- Cap beige to yellowish brown at centre, paler beige towards margin. Cap 3-6 mm, convex, low convex to plane with slightly depressed centre, margin decurved to straight, hygrophorous, translucently striate at margin, minutely pubescent; gills arcuate-decurrent, distant, forked, white, straw-coloured to beige; stem 8-40 x 0.5-1 mm, cylindrical, hollow, dry, shiny, smooth or very minutely pubescent, pale beige to almost white. Sp 5.5-9(-10) x 2.5-4 μm , long ellipsoid to cylindrical, smooth, thin-walled; cheilo- and pleurocystidia 25-65 x 7-15 μm , fusiform, lageniform, subcapitate or clavate, thin-walled, hyaline; pileocystidia similar to cheilocystidia; caulocystidia 25-60 x 5-10 μm , cylindrical, lageniform to fusiform, often subcapitate, thin- to slightly thick-walled. With mosses, often *Bryum* or *Philonotis*; solitary or in groups in moist mires, especially along brook sepages; summer to autumn; occasional in bore.-arc./alp.; NO (LC). – AAF 3:21, C&D 329, Lud 76.1.

R. mellea (Singer & Cléménçon) Lamoure

Rimbachia Pat.

THOMAS LÆSSØE

Mniopetalum Donk

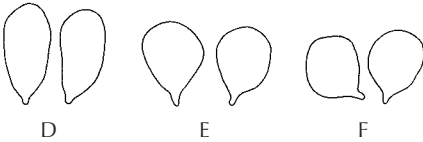
Frb cyphelloid, membranous. Frb 0.5-5(-10) mm, bell- to cup-shaped (cyphelloid) to disc-shaped with ± inrolled margin or almost spathulate, often with slightly lobed margin, rather fragile. Upper surface radially, silky fibrillose, dry, white. Hymenium smooth to veined, white to cream. Veil absent. With ± prominent hyphal cords spreading over the host surface. Smell and taste indistinct. Sp deposit whitish.

Sp globose, lacrymoid or ellipsoid, thin-walled, with a ± prominent, ± truncate apiculus, without germ pore, smooth, hyaline, without iodine reactions. Basidia 4-spored. Cystidia absent. Context with ± rhombic crystals. Epicutis a trichoderm with ± diverticulate, sometimes cystidia-like elements. Clamps present.

Parasitic on mosses, often in wet or damp habitats, such as alder carrs, along streams, etc.; summer to late autumn.

Three species in the Nordic countries.

Lit.: Kuyper in Bas et al. 1995, Redhead 1984a, Senn-Irlet & Moreau 2003.



Spores: D: *Rimbachia neckerae*, E: *R. bryophila*, F: *R. arachnoidea*.

- Sp dacryoid-ellipsoid (fig. 239D); on pleurocarpous mosses, e.g. *Antitrichia curtispindula*. Frb 1-3 mm, bell- to cup-shaped, disc-shaped or almost spathulate; upper side white; hymenium smooth, white to cream. Sp 7.5-11 × (3.5-)5-7 μm. In humid, calcareous sites, e.g. on mossy stream banks; autumn but could be present in other seasons; rare in temp.; DK (DD, Sj: Broby Vesterskov), SE. – Bol Bres 37:122, ČM 54(3-4): 152/153, M&J 2b.
R. neckerae (Fr.: Fr.) Redhead (*Cyphella muscicola* var. n. Fr.: Fr., *Leptoglossum candidum* D.A. Reid)
 - Sp globose-subglobose (figs 239E-F); on pleuro- or acrocarpous mosses 2
- Hymenium with distinct veins; sp on av > 5.5 μm long (fig. 239E). Frb 2-5 mm, bell- to cup-shaped, disc-shaped or almost spathulate; upper side white; hymenium white to cream. Sp 6-7.5 × 5-6 μm, globose-subglobose. On pleurocarpous mosses, at least *Rhynchostegium*; late summer to autumn; rare in hemib.-southern bore.; FI (DD), NO (LC), SE (LC).
R. bryophila (Pers.) Redhead (*Mniopetalum b.* (Pers.) Donk)
 - Hymenium smooth or slightly uneven at centre; sp on av < 5.5 μm long (fig. 239F). Frb 0.5-5(-10) mm, bell- to cup- or disc-shaped or almost spathulate; upper side white; hymenium white to cream. Sp 4-5(-6.5) × 4-5(-5.5) μm, globose-subglobose. On acrocarpous mosses, esp. *Mnium*, typically in *Alnus* carrs or other damp forest types; summer to late autumn; common in temp.-southern bore.; DK (LC), FI (DD), NO (NE, Vestf: Stokke), SE (Sk). – M&J *Mniopetalum* 1 (as *M. bryophila*), ☉.
R. arachnoidea (Peck) Redhead (*Mniopetalum globisporum* Donk)

Ripartites P. Karst.

JAN VESTERHOLT

One species from the Nordic countries is included in the key; see description below.

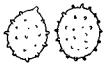
Lit.: Ludwig 2001, Noordeloos in Bas et al. 1995.

Frb clitocyboid with brown gills. Cap 10-70 mm, convex with decurved to involute margin, later expanded to depressed, sometimes with a low umbo, smooth to radially fibrillose or tomentose, often with a fringe of radiating white hairs at margin, dry to viscid, not hygrophorous, not translucently striate, whitish to pale buff. Gills short decurrent, narrow, crowded, pale greyish buff to clay buff. Stem 20-50 x 2-7 mm, cylindrical, pale pinkish buff to greyish brown, whitish flocculose. Veil absent. Smell indistinct or slightly acidulous. Taste mild. Sp deposit buff to pale greyish brown.

Sp 4-5.5 x 3-4.5 μm , globose to broadly ellipsoid, verrucose to echinulate (fig. 425A), pale brownish, without iodine reactions. Cystidia absent. Pileipellis a cutis or a tomentum. Clamps present.

Saprotrophic on soil or litter in coniferous forests, often in *Picea* needle-beds, less often in deciduous forests, on burnt soil, in rich *Salix* scrubs in arc./alp., *Betula* forests in suba., etc.; spring to late autumn; occasional in temp.-bore., rare in suba.-arc./alp.; DK (LC), FI (LC), IS (Na, Au), NO (LC), SE (LC). – B&K 3:66, 67, Lud 77.2, Phil 233g, R&H 280, Ves 177, ☉.

R. tricholoma (Alb. & Schwein.: Fr.) P. Karst. s. lato (incl. *R. helomorphus* (Fr.) P. Karst., *R. metrodii* Huijsman)



Spores.

Roridomyces Rexer

THOMAS LÆSSØE & STEEN A. ELBORNE

Roridella E. Horak

One species in the Nordic countries; see description below.

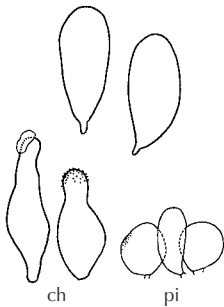
Lit.: Kühner 1938, Rexer 1994.

Frb mycenoid with a slimy stem. Cap 2-10 mm, hemispherical to convex, sometimes slightly umbilicate, sulcate-striate, with thin, ± crenulate margin, slightly velvety, dry, pale cream with a grey tinge, sometimes with a slightly darker centre. Gills arcuate decurrent, medium spaced to distant, white, edge orange red in exsiccates. Stem 15-50 × 0.5-1 mm, cylindrical with a slightly widened base, with thick slime coat, translucent, white, with a tinge of brownish at base. Veil absent. Smell and taste insignificant. Sp deposit whitish.

Sp 8-13 × 3.5-6 μm, long ellipsoid, dacryoid to ± cylindrical, smooth (fig. 389F), hyaline, amyloid. Basidia 2-4-spored. Cheilocystidia 20-31 × (5-)8-11 μm, versiform, utriform, subfusiform-subulate, with exudates at the top. Pleurocystidia absent. Caulocystidia as cheilocystidia or more gnarled-irregular. Pileipellis a hymeniderm with subglobose, pear-shaped or broadly clavate elements, up to 30 × 17 μm. Gill trama vinaceous red in Melzer. Clamps present.

In humid, often acid litter layers, on small twigs, e.g. in *Vaccinium* or *Empetrum* dominated vegetation types, with *Juniperus*, *Rubus*, *Picea*, *Quercus*, etc., often solitary; early summer to autumn; common in bore., occasional in temp.-hemib., rare in suba.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – BCat 583, B&K 3:360, C&D 613, M&J Mycena 1, R&H 347, ☉.

R. rorida (Scop.: Fr.) Rexer (*Mycena r.* (Scop.: Fr.) Quél., *Roridella r.* (Scop.: Fr.) E. Horak)



Spores, cheilocystidia and pileipellis elements.

Rubinoboletus Pilát & Dermek

HENNING KNUDSEN & ANDY TAYLOR

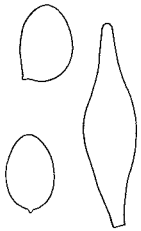
Not recorded from the Nordic countries, but known from UK; see description below.

Frb boletoid with decurrent, reddish tubes. Cap 30-80 mm, convex, buff to yellow brown. Tubes and pores carmine, slightly decurrent, angular, up to 1 mm in diam. Stem 30-60 x 4-13 mm, cylindrical with tapering base, above concolorous with the pores, below yellow. Flesh in cap whitish with reddish patches, in stem base warm yellow. Smell and taste indistinct. Sp deposit pale brown.

Sp 5.5-8 x 3.5-6 μ m, ellipsoid (fig. 173B), pale yellow. Cheilo- and pleurocystidia present. Clamps absent. Pileipellis a cutis with 4-10 μ m broad hyphae.

Mycorrhizal with *Quercus*; NL, UK. – Sing 1.10, Mar 216, OPN 2, ⊕.

R. rubinus (W.G. Sm.) Pilát & Dermek (*Boletus r.* W.G. Sm., *Suillus r.* (W.G. Sm.) Kuntze)



Spores and hymenial cystidia.

Rugosomyces Raithelh.

KUULO KALAMEES

Calocybe sects *Pseudoflammulae* Singer and *Carneoviolaceae* Singer

Frb collybioid. Cap 12-80 mm, bright coloured, melleous, fulvous, purplish red, chestnut brown, violet, pink. Stem central, bright concolorous with cap. Gills yellow or white, adnexed, emarginate or adnate, mostly narrow and crowded. Veil absent. Flesh yellow or white, thin. Smell and taste often farinaceous, taste sometimes bitter. Sp deposit white to pale cream.

Sp ellipsoid, smooth, cyanophilous, without iodine reactions. Basidia < 30 μm long, siderophilous. Cystidia absent. Pileipellis a hymeniderm, trichoderm to subepithelium of spheropedunculate, spheric to pyriform, often irregular, diverticulate, lobed, interlocking elements, or a mixture of these and filamentous hyphae. Pigments predominantly parietal. Clamps present.

Saprotrophic on humus or forest debris and litter, rarely on wood, mainly in coniferous, less often in deciduous and mixed forests, grasslands and lawns; summer to autumn.

Eight species in the Nordic countries.

Lit.: Bon 1999, Kalamees 1995, 2004.

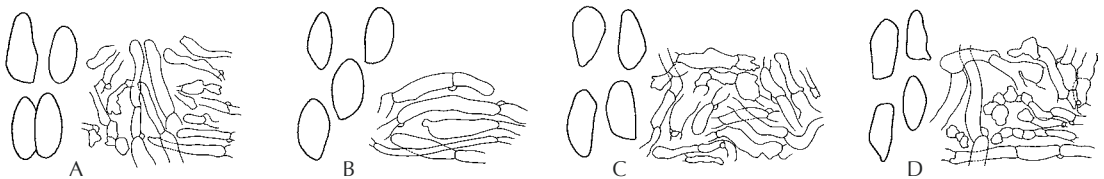


Fig. 507. Spores and pileipellis: A: *Rugosomyces obscurissimus*, B: *R. ionides*, C: *R. carneus*, D: *R. persicolor*.

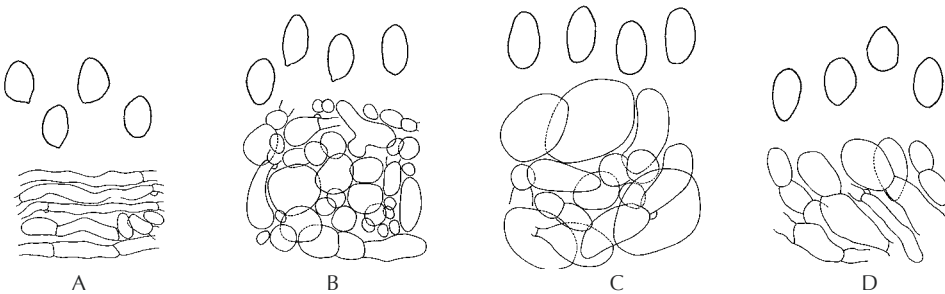


Fig. 509. Spores and pileipellis: A: *Rugosomyces chrysenteron*, B: *R. fallax*, C: *R. obscuratus*, D: *R. onychinus*.

1. Gills pure white, cream or pale yellowish only when mature; cap violet, pink, fuliginous or blackish brown to purplish black sect. *Carneoviolacei* 2
 - Gills deep yellow; cap yellow or brown sect. *Rugosomyces* 5
2. Cap fuliginous, dark purplish brown to purplish black, sometimes with a violet tinge. Cap 25-35 mm, convex to plane, minutely radially folded at centre, slightly tomentose, dry, not hygrophanous; gills emarginate with a decurrent tooth, rather broad, medium spaced to crowded, whitish to sordid cream buff; stem 40-50 x 3-7 mm, rather solid, cylindrical or somewhat tapering downwards, cottony fibrillose, concolorous with cap or slightly paler; flesh whitish, in stem somewhat yellowish; smell and taste ± farinaceous, taste mild; sp deposit white. Sp 5-6 x 3-3.5(-4.5) μm, cylindrical to conical-ellipsoid (fig. 507A); pileipellis a subtrichoderm to a hymeniderm of sphero- to pyriform-pedunculate, often interlocking elements. On debris in deciduous forests and in unfertilized, natural pastures, calciphilous;


summer to autumn; rare in temp.-hemib.; DK (vU), FI (EN, U: Helsinki, Myllypuro), NO (NT, Busk: N. Eiker, M&R: Smøla), SE (NA). – Cet 360, GBW 3:145, Jordst 16(3), M&J Calocybe 3, Svp 32:12, ©.

R. obscurissimus (A. Pearson) Bon (*Calocybe o.* (A. Pearson) M.M. Moser, *Tricholoma conicosporum* Métrod nom. inval.)

- Cap violet, pink or pinkish red 3
- 3. Cap bright blue, grey violet to brown violet, pure violet at margin; gills white at first, then becoming pale yellow. Cap 30-80 mm, bell-shaped, convex to plane, umbonate, minutely tomentose, dry, not hygrophanous; gills crowded, emarginate or adnate with a tooth; stem 30-60 x 3-10 mm, cottony-fibrillose, dry, stuffed, concolorous with cap. Flesh whitish, often with a lilac tint; taste and smell strongly farinaceous; sp deposit pale cream. Sp 5-5.5 x 2.5-3 μm , cylindrical-ellipsoid (fig. 507B); pileipellis a mixture of filamentous hyphae and subtrichodermic, sometimes interlocking elements. On leaf and needle litter in deciduous, mixed and coniferous forests, mainly in deciduous forests, but also in parks, pastures and meadows; summer to autumn; rare in temp.-suba.; DK (vU), FI (DD), NO (Finnm: Karasjok), SE (DD). – B&K 3:145, C&D 478, Cet 358, FAD 25D, M&J Calocybe 3, ©.
- R. ionides* (Bull.: Fr.) Bon (*Calocybe i.* (Bull.: Fr.) Donk)
- Cap pink to flesh red or dirty pink red; gills pure white 4
- 4. Cap and stem pure flesh pink or salmon; stem short and densely white pruinose-flocculose at top (to 1 mm), downwards very finely fibrillose-flocculose at first, then glabrescent, naked at base, not tomentose-shaggy; mainly solitary in grasslands. Cap 12-50 mm, low convex to plane, sometimes with a papilla, dry, faintly fibrillose-flocculose-granulose at first, then glabrescent, not hygrophanous; gills emarginate, crowded, rather narrow, white; stem 25-40 x 2-5 mm, widened to up to 15 mm at top, often tapering downwards, fistulose, dry, concolorous with cap, but brighter; smell and taste indistinct. Sp 3-7(-8) x 2-3 μm , navicular to cylindrical-ellipsoid (fig. 507C); pileipellis a trichoderm. In grassland, lawns, deciduous forest, tundra communities, etc.; summer to autumn; widespread in tundra, common in temp.-hemib., occasional in southern bore., rare in middle bore.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:142, C&D 480, FAD 24C, Phil 104c, R&H 305, ©.
- R. carneus* (Bull.: Fr.) Bon (*Calocybe carneus* (Bull.: Fr.) Donk)
- Cap and stem darker, sordid to dirty pink, red or pale pinkish brown, sometimes with a lilac tinge; stem white tomentose, thin, hairy, shaggy or strigose from base upwards; mainly fasciculate in forest litter. Cap 20-60 mm, convex to low convex, umbonate, with thin involute mealy margin, not or slightly hygrophanous; gills crowded, emarginate to adnate with a tooth, pure white to sordid cream; stem up to 20-50 x 6-10 mm, dry, fibrillose, fistulose, concolorous with cap; smell and taste absent or slightly fruity or farinaceous. Sp 4-5 x 2-3 μm , ellipsoid to navicular-subconical (fig. 507D); pileipellis a mixture of filamentous hyphae and hymenidermic, subtrichodermic and subepithelial spheropedunculate to spheric elements, partly interlocking. In coniferous and mixed forests, parks, grasslands, lawns; summer to autumn; common hemib.-bore., rare in temp. and suba.; DK, FI, NO, SE. – Bon 99:4D FAD 24G.
- R. persicolor* (Fr.) Bon (*Calocybe carneus* (Bull.: Fr.) Donk s. auct. p.p.)
- 5. Cap, gills and stem yellow to orange yellow 6
- Cap and stem brown to fuliginous, with a buff, rufous, purple or red tinge; gills yellow 7
- 6. Pileipellis dominated by filamentous hyphae with a small number of hymenidermic or subepithelial, subspherical to spheropedunculate elements (fig. 509A); gills not blackening when drying. Cap 20-60 mm, convex to plane umbonate, margin minutely fibrillose-tomentose, dry, smooth, slightly hygrophanous, thin, translucently striate, bright yellow to chrome yellow; gills adnexed to adnate with a tooth, narrow, crowded, bright yellow; stem 50-80 x 4-8 mm, rather stout, dry, strigose at base, concolorous with the cap; flesh sulphur yellow, also in exsiccates; smell farinaceous to raphanoid; taste mild to bitter. Sp 2.5-3.5(-4)

x 2-2.5(-3) μm , broadly ellipsoid. In groups on needle and leaf litter in coniferous, mixed and deciduous forests; rarely on very rotten wood, calciphilous; summer to autumn; rare in temp.-suba.; DK (EN), FI (NT), NO (Oslo, Finn: Tana), SE (NA, Upl). – FRIC 11:84.2, Cet 360, C&D 476, FAD 24B, Sieniop 153.

R. chrysenderon (Bull.: Fr.) Bon (*Calocybe pseudoflammula* (J.E. Lange) M. Lange, *C. cerina* (Pers.: Fr.) Donk s. auct. p.p. non Singer, Michael & Hennig, Moser, Arnolds & Becker, Bon)

- Pileipellis cellular, of spheropedunculate to subspherical elements only (fig. 509B); gills mostly blackened in exsiccates. Cap 5-20(-40) mm, \pm bell-shaped to low convex, minutely tomentose, dry, slightly hygrophanous or with hygrophanous spots, melleous to ochraceous yellow; gills adnexed, emarginate or adnate with a tooth, narrow, crowded, deep yellow, in exsiccates whitish yellow to greyish yellow, mostly blackening all over or browning on edge; stem 25-30 x 2-4 mm, fibrillose, pruinose at top, dry, stuffed, concolorous with cap; flesh yellow; smell and taste absent or slightly farinaceous, taste sometimes slightly bitter. Sp 3.5-4(-4.5) x 2-2.5(-3) μm , broadly ellipsoid. On needle litter, seldom on very decayed wood in coniferous, deciduous and mixed forests and *Dryas* heathland on rich ground, also at roadsides; summer to autumn; occasional in bore, rare, but locally occasional in temp.-hemib. and suba.-arc. / alp.; DK, FI (LC), IS (Au, Na), NO (LC), SE (LC). – FRIC 11:84.1, Jordst 9(1), M&J *Calocybe* 2,4, Sieniop 154, .

R. fallax Bon (*Calocybe f.* (Sacc.) Redhead & Singer nom. illeg., *C. cerina* (Pers.: Fr.) Donk s. Singer, auct. mult. p.p., *C. cerinoides* Kalamees)

7. Cap buff to rufous brown or fuliginous; pileipellis with up to 50 μm wide spheropedunculate elements (fig. 509C). Cap up to 90 mm, convex to plane, umbonate, minutely tomentose, hardly sulcate at margin, dry, hygrophanous in places; gills crowded, adnexed to sinuate with a tooth, dirty yellow, not blackening when drying; stem up to 60 x 15 mm, fibrillose, pruinose at top, dry, concolorous with cap; flesh yellowish; smell and taste none. Sp 3.5-5 x 2.5-3 μm , ellipsoid. In small groups on needle forest litter in coniferous and mixed forests, rarely on burnt soil; summer to autumn; rare in bore; FI (EH).

R. obscuratus (P. Karst.) Kalamees

- Cap purplish brown, red to blackish brown, chestnut-coloured, sometimes with an indistinct lilac tint; pileipellis a subhymeniderm of clavate to pyriform elements, to 15 μm wide (fig. 509D). Cap 20-90 mm, convex to low convex or depressed, often umbonate, slightly hygrophanous, not translucently striate, smooth to slightly felty; gills adnexed to adnate with a decurrent tooth, narrow, crowded, bright yellow to olivaceous yellow, sometimes staining dark brownish or blackish; stem 20-40 x 4-8 mm, solid, stuffed, top minutely pubescent, below fibrillose, concolorous with cap but paler, often with a greyish tint, sometimes becoming blackish at base; flesh sordid yellowish white; smell and taste absent. Sp 4-4.5(-5) x (2-)2.5-3 μm , ellipsoid. In coniferous forests, often at roadsides, calciphilous; summer; rare in hemib.-arc. / alp.; SE, FI (NT), NO (VU, incl. SvB), SE (LC, Mpd). – AAF 2:7, Cet 362, Däh 283, M&J *Calocybe* 2, Sieniop 155.

R. onychinus (Fr.) Raithel (*Calocybe o.* (Fr.) Donk)

Russula Pers. HENNING KNUDSEN, JUHANI RUOTSALAINEN & JUKKA VAURAS

Frb with normally developed central stem and gills and crumbling texture. Cap 20-200 mm, hemispherical to convex or plane, later depressed or umbonate, uniformly coloured or more often a mixture of various colours, in a few species dull white, grey, brown or blackish; margin smooth, sulcate or tuberculate-sulcate; surface mat or shining, dry to viscid, sometimes pruinose; cuticle ± peeling in most species. Gills almost free to slightly decurrent, crowded to distant, in some species with lamellules, sometimes forked or with anastomoses or ± interveined, white to yellow, fragile, rarely elastic, rarely with pink shine or blackening, becoming brown spotted or yellowing. Stem 20-150 x 5-30 mm, cylindrical, more rarely clavate or tapering, solid to with cavities, in most species white, but also red, pink, violaceous, lilaceous or purple, in some species yellowing, browning, greying or blackening when bruised or old. Flesh white, soft to hard, in some species yellowing, browning, reddening or blackening; consistency characteristically granulose-cheesy, not fibrous. Taste mild to unbearably acrid, rarely bitter or oily. Smell insignificant or in many species characteristic, fetid, fruity, of *Pelargonium* etc. Sp deposit from pure white to whitish (Ia-Ib), pale cream to dark cream (IIa-IIc), pale ochre to deep ochre (IIIa-d) or pale yellow to orange yellow (IVa-d). If the exact nuance is necessary, it is recommended to gather the sp deposit with a razorblade to a mm-thick layer and place this between two object-glasses and then compare the colour to the scale in e.g. Romagnesi (1967) or to a well known species.

Sp subglobose, more rarely ellipsoid, with characteristic amyloid ornamentation, varying from low warts to spines and crests and from no or few connections to almost completely reticulate. Macrocystidia on gill edge ± lanceolate or cigar-shaped, often with a small appendix, in most species becoming blue with sulpho-vanillin (SV) and black with sulpho-benzaldehyde (SBA). Pileipellis of undifferentiated hyphae except in some species, where the apical cell may be strongly tapering. In most species one or more additional structures can be found: dermatocystidia (dcy) (figs 123 C, E) reacting with SV and SBA like the cystidia, non-septate or multi-septate; primordial hyphae, often slightly thick-walled and smooth or more often incrustated, incrustations reacting with fuchsin (fig. 141F); thick-walled, rigid and tapering brown or hyaline hairs (fig. 115I). Flesh consisting of a mixture of normal hyphae and groups of spherocysts (heteroiomerous). Clamps absent.

All species in the Nordic countries are strictly mycorrhizal. The most important hosts are *Fagus*, *Picea*, *Betula*, *Quercus* and *Pinus*, less important are *Populus*, *Alnus*, *Tilia*, *Salix* and *Carpinus*, in arc./alp. areas dwarf *Betula*, *Salix*, *Dryas* and *Polygonum viviparum* act as hosts. Early summer to late autumn. All mild species with a pleasant taste are edible.

152 species in the Nordic countries, 153 species in the key.

Lit.: Adamčík 2004, Einhellinger & Marxmüller 1985, Marchand 1977, Marstad 2004, Rayner 1985, Romagnesi 1967, Sarnari 1998, 2005, Schäffer 1952, Svrček, Erhart & Erhartova 1984.

Main key

1. Frb white or whitish, often bruising brownish or yellowish; flesh firm, not or only slightly bruising when cut; cap often developed underground and thus dirty with adhering soil and with a rugged, irregular surface; many gills short, not reaching the stem Key A, sect. *Lactarioides* p. 110
 - Frb coloured *or* if white then fragile and without short gills 2
2. Frb with brown, grey or black colours or if white then strongly blackening when bruised; many gills short, not reaching the stem; flesh firm, reddening or blackening when cut or bruised Key B, sect. *Compactae* p. 110
 - Almost all gills reaching from stem to cap margin; flesh firm or fragile; cap colour red, purple, lilac, violet, green, blue, yellow, brown, etc. 3
3. Frb either with a sticky, yellow, brown or grey cap, a tuberculate-sulcate margin and a \pm hollow stem *or* if cap cream then stem solid and taste very acrid; stem concolorous with cap or paler; smell often remarkably strong and unpleasant; taste often acrid or unpleasant, nauseating; sp deposit white to cream; smooth dcy present; primordial hyphae absent Key C, sect. *Ingratae* p. 112
 - Cap either with other colours *or* the combination of colour, margin and stem different *or* sp deposit darker *or* pileipellis different 4
4. Cap dry or slightly greasy, mat or shining, green, blue, grey, lilac, brown, yellow or flesh-coloured, smooth or in a few species granulose scaly, with smooth or very slightly sulcate margin; gills white or cream, often with rust-coloured spots when old; stem white or rarely with a flush of cap colour, at base often tapering and with rust-coloured spots; flesh white, not bruising when touched, firm, in some species slowly becoming orange or red with FeSO₄, in others becoming greyish green to bluish green or unchanging; taste mild or slightly acrid; smell mostly insignificant; sp deposit white to cream, rarely ochre; apical cells in pileipellis often tapering and supported by short, almost isodiametrical cells; dcy present in most species, small and narrow, non-septate, darkening or not in SV; a few species with brown thick-walled setae-like hairs especially near centre; many species with dark intracellular grains in the pileipellis when fresh Key D, sect. *Heterophyllae* p. 116
 - Cap with other colours *or* gills ochre to yellow *or* stem bruising yellow or grey *or* flesh fragile *or* taste acrid *or* sp deposit darker *or* pileipellis with other characters 5
5. Taste moderately acrid to very acrid; cap red, lilac, purplish, vinaceous, violet or bluish; sp deposit white to ochre or pale yellow; stem white or concolorous with cap, not or only in a few species bruising yellow; pileipellis with \pm inflated, non-septate or more often septate, smooth dcy becoming strongly bluish black with SV; primordial hyphae absent, incrustations in pileipellis absent except in *R. viscida*; frb sharing the above combination except being mild either have a yellow cap and a white sp deposit or a strongly greying stem and grow with *Alnus* Key E, sect. *Russula* p. 120
 - Taste mild or if acrid then sp deposit ochre to yellow; pileipellis with primordial hyphae, dcy if present incrustated, or flesh yellowing when bruised or bluish green with FeSO₄ 6
6. Stem when bruised or cut becoming brown; frb when mature and old with a smell of cooked shell-fish (trimethylamine); FeSO₄ on stem bluish green; sp deposit cream to ochre; taste mild; pileipellis with smooth dcy, primordial hyphae and incrustations absent Key F, sect. *Polychromae* subsect. *Xerampelinae* p. 128
 - Stem when bruised unchanging or if yellowing or browning then smell absent or different; FeSO₄ on stem not becoming bluish green; sp deposit white to yellow; taste

- mild to acrid; pileipellis with dcy or primordial hyphae or both; incrustations present or absent 7
7. Taste mild or if moderately acrid then stem and flesh yellowing; stem and flesh distinctly yellowing in most species; pileipellis with conspicuous, often multi-septate dcy, strongly darkening with SV and SBA; lactifers in stem cuticle blackening in the same reagents; frb fragile; cap in most species 30-70 mm, in a few up to 150 mm; cap red, purple, lilac, violet, often mixed with green or yellow, often shining, dry or viscid, margin often sulcate tuberculate; gills cream to yellow; stem often clavate; smell mostly indistinct; sp deposit cream to yellow; pileipellis without primordial hyphae and any incrustations **Key G, sect. *Polychromae* subsect. *Puellarinae* p. 130**
- Either taste acrid, or \pm incrustated dcy or primordial hyphae present, or any differentiated hyphae in the pileipellis absent 8
8. Dcy smooth, long or voluminous and strongly reacting with SV, in many species slightly diverticulate-knobby; primordial hyphae absent; sp deposit ochre or yellow; taste acrid to very acrid or in alpine species almost mild; sp often with isolated spines **Key H, sect. *Polychromae* subsect. *Urentes* p. 134**
- Dcy if present either slightly incrustated or accompanied by primordial hyphae; sp deposit white to yellow; taste mild to acrid; sp with spines, crests or reticulate 9
9. Sp deposit white or pale cream; taste mild or resembling menthol; pileipellis with strongly incrustated primordial hyphae; well characterised dcy absent; cap mat, often pruinose **Key I, sect. *Polychromae* subsect. *Lilaceinae* p. 137**
- The combination of sp deposit, taste and pileipellis different; sp deposit white to yellow; cap mat or shining; taste mild or acrid; pileipellis with incrustated primordial hyphae and/or slightly incrustated dcy, or with undifferentiated hyphae 10
10. Pileipellis with slightly incrustated primordial hyphae and/or slightly incrustated dcy, at least at the base; some species distinctly greying; sp deposit yellow, rarely ochre; taste mild or acrid, not bitter **Key J, sect. *Polychromae* subsect. *Integroidinae* p. 139**
- Pileipellis with smooth dcy, incrustated primordial hyphae or without any differentiation in the pileipellis; taste mild; sp deposit ochre to yellow, in a few species cream 11
11. Dcy smooth, becoming blue or black with SV **Key K, sect. *Polychromae* subsects *Integriforminae* and *Mellioleptinae* p. 143**
- Dcy absent or if present not reacting with SV; incrustated primordial hyphae present or absent **Key L, sect. *Polychromae* subsect. *Polychromae* p. 145**

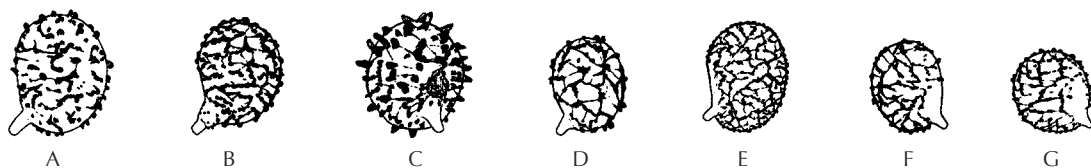
Key A: Sect. *Lactarioides* (Bataille) Konrad & Joss.

The section is in strong need of a revision.

1. Sp deposit deep cream to pale ochre 2
- Sp deposit white to pale cream 3
2. Sp deposit pale ochre (III); taste slightly acrid. Cap 50-110 mm, deeply depressed and funnel-shaped, whitish but soon dirty yellowish, rugose and practically always including some debris and grains of soil; gills decurrent, narrow, some very short, some forked and anastomosing, soon ochre; stem 20-50 x 15-25 mm, white, very firm; flesh white, at the base of the stem dirty greyish. Sp 8-9.5 x 6-6.5 μm , verrucose; dcy scattered. In deciduous forests; autumn; very rare in temp.; DK (DD). – FAD 178A, M&H 5:68.
R. pseudodelica J.E. Lange
- Sp deposit dark cream (IIcd); taste mild, then bitterish aromatic. Cap 80-200 mm, depressed but not deeply, yellowish white, often with ochraceous patches; gills short decurrent, crowded, later dark cream, often with an orange tinge; stem 35-60 x 20-35 mm, cylindrical or tapering downwards, firm, white to concolorous with cap; smell aromatic to fruity. Sp 8-10.5 x 6.5-8 μm , with small warts and at least partially reticulate (fig. 111A). In mixed forests on calcareous soil; autumn; very rare in hemib.; FI (DD, A: Hammarland). – Sar 1:205, Schff 6.
R. pallidospora Romagn.
3. Number of gills/cm margin < 10; gills 6-14 mm broad. Cap 50-150 mm, depressed at centre, soon broadly funnel-shaped, soon with straight margin, rugose, white with yellow brown patches, practically always including some debris and grains of soil; gills decurrent, of different lengths, whitish, edge sometimes becoming turquoise when dry; stem 20-45 x 15-30 mm, stout, often widest at the top and base slightly tapering, solid, sometimes with a narrow turquoise band around the top; flesh white, hard; taste mild, later acrid; smell fruity, then somewhat herring-like. Sp 8-11 x 6.5-8.5 μm , verrucose, \pm catenulate, connections few, warts up to 1 μm (fig. 111B); dcy cylindrical, greying in SV. All over the area, from forests in temp. to arc./alp. heaths; summer to autumn; common in temp.-hemib., rare in suba.-arc./alp.; DK (LC), FI (DD), FO, IS, NO (LC, incl. Svb), SE (LC). – Däh 836, Phil 46b, R&H 529, Ves 420.
R. delica Fr.
- Number of gills/cm margin > 10; gills 4-7 mm broad. Cap 50-150 mm, depressed at centre, soon broadly funnel-shaped, long time with inflexed margin, rugose, white with yellow brown patches, practically always including some debris and grains of soil; gills decurrent, of different lengths, whitish, edge sometimes becoming turquoise when dry; stem 20-50 x 15-30 mm, stout, mostly cylindrical, even, solid, sometimes with a narrow turquoise band around the top; flesh white, hard; taste acrid; sp deposit white (Iab). Sp 8-11 x 7-9 μm , echinulate, spines 1-1.5 μm , with many fine connections (fig. 111C); dcy cylindrical, greying in SV. Summer to autumn; apparently common but difficult to estimate since limits against *R. delica* are ill-defined; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Mar 401, Marst 8, Sar 1:197, 201, ☉.
R. chloroides (Krombh.) Bres. var. *chloroides*
var. *trachyspora* (Romagn.) Sarnari differs in the sp having spines > 1.5 μm . This seems to be the most common taxon of this section in Fennoscandia, but the distinction against *R. delica* is not constant.

Key B: Sect. *Compactae* Fr.

1. Gills remarkably thick and distant. Cap 60-200 mm, convex then depressed, whitish but soon dull sooty brown, becoming blackish, firm; stem 30-70 x 15-25 mm, soon brown, firm; flesh thick and hard, white but soon dull red when bruised, then entirely grey to black; taste mild, but unpleasant; smell indistinct; sp deposit white (Ia). Sp 6.5-8 x 6-7 μm , verrucose, with fine connections forming a weak partial reticulum (fig. 111D); dcy indistinct, cylindri-



Spores: A: *Russula pallidospora*, B: *R. delica*, C: *R. chloroides*, D: *R. nigricans*, E: *R. albonigra*, F: *R. anthracina* (from holotype), G: *R. acrifolia*.

cal. In deciduous and coniferous forests; late summer to autumn; very common in temp., occasional in hemib., rare in bore., in the western part of the area north to 64°, in the eastern part to 61°; DK (LC), FI (LC), NO (LC), SE (LC). – Phil 46c, R&H 529, Sar 1:155, 157, Schff 1, Ves 386, ☉.

R. nigricans (Bull.) Fr.

- Gills neither remarkably thick nor distant 2
- 2. Macrocystidia and dcy with yellowish contents in SV, without any blackening; flesh rapidly blackening. Cap 60-100 mm, viscid then dry, white, but soon browning or blackening; gills white, remarkably contrasting the black stem and flesh; stem white, soon blackening, 20-60 x 15-30 mm; taste slightly bitter, causing a chilly feeling on the tongue; smell fresh, but weak; sp deposit white (Ia). Sp 7.5-9.5 x 6-7.5 μm , verrucose with hardly visible connections (fig. 111E); dcy long, slightly swollen at the apex, with brown necropigment, not reacting with SV. In coniferous and deciduous forests on better soil; summer to autumn; rare in temp.-bore.; DK (vU), FI (LC), NO (NT), SE (LC). – Mar 404, Marst 6, R&H 530, Sar 1:179, Schff 3, ☉.

R. albonigra (Krombh.) Fr.

- Macrocystidia and dcy scattered and sometimes difficult to find, with greyish or blackish contents in SV; flesh reddening or blackening 3
- 3. Gills acrid to very acrid; flesh reddening, then blackening or rapidly blackening 4
- Gills mild or slightly acrid; flesh reddening, then blackening 5
- 4. Flesh rapidly blackening, occasionally with a trace of pink first; pileipellis with dark globules of pigment. Cap 60-100 mm, white or cream but soon browning or blackening; gills cream, with or without a flush of pink; stem 30-60 x 15-25 mm, stout, concolorous with cap; taste acrid in the gills; smell indistinct; sp deposit white (Ia). Sp 7.5-10 x 6-8 μm , verrucose with rather distinct, \pm complete reticulum (fig. 111F); macrocystidia with greyish contents in SV. In deciduous and coniferous forests; summer to autumn; rare in temp.-bore., in NO only from Østf; DK (vU), FI (LC), NO (NT), SE (NE). – Däh 837, Mar 408 (var. *carneifolia*), Marst 6, Schff 2a.

R. anthracina Romagn.

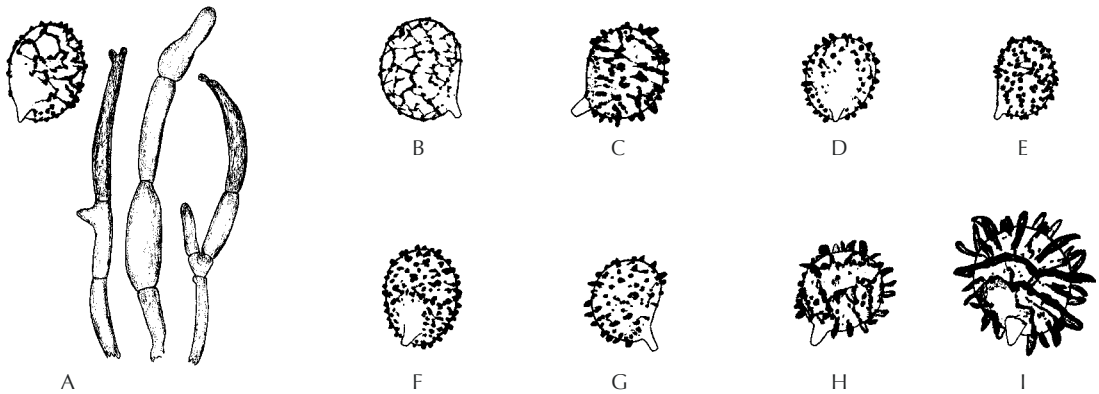
Note: some varieties differ mainly in their mild taste and red tinge of the gills (var. *carneifolia* Romagn., var. *insipida* Romagn. nom. inval.); Sarnari (1998) described *R. atramentosa* with a mild taste. The complex needs further investigation.

- Flesh reddening, then slowly blackening; pileipellis without dark globules. Cap 50-100 mm, viscid at least at centre, brown or greyish brown, darkest at centre; gills forked at stem, \pm anastomosing and irregularly wavy, whitish to cream; stem 30-60 x 10-25 mm, whitish, soon concolorous with cap; taste acrid in the gills; smell indistinct; sp deposit white (Ia). Sp 7-9.5 x 6.5-7.5 μm , verrucose, with a \pm complete reticulum (fig. 111G); dcy and hyphae in pileipellis generally < 5 μm broad. In deciduous and coniferous forests, on rich soil; summer to autumn; occasional in temp.-hemib., rare in bore., in NO north to Troms, in SE and FI to 66°; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Däh 842, R&H 530, Sar 1:151, 153, Schff 2 (left), Ves 387.
- R. acrifolia* Romagn.

5. Gills with a distinct pink tinge see *R. anthracina* 4
 - Gills without pink 6
6. Gills regular, crowded, with many lamellules, but not forked; cap soon dry and mat. Cap 40-80 mm, white, then grey brown with a tinge of olivaceous brown to black, at margin remaining whitish for a long time; gills narrow, thin, white to cream; stem 30-60 x 10-20 mm, whitish, then concolorous with cap; taste mild or slightly acrid; smell indistinct; sp deposit white (Ia). Sp 6.5-8 x 5.5-7 μm , verrucose with some connections (fig. 113A); pileipellis with dcy and hairs generally 5-10 μm broad. In deciduous and coniferous forests, on rich soil; summer to autumn; common in temp., occasional in hemib., rare in bore., in FI north to Ks; DK (LC), FI (DD), NO (LC), SE (LC). – Däh 839, Mar 407, Sar 1:165, 167, Svp 46:7, Ves 386.
R. densifolia Gillet
- Gills irregular, medium spaced to distant, with many lamellules, forked and anastomosing; cap \pm viscid, when dry glossy. Cap 40-150(-180) mm, umber to sepia, margin often whitish; gills pale, soon dirty cream; stem 30-70 x 15-30 mm, white, browning when bruised, at base irregularly inflated; flesh pale then slightly reddening becoming grey brown to black; taste mild; smell of old wine casks; sp deposit white (Ia). Sp 7.5-9 x 6-7.5 μm , verrucose, with partial, hardly visible reticulum (fig. 113B). Associated with *Pinus* on acid soil; summer to autumn; common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Mar 405, Phil 47d, Sar 1:161, Schff 4, Ves 387, \odot .
R. adusta (Pers.: Fr.) Fr.

Key C: Sect. *Ingratae* (Quél.) Maire (incl. sect. *Subvelatae* Singer)

1. Cap with grey to grey-brown colours; if yellowish is also present, then completely mild 2
 - Cap with yellow to brown colours; taste bitter, acrid or unpleasant oily, at least in the gills 4
2. Taste mild; smell weak, fruity. Cap 40-75 mm, irregular wavy-lobed, with incurved margin, smooth but soon \pm sulcate, dry or slightly viscid, from dark dirty brown to greyish and yellowish; gills medium spaced, interveined, whitish to cream, becoming finely brown spotted; stem 22-50 x 10-16 mm, cylindrical or slightly swollen at base, white, at base yellowish, especially when dried or bruised, finally \pm hollow; flesh at stem base red with ammonia or KOH; sp deposit ochre (IIIab). Sp 6.5-8 x 5.5-7 μm , echinulate, up to 1 μm , with some connections and crests (fig. 113C); dcy small and not well developed; near cap margin, especially at 'protected' areas and at stem base provided with well characterised, tapering apical hyphae incrustated with numerous small, yellow granules (in water) and sometimes with greyish contents in SV. In deciduous forests, parks and open land; summer to autumn; rare or confused with similar species; DK (DD). – E&M 18, Mar 427, Sar 1:477, S,E&E 26, \odot .
R. insignis Quél. (*R. livescens* (Batsch) Quél. s. Bres.)
- Taste acrid; smell of Camembert cheese 3
3. Sp 6.5-8.5 x 5.5-7 μm , subglobose, warts up to 0.4 μm , connections few (fig. 113D). Cap 40-110 mm, sticky-viscid, finely rugose and radially fibrillose, umber to sepia or dark greyish brown, at margin first vaguely then distinctly tuberculate-sulcate; gills dirty whitish to greyish cream, often with brown spots; stem 20-60 x 15-25 mm, whitish to greyish or dirty greyish brown, with rust-coloured spots at base; taste gradually acrid; smell resembling Camembert cheese or spermatic; sp deposit cream (IIbc). Dcy slender, tapering. In mixed and deciduous forests, often associated with *Quercus* on neutral or rich, clayey soil; summer to autumn; occasional in temp., with few records from NO; DK (LC), NO (NE). – Däh 848, Mar 425, Marst 23, Sar 1:458, 459, Ves 390.
R. sororia (Fr.) Romell (*R. consobrina* (Fr. : Fr.) Fr. var. *sororia* Fr.)
- Sp 7-8.5 x 5-6.5 μm , ellipsoid, warts up to 0.8 μm (fig. 113E), with some connections. Cap 30-65 mm, sticky-viscid, dark umber to grey brown or pale grey brown, sometimes paler when



Spores and pileipellis elements: A: *Russula densifolia*, B: *R. adusta*, C: *R. insignis*, D: *R. sororia*, E: *R. amoenolens*, F: *R. pallescens* (from lectotype), G: *R. farinipes*, H: *R. illota*, I: *R. grata*.

old, paler at margin, at first vaguely then distinctly tuberculate-sulcate; gills dirty whitish to greyish cream, often with brown spots; stem 20-55 x 10-15 mm, whitish or pale dirty greyish, sometimes almost as if lacquered; taste somewhat acrid; smell of Camembert cheese or spermatic; sp deposit cream (IIab). Dcy long, slender, tapering. Mycorrhizal with *Quercus* and *Pinus* on acid, sandy ground; summer to autumn; occasional in temp.-hemib., but confused with *R. sororia*; DK (LC), NO (LC), SE (LC). – Mar 426, Sar 1:453, 455, Schff 47, S,E&E 23, Ves 390.

***R. amoenolens* Romagn.**

- 4. Cap margin smooth or weakly sulcate, taste very acrid or bitter 5
- Cap margin distinctly sulcate, often tuberculate-sulcate and sticky-viscid; taste acrid to almost mild or oily 7

5. Mycorrhizal mainly with conifers, mainly *Pinus silvestris*. Cap 20-50 mm, often rimosely cracking when old, at first pale yellow, later ochraceous; gills narrow, medium spaced to distant, whitish; stem 25-50 x 10-18 mm, often widest in upper part, pointed towards base, almost smooth, white with a yellow tinge; taste very acrid; smell indistinct; sp deposit white (Ia). Sp 7-9 x 6-7.5 μm, verrucose with a few crests (fig. 113F); dcy slightly tapering. In coniferous forests on poor sandy soils, mainly along paths, but even found in alpine localities near *Betula nana* and dwarf *Salix*; summer to autumn; rare in bore.-arc./alp.; FI (LC), NO (LC), SE. – Sar 1:417.

***R. pallescens* P. Karst.**

- Mycorrhizal with deciduous trees, esp. *Fagus* and *Quercus* 6

6. Taste extremely bitter; cap with smooth margin, buff to yellow brown see *R. fellea*, key E 8

- Taste very acrid; cap with slightly tuberculate-sulcate margin, cream to pale ochraceous. Cap 30-70 mm, thin, but rather firm and elastic, soon plane, hardly peeling; gills rather narrow, distant, whitish; stem 30-80 x 10-15 mm, almost cylindrical, pruinose above, whitish or with a tinge of cap colour, hard and rigid; smell slight, fruity; sp deposit white (Ia). Sp 6-8 x 5-7 μm, with conical isolated warts up to 0.8 μm (fig. 113G); dcy long, tapering into a small irregular appendix. In deciduous forests; summer to autumn; occasional in temp.-hemib., rare in bore.; DK (LC), FI (LC), NO (NE, Østf: Fredrikstad, Vestf: Tønsberg), SE (LC). – Phil 41c, R&H 531, Sar 1:413, 415, Schff 44, Ves 391, ☉.

***R. farinipes* Romell**

7. Gill edge brown punctate, at least in part and when young. Cap 60-120(-150) mm, at margin strongly tuberculate-sulcate, viscid, yellow brown to dull brown, often spotted darker brown, sometimes with a slight violaceous greyish tinge; gills whitish to cream, becoming

brown spotted; stem 60-120 x 15-25 mm, whitish, but soon becoming dirty brown punctate from below, with cavities; flesh whitish, becoming brownish when cut; taste acrid; smell a mixture of nauseating and bitter almonds; sp deposit cream (IIb). Sp 7-9 x 6-8 μm , with coarse crests (fig. 113H); dcy long and narrow. In deciduous forests especially with *Quercus* on rich soil; summer to autumn; occasional in temp.-hemib.; DK (LC), FI (EN), NO (LC), SE (LC). – Mar 424, Marst 21, Sar 1:445, 446, Ves 389, ZM 46(2):1.

R. illota Romagn.

- Gill edge not brown punctate 8
- 8. Smell strong and pleasant, of bitter almonds or marzipan 9
- Smell strong and unpleasant, sweetish nauseating, of burnt rubber, oily 10
- 9. Cap 50-100 mm; stem 13-20 mm broad. Cap tuberculate-sulcate at margin, slightly viscid, soon becoming dry, ochraceous to pale brown; gills whitish to pale cream, becoming brown spotted; stem 40-80 x 13-20 mm, whitish, becoming brown spotted especially at base; flesh whitish, brown spotted; taste from almost mild to acrid; smell strong of bitter almonds; sp deposit cream (IIab). Sp 7.5-10 x 8-8.5 μm , with very conspicuous crests, up to 2 μm high (fig. 113I); dcy long and narrow. In deciduous forests; summer to autumn; occasional in temp.-hemib., in FI only in A, U and V; DK (LC), FI (NT), NO (LC), SE (LC). – Däh 846, Phil 45d, Sar 1:439, 441, Schff 45a, Ves 389, ☉.

R. grata Britzelm. (*R. laurocerasi* Melzer)

- Cap 100-130 mm; stem 20-30 mm broad. Cap with tuberculate-sulcate margin, slightly viscid, ochraceous to yellow brown with reddish tint; gills whitish, becoming brown spotted, edge sometimes browning, but not punctate; stem 100-140 x 20-30 mm, persistently whitish above, remarkably contrasting the browning at the lower part; flesh whitish, becoming brownish; taste of gills acrid, \pm mild elsewhere; smell very strong and persistent of bitter almonds and aniseed, even when dried; sp deposit cream (IIb). Sp 8-10 x 7-9 μm , with crests and isolated spines up to 1 μm (fig. 115A); dcy cylindrical or tapering. In deciduous forests on rich soil; late summer to autumn; very rare, only a few records from DK (CR). – Sar 1:449, 451.

R. fragrantissima Romagn.

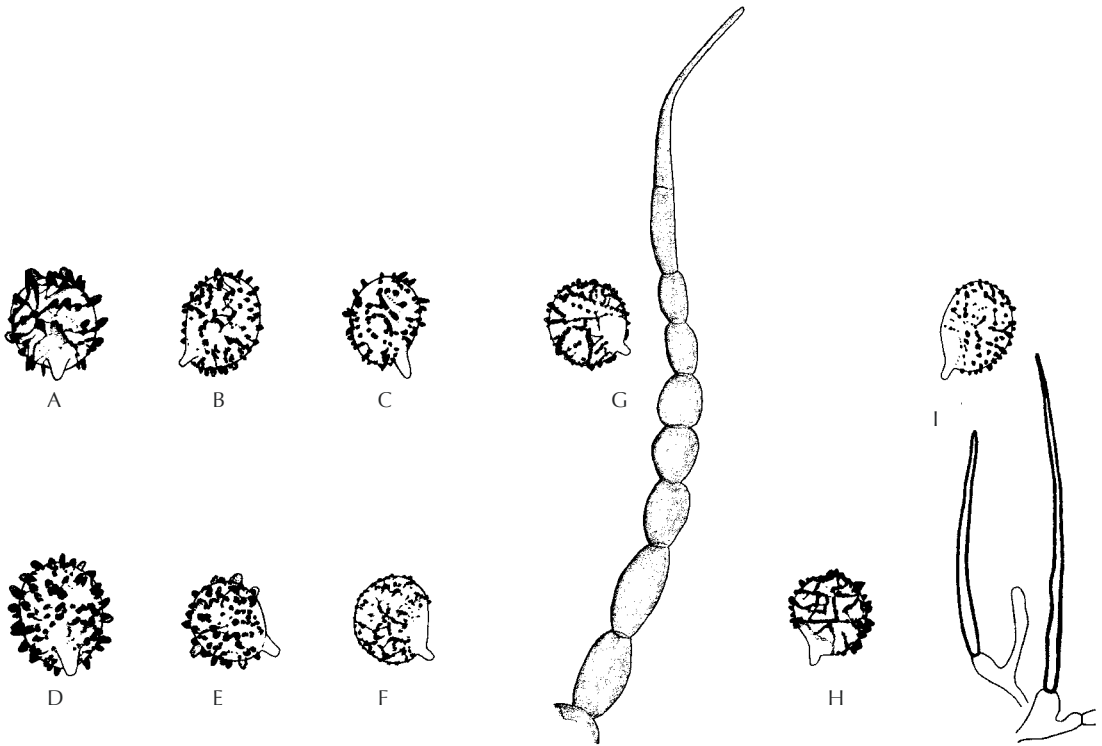
- 10. Frb when old becoming spotted copper red, stem < 50(-60) mm high and < 20 mm thick 11
- Copper red spots absent, stem > 50 mm high and > 15 mm thick 12
- 11. Taste mild or only slowly slightly acrid. Cap 30-80 mm, at margin distinctly tuberculate-sulcate, viscid, buff, pale ochre to brown, centre grey brown; gills cream; stem 30-45 x 10-20 mm, white, browning, rust, copper red to apricot at base; smell oily; taste unpleasant, oily, astringent on tongue; sp deposit cream (IIcd). Sp 7-8.5 x 6-7 μm , echinulate, connections few (fig. 115B); dcy small, non-septate, tapering. Mainly in parks and at forest margins, especially with *Quercus* and *Tilia*; summer to autumn; common in temp., occasional in hemib., rare in bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 847, Mar 428, Schff 46, Sienil 52:53, Ves 391, ☉.

R. pectinatoides Peck


Note: Sarnari (1998) described *R. praetervisa* to cover the South-European taxon similar to the American *R. pectinatoides*. We prefer to keep the traditional name for the species until DNA-sequencing have shown a difference.

- Taste very acrid. Cap 35-85 mm, at margin tuberculate-sulcate, sticky-viscid, pale yellowish; gills white, then cream; stem 30-50 x 10-20 mm, white to dirty yellowish, becoming copper spotted at base; smell fishy or somewhat nauseating; sp deposit cream (II). Sp 7-9 x 5.5-6.5 μm , echinulate, connections few (fig. 115C); dcy small, non-septate, tapering. In deciduous forests, mainly with *Quercus* on calcareous soil; autumn; rare in temp.-bore., in FI only in A: Lemland; FI (CR), SE (LC).

R. pectinata Fr. (see note p. 911)



Spores and pileipellis elements: A: *Russula fragrantissima*, B: *R. pectinatoides*, C: *R. pectinata*, D: *R. foetens*, E: *R. subfoetens*, F: *R. virescens*, G: *R. violeipes*, H: *R. amoenicolor*, I: *R. vesca*.

12. Sp 7.5-10 x 7-8.5 μm , broadly ellipsoid, echinulate, almost without connections, warts up to 1.5 μm (fig. 115D); cap 60-150 mm. Cap convex, at margin strongly tuberculate-sulcate, viscid to glutinous, soon becoming applanate, dull brownish, ochre to honey, often darker at centre or with darker brown patches; gills whitish to pale straw, becoming brown spotted; stem 60-120 x 15-30 mm, cylindrical to lageniform, dirty whitish to brownish, brown spotted when bruised, hollow; flesh whitish, browning when cut, with KOH very pale yellow; taste of gills very acrid, stem almost mild; smell strong, fetid, oily or rancid; sp deposit cream (IIbc). Dcy in pileipellis not reacting with SV. In deciduous and coniferous forests; summer to autumn; common in temp.-bore., rare in suba., but occasional in IS; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Phil 44b, R&H 532, Sar 1:423, Sienil 52:52, Ves 388, .

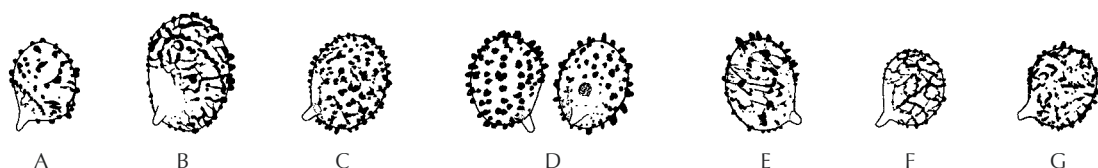
R. foetens Pers.: Fr.

- Sp 7-9.5 x 6-7.5 μm , ellipsoid, verrucose with some crests, warts up to 0.8 μm (fig. 115E); cap 50-100(-140) mm. Cap convex, soon becoming applanate, at margin tuberculate-sulcate, sticky, pale yellow, yellow to brown or red brown; gills whitish to dirty cream, becoming brown spotted when old; stem 50-80 x 15-25 mm, whitish, becoming brown spotted, \pm hollow; flesh whitish, but distinctly yellowing, especially after treatment with KOH; taste moderately acrid in the gills; smell weak, slightly fruity; sp deposit cream (IIbc). Dcy in pileipellis not reacting with SV. In deciduous forests with *Betula*, *Populus*, *Fagus* and *Quercus* and in herb-rich *Picea* forests; summer to autumn; rare in temp.-bore., but possibly confused with related species; DK (LC), FI (LC), NO (NE), SE (LC). – Mar 421, Marst 24, Sar 1:431, 432, Sienil 52:52, Ves 388.

R. subfoetens W.G. Sm.

Key D: Sect. *Heterophyllae* Fr. (incl. subgen. *Amoenula* Sarnari and sect. *Virescentinae* (Singer) Sarnari)

1. Dcy absent 2
- Dcy present 4
2. Cap cuticle when young areolately broken up into granulose green to dull green scales mixed with ochraceous buff or cream patches; smell indistinct; sp deposit whitish (I); stem white. Cap 50-100 mm, convex, at margin smooth or slightly sulcate; gills white to cream; stem 30-80 x 10-20 mm, white, slightly browning; flesh soon red with FeSO₄; taste mild. Sp 6.5-8.5 x 6-7 μm, varying from almost reniform to subglobose, ornamentation variable, from isolated warts to a ± complete reticulum (fig. 115F); apical cells of pileipellis tapering, originating from pyriform or subspherical cells; dcy absent. In dry deciduous and coniferous forests, especially with *Fagus*; summer to autumn; occasional in temp., rare in hemib., only few records from NO (VA); DK (LC), NO (NT), SE (NT). – Däh 855, Phil 38c, R&H 536, Sar 1:377, 379, 380, Ves 396, ⊙.
R. virescens (Schaeff.) Fr.
- Cap with a different colour or smooth; smell similar to that of cooked Jerusalem artichokes or *Lactarius volemus*; sp deposit cream (IIad); stem often flushed with purple, violet or yellow 3
3. Sp 7-9 x 6-7.5 μm, with a prominent, ± complete reticulum (fig. 115G), most warts up to 0.5 μm; apical cells of pileipellis tapering, supported by almost subglobose cells. Cap 40-80 mm, greenish yellow, olivaceous yellow or lemon yellow, sometimes more green, sometimes mixed with vinaceous or purplish patches or completely so; gills narrow, crowded, strongly interveined, forked near the stem, whitish to pale buff; stem 40-70 x 10-20 mm, white or more often flushed with yellow, purple or violet, often pruinose at top; flesh hard, slowly pale orange brown with FeSO₄; taste mild; smell weak, resembling that of cooked Jerusalem artichokes or *Lactarius volemus*; sp deposit pale cream (IIab). In deciduous and coniferous forests on rich soil; summer to autumn; occasional in temp.-hemib.; DK (LC), NO (NT), SE (LC). – Marst 17, Phil 38a, R&H 538, Sar 1:401, Ves 410, ⊙.
R. violeipes Quél.
- Sp 6.5-8 x 6-7 μm, with prominent crests and warts up to 1 μm (fig. 113H); apical cells of pileipellis tapering, supported by elongate, not isodiametrical cells. Cap 30-80 mm, at margin smooth or slightly sulcate, mat, deep dirty violet, blackish purple, dark vinaceous, olivaceous or almond green; gills flexible, cream; stem 30-70 x 8-15 mm, cylindrical or pointed at base, firm, often flushed with lilac or purple, rarely white, mat, pruinose; taste mild; smell of cooked Jerusalem artichokes or *Lactarius volemus*; flesh slowly pale orange brown with FeSO₄; sp deposit deep cream (IIc). In deciduous and coniferous forests on rich soil; autumn; very rare in temp.; DK (DD), NO (NE). – Mar 410, Marst 10, Sar 1:391, 393-395, S,E&E 6.
R. amoenicolor Romagn.
4. Cap especially at centre with scattered, thick-walled, brownish and setiform hairs; sp deposit white 5
- Cap without setiform hairs; sp deposit white or darker 6
5. Cap cuticle often not reaching the margin, showing some white flesh. Cap 50-100 mm, depressed and characteristically finely veined at centre, with sharp margin, soon flesh-coloured to reddish brown, sometimes lilac to greenish at margin; gills narrow, crowded to medium spaced, forked near stem, whitish; stem 30-60(-80) x 15-25 mm, firm, white, often pointed and brown spotted at the base; flesh soon orange red with FeSO₄; taste mild; smell indistinct; sp deposit white (Ia). Sp 6.5-8 x 5-6 μm, finely scattered verrucose, sometimes with a few connections (fig. 115I); dcy inconspicuous; especially at the centre with scattered, thick-walled, brown hairs, easily disappearing when dried. In deciduous and coniferous forests; early summer to autumn; common in temp.-hemib., occasional in bore.-suba., rare



Spores: A: *Russula heterophylla*, B: *R. mustelina*, C: *R. cyanoxantha*, D: *R. medullata*, E: *R. aeruginea*, F: *R. parazurea*, G: *R. atroglauca*.

in IS; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Däh 859, Phil 30a, R&H 538, Sar 261, 263, Ves 397, ☉.

R. vesca Fr.

- Cap cuticle mostly reaching the margin. Cap 50-100 mm, green or greenish but often mixed with various other colours, brownish, yellowish or olivaceous or faintly bluish, firm, only margin peeling; gills somewhat flexible, crowded, strongly forked at stem, greasy, white; flesh soon pink with FeSO_4 ; taste mild; smell indistinct; sp deposit white (Ia). Sp $5.5-7 \times 4.5-6 \mu\text{m}$, with isolated warts, of which some are comma-shaped or with a few, very thin connections or crests (fig. 117A); dcy sometimes with enlarged apex; at the centre with scattered, thick-walled hyaline or rarely brown hairs, easily disappearing when dried. In deciduous forests; summer to autumn; occasional in temp.-bore., more rare in the northern part; DK (LC), FI (DD), NO (LC), SE (LC). – Mar 413, Phil 36a, Sar 1:255, 257, 259, Schff 8, Ves 397.
- R. heterophylla* (Fr.: Fr.) Fr.

6. Cap uniformly brown, ochre brown to reddish or brownish ochre; mycorrhizal with *Picea*. Cap 50-100(-150) mm, convex, with smooth margin; gills strongly forked and anastomosing near the stem, soft, cream; stem 30-80 x 15-40 mm, strongly pruinose above, becoming spotted or entirely brown; flesh hard, white, then brownish, soon orange with FeSO_4 ; taste mild; smell indistinct; sp deposit cream (IIb). Sp $7-10.5 \times 5.5-7.5 \mu\text{m}$, verrucose, \pm catenulate (fig. 117B); dcy scattered, slender. In coniferous forests, usually on acid soil, more rarely also on rich soil; summer to autumn; rare but locally occasional in bore.-hemib., rare in temp., in SE north to Vb; DK (vu), FI (NT), NO (LC), SE (LC). – Däh 860, Marst 15, Sar 1:267, 269, 271, Schff 7, Svp 46:10, ☉.

R. mustelina Fr.

- Cap green, grey, violet, lilac, yellow to almost white, if brown then mixed with other colours and with another mycorrhizal host 7
7. Sp deposit white (Ia); FeSO_4 reaction on stem bluish green or none; gills white, flexible and greasy when touched. Cap 50-150 mm, with smooth margin, greasy and shining, firm, variously coloured, often dull lilaceous mixed with bluish, violaceous, purplish and green; stem 50-100 x 15-30 mm, robust, white, sometimes slightly flushed lilaceous; taste mild; smell indistinct. Sp $7-9 \times 6-7.5 \mu\text{m}$, with isolated warts of which some are comma-shaped (fig. 117C); dcy $2-4 \mu\text{m}$ broad, sometimes with a small appendix, easily overlooked. Summer to autumn; very common in deciduous forests in temp.-hemib., north to 61° , in FI only in A, V and U; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 856, 857, Phil 35d, R&H 537, Sar 1:235, 236, 239, 241, 242, 245, 247, Ves 398, ☉.


R. cyanoxantha (Schaeff.) Fr.

Note: a number of closely related taxa have been described, see Sarnari (1998).

- Sp deposit cream to ochre (IIa-IIIc); FeSO_4 reaction on stem orange, pink, red or brownish; gills whitish to ochre, not so flexible 8
8. Sp deposit ochre (IIIbc). Cap 40-100 mm, shining and greasy, when young greyish green, greyish olivaceous or pale green all over, when mature with a discoloured, ochre, pale brown, brown or red brown, often cracking at centre, becoming paler yellowish towards the

greenish margin; gills fairly thick, forked near stem, cream, later ochre; stem 40-70(-90) x 10-25(-30) mm, often subclavate or cylindrical, white, becoming pale brownish when dried; taste mild; smell indistinct. Sp 7-8.5 x 6-7 μm , finely and regularly verrucose, with or without a few fine connections (fig. 117D); dcy non-septate, cylindrical; hyphae of pileipellis 3-6 μm broad, short-celled. Occasional in hemib. with *Populus*, in bore.-arc./alp. common with *Betula* incl. *B. nana* and dwarf *Salix* species, also with *Dryas* and *Polygonum*; summer to autumn; FI (LC), NO (NE), SE (LC). – E&M 20, Jordst 1984(3) cover, Mar 419, Marst 14, Sar 1:349, 351.

R. medullata Romagn.


- Sp deposit cream (II) 9
- 9. Dcy 50-80 x 4-7 μm , cylindrical and mostly capitate, normal hyaline hyphae of pileipellis 70-140 x 3-5 μm , with few septa; mycorrhizal with *Betula* or *Picea*. Cap 40-90 mm, smooth or radially veined, \pm shining, at margin smooth or slightly sulcate, cuticle covering to the margin, green, yellowish green or greyish green, centre usually darker, often with rust-coloured spots; gills whitish with an ochraceous reflex, often with rust-coloured spots, somewhat acrid; stem white, often with rusty spots at the base; flesh slowly pink with FeSO_4 ; taste mild or slightly acrid in young gills; smell indistinct; sp deposit cream (IIc). Sp 7-8.5 x 5.5-7 μm , verrucose, with some connections (fig. 117E). Summer to autumn; with *Betula*, common on acid, sandy or peaty soil in the whole area except arc./alp., where it is occasional, more rarely with *Picea* on more rich soil; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Phil 39d, R&H 536, Sar 1:371, 373, Ves 396, .

R. aeruginea Lindblad

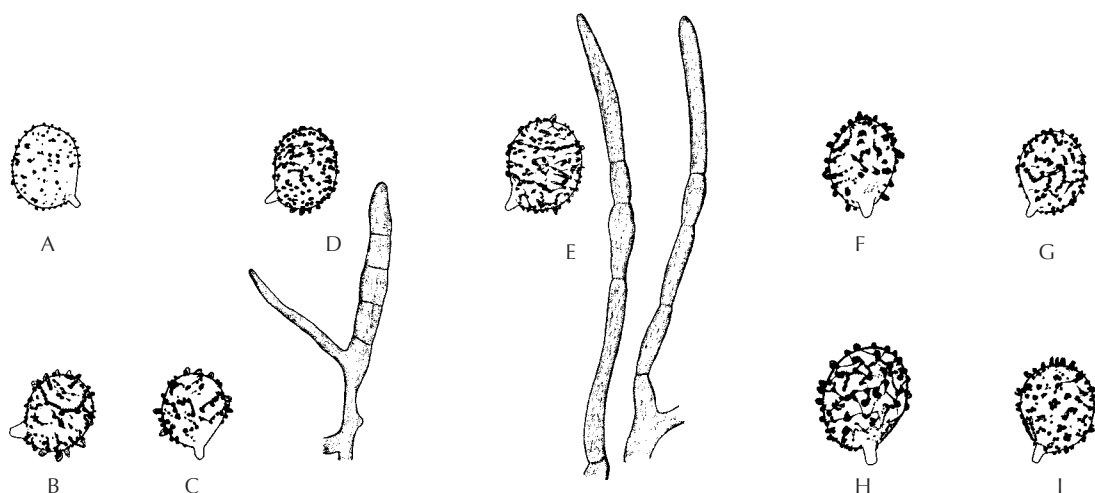
Note: the author is differently cited. Fries published it in Monographia in 1863 as '*R. aeruginea* Lindbl. Mscr.', here, and later in Hymenomycetes Europaei (1874), directly pointing to Lindblad as the person, who first 'distinguished' it. The correct citation would thus be Lindblad in Fr., which in this work is abbreviated to Lindblad.

- Dcy mainly shorter and broader, normal hyaline hyphae of pileipellis mainly shorter, broader and with several septa; mycorrhizal with various hosts, incl. *Betula* and *Picea* 10
- 10. Sp partly reticulate 11
- Sp with isolated warts or with a few connections 12
- 11. Mycorrhizal with various deciduous and coniferous trees on acid soil, incl. *Quercus*, *Betula* and *Picea*; most cells of pileipellis hyphae 4-7 μm broad, > than 5 times longer than broad, apical cells long and slightly tapering. Cap 30-60(-80) mm, often remarkably velvety-pruinose at least partially, mat, rather dark greyish green, greyish olivaceous, greyish or greenish, sometimes pale greyish blue or with rust-coloured patches, often uniformly coloured; gills cream; stem 30-60 x 7-15 mm, cylindrical or slightly tapering, white, but often with rust-coloured spots at the base; flesh brownish pink; smell insignificant; taste mild; sp deposit cream (IIb). Sp 6-8 x 5-6.5 μm , verrucose, partially reticulate (fig. 117F). Often occurring solitary or a few together; summer to autumn; occasional in temp.-hemib. and in suba. in IS; DK (LC), FI (DD), IS, NO (NT), SE (LC). – AM 32 pl. 1, Phil 37de, Schff 13, Sienil 52:49, Ves 398.

R. parazurea Jul. Schäff.

- Mycorrhizal with *Populus tremula* and *Betula* on calcareous soil; pileipellis hyphae with cells 5-10 μm broad, 2-5 times longer than broad, apical cells cylindrical and obtuse. Cap 25-65 mm, finely velvety or smooth, mat, smooth or very slightly sulcate at margin, dark greyish green, olivaceous green, dark olivaceous, with greyish tones, centre darkest; gills cream; stem 30-60 x 7-15 mm, cylindrical, but often tapering, white, at base with rust-coloured spots; flesh pink with FeSO_4 ; smell insignificant; taste mild; sp deposit cream (IIbd). Sp 6.5-8.5 x 5.5-7 μm , verrucose, warts up to 1 μm , with some connections and crests (fig. 117G). Summer to autumn; rare in temp.-bore.; FI (LC), NO (LC), SE (LC). – Marst 10, Sar 1:333, 335, .

R. atroglaucula Einhell.



Spores and pileipellis elements: A: *Russula sublevispora*, B: *R. pseudoaeruginea*, C: *R. stenotricha* (from holotype), D: *R. ionochlora*, E: *R. grisea*, F: *R. galochroa*, G: *R. faustiana*, H: *R. consobrina*, I: *R. solaris*.

12. Sp with 0.1-0.2 μm high warts with few connections (fig. 119A). Cap 40-110 mm, pale grey brown, margin often violet and centre mixed with olivaceous, brownish and pale patches; gills cream; stem 30-65 x 15-30 mm, white; smell indistinct; taste mild; sp deposit cream to pale ochre (IIc-IIIa). Sp 6.5-8 x 5.5-6.5 μm ; dcy non-septate, often appendiculate. In deciduous forests; summer; rare in hemib.; FI (DD, Kaarina), SE (Flemingsberg). – Sar 1:345, 346, SMT 28:60.
R. sublevispora (Romagn.) Romagn. (*R. ferreri* Singer var. *sublevispora* Romagn.)
 - Sp with larger warts 13
13. Cap pale green, bright green, greyish green or olivaceous green, without any lilac, bluish or dark green 14
 - Cap pale, pale brown to almost whitish, or with traces of lilac, violet or bluish 15
14. Apical cells of pileipellis strongly tapering, almost thick-walled and very pointed, supported by \pm inflated cells. Cap 40-80(-120) mm, at margin becoming somewhat sulcate, green to olivaceous green, shining; gills whitish with ochraceous reflection; stem 40-60 x 15-20 mm, white, with rust-coloured spots at base; taste mild or slightly acrid in gills; smell indistinct; sp deposit cream (IIbd). Sp 6.5-8 x 5.5-6.5 μm , verrucose with crests forming a few meshes (fig. 119B); dcy short, non-septate, often clavate. In deciduous forests on rich soil; summer to autumn; distribution and frequency poorly known, confirmed records from DK (NE) and FI (DD). – Marst 16, Sar 1:301, 303.
R. pseudoaeruginea (Romagn.) Kuyper & Vuure
 - Pileipellis with short obtuse or slightly tapering apical cells, of almost same width as the basal cells. Cap 40-70 mm, with smooth margin, bright green, pale green, at centre discolouring yellowish green; gills cream; stem 40-70 x 8-15 mm, cylindrical, white, with small rust-coloured spots; taste mild; smell indistinct; sp deposit cream (IIb). Sp 6.5-8 x 5-6 μm , with crests (fig. 119C); dcy short, non-septate, often clavate. In deciduous forests with *Fagus* on rich soil; rare, but possibly confused with similar species; DK (NE), SE (LC). – Sar 1:297.
R. stenotricha Romagn.
15. Cap a mixture of blue, violet, lilac, grey, yellow and green, smooth and often shining; stem white or with a flush of cap colour; apical cells in pileipellis distinctly tapering 16
 - Cap grey, green, olivaceous, buff or cream, smooth or velvety, mat; stem white; apical cells in pileipellis cylindrical or slightly tapering 17

16. Apical cells in pileipellis tapering, supported by short rectangular cells, 5-10 μm broad (fig. 119D); sp deposit pale cream (IIa). Cap 40-80 mm, often lobed, with smooth margin, centre pale green, green or olivaceous, especially near the margin mixed with lilac or violet; gills cream; stem 30-60 x 10-20 mm, firm, white or with a slight violet or yellowish green tinge; flesh bright orange pink with FeSO_4 ; taste mild or slightly acrid of gills; smell indistinct. Sp 6.5-7.5 x 5-6 μm , finely verrucose without or with a few connections; dcy non-septate, cylindrical or slightly clavate. Mycorrhizal, mainly with *Fagus* in deciduous forests; summer to autumn; occasional in temp.-hemib.; DK (LC), FI (DD), NO (NE), SE (LC). – E&M 17, Phil 36c, Sar 1:286-288, Sienil 56:40, Ves 399.

R. ionochlora Romagn. (*R. grisea* Fr. s. Schäffer)

- Apical cells in pileipellis tapering, supported by oblong cells, 3-6 μm broad (fig. 119E); sp deposit dark cream (IIc). Cap 40-120 mm, depressed, often shining, greyish blue, greyish olivaceous, lilaceous, greyish lilaceous to almost blackish at margin, centre paler, cream, brownish or pale lilaceous; gills whitish; stem 30-80 x 10-25 mm, white, often with a lilac tinge; flesh pink with FeSO_4 ; taste mild; smell indistinct. Sp 7-8.5 x 5.5-6.5 μm , verrucose to echinulate, forming connections and crests; dcy non-septate, cylindrical. In deciduous forests with *Fagus* and *Quercus*; summer to autumn; occasional but distribution and frequency unclear due to confusion with related species; DK (LC), FI (LC), NO (NE), SE (LC). – E&M 14, Mar 418, Phil 36b, Sar 1:291, 293, Ves 399, ☉.

R. grisea Fr. s. Gillet

17. Cap cuticle at least near margin velvety, irregularly cracking. Cap 40-100 mm, soon depressed at centre, typically dark olivaceous, sometimes with an additional grey or brown tinge; gills whitish to cream; stem 20-60 x 10-15 mm, firm, white becoming brown spotted, especially near base; flesh becoming pale brownish pink with FeSO_4 ; sp deposit dark cream (IIId). Sp 6.5-8 x 6-7 μm , verrucose, without connections (fig. 119F); dcy 4-10 μm broad; hair-like hyphae in pileipellis very variable in shape, 5-8 μm thick. Mycorrhizal with *Betula*, possibly also with other hosts; distribution and frequency poorly known, but confirmed records from DK, FI (DD), IS (Au), NO (NE) and SE (NA). – Sar 1:337, 339.

R. galochroa (Fr.) Fr. (*R. heterophylla* Fr. var. *galochroa* Fr., *R. anatina* Romagn.)

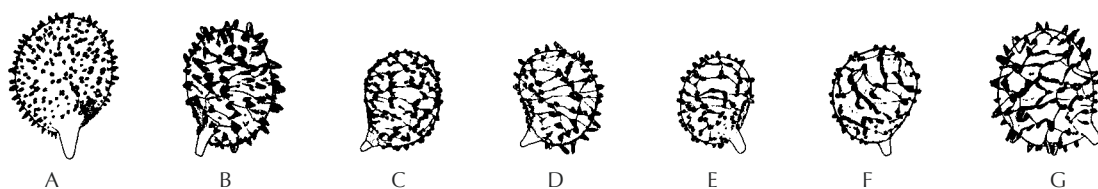
Note: The interpretation of this species has varied among the authors. We put the emphasis on Fries description that it is greenish-floccose (resembling *R. virescens*) and growing with *Betula*.

- Cap cuticle near margin mat and pruinose but not velvety. Cap 40-100 mm, convex becoming slightly depressed, at margin finally short sulcate, mat, \pm pruinose, cream, buff, pale greyish to pale greyish olive, centre brownish; gills sometimes forked, whitish; stem 30-70 x 10-20 mm; flesh pink with FeSO_4 ; taste mild; smell insignificant; sp deposit cream. Sp 6.5-8 x 5.5-6.5 μm , with some ridges (fig. 119G); dcy clavate with pointed apex, mixed with hair-like hyphae with an inflated base and tapering apical cells. Mycorrhizal with *Fagus* on calcareous soil; summer; occasional in temp.; DK (LC), SE (NA). – FAD 188A, E&M 13, Sar 1:327, 329, Svp 34:36.

R. faustiana Sarnari

Key E: Sect. *Russula* (excl. subsects *Urentes* Maire and *Rubrinae* (Melzer & Zvara) Singer, incl. sects *Felleinae* (Melzer & Zvara) Sarnari and sect. *Viscidinae* (Sarnari) Sarnari)

1. Cap yellow, greenish yellow, grey or greyish brown, rarely with a weak orange flush near the margin 2
 - Cap red, lilac, violet, purple, brownish, olivaceous, green or a mixture of these 10
2. Cap pale greyish, greyish sepia or umber. Cap 50-120 mm, radially veined, often shining and almost viscid, margin smooth; gills medium spaced, white with a greyish tinge, then pale cream; stem 60-100 x 15-30 mm, whitish, then greyish; flesh white, greying; taste very acrid; sp deposit cream (IIbc). Sp 8.5-10 x 7.5-9 μm , verrucose with \pm complete reticulum



Spores: A: *Russula innocua*, B: *R. ochroleuca*, C: *R. citrinochlora*, D: *R. fellea*, E: *R. raoultii*, F: *R. nana*, G: *R. betularum*.

(fig. 119H); dcy long, irregular, often slightly capitate at apex. In forests of *Picea*, with *Betula* on mountains; summer to autumn; common in bore., occasional in hemib., rare in temp. and suba.; FI (LC), NO (LC), SE (LC). – Cet 200, Marst 18, R&H 534, Sar 1:589,591, Schff 47a, ☉.

R. consobrina (Fr. : Fr.) Fr.

- Cap yellow or greenish yellow, rarely with a faint orange flush near the margin 3
- 3. Sp deposit cream (IIbc); cap bright yellow or darker yellow at centre and pale yellow to almost white near the margin, tuberculate-sulcate. Cap 20-70 mm, convex then slightly depressed, fragile; gills white then cream with a yellowish reflection; stem 30-60 x 5-14 mm, soft and fragile, white, when old sometimes with ochraceous patches; taste very acrid; smell distinct, resembling *Pelargonium*. Sp 7-8 x 5-7 μ m, echinulate, spines up to 1 μ m, connections very few (fig. 119I). Mycorrhizal with *Fagus* and *Quercus* on rich soil; summer to autumn; occasional in temp., rare in bore., in NO only in Vestf, in FI in V; DK (LC), FI (DD), NO (NT), SE (NT). – E&M 27, Marst 38, Sar 1:543, 544, Schff 49, Ves 411.

R. solaris Ferd. & Winge

- Sp deposit white to whitish (Ia-IIa); cap yellow, dull yellow or greenish yellow 4
- 4. Taste mild or slightly acrid 5
- Taste very acrid or very bitter 7
- 5. Sp with isolated spines up to 1.8 μ m (fig. 121A). Cap 20-40 mm, sulcate at margin when old, mat, towards centre pale green to pale greyish green with a yellow flush, whitish at margin; gills distant, whitish; stem 20-40 x 5-10 mm, slightly swollen below, white, greying; taste mild or slightly acrid; smell indistinct or fruity; sp deposit whitish (IIa). Sp 7.5-10 x 6.5-9 μ m; dcy 5-9 μ m broad. Mycorrhizal with deciduous trees, e.g. *Fagus*, on rich clayey soil; summer to autumn; very rare in temp.-hemib., very rare in DK (EN), one record from NO (NT, Vestf: Nøtterøy), two from SE (NE, Sk, ÖI). – E&M 16, FAD 187B, Marst 13, Sar 1:601, 603, Svp 38:14.

R. innocua (Singer) Bon

- Sp reticulate 6
- 6. Cap 50-120 mm. Cap ochre, yellow or rarely yellowish green; gills whitish, medium spaced to distant, rarely forked; stem 30-70 x 10-20 mm, firm then rather fragile, white to pale ochre, when old greyish water-soaked; taste mild or slightly acrid; smell indistinct; sp deposit white (Iab). Sp 8-10 x 7-8 μ m, echinulate, warts up to 1.3 μ m, with a partial reticulum (fig. 121B); dcy few and scattered; apical cells of pileipellis often finely, golden yellow incrusted. In deciduous and coniferous forests (*Fagus*, *Picea*); autumn; very common in temp.-bore., but rare in FI; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 850, Marst 21, Phil 42a, Sar 2:862, 864, Ves 410, ☉.

R. ochroleuca Pers.

- Cap 30-45(-55) mm. Cap margin first brownish or brownish orange, but soon pure yellow or greenish yellow, discolouring to greyish buff at centre; gills whitish to cream; stem 15-35(-50) x 7-14(-19) mm, white or with a flush of the cap colour; taste mild; smell indistinct; sp

deposit whitish (Ib). Sp 8-9(-9.5) x 6.5-7.5(-8) μm , finely reticulate, warts up to 0.5 μm (fig. 121C); dcy long, clavate, up to 8 μm broad. Mycorrhizal, in arc./alp. areas with dwarf *Salix*, e.g. *S. herbacea*, *S. glauca* and *Polygonum viviparum*, in hemib.-bore. with *Picea* and *Betula* in fairly moist forests; summer to autumn; recently redescribed species known from FI (DD), NO (NE), SE. – Bor 79, Marst 27, Pers 14:516, Sar 1:549, Sieniop 62.

R. citrinoclora Singer

7. Taste very bitter. Cap 30-80 mm, convex to plane, yellow, ochraceous, buff or yellow brown; gills whitish with a tinge of the cap colour; stem 30-70 x 10-20 mm, concolorous with cap; flesh white, then honey-coloured; smell sweetish, of apple compote; sp deposit white (Ia). Sp 7.5-9 x 6-7 μm , verrucose, with many connections (fig. 121D); dcy septate. Mycorrhizal with *Fagus*, occasionally with other trees; summer to autumn; very common in temp., occasional in hemib., rare in bore., in NO north to M&R, in SE to Upl.; DK (LC), NO (LC), SE (LC). – Däh 849, Phil 42c, R&H 533, Sar 1:483, Ves 411, ☉.

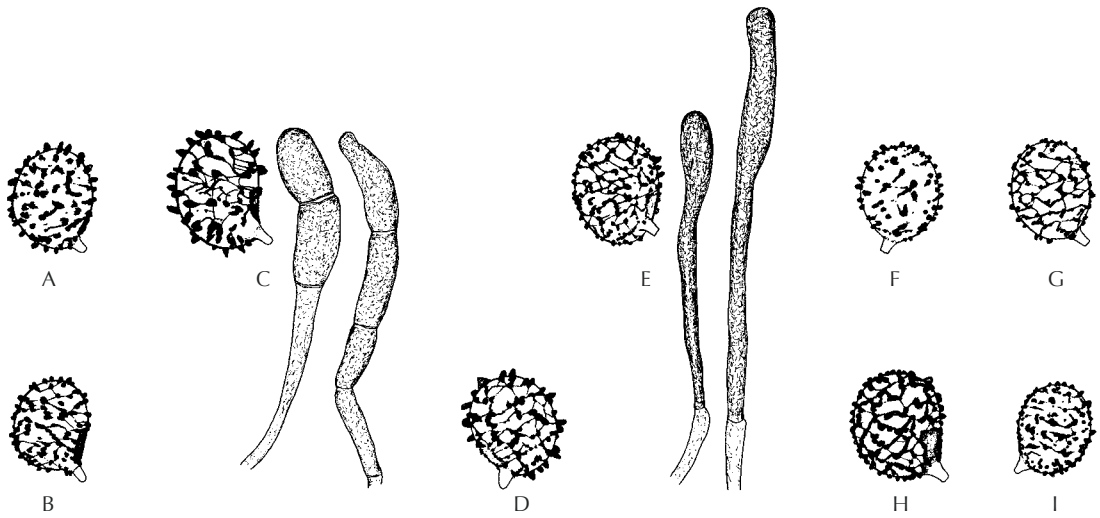
R. fellea (Fr.: Fr.) Fr.

- Taste very acrid 8
8. In coniferous forests; sp with isolated warts or a few connections see *R. pallescens*, key C 5
- In deciduous forests 9

9. Gill edge entire; smell of coconut; dcy non-septate. Cap 20-70 mm, lemon yellow, with whitish, smooth or finely tuberculate-sulcate margin; gills white to pale cream, sometimes strongly interveined in front; stem 20-40 x 8-15 mm, whitish, slightly greying or browning; taste acrid; sp deposit white (Ia). Sp 7-8.5 x 5.5-7 μm , partially reticulate (fig. 121E). In deciduous forests on acid ground; summer to autumn; occasional in temp.-hemib., rare in bore.; DK (LC), NO (LC), SE (LC). – Mar 440, Marst 36, Sar 1:539, 540, Schff 53b, ZS pl. 8, ☉.

R. raoultii QuéL.

- Gill edge serrulate; smell of fruit drops (amylacetate); dcy septate. DK, FI, SE. – E&M 11. Yellow forms of *R. fragilis* (Pers.: Fr.) Fr., see also 34.
10. Cap pure red, sometimes \pm discolouring to pink or whitish, without any trace of lilac, purple or violet; stem pure white, often greying when old; sp deposit whitish; frb slender and fragile 11
- Cap either having other colours or if pure red then stem concolorous with cap and gills slightly decurrent or sp deposit darker; sp deposit white, cream or ochre; frb slender or robust 16
11. Mycorrhizal with *Betula*, dwarf *Salix* or *Polygonum viviparum* 12
- Mycorrhizal with other hosts 13
12. Cap blood red when young; mycorrhizal with *Betula*, *Salix* or *Polygonum viviparum* in arc./alp., in bore.-hemib. in moist, mixed forests with *Betula*. Cap 15-60(-80) mm, convex but soon plane or depressed, at margin \pm undulating, blood red at centre, red near margin, in mountains soon fading to red and discolouring whitish in patches; gills white; stem 15-80 x 5-20 mm, often short, white then greying, fragile; smell slightly of cocoa; taste moderately acrid, when old almost mild; sp deposit white (Ia). Sp 7.5-9.5 x 6.5-7.5 μm , with warts up to 0.5 μm and \pm complete reticulum (fig. 121F); dcy non- or few-septate. June to Aug.; common in suba.-arc./alp., occasional in hemib.-bore.; FI (LC), FO, IS, NO (LC, incl. SvB), SE (LC). – FF 2d, G,J&S 47, Marst 34, R&H 551, Sar 1:571, 573.
- R. nana*** Killerm. (*R. alpina* (Blytt) F.H. Møller & Jul. Schöff.)
- Cap pale pink when young; mycorrhizal with *Betula* in forests. Cap 20-50 mm, depressed at centre, at margin smooth or slightly sulcate, pink, often with darker and paler patches, discolouring to white; gills white; stem 30-60 x 5-10 mm, white; taste very acrid; smell indistinct; sp deposit white (Ia). Sp 8.5-11.5 x 7.5-8.5 μm , with obtuse spines, up to 1 μm , and a nearly complete reticulum (fig. 121G); dcy non- or few-septate. Summer to autumn;



Spores and pileipellis elements: A: *Russula luteotacta*, B: *R. mairei*, C: *R. emetica* var. *emetica*, D: *R. emetica* var. *silvestris*, E: *R. griseocens* (from holotype), F: *R. sanguinea*, G: *R. rhodopus*, H: *R. helodes*, I: *R. renidens* (from holotype).

common in temp.-bore., in NO north to Troms, in FI to InL; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 901, R&H 549, Phil 20b, Sar 1:529, 530, Ves 414.

R. betularum Hora (*R. emetica* (Schaeff: Fr.) Pers. var. *b.* (Hora) Romagn.)

13. Mycorrhizal with *Quercus*; gills distant, rather thick, white to pale cream, strongly yellowing when bruised, but sometimes only hours later, subdecurrent. Cap 30-70 mm, cuticle rugose, hardly separable, red or pink, sometimes discolouring to whitish; stem 30-60 x 5-10 mm, white, rarely ± red, rather firm; taste very acrid; smell indistinct or slightly of coconut; sp deposit white (Ia). Sp 7-9 x 6-7.5 μm, verrucose, with or without a few connections (fig. 123A); dcy very long, non- or few-septate. Summer to autumn; on clayey soil; rare in temp.-hemib., in NO only in Østf; DK (NT), NO (NE), SE (LC). – E&M 19, Phil 20a, R&H 548, Sar 1:675, 677, Ves 415, ☉.

R. luteotacta Rea

- Mycorrhizal with other trees or gills different 14
14. Mycorrhizal with *Fagus*; gills often with a faint turquoise reflex, especially near the stem. Cap 30-60 mm, hemispherical to convex, mat, red or pink, sometimes discolouring to whitish; stem 25-45 x 8-15 mm, white, slightly yellowish at the base; smell acidulous, taste acrid; sp deposit white. Sp 6.5-8 x 5.5-6.5 μm, verrucose, with warts up to 0.5 μm, and a fine, ± complete reticulum (fig. 123B); dcy non-septate, short. Summer to autumn; common in temp., occasional with planted *Fagus* in hemib., in NO north to Hord, in SE north to Upl.; DK (LC), NO (LC), SE (LC). – Däh 904, Phil 19ef, R&H 550, Sar 1:567, 569, Ves 414, ☉.

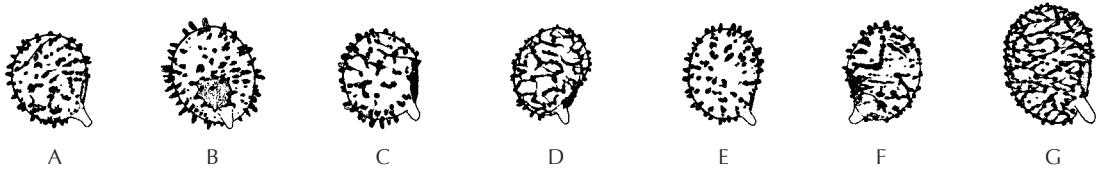
R. mairei Singer

- Mycorrhizal with coniferous or deciduous trees; gills without a turquoise reflex 15
15. Mycorrhizal with *Pinus sylvestris*, *Fagus* etc. on acid soil; gills whitish and adnate. Cap 30-100(-120) mm, slightly sulcate at margin, shining scarlet or blood red, discolouring to whitish; stem 50-80 x 10-20 mm, clavate, rugulose, white; taste very acrid, smell clearly of cocoa; sp deposit whitish. Sp 8-11 x 7-8.5 μm, with warts up to 1 μm and a ± complete reticulum

(figs 123C-D); dcy long and multi-septate. Summer to autumn, mainly late in season; common in temp.-bore., in FI north to Ks; DK (LC), FI (LC), FO, NO (LC), SE (LC). – Däh 899, Phil 16a, R&H 549, Sar 1:555, 557, 561, Ves 415, ☉.

R. emetica (Schaeff.: Fr.) Pers. s. lato (incl. *R. e.* (Schaeff.: Fr.) Pers. var. *silvestris* Singer, *R. silvestris* (Singer) Reumaux)

- Mycorrhizal with *Picea abies*; gills soon greyish and slightly decurrent. Cap 20-60(-80) mm, blood red or pink, sometimes yellow at centre; stem 30-80 x 10-20 mm, often unregular, strongly greying, rarely with a pink tinge; sp deposit white; taste acrid; smell indistinct. Sp 7-9.5 x 6-8 μ m, with low warts (fig. 123E); dcy non- or one-septate. In moist *Picea* forests among *Sphagnum* and other mosses; summer; occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – Marst 31, Sar 1:577, 579, Sieniop 71.
- R. grisescens* (Bon & Gaugué) Marti ('*griseascens*', *R. emetica* (Schaeff.: Fr.) Pers. var. *grisescens* Bon & Gaugué)
- 16. Cap red; stem either concolorous with cap, white or flushed with red 17
- Cap with a mixture of red, lilac, purple, violet and green; stem concolorous with cap or white 21
- 17. Mycorrhizal with coniferous trees 18
- Mycorrhizal with deciduous trees 20
- 18. Mycorrhizal with *Pinus* in grassy places, often in parks and at forest margins. Cap 50-100 mm, often characteristically rugose, dull red to blood red, red, often as small spots, with yellowish discoloured patches, sometimes without any red from beginning, then grey or pale cream, cuticle hardly peeling; gills somewhat forked, subdecurrent, when old rather distant, pale cream; stem 40-60 x 10-25 mm, mostly cylindrical, finely reticulate rugose, \pm pink, rarely white, when old fading and greyish water-soaked; smell with *Lactarius*-like component; taste moderately acrid; sp deposit pale ochre (IIIa). Sp 7-8.5 x 6.5-7.5 μ m, verrucose with few connections (fig. 123F); dcy long, narrow, septate. Autumn; occasional in temp.-bore., in NO north to Troms, in FI north to Ks; DK (vU), FI (LC), NO (LC), SE (LC). – Däh 920, Mar 448, Phil 16b, R&H 552, Sar 1:619, 621.
- R. sanguinea* (Bull.) Fr. (*R. pallida* P. Karst.)
- Mycorrhizal with *Picea* 19
- 19. In mossy *Picea* forests; sp verrucose, with crests and numerous meshes (fig. 123G). Cap 50-100 mm, often with wavy margin, viscid, brilliantly shining red, often discolouring; gills almost free to adnate, pale cream; stem 40-100 x 10-20 mm, often clavately swollen and bent at base, surface even, \pm red, sometimes in irregular patches, rarely white; taste moderately acrid; smell indistinct or fruity; sp deposit ochre (IIc-IIIb). Sp 7.5-9 x 6.5-7.5 μ m; dcy non- or few-septate. Summer to autumn; common in bore., occasional in hemib. and rare in temp., in FI north to InL; DK (vU), FI (LC), NO (LC), SE (LC). – Mar 451, R&H 552, Sar 1:623, 625, Schff 57, S,E&S 40.
- R. rhodopus* Zvára ('*rhodopoda*')
- In moist *Picea* forests; sp almost completely reticulate (fig. 123H). Cap 50-120 mm, soon depressed, with wavy margin, mat when dry, red to blood red, with paler yellowish patches, centre darker; gills subdecurrent, forked, cream; stem 40-100 x 15-30 mm, tapering at base, surface uneven, white or partly with a red tinge, greying from the base; taste moderately acrid; smell indistinct; sp deposit ochre (IIIab). Sp 8.5-10.5 x 7.5-8.5 μ m; dcy non-septate, finely diverticulate. Autumn; distribution and frequency not well known due to confusion with related species; rare in FI (DD), NO (LC) and SE (LC), very rare in DK (EN). – Cet 1088, Mar 452, Sar 1:627, 629, Schff 56.
- R. helodes* Melzer
- 20. Mycorrhizal with *Betula*; mostly in bore.-suba. Cap 30-80(-90) mm, shining blood red to violaceous purple, darkest at centre, often mixed with yellow, sometimes yellowish to greenish,



Spores: A: *Russula persicina*, B: *R. queletii*, C: *R. sardonina*, D: *R. torulosa*, E: *R. gracillima*, F: *R. depallens*, G: *R. alnetorum* (from lectotype).

discolouring to pink with cream areas; gills adnexed to subdecurrent, whitish, later cream; stem 30-100 x 10-22 mm, pruinose above, often soon grey with a red tinge, often with yellowish patches; smell indistinct to slightly fruity, smell weak, fruity, taste acrid; sp deposit dark cream (IIcd). Sp 7-9(-9.5) x 5.5-7(-7.5) μm , verrucose, with or without some connections (fig. 123I); dcy narrow, 5-6 μm broad, cylindrical. On rich, mostly moist soil; autumn; occasional in bore., rare in hemib.; FI (LC), NO (NE), SE (NE). – Marst 36, Sar 1:663-665.

R. renidens Ruots., Sarnari & Vauras (*R. persicina* Krombh. s. Knudsen & Stordal)

- Mycorrhizal with e.g. *Quercus*, *Fagus* and *Carpinus*; in temp.-hemib. Cap 40-90 mm, shining, pure red to blood red, sometimes cream at centre, cuticle hardly peeling; gills medium spaced to distant, cream; stem 30-70 x 10-25 mm, white, often partly red, yellowing later, pruinose above; smell slightly of cocoa, taste acrid; sp deposit cream (IIc). Sp 6.5-8.5 x 5.5-7 μm , verrucose, with few connections (fig. 125A); dcy 4-8 μm broad, cylindrical to clavate. Autumn; rare; DK (vu), FI (vu), SE (LC). – Cet 1081, Mar 438, 439, Marst 35, Sar 1:669, 671, Schff 55bc.

R. persicina Krombh.

- 21 Stem partly or totally red or purple; sp deposit cream to pale yellow 22
- Stem white, grey or yellowing, rarely locally with a pink flush; sp deposit white to cream 27
- 22. Mycorrhizal with *Picea* on rich, clayey or calcareous soil. Cap 30-70 mm, dark purple to violet red, when young often umbonate; gills white to cream; stem 30-80 x 5-20 mm, concolorous with cap or paler; taste acrid; smell of gooseberry compote; sp deposit cream (II d). Sp 7.5-9 x 6.5-7.5 μm , with isolated spines up to 1.2 μm (fig. 125B). Late summer to autumn; occasional in temp.-suba., in NO north to Nordl, in FI north to SoL; DK (LC), FI (LC), NO (LC), SE (LC). – E&M 12, R&H 553, Sar 1:641, 643, Schff 59, Ves 416, ☉.

R. queletii Fr.

- Mycorrhizal with *Pinus* or *Betula* 23
- 23. Mycorrhizal with *Pinus* 24
- Mycorrhizal with *Betula* 26
- 24. Sp deposit dark ochre to pale yellow; taste first mild, gradually very acrid
see *R. badia*, key H 4
- Sp deposit pale ochre 25
- 25. Young gills lemon-yellow, becoming pink with ammonia. Cap 40-100 mm, when young often umbonate, dark violaceous purple, reddish purple or livid vinaceous, sometimes greyish olivaceous or with yellowish patches; stem 40-100 x 10-25 mm, livid vinaceous, pale lilac or pale purplish, at the base yellowish, firm; flesh pale lemon-yellow; taste very acrid; smell indistinct or fruity; sp deposit pale ochre (IIcd). Sp 7-9 x 6-7 μm , verrucose, with crests or a few meshes to partially reticulate (fig. 125C); dcy long, narrow, non-septate. Mycorrhizal with *Pinus* on acid soil; mostly in late autumn; occasional in temp.-bore.; DK (LC), FI

(LC), FO, NO (LC), SE (LC). – Däh 924, Phil 26b, R&H 554, Sar 1:633, 635, Ves 416, ☉.

R. sardonica Fr. (*R. drimeia* Cooke)

- Gills cream, not becoming pink with ammonia. Cap 40-90 mm, plane, rugose, firm, reddish purple, vinaceous purple or red, often marbled olivaceous to brownish olivaceous or blackish at centre; stem 30-60 x 10-25 mm, remarkably short and stout, concolorous with cap or pale lilac to almost white, at base often whitish, yellowing; flesh firm; taste moderately acrid; smell fruity; sp deposit deep cream to pale ochre (IId-IIIa). Sp 7-9 x 5.5-7 μm , verrucose with low warts forming crests and also some connections (fig. 125D). Mycorrhizal with *Pinus* on sandy, calcareous soil; autumn; distribution and frequency not known, but with few records from DK (EN) and SE (NT). – Mar 450, Marst 39, Sar 1:647, 649, Schff 58a, Svp 46:24.

R. torulosa Bres.

26. Frb slender and fragile; stem usually \pm pink, at least at base, rarely completely white, later greyish, 20-60 x 5-10 mm, usually clavately swollen; sp deposit pale cream (IIab). Cap 20-60 mm, convex, sometimes umbonate, but usually soon with depressed centre, shining, greasy, margin red or pink, centre dark purplish black, violaceous black or greenish black, often surrounded by a paler greenish or pale yellowish green zone or completely so; gills medium spaced to distant, pale straw and greyish; taste moderately acrid in the gills, soon mild; smell indistinct. Sp 7-8.5 x 5.5-6.5 μm , with isolated warts up to 0.8 μm (fig. 125E); dcy long, non-septate. Mycorrhizal with *Betula*, mainly in moist forests; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Phil 39e, R&H 551, Sar 1:658, 659, 670, Schff 60, Ves 403.

R. gracillima Jul. Schäff.

- Frb medium sized, stout; stem 30-60 x 10-20 mm, white, \pm greying, rarely with a pink tint; sp deposit ochre (IIIac). Cap 40-100(-120) mm, when young red, but soon with discoloured, greyish, cream or greenish centre and a red, pink purplish or flesh-coloured margin, also entirely discoloured or green with a very narrow purplish margin; gills subdecurrent but slightly emarginate, cream; taste of gills moderately acrid, flesh mild. Sp 8-9.5 x 6-7 μm , verrucose, catenulate, with many connections and partly reticulate (fig. 125F); dcy long, non- or few-septate. Mycorrhizal with *Betula* on rich, often naked calcareous soil, mainly in parks and at roadsides; early summer to autumn; common in temp.-bore., occasional in suba.; DK (LC), FI, IS, NO (LC), SE (LC). – Phil 32a, R&H 553, Sar 1:653, 655, Schff 61, Ves 417, ☉.

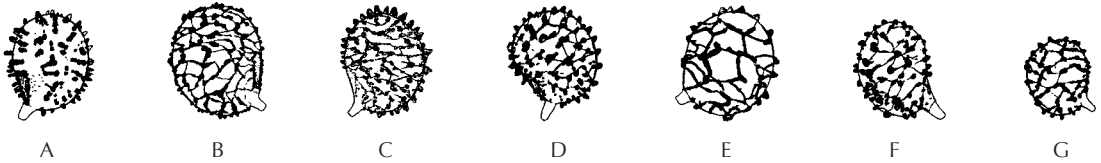
R. depallens (Pers. : Fr.) Fr. (*R. pulchella* I.G. Borshch.)

Note: Romagnesi (1967) and Sarnari (1998) use the name *R. exalbicans* for this species. However, according to the original description by Persoon (1801: 439) of *R. rosacea* var. *exalbicans*, it is smaller than *R. emetica* ('sequente minor'), which is not true for the present species. We therefore stick to the name that has been used for the species in Scandinavia for a long time.

27. Mycorrhizal with *Alnus* in moist, rich forests. Cap 25-40(-60) mm, \pm sulcate, fragile, margin purplish to vinaceous or violaceous, centre blackish; gills medium spaced to distant, whitish to cream; stem 30-50 x 5-10 mm, fragile, first whitish, soon \pm yellowing, when old and in moist weather strongly greying; taste moderately acrid to almost mild; smell indistinct; sp deposit whitish (Ib). Sp 8.5-10.5 x 7-8 μm , \pm completely reticulate (fig. 125G); dcy long, non- or few-septate. Late summer to autumn; rare in temp.-bore., in FI north to OP; DK (NT), FI (LC), NO (LC), SE (LC). – Mar 444, Marst 24, R&H 550, Sar 1:532, 533, 537, Ves 407, ☉.

R. alnetorum Romagn. (*R. pumila* Rouzeau & F. Massart)

- Mycorrhizal with other hosts 28
28. Mycorrhizal with *Populus tremula*, *P. alba* and *P. canescens*. Cap 20-70 mm, with smooth or almost smooth margin, purplish vinaceous, violet, greyish violet to pale olivaceous green or green, also more dull olivaceous brown or ochre; gills white; stem 20-50 x 7-10 mm, white, slightly greying, especially when wet, fragile; smell strong, of *Pelargonium*, when old more fishy; taste slightly acrid; sp deposit cream (IIab). Sp 7-9 x 6-7.5 μm , with spines up to 1 μm ,



Spores: A: *Russula pelargonica*, B: *R. viscida*, C: *R. undulata*, D: *R. aquosa*, E: *R. fragilis*, F: *R. laccata* (from holotype), G: *R. atrorubens*.

partially to almost fully reticulate (fig. 127A); dcy septate, up to 9 μm broad. Summer to autumn; rare in temp.-bore, in FI north to KS; DK (vu), FI (lc), NO (lc), SE (ne). – E&M 16, Sar 1:597, 599, 605, 607, Ves 412.

R. pelargonica Niolle (*R. clariana* Kuyper & Vuure)

Note: some authors separate two species.

- Mycorrhizal with other hosts 29
- 29. Frb robust; cap 50-120 mm; taste almost mild to moderately acrid; stem when old greying or yellowing 30
- Frb fragile; cap 20-80 mm; taste acrid or if mild then stem white 33
- 30. Stem 40-80 x 15-35 mm, firm to hard, distinctly yellowing or browning, especially at base due to incrusted veil-hyphae. Cap 50-120 mm, convex or slightly depressed, \pm viscid, mottled with vinaceous, purple, black, yellow and brownish green; gills strongly interveined, almost white, then cream; taste almost mild to moderately acrid; smell slightly fruity; sp deposit pale cream (IIab). Sp 8-11 x 6.5-9.5 μm , with a fine almost complete reticulum (fig. 127B); dcy one- to multi-septate, very finely yellow incrusted. In coniferous and deciduous forests, mostly on rich soil, often subfasciculate; summer to autumn; rare in temp.; DK (lc), SE (ne). – Mar 476, Sar 2:855,857, Schff 26, S,E&E 55, Ves 395,

R. viscida Kудřna

- Stem white or greying when old 31
- 31. Mycorrhizal with *Pinus*; stem remaining white when old; taste mild then very acrid see *R. badia*, key H 4
- Mycorrhizal with *Betula*, *Quercus* or *Fagus*; stem greying when old; taste mild or somewhat acrid 32
- 32. Mycorrhizal with *Quercus*, more rarely *Fagus* and conifers. Cap 40-100 mm, convex to slightly depressed, rather firm, dark reddish purple to almost black at centre, also more reddish or violaceous, often with yellowish irregular spots; gills white to pale cream; stem 30-60 x 10-20 mm, firm, then \pm fragile, white or greying, at base with brown spots, rarely with a pink flush; taste \pm acrid in the gills, almost mild in stem; with faint smell of apples; sp deposit white (Ia). Sp 6.5-9 x 6-7 μm , verrucose, incompletely reticulate (fig. 127C); dcy non- or few-septate. Summer to autumn; occasional in temp.-hemib., in NO north to Hord; DK (lc), FO, NO (lc), SE (lc). – Däh 907, Phil 22a, Sar 1:495, 497, Schff 51, Ves 401.

R. undulata Velen. (*R. atropurpurea* (Krombh.) Britzelm. non Peck, *R. krombholzii* Shaffer)

- Mycorrhizal with *Betula*; cap strongly discolouring see *R. depallens* 26
- 33. Taste slightly acrid; smell insignificant. Cap 30-70 mm, with \pm sulcate margin, greasy, purplish red, carmine or brownish red, darker at centre, shining; gills medium spaced, white; stem 40-80 x 7-20 mm, clavately swollen, white, with yellow tinge; sp deposit white (Ib). Sp 7-8.5 x 6-7 μm , with warts up to 0.8 μm and many connections (fig. 127D); dcy short, clavately swollen at apex, rarely with a septum. In coniferous forests, rarely with *Betula*; summer to late autumn; common in bore.-hemib., in FI north to EnL, occasional in temp., in DK only a few records; DK (na), FI (lc), NO (lc), SE (lc). – E&M 2, Mar 443, Sar 1:501, 503,

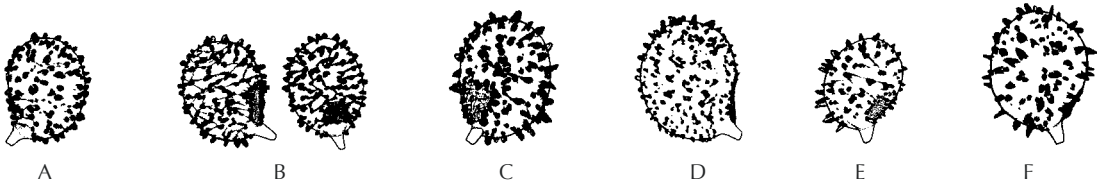
Schff 53a, Sieniop 58.

R. aquosa Leclair (*R. carminea* (Jul. Schäff.) Kühner & Romagn.)

- Taste acrid; smell distinct, e.g. fruity or of *Pelargonium* or coconut 34
- 34. Gill edge serrulate (lens!); smell of coconut. Cap 20-60(-80) mm, convex, then depressed, often with wavy margin, purplish, purplish red, violaceous or dark olivaceous, centre often darker; gills white, then cream; stem 30-70 x 5-25 mm, often clavate, white, sometimes slightly yellowing; taste acrid; sp deposit white (Ib). Sp 7.5-9 x 6-7.5 μm , reticulate with warts not exceeding 0.5 μm (fig. 127E); dcy multi-septate. Mycorrhizal mainly with *Quercus* and *Betula*, but also with other deciduous trees and conifers, always on acid, peaty or sandy soil; summer to autumn; common in temp.-bore., in FI only in A, V and U; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 910, E&M 11, Phil 21c, Sar 1:505, 507, Ves 413, ☉.
- R. fragilis* (Pers. : Fr.) Fr.
- Gill edge entire; smell of fruit or *Pelargonium* 35
- 35. Mycorrhizal with *Salix*, in alpine areas also with *Polygonum viviparum*. Cap 15-40 mm, convex or plane, dark blackish purple, then fading to pinkish purple or discolouring to almost white, flushed with pinkish purple; gills with even edge, white; stem 10-30 x 3-8 mm, white, sometimes flesh-coloured near base, also in flesh; taste very acrid, but soon evanescent; smell insignificant; sp deposit whitish to pale cream (Ib-IIa). Sp 6.5-9 x 6-7.5 μm , verrucose, partially reticulate (fig. 127F); dcy non- or few septate. Autumn to late autumn; common in arc./alp., occasional in temp.-bore., especially in dunes with *Salix repens*; DK (LC), FI (LC), FO, IS, NO (LC, incl. Svb), SE (LC). – FRIC 6, pl. 48, Marst 31, Phil 24a, Sar 1:519, 523, Ves 412.
- R. laccata* Huijsman (*R. norvegica* D.A. Reid)
- Mycorrhizal with *Picea* and *Pinus*. Cap 40-80 mm, convex, then slightly depressed; typically red or purplish red, with olivaceous greenish or dark olivaceous to black centre; gills with even edge, medium spaced, white; stem 30-70 x 5-15 mm, white, sometimes slightly yellowing; smell fruity; taste very acrid; reaction on flesh with guaiac strong; sp deposit white to pale cream (I-IIa). Sp 6-8 x 5-6.5 μm , verrucose, with fine connections and few to numerous meshes (fig. 127G); dcy non- or few-septate. In coniferous forests; late summer to autumn; common in temp.-bore., in FI north to InL; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 909, 915 (as *olivaceoviolascens*), E&M 3, Mar 446, Sar 1:511, 512, Svp 46:21, Ves 413, ☉.
- R. atrorubens* Quéf. (*R. subaffinis* Bidaud & P.-A. Moreau)

Key F: Sect. *Polychromae* Maire subsect. *Xerampelinae* Singer

1. Associated with *Salix* and possibly also *Betula nana* 2
- Associated with other hosts 4
2. Cap 20-60 mm, slightly viscid, red, pink or purplish red, centre and often whole cap soon discolouring cream or yellow brown, convex, margin smooth or slightly sulcate; gills cream to ochre; stem white, yellowing, sometimes flushed pink at the base, clavate, 20-50 x 7-15 mm; FeSO₄ on flesh bluish green; taste mild; smell weak to rather strong of cooked shell-fish; sp deposit ochre (IIIbc). Sp 7-9 x 6-7 μm , strongly verrucose, warts up to 0.5 μm , connections absent or few (fig. 129A); dcy long, 0-2-septate, 5-10 μm broad, irregularly knobby, not reacting with SV. With *Salix*; summer; occasional in arc./alp.; FI (DD), FO, IS, NO (LC, incl. Svb), SE (LC). – Fav 55:10.8, FF 2c, P,R&V 59, Sar 2:903, 904, ☉.
- R. pascua* (F.H. Møller & Jul. Schäff.) Kühner
- Cap 30-80 mm, mat, convex but soon depressed, dark violaceous brown, dark brownish red to brownish red; gills cream to ochre; stem 30-60 x 10-20 mm, \pm pink especially at base, browning when bruised; FeSO₄ on flesh bluish green; smell when old of cooked shell-fish; taste mild or slightly bitter; smell slightly of cooked shellfish; sp deposit pale ochre (IIIa). Sp 8-10 x 6-7.5 μm , verrucose to spinose, spines up to 1 μm long, also with some crests (fig. 129B); dcy long, septate, without knobs. Mycorrhizal with *Salix repens* in scrubs and dunes



Spores: A: *Russula pascua*, B: *R. subrubens* (left: from holotype, right: from holotype of *R. chamiteae*), C: *R. xerampelina* (from epitype in IB), D: *R. favrei* (from holotype), E: *R. clavipes* (from holotype), F: *R. faginea*.

in temp. and in arc./alp. with other dwarf *Salix* species; summer to autumn; occasional; DK (LC), FI (DD), NO (NE), SE (LC). – FAD 190B, G,J&S 45, M&J 49, Ves 393.

R. subrubens (J.E. Lange) Bon (*R. graveolens* Romell var. *subrubens* J.E. Lange, *R. chamiteae* Kühner, *R. c.* Kühner var. *microsperma* Kühner)

3. Stem ± red. Cap 60-120 mm, with depressed centre, mat, smooth, dark purplish red to almost black centre, at margin red, sometimes becoming brownish or olivaceous; gills ochraceous; stem 40-80 x 15-30 mm, firm, ± red or pink, browning when bruised; FeSO₄ on flesh bluish green; taste mild; smell strong, of cooked shellfish; sp deposit ochre (IIIc). Sp 8-10 x 7-8.5 μm, verrucose, without connections, warts up to 0.8 μm (fig. 129C); dcy only slightly broader than hyphae of pileipellis and only weakly reacting with SV. Associated with *Pinus*, more rarely *Picea*; autumn; common in temp.-bore., occasional in suba., in FI north to Ks; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Däh 887, R&H 544 (above), Sar 2:877, 879, Schff 24c, Ves 392, ☉.

R. xerampelina (Schaeff.) Fr. s. str. (*R. erythropus* Pelt., 'erythropoda')

- Stem white or with a faint pink flush, then browning 4
- 4. Cap some shade of olivaceous, brown or yellow, without any red, vinaceous and lilac 5
- Cap at least partly with red, vinaceous, lilac or green colours 6
- 5. Cap purplish brown, brown, olivaceous brown to blackish brown at centre. Cap 35-100 mm, mat, at margin smooth or slightly sulcate; gills cream to pale ochre; stem 35-90 x 10-25 mm, whitish, often with a pink flush either on one side or at the base, browning when bruised; FeSO₄ on flesh bluish green; taste mild; smell faint of cooked shellfish or sweetish; sp deposit ochre (IIIb). Sp 8-11 x 6-8.5 μm, verrucose to spinose, spines up to 1 μm, isolated or with a few connections (fig. 129D); dcy few-septate. Associated with *Picea* and *Pinus*; occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – Marst 64, R&H 544C, Sar 2:885, 887.

R. favrei M.M. Moser

- Cap olivaceous, brownish olivaceous to yellow brown with olivaceous tinge, near margin sometimes vinaceous brown and with fine concentric crackings. Cap 40-85 mm, convex to low convex, with short striate margin, firm; stem 40-70 x 10-25 mm, often clavate, white or tinged pink, browning when bruised and old; FeSO₄ on flesh bluish green; taste mild; smell of cooked shellfish; sp deposit ochre (IIIb). Sp 8-9 x 6.5-7 μm, verrucose to spinose, spines up to 1 μm, connections few or absent (fig. 129E); dcy cylindrical, 4-8 μm broad, reacting weakly with SV; a variable number of inflated, up to 12 μm broad apical hyphae present especially at centre of cap. In coniferous and deciduous forests; late summer to autumn; occasional in temp.-suba.; DK (LC), FI (DD), NO (LC), SE (LC). – Bres 420, E&M 8, Mar 480, R&H 544 (centre), S,E&E 60.

R. clavipes Velen. (*R. xerampelina* (Schaeff.) Fr. var. *elaeodes* Bres., *R. elaeodes* (Bres.) Bon)

Note: *R. nuoljae* Kühner was described based on one specimen from Norway. The microscopical characters are very close to *R. clavipes*, but the colours are generally reddish. The status of the taxon awaits further records.

6. Associated with *Fagus*. Cap 60-140 mm, rugose or finely concentrically wavy, with smooth

margin, mat, pale red, vinaceous red, brownish, pink, with ochraceous to pale olivaceous spots; gills ochraceous; stem 40-110 x 15-30 mm, firm, white, browning but sometimes slowly; FeSO₄ on flesh bluish green; taste mild; smell of cooked shellfish, sometimes faint; sp deposit ochre to pale yellow (IIIc). Sp 8.5-11 x 7.5-8.5 μm, spines isolated, 1-1.5 μm high (fig. 129F); dcy long and slender, 3-5 μm broad. Summer to autumn; occasional in temp.; DK (LC), NO (NE), SE (LC). – Mar 477, Marst 64, Schff 24d (as *barlae*), Ves 392.

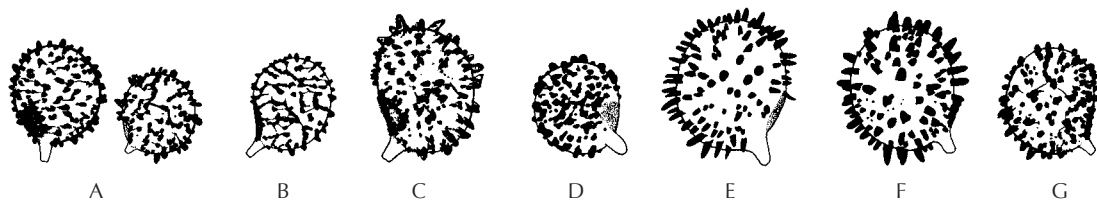
R. faginea Romagn.

- Especially associated with *Quercus*. Cap 40-80(-100) mm, often with a fine concentric, wavy pattern near margin, mat, brownish purple to dark vinaceous or vinaceous brown, at centre sometimes slightly olivaceous; gills ochraceous; stem 40-80 x 10-25 mm, rather firm, white, with or without a pink tinge, browning; FeSO₄ on flesh bluish green; taste mild; smell of cooked shellfish; sp deposit ochre (IIIab). Sp 7.5-10 x 6-8 μm, verrucose with warts up to 0.5 μm; dcy long, 4.5-9 μm broad, attenuated. Summer to autumn; occasional in temp.-hemib.; DK (LC), FI (LC), NO (LC), SE (LC). – E&M 25, Mar 479, Ves 393.

R. graveolens Romell (*R. xerampelina* (Schaeff.) Fr. var. *purpurata* Crawshay)

Key G: Sect. *Polychromae* Maire subsect. *Puellarinae* Singer (subgen. *Tenellula* Romagn., sect. *Tenellae* (Quél.) Sarnari)

1. Frb strongly yellowing. Cap 25-60 mm, with depressed centre, with ± sulcate margin, red, purple, vinaceous, reddish brown or dark brown, often discolouring to a pale mixture of these, centre usually darker to almost black; gills cream then yellowing; stem 30-60 x 7-15 mm, white, but almost always distinctly yellowing all over or in large patches; flesh yellowing; taste mild; smell indistinct; sp deposit cream (IIcd). Sp 6.5-9 x 5.5-7 μm, strongly verrucose to echinulate, spines up to 1.3 μm, connections few or absent (fig. 131A). In moist coniferous and deciduous forests; summer to autumn; common in temp.-hemib., occasional in bore., rare in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Däh 886, Phil 27d, R&H 542, Sar 2:1149, 1150, Ves 394, ☉.
R. puellaris Fr.
 - Frb not yellowing or yellowing in isolated spots or in smaller parts 2
 - 2. Mycorrhizal with conifers 3
 - Mycorrhizal with deciduous trees or scrubs 8
3. Mycorrhizal with *Pinus*, often in parks, at forest margins and along paths. Cap 30-70 mm, finally with ± sulcate margin, mat or shining, red, vinaceous, violaceous, purplish, brown or pale lilac, centre often darker; gills broad, ± interveined, yellow; stem 30-70 x 5-15 mm, white; taste mild; smell indistinct; sp deposit yellow (IVbc). Sp 7.5-9 x 6.5-7.5 μm, verrucose with few to many crests and connections (fig. 131B); dcy none to multi-septate, apical cell cylindrical or clavate. Summer to autumn; common in bore., occasional in temp.-hemib.; DK (LC), FI (LC), NO (LC), SE (LC). – E&M 7, Sar 2:1253, 1255, Sieniop 61, Svp 46:13, Ves 406, ☉.
R. cessans A. Pearson
 - Mycorrhizal with *Picea* 4
4. Stem white, soon yellow brown all over or in patches. Cap 20-85 mm, soon with depressed centre, becoming strongly sulcate at margin, centre blackish to greyish green, margin vinaceous; gills soon ochre and with yellow brown patches; stem 30-120 x 6-20 mm; taste mild, smell weak; sp deposit dark ochre to pale yellow (IIIc-IVa). Sp 8.5-11 x 7-8.5 μm, echinulate, slightly ridged (fig. 131C); dcy multi-septate, short-celled. In forests with *Picea abies* on rich soil; summer; rare in hemib.-bore.; FI (LC), NO, SE. – Marst 54, Sar 2:1261, 1263.
R. sapinea Sarnari
 - Stem not or very slightly yellowing 5
5. Cap mat, red to brown; stem fairly thick and partly red; like a species of *R. xerampelina*



Spores: A: *Russula puellaris* (right spore from holotype of *R. puellaris* var. *cupreovinosa*), B: *R. cessans*, C: *R. sapinea* (from holotype), D: *R. taigarum* (from holotype), E: *R. olivina* (from holotype), F: *R. olivobrunnea* (from holotype), G: *R. nauseosa*.

group, but without smell. Cap 30-150 mm, narrowly sulcate, dark vinaceous to brown, centre darker, blackish brown or paler, cream or green with a yellow-brown tinge; gills cream to pale yellow; stem 30-150 x 10-30 mm, not changing when bruised; taste of gills mild to slightly acid; smell weak; sp deposit ochre (IIIbc). Sp 8-10 x 7-9.5 μm , with partial reticulum (fig. 131D); dcy cylindrical to clavate. In moist *Picea* forests on rich soil; summer; occasional in temp.-bore; FI (LC), NO (LC), SE (LC). – Jordst 12(1), Marst 55, Sar 2:977, 979, Sienil 48:81, Sieniop 83.

R. taigarum Ruots. & Vauras

- Stem white, not like a species of the *R. xerampelina* group 6
- 6. Cap olivaceous green, brownish green to yellow green; basidia 2-spored. Cap 20-70(-90) mm, soon depressed, centre often darker or paler, e.g. dark green, brownish green or yellow; gills cream, then yellow; stem 30-90 x 8-20 mm, cylindrical to subclavate, soft and fragile, white; taste mild; smell weak; sp deposit pale yellow (IVb). Sp 10-12(-14) x 8.5-10(-11.5) μm , echinulate, up to 2 μm high (fig. 131E); dcy cylindrical to clavate. In moist *Picea* forests, preferably on calcareous soils; summer; rare in hemib.-bore.; FI (LC), SE (vu). – Marst 51, Sar 2:1257, 1259, Sieniop 75.

R. olivina Ruots. & Vauras

- Cap with other colours, rarely green; basidia 4-spored 7
- 7. Frb medium sized; cap 50-110(-180) mm; stem 60-130 x 10-25 mm. Cap soon fairly strongly sulcate at margin, shiny, brown, often mixed with green or violet, rarely olivaceous green, centre darker or greenish to yellowish; gills broad, yellow; stem subclavate, white; taste mild; smell weak; sp deposit yellow (IVd). Sp 9.5-11.5(-12) x 8-9.5(-10.5) μm , warts isolated and large, up to 1.5 μm high (fig. 131F); dcy long, narrow, multi-septate and finely diverticulate. In moist *Picea* forests, on calcareous soils; summer; rare in hemib.-bore.; FI (LC), NO (NE), SE (vu). – Kar 34:22, Marst 51, Sar 2:1013, 1014, Sieniop 76.


R. olivobrunnea Ruots. & Vauras

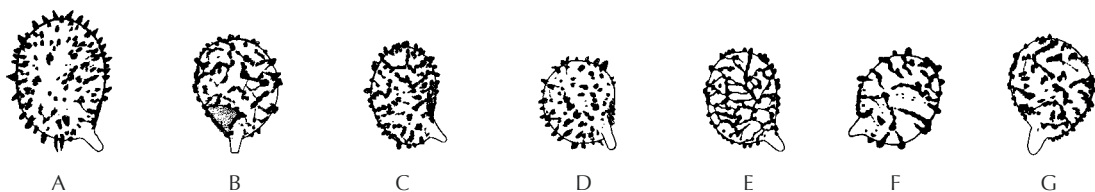
- Frb fairly small and slender; cap 20-70 mm; stem 20-70 x 5-15 mm. Cap shiny, pale, often with dull, mixed colours, dark vinaceous, red, brown, violaceous or olivaceous, centre often paler or darker, margin finally sulcate; gills broad, yellow; stem white; smell insignificant; taste mild; sp deposit yellow (IVb). Sp 7-10 x 6-8 μm , with \pm isolated spines (fig. 131G); dcy non- to few-septate, apical cell strongly clavate. Summer to autumn; in *Picea* forests and plantations, preferably on fairly moist, calcareous soils; early summer to autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Phil 32b, Sar 2:1241, 1243, Schff 39, Sieniop 73, Ves 406.

R. nauseosa (Pers.) Fr.

Note: *R. laricina* Velen. is possibly not specifically different. It is reported to have sp with more connections, smoother cap margin and being slightly acid.

- 8. Mycorrhizal with *Betula* or *Carpinus* 9

- Mycorrhizal with *Fagus*, *Quercus* or dwarf *Salix* 15
- 9. Cap margin strongly sulcate; in bogs and forests, often with *Sphagnum* 10
- Cap margin not or slightly sulcate; in forests, gardens, parks 11
- 10. Sp 7.5-10 x 6.5-8.5 μm , strongly echinulate, spines up to 1.5 μm , connections few or absent (fig. 133A); sp deposit ochre (IIIbc). Cap 20-60 mm, often umbonate when young, but soon depressed at centre, with strongly sulcate margin, purple, vinaceous, ochraceous or brownish, centre often discolouring; gills medium spaced, cream, then ochre, sometimes with a red edge near cap margin; stem 25-70 x 5-15 mm, clavate, fragile, white, often reddish at the base; taste of gills mild or slightly acrid; smell indistinct. Dcy multi-septate. With *Betula* in moist forests, but also in more dry sites, even in parks; summer to autumn; occasional in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Däh 885, Phil 27e, Sar 2:1277, 1279, Schff 33, Ves 402.
R. nitida (Pers. : Fr.) Fr.
- Sp 8-9.5 x 6.5-8 μm , with spines and warts up to 1 μm and few to many connections (fig. 133B); sp deposit cream (IIcd). Cap 30-60 mm, depressed at centre, with strongly tuberculate-sulcate margin, fragile, shining, pale olivaceous brown, pale greyish olivaceous, pale vinaceous to dirty vinaceous; gills whitish to cream; stem 40-70 x 8-10 mm, widened towards base, white or watery grey; flesh soft and fragile; smell fruity. Dcy septate, apical cell sometimes with conical apex, up to 10 μm broad. In *Sphagnum* mires with *Betula*; summer to autumn; occasional in temp.-suba.; DK (LC), FI, NO, SE (LC). – E&M 28, FAD 193B, Mar 471, Sar 2:1271, 1273.
R. sphagnophila Kauffman (*R. venosa* Velen. var. *pallida* J.E. Lange)
- 11. Cap 15-50 mm, rarely larger; stem up to 10 mm broad 12
- Cap 40-150 mm; stem > 10 mm broad 13
- 12. Taste \pm acrid and of iron, at least in the gills; sp deposit dark cream to pale ochre (IIId-IIIb); mycorrhizal with *Betula*. Cap 15-50(-70) mm, convex but soon depressed, \pm sulcate at margin, colour very variable, dark olivaceous, green and brown mixed with purple, vinaceous, lilaceous or reddish; gills cream then ochre; stem 20-50 x 5-10 mm, white, often \pm yellowing; smell indistinct. Sp 6-9 x 5.5-7 μm , variable, often oblong, verrucose, with few to many connections, sometimes with \pm developed reticulum (fig. 133C); dcy multi-septate. Mainly in human-influenced localities; summer to autumn; occasional in temp.-suba.; DK (LC), FI (LC), IS, NO, SE (LC). – Däh 917, R&H 543, Sar 2:1165, 1167, Schff 23, Ves 407, .
R. versicolor Jul. Schäff.
- Taste slightly acrid in the gills; sp deposit variable, ochre to pale yellow (III-IVa); mycorrhizal with *Carpinus* and *Betula*. Cap 20-50 mm, becoming depressed at centre, becoming sulcate at margin, shining, purplish vinaceous, brownish vinaceous mixed with olivaceous or brown, often mottled; gills ochre; stem 20-50 x 4-10 mm, white, slightly yellowing; flesh white, slightly yellowing, fragile; smell of *Pelargonium*. Sp 7-8.5 x 6-7 μm , without connections (fig. 133D); dcy multi-septate. In deciduous forests; very rare in temp. and bore.; DK, FI. – Sar 2:1159, 1161.
R. versatilis Romagn. (1962 nom. illeg., 1967 nom. illeg., validated later in 1967)
- 13. Sp deposit ochre to pale yellow (III-IVa); cap colour very variable, greyish brown red, violaceous brown, brownish orange, greyish violet, at centre blackish brown to greyish or pale olivaceous. Cap 40-150(-180) mm, with smooth or very slightly sulcate margin, shining; gills adnexed, pale ochre; stem 25-80 x 10-25 mm, often flaring at the top, pruinose, white, sometimes with a red flush, slowly slightly brownish towards the base; taste mild or slightly acrid; smell insignificant. Sp 7-9 x 6-7.5 μm , \pm completely reticulate (fig. 133E); dcy non- or few-septate, often finely diverticulate, up to 8 μm broad. Mycorrhizal with *Betula* in forests, parks and tundra, mostly along roads and paths, in Greenland also mycorrhizal with *Salix*; summer; common in hemib.-arc./alp.; FI (LC), NO (NE), SE (LC). – Marst 61, Pers 14:516, Sar



Spores: A: *Russula nitida*, B: *R. sphagnophila* (from holotype of *R. robertii*), C: *R. versicolor*, D: *R. versatilis* (from holotype), E: *R. violaceoincarnata* (from holotype), F: *R. fulvograminea* (from holotype), G: *R. font-queri*.

2:1023, 1024, Sienil 47:48, 49, Sieniop 87.

R. violaceoincarnata Knudsen & T. Borgen

- Sp deposit deeper yellow or cap colours ochre to orange or reddish 14
14. Cap colour very variable, at centre often olivaceous green, dull reddish green, pale brown to dull red brown, at margin red brown, violet brown or dull vinaceous, yellowish green or greyish green. Cap 50-120 mm, convex; gills yellow; stem 50-70 x 15-30 mm, white, unchanging; taste mild or slowly slightly acrid; smell fruity; sp deposit yellow (IVcd). Sp 7-9.5 x 6-8 μm , with low warts and many crests (fig. 133F); dcy septate. Mycorrhizal with *Betula* on calcareous soil; summer; rare in hemib.-suba.; FI (NT), SE. – Marst 58, RdM 40:99, 104, 105, Sar 2:1037, 1038.

R. fulvograminea Ruots., Sarnari & Vauras

- Cap ochre, ochraceous orange, reddish orange, red or vinaceous, without any green. Cap 40-80 mm, smooth, becoming shortly sulcate at margin, centre often discolouring pale; gills pale becoming yellow; stem 30-70 x 10-20 mm, white or with a pink flush, especially at the lower part, becoming brownish when bruised; taste mild or slightly acrid; smell indistinct; sp deposit pale yellow (IVa). Sp 8-9 x 6.5-7.5 μm , verrucose, with some connections (fig. 133G); dcy cylindrical, septate, near apex often with irregular knobby excrescences. Mycorrhizal with *Betula*; summer; rare in hemib.-suba., very rare in temp.; DK (NA), FI (LC), NO (NE), SE (LC). – Mar 469, SBT 80:313.

R. font-queri Singer (*R. integra* (L.) Fr. var. *aurantiaca* Jul. Schäff., *R. aurantiaca* (Jul. Schäff.) Jul. Schäff.)

15. Mycorrhizal with dwarf *Salix* in suba.-arc./alp., also in bore. in bogs. Cap 15-40 mm, smooth or slightly sulcate at margin, shining, dark blood red, dark purple to dark violaceous purple, then paler; gills distant, cream, edge often reddish near cap margin; stem 15-45 x 5-15 mm, soft, fragile, white or often pink at least at base; taste mild; smell indistinct; sp deposit ochre (IIIb). Sp 8-11 x 7-9 μm , verrucose, with partial reticulum (fig. 135A); dcy non- to few-septate. Summer; occasional; FI, FO, IS, NO (LC, incl. Svb), SE (LC). – Fav 55:10 (as *brunneoviolacea*), R&H 542, Sar 2:1283.

R. saliceticola (Singer) Knudsen & T. Borgen

- Mycorrhizal with *Fagus* or *Quercus* 16
16. Sp deposit yellow (IVc); mycorrhizal with *Quercus*. Cap 20-60 mm, smooth or sulcate at margin, shining, vinaceous purple or lilaceous, centre sometimes discolouring to greyish olivaceous, whole cap often with pale, washed-out colours; gills yellow; stem 30-50 x 5-10 mm, white or yellowing; taste mild; smell strong, sweetish-fruity, somewhat resembling *Pelargonium*. Sp 6.5-8.5 x 5.5-7 μm , verrucose to echinulate, with numerous crests (fig. 135B); dcy septate. In deciduous forests; summer to autumn; occasional in temp.-hemib.; DK (LC), NO (NE), SE (LC). – E&M 21, Marst 50, Sar 2:1176, 1179, ☉.

R. odorata Romagn.

- Sp deposit cream or ochre, or mycorrhizal with *Fagus* 17

17. Sp deposit cream (IIbc); cap deep violet, sometimes purple or dark vinaceous. Cap 30-70 mm, thin-fleshed, margin smooth; gills cream; stem 30-60 x 8-15 mm, white, at the base often with a flush of lemon-yellow; taste mild; smell indistinct. Sp 7-9 x 6-7.5 μm , spines up to 2 μm long, with many fine connections or a partial reticulum (fig. 135C); dcy septate. Mycorrhizal with *Fagus*, often solitary; summer to autumn, mostly early in the season; occasional in temp.-hemib.; DK (LC), FI (DD), NO (LC), SE (LC). – Mar 470, M&H 5:95, Phil 29f, Sar 2:1285, 1289, Schff 21.
R. brunneoviolacea Crawshay
- Sp deposit darker or cap with red colours 18
18. Cap 20-35 mm, mat, finely velvety, bright red, darker towards centre, margin finely sulcate; dcy multi-septate, of short, almost isodiametrical hyphae. Gills pale, becoming pale yellowish; stem 25-35 x 4-6 mm; taste mild; smell fruity; sp deposit ochre (IIIb). Sp 6.5-8.5 x 5.5-7 μm , ellipsoid, verrucose; base of pileipellis with some \pm isodiametrical, amorphous hyphae; dcy multi-septate, of short, almost isodiametrical hyphae. Mycorrhizal with *Fagus* and *Quercus*; very rare in temp.; DK. – FAD 192E, Mar 457, Sar 2:1208.
R. melzeri Zvára (*R. minutula* Velen. s. J.E. Lange)
- Cap 20-55 mm, dull red and mixed with purple or vinaceous, rarely also olivaceous; dcy without isodiametrical hyphae 19
19. Sp 6.5-8 x 5-7 μm , ellipsoid to subglobose, verrucose with warts up to 0.5 μm , with many connections forming crests (fig. 135D); sp deposit cream (IIbc). Cap 20-50 mm, smooth or weakly sulcate at margin, dark to pale carmine red to purplish red or vinaceous, paler towards the margin, centre darker, becoming yellow brown when old; gills cream, slightly yellowing or browning towards the edge; stem 15-50 x 5-15 mm, white, sometimes with a pink tinge at base, after some time with yellow brown patches; flesh white or with small yellow patches; smell insignificant; taste mild or very slightly acrid after some chewing; dcy multi-septate. Mycorrhizal with *Fagus*; summer to autumn; rare in temp.-hemib.; DK (EN), NO (LC), SE (LC). – BSMF 65 Atlas pl. 113 ('93'), E&M 24, MH 5:131, Sar 2:1199, Schff 22a.
R. puellula Ebbesen, F.H. Møller & Jul. Schäff.
- Sp 7-9 x 7-8 μm , subglobose, echinulate with 0.5-1 μm high, mostly isolated spines or with a few connections (fig. 135E); sp deposit pale ochre (IIIa). Cap 20-55 mm, slightly depressed, sometimes slightly sulcate, sometimes zonate, at centre often very dark surrounded by a pale zone, then a dark zone and a paler margin, generally dull red, flesh red to brownish red, margin sometimes with an olivaceous tinge; stem 30-40 x 7-12 mm, white, without yellow but sometimes with rust-coloured spots below; flesh white; smell insignificant, when drying cheesy; taste of gills acrid to very acrid; dcy multi-septate. Mycorrhizal with *Fagus*; summer to autumn; rare in temp., only few records known; DK (CR). – AM 32.3, FAD 191C, Schff 23a.
R. zonatula Ebbesen & Jul. Schäff.

Key H: Sect. *Polychromae* Maire subsect. *Urentes* Maire

1. In arc./alp.; mycorrhizal with *Salix* or *Dryas* 2
- In temp.-bore.; mycorrhizal with conifers or deciduous trees 3
2. Sp (7.5-)8-10 x 6.5-8 μm , finely verrucose, warts up to 0.5 μm , with few to many fine connections (fig. 135F). Cap 20-30 mm, plane, with a smooth margin, shining, brown with a purplish tinge, dull red brown, purple, or dull red, darker at centre; gills ochre; stem 15-30 x 5-13 mm, white; smell insignificant; taste first mild then very acrid; sp deposit yellow (IVc); dcy septate and diverticulate. Mycorrhizal with *Salix*; summer; rare in arc./alp.; FI (DD), NO (Busk). – Sar 1:733,734.
R. purpureofusca Kühner (*R. cupreola* Sarnari)
- Sp 8.5-11.5 x 7.5-10 μm , echinulate, connections absent, longest spines > 1 μm (fig. 137A).





Spores: A: *Russula saliceticola*, B: *R. odorata*, C: *R. brunneoviolacea*, D: *R. puellula*, E: *R. zonatula*, F: *R. purpureofusca* (left from holotype, right from the holotype of *R. cupreola*).

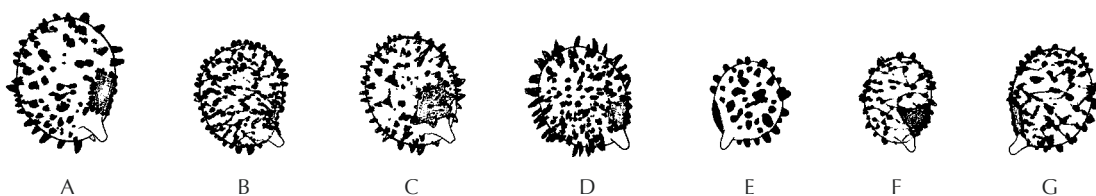
Cap 35-60 mm, with smooth margin, shining, slightly sticky-viscid, colour very variable, from deep brownish red, purplish red, dirty olivaceous green mixed with flesh-colour and brown, discolouring paler olivaceous yellow with a red-brown margin; gills ochre, then yellow, with a salmon tinge; stem 20-35 x 8-17 mm, white; smell insignificant, slightly fruity; taste mild or somewhat acrid; sp deposit yellow (IV). Basidia 2-4-spored; dcy septate. Mycorrhizal with *Dryas* in arc./alp., also in suba. with *Betula*, occasional, especially in calcareous areas; summer; FI, IS, NO (NE, SvB), SE (LC).

R. heterochroa Kühner (*R. maculata* Quél. var. *alpina* Singer, *R. maculata* Quél. subsp. *alpina* (Singer) Knudsen & T. Borgen, *R. pseudocampestris* Kühner, *R. dryadicola* Fellner & Landa)


- 3. Mycorrhizal with conifers 4
- Mycorrhizal with deciduous trees 6
- 4. Taste first mild, then slowly burning; sp with low warts and few to many connections. Cap 60-120 mm, convex, with a slightly sulcate or smooth margin, deep brownish red to dark purplish, more rarely pure red, centre usually darker; gills pale ochre, then more yellow; stem 50-110 x 10-25 mm, hard, above pruinose and finely veined, white, often with a thin red flush or streaks; taste first mild, gradually very acrid; smell of pencil-wood or pepper; sp deposit deep ochre to pale yellow (IIIc-IVa). Sp 8-11 x 6.5-8.5 μ m, with connections forming crests or incompletely reticulate (fig. 137B); dcy multi-septate. Mycorrhizal with *Picea* and *Pinus*; mostly in late autumn; occasional in temp.-bore., in FI north to PH, in DK one record; DK (EN), FI (LC), NO (LC), SE (LC). – Däh 930, Mar 455, Marst 26, R&H 554, Schff 64. *R. badia* Quél.
- Taste immediately acrid; sp with isolated spines 5
- 5. Cap 70-120 mm, dark umber, blackish brown or dark yellow brown, centre sometimes with olivaceous tinge, margin smooth, rarely slightly sulcate. Gills yellow; stem 40-80 x 15-25 mm, cylindrical, firm, white, becoming grey brown below; taste first mild then very acrid; smell resembling apple compote; sp deposit yellow (IVe). Sp 10-12 x 8-10 μ m, echinulate, spines up to 2 μ m (fig. 137C); dcy few to multi-septate; apical hyphae in pileipellis very thin and tapering. In coniferous forests, especially with *Picea*; summer to autumn; distribution and frequency poorly known due to confusion with related species, but occurring in hemib.-bore., in FI north to Ks; FI, NO (LC), SE (LC). – E&M 1, Mar 494, 496 (as *urens*), Sar 1:747, 749, Schff 68.
- R. adulterina* (Fr.) Peck s. auct. (*R. integra* (L.) Fr. var. *a.* Fr., *R. cinnamomicolor* Krombh. s. auct., *R. piceatorum* Singer)
- Cap 40-70 mm, dull dark purplish violet or purplish brown, centre almost black, shining, margin smooth. Gills yellow; stem 30-60 x 10-15(-20) mm, cylindrical, firm, white; smell of *Pelargonium*; taste very acrid; sp deposit yellow (IVe). Sp 8-10.5 x 7-8.5 μ m, echinulate, spines up to 1 μ m, isolated or with some fine connections (fig. 137D); dcy multi-septate; apical hyphae in pileipellis very thin and tapering, sometimes branched. Mycorrhizal with conifers; summer to autumn; boreal, but distribution poorly known due to confusion with

related species; FI (LC), NO (LC), SE (LC). – Marst 71, Rim 5:102, Sar 1:753, S,E&E 74.
R. firmula Jul. Schäff. (*R. transiens* (Singer) Romagn.)

6. Mycorrhizal with *Betula* 7
 - Mycorrhizal with *Quercus* and *Fagus* 8
7. Sp 7-8 x 6.5-7 μm , subglobose, with warts, low spines and a few crests (fig. 137E); dcy cylindrical, very long, non-septate, not diverticulate. Cap 70-160 mm, convex, then somewhat depressed, red, blood red, scarlet, orange or abricot; gills cream, then ochre; stem 60-100 x 15-25 mm, firm to hard, white, rarely with a pink or purplish flush, when old sometimes with ochre or orange patches; taste bitter and acrid; smell faintly of coconut; sp deposit yellow (IVd). Mycorrhizal with *Betula* on rich soil; summer to autumn; occasional in temp.-suba., in NO north to Finnm, only a few records from DK; DK (NE), FI (LC), IS, NO (LC), SE (LC). – Mar 498, 499 (as *mesospora*), Phil 29e, Sar 1:713, 715, Schff 69, Sieniop 71.
R. intermedia P. Karst. (*R. pulcherrima* S. Lundell & Jul. Schäff. non Velen., *R. lundellii* Konrad & Maubl., *R. mesospora* Singer)
- Sp 7.5-9 x 6-7.5(-8) μm , broadly ellipsoid, with warts and low spines and a few crests (fig. 137F); dcy clavate, 0-2-septate, slightly diverticulate. Cap 40-120(-150) mm, convex then depressed, with smooth margin, pale red, pink or orange mixed with yellow, centre discolouring yellow; gills yellow; stem 40-90 x 17-30 mm, white or with a slight pink flush; taste first mild, then slowly very acrid, not bitter; smell indistinct; sp deposit yellow (IVbc). Mycorrhizal with *Betula* and *Picea* on calcareous soil; summer to autumn; recently described species, so far recorded as rare from hemib.-suba. in FI (LC), NO (NE) and SE (NE). – Sar 1:719, 721, Sieniop 59.
R. aurantioflammans Ruots., Sarnari & Vauras
8. Cap with small rust-coloured spots 9
 - Cap without rust-coloured spots 10
9. Sp 8-10 x 7-8.5 μm (fig. 137G). Cap 40-100 mm, pink to orange, brick or flesh-coloured, often with cream patches, typically with small rust-coloured dots; gills often strongly forked, ochre then yellow; stem 40-80 x 10-30 mm, firm or hard, white, browning, often \pm pink, at least near the base; taste slightly to somewhat acrid, at least of gills; sp deposit yellow (IVcd). Sp verrucose to echinulate with spines up to 1 μm , connections fine, few to many, with or without a few meshes. In deciduous forests on rather dry, calcareous ground; summer to autumn; rare in temp.; DK (LC), NO (NT), SE (LC). – Mar 497, Phil 21d, Sar 1:697, 699, Schff 65, Ves 418, .
R. maculata Quéf.
- Sp 9.5-12 x 8-11 μm (fig. 139A). Cap 40-75 mm, pink to orange red, violet to copper brown, discolouring at centre to pale yellow; gills yellow; stem 40-70 x 12-25 mm, white; taste \pm acrid; smell fruity; sp deposit yellow (IVd). Sp verrucose to echinulate with spines 1-1.5 μm ; dcy non- to few-septate. Mycorrhizal with deciduous trees, e.g. *Fagus*, *Quercus*, *Betula*; summer; occasional in hemib.-bore.; FI (LC), NO (NE), SE. – Marst 71, Sar 1:703, 705.
R. globispora (J. Blum) Bon
10. Apical cells in pileipellis diverticulate with short knobs (fig. 139B). Cap 30-70 mm, convex, then depressed, with \pm sulcate margin, dark purple, violet, vinaceous to deep coral, red brown, ochre brown or olivaceous; gills deep yellow, fragile; stem 30-70 x 7-15 mm, white, slightly browning; smell insignificant; taste very acrid; sp deposit yellow (IVe). Sp 8-10 x 7-8.5 μm , strongly echinulate, spines up to 1.5 μm ; dcy septate. In deciduous forests and parks; summer to autumn; confused with related species and distribution unknown, but occasional in temp.; DK (LC), FI, NO (vU), SE (LC). – FAD 194E, Jordst 1985(3) cover, Mar 495, Marst 70, Sar 1:723, 725, Ves 418, .
R. cuprea (Krombh.) J.E. Lange
 Note: *R. urens* was found by Romell under *Corylus* (aquarelle in S) and is possibly a synonym of *R. cuprea*, not of *R. adulterina*.



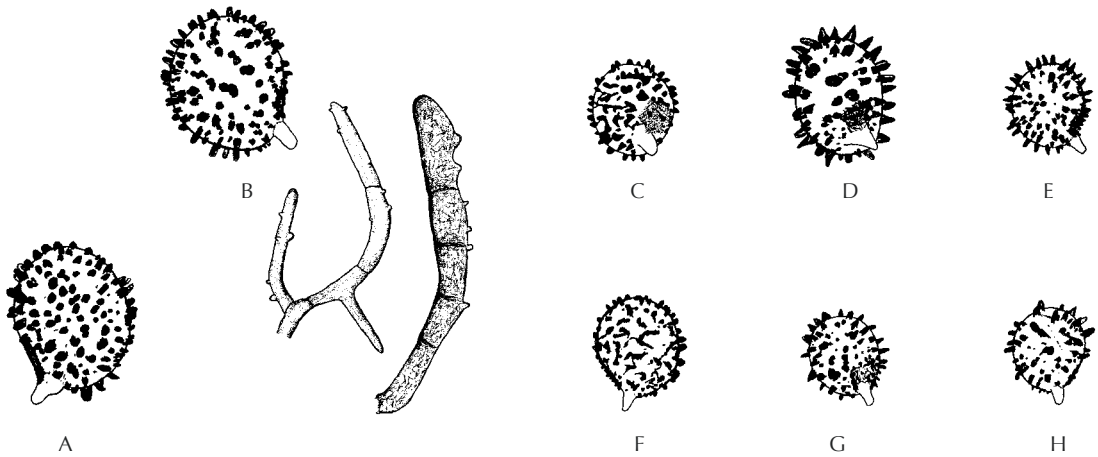
Spores: A: *Russula heterochroa* (from holotype), B: *R. badia*, C: *R. adulterina* s. auct., D: *R. firmula*, E: *R. intermedia* (from neotype), F: *R. aurantioflammans*, G: *R. maculata*.

- Apical cells in pileipellis not diverticulate 11
- 11. Cap uniformly pale to bright red; dcy slightly incrustated see *R. rutila*, Key J 12
- Cap not red or if red then mixed with olivaceous or green; dcy not incrustated 12
- 12. Sp with some connections, spines less than 1 μm (fig. 139C). Cap 40-100 mm, soon depressed, vinaceous, red or lilaceous brown, centre discoloured ochre; gills ochre to yellow; stem 40-100 \times 10-20 mm, white, becoming slightly grey when old; taste mild to somewhat acrid; smell insignificant; sp deposit yellow (IVe). Mycorrhizal with *Quercus*; summer to autumn; rare in temp.-hemib.; DK (EN), FI (VU), SE (NE). – Mar 500, Marst 70, Sar 1:691, 693, S,E&E 79, Sienil 44:49.
R. decipiens (Singer) Svrček (*R. maculata* Quél. var. *decipiens* Singer)
- Sp with isolated spines up to 1.5 μm 13
- 13. Smell indistinct. Cap 40-90 mm, red brown, purplish brown or vinaceous, centre discolouring to ochre; gills ochre to yellow; stem 35-80 \times 10-25 mm, white, firm but soon soft, slightly browning when dried; taste acrid at least of the gills; smell indistinct; sp deposit deep yellow (IVd). Sp 8-10 \times 6.5-8 μm , with isolated spines up to 1.5 μm (fig. 139D); dcy non- to few-septate. Mycorrhizal with *Quercus* on rich clayey or calcareous soil; very rare in hemib.; FI (DD, V: Turku). – E&M 32, Sar 1:765, 767.
R. vinosopurpurea Jul. Schäff.
- Smell of honey. Cap 40-80 mm, convex but soon depressed, margin pink or violaceous, centre straw to buff or olivaceous buff; gills cream then ochre; stem 30-70 \times 10-20 mm, at first firm but soon soft, white; taste almost mild to moderately acrid; sp deposit pale yellow (IVb). Sp 7-8.5 \times 6-7 μm , with isolated spines up to 1 μm (fig. 139E); dcy 0-2-septate, with a short \pm inflated apical cell. Mycorrhizal with *Fagus* on rich, clayey or calcareous soil; summer to autumn; occasional in temp.; DK (LC), SE (LC). – AM 32 pl. 4, E&M 30, Sar 1:761, Schff 66, Ves 419, .
- R. veterosa* Fr.

Key I: Sect. *Polychromae* Maire subsect. *Lilaceinae* (Melzer & Zvára) Jul. Schäff. (subgen. *Incrustatula* Romagn. sect. *Lilaceinae* (Melzer & Zvára) Konrad & Joss., sect. *Incrustatae* Romagn. nom. inval.)

1. Cap bluish violet, brownish violet, greyish, sometimes mixed with olivaceous, centre darker. Cap 30-80 mm, convex, distinctly pruinose and mat, when moist viscid, often finely concentrically cracked, with smooth margin; gills white; stem 40-60 \times 5-15 mm, white; smell insignificant; taste mild; sp deposit white (Ia). Sp 8-10 \times 7-8 μm , verrucose with a few connections (fig. 139F); primordial hyphae strongly incrustated and prominent, up to 8 μm broad. Associated with *Picea* on acid soil; summer; rare in temp.-bore., in FI north to PS; FI (LC), NO (NT), SE (LC). – E&M 15, R&H 539, Sar 2:1337, 1339, S,E&E 45, Sieniop 60.
R. azurea Bres.

- Cap red, pink, orange pink, lilaceous or vinaceous 2
- 2. Sp with isolated spines or warts 3
- Sp with low warts and some crests or reticulate 4
- 3. Cap lilaceous red, vinaceous, brownish pink, margin sometimes pale olivaceous to greyish green, centre discolouring to brownish ochre. Cap 30-60 mm, with smooth margin, mat, strongly pruinose; gills pale cream; stem 25-50 x 5-15 mm, fragile, pruinose, white or tinged pink; taste mild; smell insignificant; sp deposit white (Ib). Sp 7-8.5 x 5.5-7 μm , with isolated spines (fig. 139G); primordial hyphae up to 5 μm broad, incrustated. Mycorrhizal with *Carpinus*, *Fagus* and *Quercus*; summer, less often in autumn; occasional in temp. and hemib., in FI only in V and EH; summer; DK (VU), FI (LC), NO (LC), SE (LC). – FAD 184B, C, Mar 459, Sar 2:1327, 1329, Schff 20, Svp 34:37, ☉.
R. lilacea Quél.
- Cap bright red. Cap 20-50(-60) mm, often irregular, becoming depressed at centre, pruinose, mat, margin often slightly sulcate; gills white, rather distant; stem 30-40 x 5-10 mm, cylindrical or inflated, pruinose, white or with pink flush at base; flesh slightly greying or browning; taste mild; smell insignificant; sp deposit white (Ia). Sp 6-8.5 x 6-7 μm , with isolated spines up to 1 μm long (fig. 139H); primordial hyphae up to 4 μm broad, incrustated. In forests of *Fagus* on rich soil; summer; rare in temp.; DK (EN), NO (NE), SE (NT). – E&M 10, Sar 2:1313, 1315, Schff 20b, Svp 34:37.
R. emeticicolor (Jul. Schäff.) Singer (*R. lilacea* Quél. var. *emeticicolor* Jul. Schäff.)
- 4. Cap pale orange or orange pink, 20-60 mm. Cap convex, mat, with smooth margin, pale cream, yellowish cream to orange cream, sometimes with a greenish flush; gills white; stem 20-50 x 8-12 mm, white; taste mild; smell insignificant; sp deposit white (Ib). Sp 7-9 x 6.5-7 μm , with low warts and numerous crests (fig. 141A); primordial hyphae up to 6 μm broad, incrustated. Mycorrhizal with *Fagus* on rich, clayey soil; summer to early autumn; rare in temp.; DK (VU), NO (NT). – E&M 15 (as *incarnata*), Sar 2:1319, Svp 34:36.
R. roseoaurantia Sarnari (*R. incarnata* Quél. s. Blum)
- Cap red or pink or > 60 mm 5
- 5. Cap 15-30 mm. Cap mat, red, with smooth margin; gills cream; stem 15-30 x 4-8 mm, fragile, pruinose, white or with a pink tinge; a section of the flesh becoming red, sometimes slowly, with SV; smell of *Scleroderma* or *Lepiota cristata*; sp deposit white (Ib). Sp 6-8 x 5.5-7 μm , finely verrucose or with partial reticulum (fig. 141B); some hymenial cystidia partly covered with a gelatinous sheath as seen in SV; primordial hyphae up to 4 μm broad, slightly incrustated. In deciduous forests; summer; very rare in temp.-hemib.; DK (EN), FI, NO (NE, Østf: Kråkerøy), SE (NE). – Mar 457, Marst 43, MH 5:103, Sar 2:1353, 1355, Schff 17a.
R. minutula Velen.
- Cap larger 6
- 6. Taste bitter, resembling pencil wood or wood of *Cedrus*. Cap 40-120 mm, with a smooth margin, mat, firm, hardly peeling, red or discolouring to cream or whitish; gills pale cream; stem 30-80 x 10-30 mm, hard, concolorous with cap all over or partly, or whitish to cream; sp deposit pale cream (IIa). Sp 8-9 x 7-8 μm , verrucose and almost completely reticulate (fig. 141C); dcy present but scattered and not reacting with SV or SBA; primordial hyphae not incrustated. Mycorrhizal with *Fagus* and *Quercus*; summer to autumn; common in temp., occasional in hemib., in NO north to M&R; DK (LC), FI (NT), NO (LC), SE (LC). – Marst 32 (incl. var. *lactea*), Phil 17d, R&H 539, Schff 16a, Ves 394, ☉.
R. lepida Fr. (*R. lepida* Fr. var. *lactea* (Pers.: Fr.) F.H. Møller & Jul. Schäff., *R. rosacea* (Pers.) Gray nom. illeg.)
- Taste totally mild 7
- 7. Stem \pm pink, often as a very slight flush. Cap 40-70 mm, with smooth margin, dry, mat,



Spores and pileipellis elements: A: *Russula globispora*, B: *R. cuprea*, C: *R. decipiens*, D: *R. vinosopurpurea*, E: *R. veternosa*, F: *R. azurea*, G: *R. lilacea*, H: *R. emeticicolor*.

pruinose, uniformly red or red with a whitish sheen, often finely concentrically cracking; gills whitish to cream; stem 35-60 x 6-15 mm, cylindrical or clavate, pruinose-mealy or when old scaly, whitish but with a ± pale pink flush; flesh firm; smell insignificant; taste mild; sp deposit white (Ib). Sp 6.5-8 x 6-7 μm, with low warts and some connections (fig. 141D); primordial hyphae up to 4.5 μm, incrusting, apical cell tapering. In deciduous forests, mainly with *Quercus* and *Fagus* on acid ground; summer; rare in temp.-bore.; DK (EN), FI (CR), NO (NE), SE. – Marst 47, Sar 2:1305, 1307, Schff 19.

R. zvarae Velen.

- Stem white. Cap 40-100 mm, smooth, when old becoming rugulose at centre, red or pink or discolouring cream or whitish; gills much forked, white; stem 30-70 x 10-20 mm, pruinose above, white; a section of the flesh becoming red, sometimes slowly, with SV; taste mild, insignificant; sp deposit white (I), soon discolouring cream. Sp 6-8 x 5-6.5 μm, low verrucose with few to many crests (fig. 141E); primordial hyphae slightly incrusting. In deciduous forests with *Quercus* and *Fagus*; summer to autumn; occasional in temp.-hemib.; DK (LC), FI (EN), NO (NE), SE (LC). – Däh 876, Phil 21e, Sar 2:1344, 1349, Schff 17, Ves 395, ☉.
- R. velutipes* Velen. (*R. rosea* (Schaeff.) Quéf. non Pers.)

Key J: Sect. *Polychromae* Maire subsect. *Integroidinae* (Romagn.) Bon (incl. subsect. *Paraintegrinae* Sarnari, sect. *Paraincrustatae* Sarnari subsect. *Integrae* Maire, sect. *Russula* subsect. *Rubrinae* (Melzer & Zvara) Singer)

1. Frb distinctly greying, especially when old 2
 - Frb not or hardly greying 6
2. Mycorrhizal with conifers. Frb distinctly greying; cap 40-120 mm, with age with slightly sulcate margin, dark vinaceous, dark purplish, blood red to brownish red, centre darker than margin or paler, discolouring to brownish or yellowish, soon depressed, margin lilaceous pink, sometimes white pruinose; gills strongly interveined, ochre, edge blackening; stem 30-80 x 15-25 mm, cylindrical, strongly greying with age, firm, venose-reticulate; sp deposit ochre (IIIab). Sp 9-11 x 7-9 μm, with isolated, slender, pointed spines up to 1 μm (fig. 141F); primordial hyphae distinct, up to 7 μm broad; dcy absent. In coniferous forests and in mountains also with *Betula*; late summer to autumn; common in temp.-suba., in NO north

to Finnm, occasional in DK; DK (LC), FI (LC), NO (LC), SE (LC). – Mar 482, Phil 24b, R&H 535, Sar 2:1427, 1429, Schff 29, ☉.

R. vinosa Lindblad (*R. obscura* (Romell) Peck)

- Mycorrhizal with deciduous trees or scrubs 3
- 3. Mycorrhizal with *Quercus* in warm, temperate parkland. Cap 50-100 mm, plane or slightly depressed with obtuse margin, reddish purple, mixed with dark grey, especially near margin, shining; gills rigid, cream, becoming ochre, blackening from the edge; stem 30-60 x 10-15 mm, white but soon becoming dark grey; flesh when cut immediately vinaceous, then rapidly changing to grey, finally almost black; sp deposit yellow (IVc). Sp 8-10 x 6.5-8 μm , echinulate with some fine connections (fig. 141G); dcy with yellowish contents, \pm incrustated; primordial hyphae absent. Summer to early autumn; a southern species, very rare in temp., DK (CR, Lol: Skejten). – Mar 490, Sar 2:1065, 1067, Ves 400, ☉.

R. seperina Dupain

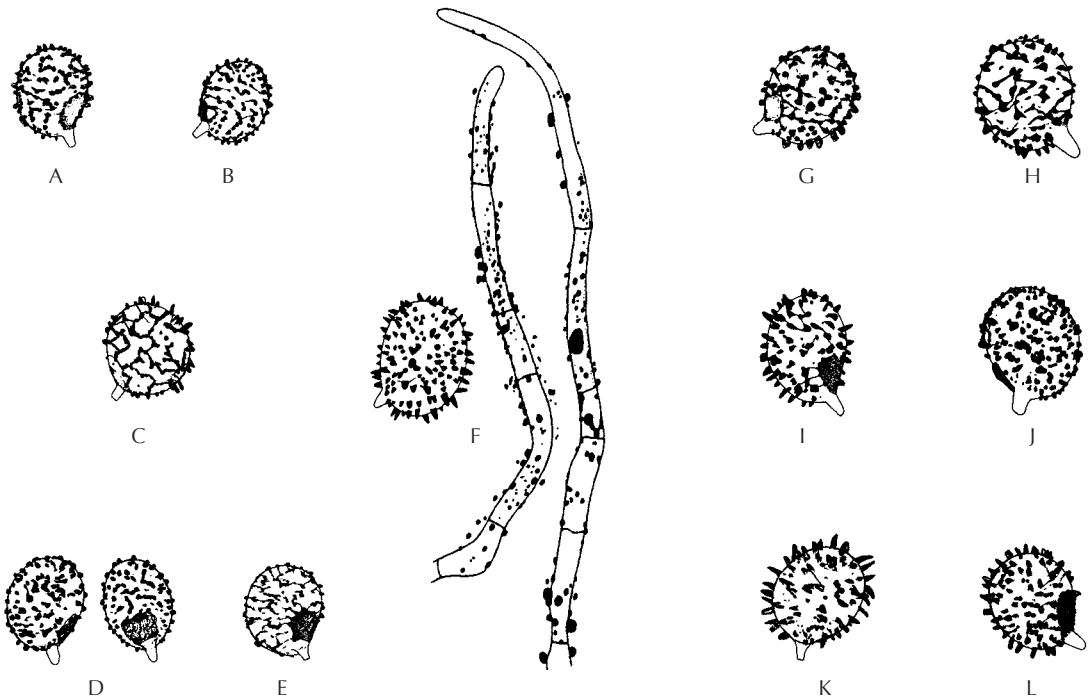
- Mycorrhizal with *Betula* 4
- 4. Cap with dull colours, variable and mixed, lilaceous brown, olivaceous yellow, reddish, with ochre patches, centre often greenish yellow, margin lilaceous red brown. Cap 70-130 mm, with smooth or sulcate margin when old, mat, when growing in suba. strongly pruinose-pubescent; gills cream to ochre, when old with greying edge; stem 65-100 x 20-30 mm, white, yellowing below, resembling a species from the *Xerampelinae*-group; flesh white, only very slowly becoming grey, firm; smell insignificant; taste mild; sp deposit pale yellow (IIIc-IVa). Sp 9-11.5 x 7-9 μm , verrucose with a few connections or crests (fig. 141H); primordial hyphae up to 6 μm broad, sparsely incrustated, clustering. In forests and scrubs with *Betula*, incl. *B. nana*; summer; recently rediscovered, occasional in hemib.-arc./alp.; FI (LC), NO (LC), SE (LC). – Marst 45, Sar 2:1423, 1425, Sienil 43:40, Sieniop 78.

R. pubescens A. Blytt (*R. subalpina* O.K. Mill.)

- Cap yellow, yellow green or green 5
- 5. Cap deep yellow, yellowish orange to deep chrome yellow. Cap 50-100 mm, firm; gills whitish to cream, but soon with ochraceous or greenish tinge, greying; stem 40-100 x 10-20 mm, white or yellowish soon greying; flesh distinctly greying; smell fruity; taste mild; sp deposit ochre (IIIc). Sp 8-9.5 x 6.5-7.5 μm , with warts 0.5-1 μm , with connections or a \pm complete, fine reticulum (fig. 141I); primordial hyphae incrustated, mainly diffuse, up to 6 μm broad; dcy absent. Mycorrhizal with *Betula*, mostly in moist sites such as mire margins; summer to autumn; common in temp.-suba., but rare in IS; DK (LC), FI (LC), IS (Ve), NO (LC), SE (LC). – Däh 852, Phil 40a, R&H 535, Sar 1432, 1434, Ves 401, ☉.

R. claroflava Grove (*R. flava* (Romell) Romell)

- Cap olivaceous green, olive brown to greyish yellow or more bright green, discolouring buff at centre. Cap 50-100 mm; gills ochre; stem 30-50 x 15-25 mm, clavate, white, soon greying; flesh distinctly greying; smell insignificant; taste mild; sp deposit not obtained, probably yellow (IV). Sp 8.5-11 x 7-9 μm , verrucose, warts up to 1 μm , with some connections (fig. 141J); primordial hyphae incrustated, up to 7 μm broad, clustering; dcy absent. Mycorrhizal with *Betula* incl. *B. glandulosa* and *B. nana* in suba.-arc./alp.; summer; recently described and so far only known from NO (LC) and Greenland.
- R. groenlandica* Ruots. & Vauras (*R. claroflava* Grove var. *viridis* Knudsen & T. Borgen)
- 6. Sp with isolated, slender spines up to 1.7 μm long (fig. 141K), 8-11 x 7-9 μm ; cap umber, sepia, yellow brown or buff, often with a purple shin. Cap 60-120 mm, slightly depressed, shining, with margin smooth or becoming slightly sulcate; gills broad, thick, strongly interveined, medium spaced to distant, whitish, finally yellow; stem 50-100 x 15-30 mm, white, firm, becoming thicker at base; flesh spongy in stem; sp deposit yellow (IVc). Pileipellis with cylindrical or clavate, 4-7 μm broad, finely incrustated dcy, and scattered, incrustated primordial hyphae. In coniferous forests and parks with *Picea* and *Pinus*, more



Spores and primordial hyphae: A: *Russula roseoaurantia*, B: *R. minutula*, C: *R. lepida*, D: *R. zvarae*, E: *R. velutipes*, F: *R. vinosa*, G: *R. seperina*, H: *R. pubescens*, I: *R. claroflava*, J: *R. groenlandica* (from holotype), K: *R. integra* s. Maire, L: *R. cremeoavellanea*.

rarely in deciduous forests, on rich soil; summer to autumn; common in hemib.-bore., rare in temp.; DK (vu), FI (LC), NO (LC), SE (LC). – Däh 893, Phil 31d, R&H 546, Sar 2:1089, 1091, Ves 409, ☉.

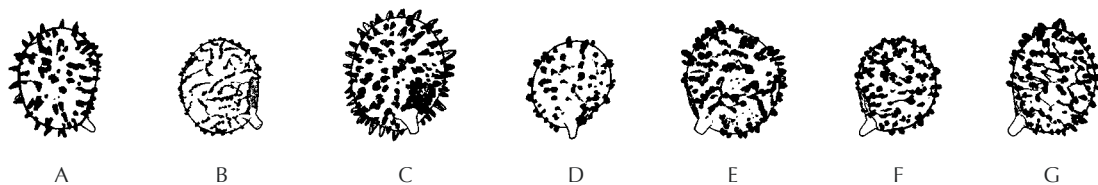
R. integra (L.) Fr. s. Maire (*R. polychroma* Hora)

- Sp without long isolated spines or cap red 7
- 7. Pileipellis with incrustated dcy and incrustated primordial hyphae 8
- Pileipellis with slightly incrustated dcy; primordial hyphae absent 11
- 8. Mycorrhizal with *Betula*; cap 40-80 mm, avellaneous brown to yellow brown or ochre, sometimes with a greenish tinge and a smooth pink or red brown margin. Gills broad, veined, yellow; stem 40-50 x 10-20 mm, veined, white becoming brownish when bruised; sp deposit yellow (IVc). Sp 7-8.5 x 6-7 μ m, with isolated short spines (fig. 141L); primordial hyphae slightly incrustated and narrow, weakly reacting; dcy weakly incrustated. Summer; occasional in hemib.-bore., in FI north to Ks; FI (LC), NO (NE), SE (LC). – Mar 492, Marst 67, Sieniop 64, SBT 79:315.
- R. cremeoavellanea* Singer
- Mycorrhizal with *Fagus*, *Quercus* or *Carpinus* or cap stronger red 9
- 9. Mycorrhizal with *Fagus* and *Quercus*; primordial hyphae with scattered incrustations and with obtuse apex. Cap 30-70(-100) mm, with short sulcate margin, with red or pale red margin and orange to ochraceous centre, shining; gills ventricose, deep ochre; stem 30-40 x 10-15 mm, often obclavate, white; smell insignificant; taste mild; sp deposit yellow (IVa). Sp 8-9 x 7-8 μ m, with isolated spines up to 0.8 μ m or a few fine connections (fig. 143A); dcy cylindrical to slightly clavate, 3-5 μ m broad, some apical cells up to 8 μ m, finely incrustated. In

deciduous forests; summer to early autumn; rare in temp.-bore.; DK (VU), FI (DD), NO (NE), SE (VU). – AM 32 pl. 4, E&M 4 (as *borealis*), Sar 2:1113, 1115, Schff 36b, Svp 15:11.

R. laeta F.H. Møller & Jul. Schäff. (*R. borealis* Kauffman s. Romagnesi non Kauffman = a species of *Xerampelinae*)

- Mycorrhizal with *Quercus*, *Carpinus* or *Betula*; some primordial hyphae long tapering 10
- 10. Sp partially reticulate with very low warts (fig. 143B). Cap 45-85 mm, with smooth margin, purplish red, lilaceous red, becoming pink or brownish with a flesh-coloured tone, at centre sometimes discolouring cream; gills yellow; stem 35-60 x 15-30 mm, firm, white, sometimes partly pink especially below; smell insignificant; taste mild; sp deposit yellow (IVb). Sp 8-10 x 6.5-8 μm , with a very low, \pm complete reticulum; dcy smooth or incrustated, 1-2-septate; primordial hyphae incrustated, apical cells obtuse or long tapering. In deciduous forests, parkland and other open and warm localities; very rare; DE. – Sar 2:1096, 1099.
R. carminipes J. Blum
- Sp with spines up to 1.5 μm and a few fine connections (fig. 143C). Cap 50-80 mm, convex but soon broadly depressed, with smooth or finely sulcate margin, shining, red to reddish brown or purplish brown, centre discolouring to olivaceous yellow or olivaceous brown; gills yellow; stem 45-70 x 10-20 mm, firm, white, slightly yellowing towards base and with some brown spots; smell insignificant or of honey; taste mild; sp deposit yellow (IVb). Sp 8.5-10 x 7-9 μm ; primordial hyphae with a long and strongly tapering apical cell, strongly incrustated below, smooth towards apex, incrustations becoming red in SV on dried frb; dcy not septate or 1-septate, incrustated below, either typically clavate or tapering to a narrow apex. Mycorrhizal with *Quercus*, *Betula* and *Carpinus* on clayey soil; very rare in temp.-bore.; FI (NT), NO (NE). – FRIC 4:16, Sar 2:1083, 1084.
R. melitodes Romagn.
- 11. Sp deposit yellow (IVac); mycorrhizal with *Picea*. Cap 50-80 mm, with a smooth or very finely sulcate margin, mat when dry, shining when wet, red brown, reddish brown or reddish lilac, at centre discolouring to yellow or olivaceous green; gills yellow; stem 50-75 x 18-25 mm, slightly clavate, white or sometimes slightly pink in places; smell insignificant; taste mild. Sp 7-9 x 6-7 μm , verrucose to echinulate, warts scattered, up to 0.5 μm , connections few or scattered (fig. 143D); dcy long, septate, below with scattered incrustations; primordial hyphae absent. In coniferous forests on calcareous soil; summer; recently described, but seemingly occasional in bore.; FI (LC), SE. – Marst 59, Sar 2:1057.
R. integriformis Sarnari
- Sp deposit ochre or mycorrhizal with deciduous trees 12
- 12. Sp deposit yellow (IVc). Cap 20-60 mm, convex or slightly depressed, with smooth margin, mat, uniformly bright red to pink or orange red; gills pale yellow; stem 20-50 x 7-12 mm, cylindrical or tapering at base, white; smell weak, resembling that of *R. delica*; taste moderately to strongly acrid. Sp 7.5-9.5 x 7-8 μm , echinulate with some short crests, spines up to 1.3 μm (fig. 143E); dcy multi-septate, finely and partly incrustated. Mycorrhizal with old *Quercus* on rich soil; summer to autumn; very rare in temp.-hemib.; DK (NA), NO (NT, Østf: Fredrikstad), SE (VU). – E&M 26, Marst 73, Sar 1:779, 781.
R. rutila Romagn.
- Sp deposit ochre 13
- 13. Taste acrid; mycorrhizal with deciduous trees. Cap 40-100 mm, velvety, with smooth margin, mat, firm, cap cuticle hardly peeling, cinnabar red with a whitish tinge; gills adnexed to subdecurrent, medium spaced, forked and anastomosing, strongly interveined, cream then ochre; stem 30-80 x 10-25 mm, firm, pruinose, white, slightly greyish and yellowing when old and bruised; smell of honey; taste acrid; sp deposit ochre (IIIbc). Sp 6.5-8.5 x 6-7.5 μm , with isolated warts or a few crests (fig. 143F); dcy exuding very small red drops after treatment with fuchsin; primordial hyphae absent. In deciduous forests with *Betula*, *Quercus* and



Spores: A: *Russula laeta*, B: *R. carminipes*, C: *R. melitodes* (from holotype), D: *R. integriformis* (from holotype), E: *R. rutila*, F: *R. rubra*, G: *R. paludosa*.

Fagus; summer to autumn; rare in temp.; DK (EN), NO (EN). – Bres 415, E&M cover, Sar 1:773, 775, Schff 63, Ves 419.

R. rubra (Lam.: Fr.) Fr. (*R. pungens* Beardslee, *R. kavinae* Melzer & Zvára)

- Taste mild or if slightly acrid then mycorrhizal with conifers 14
14. Mycorrhizal with conifers, especially with *Pinus* on poor soil, in arc./alp. also with *Betula*; stem usually faintly flushed with red in most part, more rarely white, 60-130 x 15-35 mm. Cap 60-120 mm, convex to slightly depressed, shining, bright red, margin sometimes paler, centre or whole cap sometimes discolouring to ochraceous; gills cream then ochre; taste mild, when young often slightly acrid; sp deposit pale ochre (IIIb). Sp 8-11 x 7-9 μm , verrucose to echinulate with few to many connections and crests (fig. 143G); dcy long, septate, 4-7 μm broad, with scattered incrustations; primordial hyphae absent. Summer to autumn; common in temp.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 895, Phil 23e, R&H 547, Sieniop 76, Ves 402, ☉.

R. paludosa Britzelm. (*R. elatior* Lindblad)

- Mycorrhizal with deciduous and coniferous trees, especially with *Betula* on better soil; stem white but often with a pink flush near the base, 30-80 x 10-15 mm. Cap 30-80 mm, with smooth to somewhat sulcate margin, mat when dry, blood red, red, brownish red or brownish pink, centre blackish or pale ochraceous to buff or pale olivaceous; smell insignificant; taste mild; sp deposit ochre (IIIb). Sp 6.5-9 x 6-7 μm , verrucose to echinulate, with spines up to 0.8 μm , connections few or absent (fig. 144A); dcy long, septate, with scattered incrustations; primordial hyphae absent. Summer to autumn; common in temp.-bore., in FI north to OP; DK (LC), FI (LC), NO (LC), SE (LC). – Phil 42b, R&H 547, Sar 2:1047, 1048, Schff 31, Ves 403. *R. velenovskiji* Melzer & Zvára

Key K: Sect. *Polychromae* Maire subsect. *Integriforminae* Bon and *Melliolentinae* Singer

1. Frb distinctly greying when old; stem tall compared to cap diam. 2
 - Frb yellowing or unchanging when old; stem short compared to cap diam. 4
2. Sp echinulate, most spines isolated; frb incl. gills strongly greying. Cap 40-100 mm, with smooth margin, rather firm, pale to dark orange, reddish orange or brownish orange; gills strongly interveined, cream to ochraceous, edge blackening; stem 30-120 x 15-25 mm, often remarkably long, cylindrical, often rugose; flesh slightly reddening when cut then greying; sp deposit deep cream to pale ochre (IIc-IIIa). Sp 9-14 x 8-11 μm , echinulate, spines up to 1.5 μm , connections few (fig. 144B); dcy non- or 1-septate, not incrustated. In coniferous forests, especially with *Pinus*, but in suba. with *Betula*; summer to autumn; common in temp.-suba., rare in arc./alp., in DK rare, but occasional in WJyl; DK (LC), FI (LC), NO (LC), SE (LC). – R&H 534, Sar 2:949, Schff 27, Sieniop 65, Ves 400, ☉.
 - R. decolorans* (Fr.: Fr.) Fr.
 - Sp verrucose with \pm complete reticulum; frb except gills slightly greying 3



Spores: A: *Russula velenovskyi*, B: *R. decolorans*, C: *R. rivulicola* (from holotype), D: *R. vinososordida* (from holotype), E: *R. melliolens*, F: *R. curtipes*, G: *R. carpini*.

3. On moist ground. Cap 30-75(-100) mm, soon depressed, often with an undulate and soon slightly sulcate margin, shining, yellow brown, orange brown, reddish brown, dirty red, wine red, centre usually darkest; gills medium spaced to distant, some forking, pale ochre, edge concolorous; stem 25-80 x 7-25 mm, subclavate, soft, whitish, later greyish or watery blackish grey, base often yellowish brown; smell indistinct; taste in young fruit slightly acrid, later mild; sp deposit pale ochre (IIc-IIIb). Sp 7-9 x 6-7.5 μm , subglobose, partly reticulate, warts rounded (fig. 144C); dcy cylindrical to clavate. Mycorrhizal, especially with *Betula* on better, moist ground; summer; rare in hemib., occasional in bore.-arc. / alp.; FI (LC), SE. – Marst 53, Mic Due 563, Sar 2:952, 954, Sienil 53:72.

R. rivulicola Ruots. & Vauras

- On mesic or dry ground. Cap 50-100(-190) mm, with margin becoming slightly sulcate, red, violet red, red brown, brown, rarely dirty greenish yellow, centre often dark and shining with yellowish patches around; gills crowded, some forking, ochre, edge concolorous, taste slightly to fairly strongly acrid; stem 40-80(120) x 15-30(-35) mm, cylindrical, white, later slightly greyish and with rust-coloured patches; smell weak, of cedar-wood; taste mild; sp deposit ochre (IIIac). Sp 7-8 x 5.5-7 μm , broadly ellipsoid, partly reticulate, warts rounded (fig. 144D); dcy cylindrical to clavate. In forests, especially with *Betula*, rarely with coniferous trees; summer to autumn; common in bore., occasional in hemib.; FI (LC), NO (NE), SE. – Marst 61, Mic Due 559, Sar 1:77, 2:959, 960, Sienil 53:69.

R. vinososordida Ruots. & Vauras

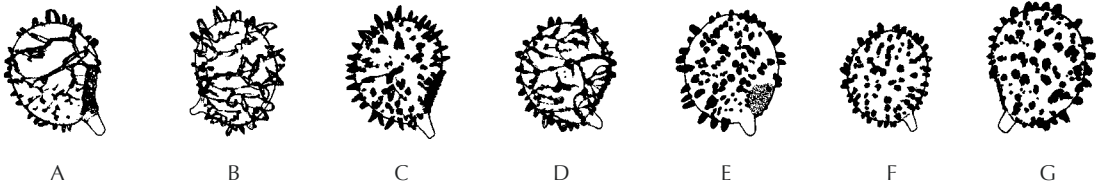
4. Smell characteristic, of honey, especially when dry; sp with hardly visible partial reticulum (fig. 144E). Cap 50-100 mm, with smooth or slightly sulcate margin, shining, from red to orange pink or purple, may be mixed with ochraceous patches; gills forked near stem, pale cream, ochraceous spotted; stem 50-100 x 10-30 mm, white, distinctly browning especially at base; smell of honey, especially when dried; sp deposit cream (IIab). Sp 8.5-11 x 8-9.5 μm ; dcy multi-septate, not incrustated. In deciduous forests on rich soil; summer to early autumn; rare in temp.-hemib.; DK (EN), NO (NE, Østf: Fredrikstad), SE (VU, Og). – Mar 475, Marst 60, Sar 2:919, 920, Schff 225, V&K 29, ☉.

R. melliolens Quél.

- Smell insignificant; sp verrucose to echinulate 5
5. Mycorrhizal with *Fagus*. Cap 50-100(-120) mm, soon depressed, mat, dry, dark vinaceous to brown vinaceous or red with an ochraceous to greenish centre, margin often finely concentrically cracked; gills cream then pale yellow; stem 30-60 x 15-25 mm, firm, white; sp deposit deep ochre to pale yellow (IIIc-IVa). Sp 7-9.5 x 6-7.5 μm , verrucose to echinulate, with crests forming a few meshes (fig. 144F); dcy scattered and weakly differentiated, hardly reacting with SV; apical cell in hyphae of pileipellis attenuated at the apex but often \pm ampulliform at the base. Summer to autumn; occasional in temp., rare in hemib.; DK (LC), NO (NE), SE (NT). – Däh 894, E&M 9, Sar 2:1003, 1005, Schff 35a, Ves 409.

R. curtipes F.H. Møller & Jul. Schff.

- Mycorrhizal with *Carpinus*. Cap 30-90 mm, with smooth or sulcate margin, shining, \pm viscid,



Spores: A: *Russula aurea*, B: *R. romellii*, C: *R. olivacea*, D: *R. alutacea*, E: *R. olivascens*, F: *R. risigallina* var. *ochracea*, G: *R. vitellina*.

reddish orange, brownish orange, orange yellow, red or blood red, more rarely brownish with greenish or ochraceous centre or greyish olivaceous; gills yellow; stem 25-60 x 7-15 mm, often somewhat eccentric, white; sp deposit yellow (IVd). Sp 7.5-10 x 7-8 μm, echinulate, without connections (fig. 144G); dcy multi-septate, not incrustated. Summer to autumn; rare in temp.; DK (vU), SE (NT). – BSMF 74 pl. 2, E&M 5, Marst 57, Sar 2:973, 975, Ves 408. *R. carpini* R. Girard & Heinem.

Key L: Sect. *Polychromae* Maire subsect. *Polychromae* (incl. subsect. *Auratinae* Bon)

1. Gill edge lemon-yellow; whole frb strongly yellowing. Cap 40-90 mm, blood red, red, pink, brownish pink to reddish orange, often partly yellow, convex, firm; gills cream then ochre, edge often lemon-yellow; stem 30-70 x 10-25 mm, rather firm, white but often partly or wholly yellowish; sp deposit ochre to yellow (IIIc-IVb). Sp 7-10 x 6-8 μm, with prominent connections enclosing a ± well-developed reticulum (fig. 145A); pileipellis undifferentiated, without dcy and primordial hyphae. In deciduous forests and rich *Picea* forests; summer to autumn; occasional in temp., rare in hemib.-bore., in NO north to NTr, in SE north to Jmt., in FI north to Ps; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 897, Phil 19d, R&H 548, Sar 2:1073, 1075, Ves 405, ☉.
 - *R. aurea* Pers. (*R. aurata* (With.) Fr.)
 - Gill edge concolorous with gills; frb not or only partly yellowing 2
2. Dcy present, either incrustated, or smooth and weakly reacting to SV 3
 - Dcy absent 5
3. Dcy smooth or incrustated below, normally reacting with SV; sp with a very low, ± complete reticulum see *R. carminipes*, key J 10
 - Dcy smooth and only slightly differentiated and weakly reacting with SV; sp verrucose to echinulate 4
4. Stem longer than cap diam. or of similar size, 60-130 mm long; cap shiny, greasy, not zonate. Cap 60-130 mm, convex or slightly depressed at centre, violaceous, vinaceous or purplish vinaceous, often mixed with grey, at centre yellow or greenish or black, or totally green; gills broad, cream, then yellow; stem 20-30(-40) mm broad, white, later browning; sp deposit yellow (IVd). Sp 6.5-9 x 5.5-7 μm, verrucose to echinulate, with crests forming a partial to almost complete reticulum (fig. 145B); dcy hardly reacting with SV; apical cells in hyphae of pileipellis attenuated in whole length. Especially with *Fagus* and *Quercus* on rich soil; summer to autumn; occasional in temp., rare in hemib.; DK (LC), FI (LC), NO (LC), SE (LC). – FAD 192D, Mar 485, Marst 60, Sar 2:983, 985, Schff 35, ☉.
 - *R. romellii* Maire
 - Stem shorter than cap diam., 30-60 mm long; cap mat, often concentrically zonate see *R. curtipes* Key K 6
5. Pileipellis undifferentiated, without dcy and primordial hyphae 6

- Pileipellis ± differentiated, at least with incrustated primordial hyphae 7
- 6. Sp 8-11 × 7-9 μm, echinulate with isolated spines (fig. 145C); stem when mature with pink zone at top or all over, 50-100 × 20-30(-50) mm. Cap 70-140(-200) mm, low convex, centre depressed, dry, mat, green, greyish or olivaceous green, yellowish green, purplish, brownish purple, vinaceous to brownish vinaceous or purplish red, when mature with characteristic, fine, concentric crackings; gills broad, yellow; flesh violaceous purplish with phenol after minutes; smell insignificant; taste mild; sp deposit yellow (IVcd). Pileipellis of simple, long septate hyphae, terminal cell often ampulliform; dcy and primordial hyphae absent. In deciduous forests; summer to autumn; common in temp., occasional in hemib., in FI only in A and V; DK (LC), FI (EN), NO (NT), SE (LC). – Däh 892, Phil 33e, R&H 546, Sar 2:1460, 1462, 1464, Ves 408, ☉.
R. olivacea (Schaeff.) Pers. (*R. alutacea* (Pers.: Fr.) Fr. s. J.E. Lange)
 - Sp 8.5-11 × 8-9.5 μm, with many crests or partially reticulate (fig. 145D); stem 40-70 × 15-30 mm, white, sometimes with a pink flush on the lower half, slightly browning. Cap 50-120 mm, with smooth margin, purplish red, vinaceous red or brownish red, centre discolouring to ochre or olivaceous yellow; gills distant, yellow; smell slightly fruity; flesh violaceous purplish with phenol after minutes; smell insignificant or slightly fruity; taste mild; sp deposit yellow (IVbc). Pileipellis of simple, long septate hyphae, terminal cell often ampulliform, dcy and primordial hyphae absent. Mycorrhizal with *Fagus* and *Quercus* on rich soil; easily confused with related species and distribution poorly known; very rare in temp.; DK (NE), NO (LC), SE (NE). – Cet 189, Mar 139, Phil 33f, Sar 2:1467, 1470.
R. alutacea (Pers.: Fr.) Fr. s. Melzer & Zvára
- 7. Cap yellow, olivaceous or green 8
 - Cap red, pink, lilac, violet or purple, sometimes mixed with yellow or green 11
- 8. Mycorrhizal with *Picea* and *Pinus*. Cap 30-60 mm, with smooth margin, olivaceous yellow to dark olivaceous green, often mixed with brownish and violet; gills yellow to orange; stem 40-70 × 10-15 mm, often tapering below, white; flesh not reacting with SV; smell at stem base often of iodoform; taste mild; sp deposit yellow (IVd). Sp 8-10.5 × 7-9 μm, echinulate with few connections (fig. 145E); primordial hyphae slender, 3-6 μm broad, incrustated. In rich coniferous forests; summer to autumn; occasional in hemib.-bore., in NO north to NTr, in FI north to KS; FI (LC), NO (LC), SE (LC). – E&M 22, Mar 464, R&H 540, Sar 2:1407, 1410, 1412, Schff 38.
R. olivascens Fr. s. Romagnesi non Fries (*R. postiana* Romell, *R. multicolor* Bon)
 - Mycorrhizal with deciduous trees 9
- 9. Cap > 70 mm; stem > 20 mm thick see green forms of *R. olivacea* 6
 - Cap smaller and stem thinner 10
- 10. Mycorrhizal with *Fagus* or *Quercus*. Cap 40-70 mm, with smooth margin, mat, dry, ochre yellow; stem 40-85 × 10-20 mm, white; smell insignificant. Sp (fig. 145F). Otherwise similar to the main variety. A poorly known, more stout and differently coloured variety; summer; FI. – Sar 2:1388.
R. risigallina (Batsch) Sacc. var. *ochracea* (Fr. 1815, non 1838) Knudsen, Ruots. & Vauras (*R. lutea* (Huds.) Gray var. *ochracea* (Fr.) Singer, *R. chaemaeleontina* Fr. var. *ochracea* (Fr.) Romagn. comb. inval.)
 - Mycorrhizal with *Betula*, rarely *Picea*. Cap 20-50 mm, shining, with smooth or slightly sulcate margin, viscid, uniformly bright lemon yellow; gills deep yellow; stem 20-40 × 5-10 mm, white; smell slightly acidulous when old; taste mild; sp deposit yellow. Sp 7.5-9 × 6-7.5 μm, verrucose to echinulate, warts isolated or forming a few crests (fig. 145G); primordial hyphae incrustated, up to 5 μm broad. Summer to autumn; occasional in temp.-bore., in FI north to SoL; FI, IS, NO, SE. – Mar 466, R&H 541, Sar 2:1390, 1392, Sieniop 72.
R. vitellina Gray



Spores: A: *Russula roseipes*, B: *R. caerulea*, C: *R. turci*, D: *R. amethystina*, E: *R. pseudointegra*, F: *R. risigallina* var. *risigallina*, G: *R. sericatula* (from holotype).

Note: when Persoon (1801) described *R. vitellina* he simultaneously listed *R. risigallina* as a synonym, thus creating a superfluous name. To use the name a conservation with another type and author will be necessary, a solution we prefer because the name is in general use. The alternatives are either to replace the name with *R. lutea* (Huds.: Fr.) Gray, a very dubious taxon, or to use the recently described replacement name, *R. acetolens* Rauschert, which has not won general acceptance.

- 11. Mycorrhizal with *Pinus* 12
 - Mycorrhizal with deciduous trees 15

- 12. Cap bright red, centre discolouring orange to yellow. Cap 30-60 mm, pink, reddish orange, red, mat, pruinose especially near margin; gills yellow; stem 30-60 x 5-10(-15) mm, partially or totally pink on white background; flesh white; smell at stem base often of iodoform; taste mild; sp deposit yellow (IVc). Sp 7-10 x 6-9 μm , verrucose, with crests (fig. 147A); primordial hyphae voluminous, strongly incrustated. In coniferous forests, associated with *Pinus*, mostly on sandy soils; summer to autumn; rare in temp.-bore.; FI (LC), NO (NT), SE (LC). – Mar 463, R&H 541, Sar 2:1361, 1363, Schff 43a, Sieniop 82.
R. roseipes Bres.
 - Cap bluish, violet, lilac or purplish, mixed with brown and green 13

- 13. Cap almost conical and usually distinctly umbonate, rarely depressed without an umbo. Cap 30-80 mm, dark violet, dark vinaceous or dark purplish, discolouring to dark brown, shining; stem 40-100 x 10-20 mm, rather long, often clavately swollen at base, white; stem surface bright red with SV; flesh mild, cuticle bitter; sp deposit yellow (IVab). Sp 8-9 x 6.5-8 μm , echinulate with spines up to 1 μm and \pm connections and crests (fig. 147B); primordial hyphae sparsely incrustated. Mycorrhizal with *Pinus*, often in grassy localities; late summer to autumn; rare in temp.-bore., with an oceanic distribution in NO; DK (vu), FI (LC), NO (LC), SE (LC). – Däh 891, R&H 543, Sar 2:1445, 1447, Svp 46:17, Ves 417.
R. caerulea (Pers.) Fr. ('*coerulea*', *R. amara* Kučera)
 - Cap not umbonate 14

- 14. Sp 7.5-9 x 6.5-7.5 μm , verrucose, warts low, mostly 0.5(-0.8) μm , with many crests to almost reticulate (fig. 147C); stem base often with strong smell of iodoform when collected. Cap 40-100 mm, broadly depressed, with smooth margin, viscid when moist, mat when dry, \pm pruinose especially near margin, usually dark coloured, dark purplish, bluish violaceous, lilaceous, brown vinaceous, more rarely pale vinaceous to reddish, centre sometimes almost blackish, margin paler, giving an impression of broad zonation; gills yellow; stem 30-70 x 10-20 mm, white, rarely with pink flush, when old slightly yellowing; sp deposit pale yellow (IVa). Primordial hyphae strongly incrustated, up to 7 μm broad. In coniferous forests on acid and sandy soil, especially with *Pinus*; autumn; occasional in temp.-bore.; DK (vu), FI (LC), NO (LC), SE (LC). – Däh 870, E&M 29, Mar 462, Phil 25d, Sar 2:1365, 1376.
R. turci Bres. s. Maire
 - Sp 7.5-9 x 6-7.5 μm , verrucose to echinulate, spines up to 1 μm , mostly isolated, but with a few connections (fig. 147D); smell faintly of iodoform. Cap 40-100 mm, broadly depressed, smooth or when old shortly and slightly sulcate at margin, when wet shining and viscid,

when dry mat, lilaceous red, purplish red, brownish red to dark violet, centre darker and often with an olivaceous tinge, strongly discolouring after rain to yellow; gills yellow; stem 30-80 x 10-25 mm, white or faintly flushed with pink; taste mild; sp deposit deep ochre to pale yellow (IIIId-IVa). Primordial hyphae strongly incrustated, up to 7 μm broad. In coniferous forests, especially with *Picea*; confused and mixed with *R. turci* and distribution and frequency thus poorly known, assumed to be very rare in temp., rare in hemib.-bore.; DK (NE), FI (DD), NO (NT), SE (LC). – Cet 1064, Däh 871, Mar 461, Sar 2:1370, 1372.

R. amethystina Quél.

15. Taste slightly bitter. Cap 40-100 mm, hemispherical to convex, then plane, mat, typically of a pure scarlet or blood red colour, sometimes with discoloured pale areas; gills cream, then ochre; stem 30-70 x 10-25 mm, firm, pure white, very occasionally with a pink flush near base; smell of fruit and menthol; sp deposit ochre to yellow. Sp 7-8.5 x 6.5-8 μm , finely verrucose, with fine connections often forming a few meshes (fig. 147E); some hymenial cystidia partly covered with a gelatinous sheath; a microscopical section becomes red with SV; primordial hyphae conspicuous, 3-4 μm broad, multi-septate, with scattered incrustations. Especially with *Quercus* on clayey ground; summer to autumn; occasional in temp.-hemib., in FI only in V and U, rare in NO; DK (LC), FI (LC), NO (VU), SE (LC). – E&M 23, Mar 458, Phil 17c, R&H 540, Sar 2:1451,1453, Ves 404, ☉.

R. pseudointegra Arnould & Goris

- Taste mild 16
16. Cap 20-50(-70) mm, yellow at centre with pink margin or yellowish orange. Cap convex, mat, margin smooth or slightly sulcate; gills yellow; stem 25-60 x 7-15 mm, white, slightly yellowing with age; smell strong, sweetish-fruity; sp deposit yellow. Sp 7.5-9 x 6-7.5 μm , verrucose to echinulate, warts isolated or forming a few crests (fig. 147F); primordial hyphae incrustated, up to 5 μm broad. Mycorrhizal with *Fagus* and *Quercus*; summer to autumn; temp.-hemib., common in DK, occasional in SE, rare in NO and FI; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 878, E&M 22, Phil 41b, Sar 2:1380, 1382, Schff 43, Ves 404, ☉.
- R. risigallina* (Batsch) Sacc. var. *risigallina* (*R. chamaeleontina* Fr.)
- Cap 50-90 mm, purplish red, vinaceous red, vinaceous brown to brown, sometimes discolouring olivaceous green at centre. Cap convex, mat, near margin pruinose, margin smooth; gills yellow; stem 40-80 x 12-20 mm, white or in places flushed with pink, when old slightly greying; smell insignificant; taste mild; sp deposit yellow (IVb). Sp 7-9 x 6-7 μm , with isolated spines up to 1 μm or with a few connections (fig. 147G); primordial hyphae incrustated, up to 5 μm broad, with scattered incrustations, multi-septate. Mycorrhizal with deciduous trees, especially *Carpinus*; summer; very rare, one record from FI (V: Turku). – Sar 2:1441.
- R. sericatula* Romagn.

Sarcomyxa P. Karst.

STEEN A. ELBORNE & THOMAS LÆSSØE

Monotypic genus; see description below.

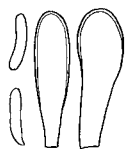
Lit.: Horak 1968, Vellinga in Bas et al. 1995, Watling & Gregory 1989.

Frb pleurotoid or fan-shaped with viscid-slimy cap. Cap 30-100 mm, convex, shell-, fan- or kidney-shaped, with incurved margin, later straight, finely floccose to smooth, viscid when moist, dark olive green, yellowish brown or olive grey, yellow near stem. Gills decurrent, narrow, crowded, yellow orange to pale cream. Stem 5-30 x 8-20 mm, lateral, minutely floccose, pale yellow to ochre yellow, red brown punctate-finely scaly. Flesh thick with gelatinous layer below cap cuticle. Smell indistinct. Taste mild to bitter. Sp deposit white to pale yellow.

Sp 4-6.5 x 1-2 μm , cylindrical to allantoid, smooth (fig. 239G), amyloid. Basidia (2-)4-spored. Cheilo- and pleurocystidia 40-60 x 7.5-16 μm , fusiform to clavate, thin- to slightly thick-walled, sometimes with yellow content. Caulocystidia similar to cheilocystidia or narrower. Pileipellis a tomentum, below this a gelatinous layer of narrow hyphae. Clamps present.

Saprotrophic, solitary or imbricate on standing or fallen trunks of deciduous trees, esp. *Fagus*, *Quercus*, *Betula* and *Alnus*, rarely on conifers; autumn to winter; common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:403, GBW 3:515, Phil 270a, R&H 341, Ves 179, 🕒.

S. serotina (Schrad.: Fr.) P. Karst. (*Panellus* s. (Schrad.: Fr.) Kühner)



Spores and cheilocystidia.

Schizophyllum Fr.: Fr.

HENNING KNUDSEN

Auriculariopsis Maire

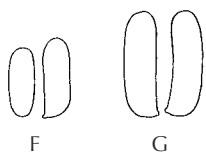
Frb compound, crepidotoid, with split pseudo-gills. Frb disc-, cup- or fan-shaped, enrolled or folded in dry weather, expanded when wet, rather tough. Hymenium pale brown, somewhat waxy, true gills absent, but folds or ribs present; pseudogills arising from sideways merged oblong cups with free margins present in one species. Outside whitish, pubescent or hairy. Stem rudimentary or absent. Smell and taste indistinct. Sp deposit white to pale pink or cream.

Sp ellipsoid to allantoid, smooth, thin-walled, without iodine reactions. Basidia narrowly clavate, 4-spored. Clamps present. Cystidia absent. Hyphae thin- to thick-walled, ± gelatinized.

On dead wood of deciduous and coniferous trees, often in dry and sun-exposed localities.

Two species in the Nordic countries.

Lit.: Eriksson & Ryvarden 1975.



Spores: F: *Schizophyllum commune*, G: *S. amplum*.

1. Frb 10-40 mm, fan-shaped with a short pseudostem. Frb with even margin or more often irregularly lobed, thin-fleshed; underside composed of numerous, sideways merged canoe-shaped cups forming pseudogills with a split, curving edge, covering the underside when dry; upper side pale grey, strongly hairy; underside pale brown, somewhat waxy; context leathery to subcoriaceous, reviving after desiccation, even after years. Sp 4-6 x 1.5-2.5 μm , cylindrical to slightly allantoid (fig. 249F); hairs on upper side thick-walled, elastic, 4-5 μm broad, resembling skeletal hyphae. Saprotrophic on deciduous wood, especially *Fagus* and *Alnus*, rarely on conifers; more rarely found on a number of extreme habitats like whale-bones and also isolated from human beings, in recent times many records from plastic wrapped straw bales, often on sun-exposed trunks and branches; all year round; common in temp., occasional in hemib., rare in southern bore., in NO north to S&F, in FI to EH; DK (LC), FI (VU), IS (Su), NO (LC), SE (LC). – Däh 1006, Phil 269c, R&H 200, Sieniop 294, Ves 126, ⊙. *S. commune* Fr.: Fr.
 - Frb cup- to bell-shaped or almost disc-shaped. Frb 2-20 mm in diam., ± gelatinous; outside tomentose, whitish; hymenium smooth or folded in radial ridges, ochraceous to brown, thin-fleshed. Sp 7.5-10 x 2.5-3 μm , cylindrical to allantoid (fig. 249G); hyphae thin- to thick-walled; tomentum hyphae thick-walled, resembling skeletal hyphae. Saprotrophic on deciduous wood, mainly on dead, sun-exposed, still attached branches and twigs of *Populus* species, incl. cultivated species, all year round; occasional in temp; DK (NT), SE. – BCat 254, Jordst 25(3):5, M&J *Auriculariopsis* 1, ⊙. *S. amplum* (Lév.) Nakasone (*Auriculariopsis a.* (Lév.) Maire)

Simocybe P. Karst.

BEATRICE SENN-IRLET

Ramicola Velen.

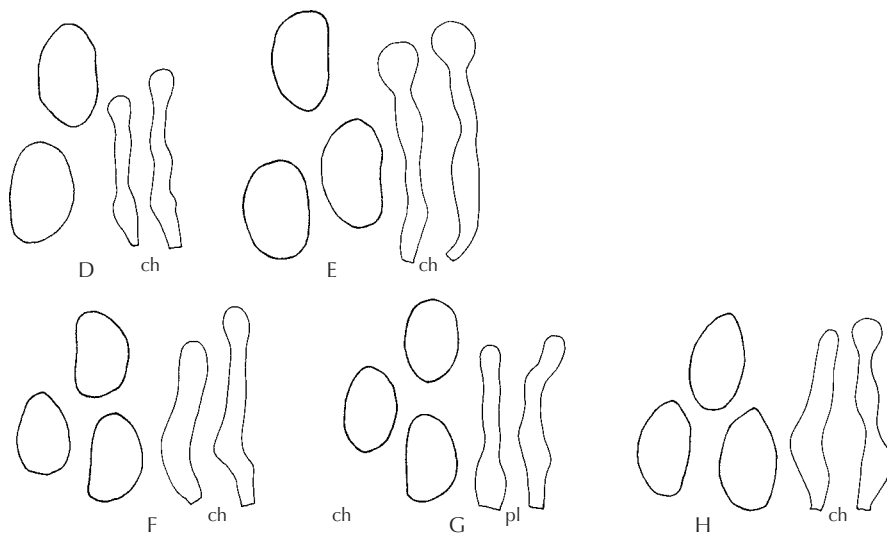
Frb crepidotoid, cyphelloid, mycenoid or collybioid. Cap 2-50 mm, typically pruinose to felty, dry, slightly hygrophanous, greyish brown, buff, honey brown, fulvous, cigar brown to dark brown, often with distinct olivaceous tints. Gills adnexed, lageniform, pale brown to tan brown, edge paler, fimbriate and sometimes exuding droplets. Stem pruinose at top. Veil absent. Smell indistinct. Taste mild, indistinct. Sp deposit tan brown, snuff brown.

Sp reniform, ellipsoid to amygdaloid, without or only with a faint and hardly visible apical pore, moderately thick-walled, smooth, brown, pale honey-coloured, without iodine reactions. Phaeobasidia present. Cheilocystidia, caulocystidia and pileocystidia present, in lower part sometimes with yellowish brown walls or filled with yellowish pigment. Pleurocystidia absent. Trama regular. Pileipellis a complex trichoderm or trichodermal cutis. Pigment incrusting and intracellular. Clamps present.

Saprotrophic on deciduous wood, at the base of grasses or sedges or on soil.

Five species in the Nordic countries. Microscopical examination, especially of the pileipellis, spore size and cheilocystidia is recommended for identification.

Lit.: Bon 1992, Senn-Irlet 1995b, Watling & Gregory 1989.



Spores, pleurocystidia and cheilocystidia: D: *Simocybe haustellaris*, E: *S. sumptuosa*, F: *S. centunculus* var. *centunculus*, G: *S. laevigata*, H: *S. reducta*.

1. Stem eccentric, lateral to lacking; cap 2-20 mm; pileipellis a cutis of repent narrow hyphae with densely packed, erect, geniculate, cylindrical pileocystidia, without vesiculose elements; basidia 2-spored. Cap convex to low convex, vinaceous buff, greyish to olivaceous brown; stem 2-8 x 0.5-2 mm, pruinose, tomentose at base. Sp 7-10 x 4.5-6.5 μ m, Q = 1.35-1.7, broadly ellipsoid, with a slightly tapering apex (fig. 909D); cheilocystidia 25-50 x 3.8-7 μ m, cylindrical to narrowly lageniform, not distinctly capitate. On wood of deciduous trees, often solitary; summer to late autumn; occasional in temp.-hemib., rare in bore., only two records from NO (Akh: Oslo, Troms: Storfjord); DK, FI (LC), NO (NE), SE (LC). – B&K 5:395, Bol Bres 48:19, FAD 125C, Lud 80.5, M&J 3, ⊙.

S. haustellaris (Fr.: Fr.) Watling (*S. rubi* (Berk.) Singer)

- Stem central to slightly eccentric, well developed; cap up to 50 mm; pileipellis with vesiculose, repent hyphae and lageniform to utriform pileocystidia; basidia usually 4-spored

2. On wood 3
 - On sedges and grasses or terrestrial 4
3. Frb collybioid; cap 8-50 mm; pileocystidia numerous, 40-80(-100) x 7-12 μm , often distinctly capitate. Cap convex to depressed, dark brown, teak brown, with an olivaceous tint, later bronze-coloured; stem 10-50 x 4 mm, completely pruinose-flocculose when young, later only in top, bronze brown, darkening from base upwards. Sp 8-9.5 x 5-5.5 μm , Q = 1.5-1.8, distinctly reniform, ellipsoid (fig. 909E); cheilocystidia 33-75 x 5-7 x 8-11 μm , cylindrical, capitate. On wood of deciduous trees, especially *Betula*; summer to autumn; rare in temp.-southern bore.; DK (vU), FI (DD), NO, SE. – B&K 5:397, M&J 3, Phil 229h.
S. sumptuosa (P.D. Orton) Singer
- Frb more slender; cap 5-20 mm; pileocystidia 20-40 x 6-8 μm , cylindrical, broadly lageniform to clavate. Cap 5-20 mm, low convex, brown to fulvous; stem 8-30 x 1-2 mm, completely pruinose or finely fibrillose, concolorous with the cap. Sp 6-8.5 x 4-6 μm , Q = 1.4-1.7, ellipsoid to slightly reniform, with a rounded apex (fig. 909F); cheilocystidia 30-52 x 5-8 μm . On wood of deciduous trees, rarely on *Pinus*; summer to late autumn; occasional in temp.-bore.; DK (LC), FI (LC), NO (NE), SE (LC). – B&K 5:394, GBW 4:440, M&J 1, OPN 11C, ☉.
- S. centunculus* (Fr.: Fr.) Singer var. *centunculus*
 var. *obscura* (Romagn.) Singer differs in having very dark brownish black cap; SE. – M&J 1.
4. Sp broadly ellipsoid to reniform with a rounded apex, 8-9 x 5-5.5 μm , Q = 1.6-1.8 (fig. 909G). Cap 6-15 mm, convex to low convex, fulvous; stem 18-30 x 0.8-1.2 mm. Cheilocystidia 26-43 x 6-10 μm , clavate to cylindrical. At the base of sedges, *Cladium mariscus* or *Phragmites* in fens; summer to autumn; rare in temp.-bore.; DK (DD), FI (DD, PS: Joroinen), SE (LC). – Lud 80.4, ☉.
- S. laevigata* (J. Favre) P.D. Orton
- Sp amygdaloid to ellipsoid, 8.5-10 x 4-5.5 μm , Q = 1.7-2.3 (fig. 909H). Cap 6-10 mm, convex, almost smooth, olivaceous brown to reddish brown; stem 15-20 x 1-2 mm, central, pruinose at top. Sp at times with a visible pore; cheilocystidia 40-62 x 4-8 x 5.5-10 μm , cylindrical to narrowly utriform, occasionally capitate; pileipellis a cutis of broad hyphae, with pileocystidia. Among grasses, on soil, rarely on deciduous wood; spring to autumn; rare in temp.-bore.; DK (DD, Lol: Møns Klinteskov), FI (DD), SE (NE). – FAD 124D, M&J 2.
S. reducta (Fr.: Fr.) P. Karst.

Squamanita Imbach

THOMAS LÆSSØE

Dissoderma (A.H. Sm. & Singer) Singer

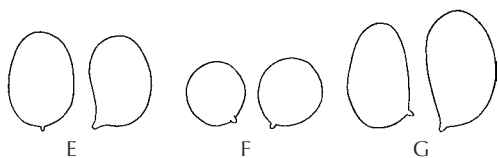
Frb collybioid-tricholomatoid to almost mycenoid, erumpent from ± transformed host tissue. Cap 3-32 mm (to much bigger outside area), strongly fibrillose to recurved scaly, often with appendiculate margin, dry, often with violaceous to blue grey colours. Gills ± sinuate adnexed-adnate with a decurrent tooth, distant to medium spaced, often bluish to violaceous or more greyish. Stem 10-70 x 1.5-5 mm, cylindrical to clavate, mostly with distinct scale girdles, dry, sometimes pruinose-pubescent at the top. Veils present but fugacious, arachnoid, but also host tissues can act as such. Flesh rather thick. Smell absent to very strongly aromatic; lower parts may smell of the host (radish in the case of *S. odorata*). Taste insignificant where recorded. Sp deposit white to whitish or greyish (hyaline spores are produced alongside clusters of pigmented spores).

Sp globose to ellipsoid, amyloid, dextrinoid or without iodine reactions, without germ pore, thin- to slightly thick-walled, initially hyaline, but sometimes becoming coloured. Basidia typically 4-spored, without siderophilic granulation. Hymenial cystidia often present in the form of cheilocystidia. Pileocystidia absent. Pileipellis a trichoderm grading to a cutis. Caulocystidia often present, clavate. Pigments in pileipellis incrusting, vacuolar or parietal. Clamps present. Chlamydospores of a range of types formed within host tissue in some, if not all, species.

Biotrophic; parasitic and ± gall forming on a range of agarics including *Hebeloma*, *Galerina*, *Kuehneromyces* and *Cystoderma* in the area covered; one gall may bear one or several to many *Squamanita* frb. There has been considerable confusion over the morphological characters associated with species of *Squamanita*, mostly caused by including features from the host in the specific descriptions.

Four species in the Nordic countries, five species in the key.

Lit.: Bas 1965, 1994, Gulden et al. 1977, Harmaja 1988, Ludwig 2001, Redhead et al. 1994, Stridvall & Stridvall 1994.



Spores and cheilocystidia: A: *Floccularia rickenii*, B: *Leucopholiota decorosa*, C: *Phaeolepiota aurea*, D: *Pseudobaespora celluloderma*, E: *Squamanita odorata*, F: *S. contortipes*, G: *S. paradoxa*.

1. Frb springing from tuber-like, galled tissue, often more than one from each tuber; smell strongly aromatic-fruity 2
- Frb from only somewhat inflated galled tissue and singly; smell variable, not strongly aromatic-fruity 3
2. Tubers formed on soil in association with *Hebeloma mesophaeum*; without hymenial cystidia. Cap (5-)10-20 mm, convex to low convex, dry, fibrillose-finely scaly to recurved scaly at centre, greyish violet to dark blackish violet; gills broad, sinuate adnate, some forked or branched, distant, pale greyish violet; stem dry with recurved scaly belts, concolorous with cap, top paler; galls 10-30 mm diam., pale brownish yellow; flesh in galls smelling of radish; smell of caps strongly sweet fruity to nauseous, recalling that of *Hebeloma sacchariolens*; taste of cap insignificant. Sp 6.5-9.5 x 4-6 μm, ovoid to broadly ellipsoid (fig. 517E), without iodine reactions; basidia (2-3-)4-spored; clamps present; chlamydospores of irregular shape, involving a clamp, may be present. On galled *Hebeloma mesophaeum* (and allies?) in a variety of habitats, including coniferous and broadleaved woodland, sand dunes and city parks;

autumn; rare in temp.-suba., but probably more widespread than records indicate.; DK (NT), NO (VU), SE (LC). – B&K 4:261, C&D 647, Ger 119, Lud 81.4, Svp 12:67, ☉.

S. odorata (Cool) Imbach

- Tubers formed on rotten wood with *Kuehneromyces*; with prominent cheilocystidia. Frb erumpent in a cluster from a pale yellowish to brown tuberoid gall, to c. 30 mm wide; cap 10-20 mm, convex to indistinctly umbonate, felty and finely scaly, dark violet grey at centre, paler outwards; gills broad, sinuate adnate, distant, whitish to pale violet grey, edge fimbriate; stem 20-30 x 1.5-3 mm, whitish above and finely scaly in white to pale violet grey further down; smell strong and aromatic. Sp (5-)5.5-7 x 4-5 μm , ovoid, obovoid to ellipsoid, hyaline to yellowish, wall slightly thickened, amyloid; basidia (2-)4-spored; cheilocystidia 50-90 x 5.5-8 μm , making the gill edge sterile, narrowly clavate, occasionally with finger-like projections; clamps present; \pm ellipsoid chlamydospores may be formed. Suspected host *Kuehneromyces mutabilis*, but said to grow on *Picea* trunk; summer; only known from holotype in NO (CR, Oppl: Lunner).

S. fimbriata Gulden, Bendiksen & Brandrud

3. Sp amyloid. Cap 5-20 mm, bell-shaped to convex or plane, initially slightly scaly, then innately fibrillose, dark greyish, with or without a lilac or blue tinge, especially at margin; gills adnate to slightly decurrent, grey to dark grey, with or without blue tinge; stem (above mixed parasite/host tissue) 10-40 x 1.5-2 mm, slightly scaly-fibrillose, paler grey than cap; galled basal part 10-50 x 3-5.5 mm, thicker than uninfected stem tissue, smooth, brownish yellow; smell absent; taste somewhat farinaceous. Sp 5-7 x 5-6.5 μm , globose-subglobose (fig. 517F); cheilocystidia 25-55 x 15-20 μm , clavate, present in varying amounts; caulocystidia \pm like cheilocystidia; clamps present. Parasitic on *Galerina* sp., *G. pumila* is commonly co-occurring, in open, non-fertilized grassland; autumn to late autumn; rare in hemib.-southern bore.; FI (DD, EH: Nokia), SE (VU). – BKPM 13:xxx, Jordst 15(1):29, Lud 81.5 (as 4). *S. contortipes* (A.H. Sm. & D.E. Stuntz) Heinem. & Thoen (*S. scotica* Bas nom. prov.)

- Sp dextrinoid

4

4. Cap recurved scaly. Cap 10-25 mm, convex to plane, violaceous; gills sinuate adnate, somewhat veined, distant; stem 20-60 x 3-8 mm, including infected tissue, pruinose on top, below with recurved scaly, violaceous belts, and thereunder a \pm smooth swollen, yellowish infected part; smell at least in some collections strong and unpleasant. Sp 7-10 x 4.5-6 μm , ellipsoid, slightly thick-walled, dextrinoid; basidia (2-3-)4-spored; hymenial cystidia absent; clamps present; thick-walled, globose chlamydospores may be formed on infected tissue. Suspected host *Cystoderma amianthinum* in rather open habitats; autumn; DE, UK. – B&K 4:262, FM 6(1): 10, Lud 81.6 (as 5).

S. pearsonii Bas

- Cap appressed fibrillose. Cap 9-32 mm, hemispherical, convex to almost funnel-shaped, sometimes umbonate, dry, with appendiculate margin, greyish violet; gills \pm sinuate adnate to slightly decurrent, distant to medium spaced, some forked or veined, pale greyish violet; stem above parasitized part 10-30 x 2.5-3.5 mm, finely scaly in belts, pale greyish violet, parasitized part 25-35 x 8-9 mm, brownish yellow, mealy-granulose; flesh as if grafted onto the basal galled flesh when seen in longitudinal section; smell faintly fruity like oranges or of fresh laundry; taste insignificant. Sp (7-)8-10(-11) x (4-)4.5-5(-6) μm , ellipsoid (fig. 517G), dextrinoid; basidia 4-spored; hymenial cystidia absent; clamps present. On *Cystoderma amianthinum* in open mossy habitats, natural pastures and rich *Picea* forests; autumn; very rare in temp.-bore.; DK (EN, EJyl: Gærum Hede, Kærsgård Strand), FI (DD), NO (EN), SE (VU). – Blekks 95:xxx, FM 6(1):11, Jordst 15(1):27, Lud 81.2, Svp 19:36, ☉.

S. paradoxa (A.H. Sm. & Singer) Bas

Note: *S. umbilicata* Harmaja and *S. basii* Harmaja described from Finland would appear to differ in such minor characters that they probably can be synonymized with *S. paradoxa*.

Stagnicola Redhead & A.H. Sm.

GRO GULDEN

Monotypic genus; see description below.

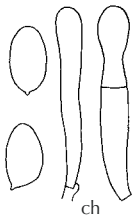
Lit.: Laber & Marklund 1992, Redhead & Smith 1986, Stridvall & Stridvall 1996.

Frb mycenoid. Cap 5-25 mm, hemispherical-conical, initially with incurved margin, becoming bell-shaped to conical with a distinct umbo or papilla, with translucently striate margin, smooth, lubricous-viscid, fulvous to sienna, at margin ± yellow, fading to pale orange yellow. Gills when young ascending and adnexed to narrowly adnate, later with a decurrent tooth, ventricose, crowded, when young lemon yellow, later honey coloured to cinnamon brown or with an olivaceous tinge. Stem 15-50 × 0.5-2 mm, cylindrical or faintly bulbous at base, often deeply rooting but without a pseudorrhiza, cartilaginous-elastic, shiny, at top ochraceous to fulvous and finely pubescent, at base reddish brown to blackish, with saffron to ochre basal mycelium. Smell not distinctive; taste ± bitter. Sp deposit pale hazel brown to milky coffee brown.

Sp 5-6(-6.5) × 3-4(-4.5) μm, ellipsoid, smooth (fig. 909I), without a germ pore, almost hyaline, cyanophilous, without iodine reactions. Basidia 4-spored. Cheilocystidia 25-55 × 5-7 μm, cylindrical to narrowly clavate or subcapitate, numerous. Pileipellis a thin ixocutis of narrow (2.5-4.5 μm broad) hyphae overlying a subpellis of 10-20 μm broad hyphae with ± isodiametric cells and yellow brown parietal pigment. Clamps present.

Saprotrophic, gregarious on rotting plant remains often ± buried needles, leaves, twigs or wood chips, in moist to wet sites such as bogs, ditches, temporary pools, in acid coniferous forests, often among *Sphagnum*; autumn; very rare in bore., in Europe montane-boreal; FI (DD), SE (LC). – Lud 82.1, ZM 58:56a, ⊙.

S. perplexa (P.D. Orton) Redhead & A.H. Sm. (*Phaeocollybia* p. P.D. Orton, *Naucora cidaris* Fr. var. *minor* (Fr.) Sacc.)



Spores and cheilocystidia.

Strobilomyces Berk.

HENNING KNUDSEN & ANDY TAYLOR

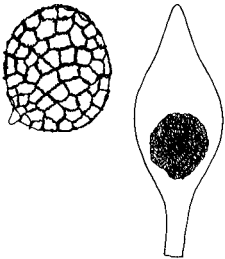
One species in the Nordic countries; see description below.

Frb boletoid with grey to black tubes. Cap 60-150 mm, convex, with cm-large, fibrous, greyish to black scales on a whitish background, with overhanging remnants of the membranous, whitish veil at margin. Tubes and pores angular, greyish white, reddish when bruised, then browning. Stem 80-150 x 10-20 mm, cylindrical, with a pale greyish ring zone, above ring zone pale greyish, below concolorous with cap and covered with a copious tomentum and scales. Flesh white, reddish when cut, finally browning. Taste and smell indistinct or slightly acidulous. Sp deposit dark grey.

Sp 10-12 x 8.5-11 μm , subglobose, distinctly reticulate (fig. 173C), dark brown. Cheilo- and pleurocystidia present in tubes and pores. Clamps present.

Ectomycorrhizal with *Fagus* or *Quercus*, solitary or few together in deciduous forests on rich soil; late summer to autumn; occasional in temp., rare in hemib., in SE north to Upl, in NO very rare, north to Hord: Ulvik; DK (LC), NO (EN), SE (NT). – Däh 17, GBW 2:293, Phil 286b, R&H 209, Ves 128, ⊙.

S. strobilaceus (Scop.: Fr.) Berk. (*S. floccopus* (Vahl: Fr.) P. Karst.)



Spores and hymenial cystidia.

Strobilurus Singer

GRO GULDEN

Pseudohiatula Singer

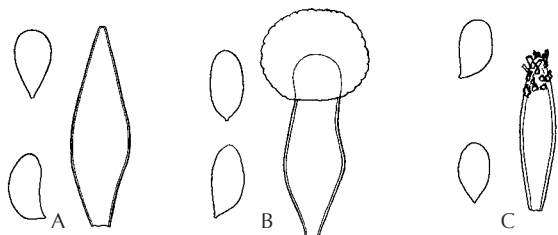
Frb collybioid to marasmioid, on cones. Cap 5-40 mm, smooth, mat, brown, grey or whitish. Gills free to adnexed, crowded to very crowded, whitish. Stem 30-80 x 1.5-2.5(-3) mm, cartilaginous, fistulose, glabrous, whitish at top, below more like the cap, with a basal, often long pseudorrhiza emerging from cones, base and pseudorrhiza with rusty brown or ochre mycelial coating. Smell insignificant. Taste mild or bitter. Sp deposit white.

Sp ellipsoid, smooth, hyaline, without iodine reactions, non-cyanophilous. Cheilo- and pleurocystidia scattered, lageniform-capitate or lageniform-fusiform, thin- or thick-walled and with ± amorphous or crystalline exudates at apex. Pileo- and caulocystidia present, the latter also present on the pseudorrhiza and there extraordinary long and forming the coating. Pileipellis a hymeniderm of spheropedunculate cells with intracellular pigment. Clamps absent.

Saprotrophic. On fallen, often buried cones of *Picea* and *Pinus*. Autumn through mild winters and with fruiting maximum in early spring to early summer. *S. esculentus*, is known to be edible and tasty.

Three species in the Nordic countries.

Lit.: Anderson 1978, Favre 1939, Gulden 1966, Tuomikoski 1953.



Spores and pleurocystidia: A: *Strobilurus tenacellus*, B: *S. stephanocystis*, C: *S. esculentus*.

1. Taste bitter; cap margin translucently striate; cystidia fusiform, thin-walled, with ± amorphous exudates at apex (fig. 263A). Cap 10-25 mm, convex-plane or faintly umbonate, ochre brown, brown to grey brown; gills whitish; stem 30-80 x 1.5-2.5 mm, greyish or brown from base upwards, white at top. Sp 4.5-5.5 x 2-2.5 μm, narrowly ellipsoid; cystidia 35-60 x 6.5-18.5 μm. On cones of *Pinus*, rarely *Picea*, in forests and parks; early spring to autumn, with peak in May-June; occasional in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:407, Däh 338, Lud 83.3, Phil 125f.
S. tenacellus (Pers. : Fr.) Singer
- Taste mild; margin usually not striate; cystidia capitate, thick-walled 2
2. On cones of *Pinus*; cystidia with thick necks and with fine exudates at apex, 40-65 x 9-17 μm (fig. 263B). Cap 10-25 mm, convex, ochre to dark yellow brown; gills whitish, stem 40-60 x 1-2 mm, yellow brown to rusty brown from base upwards. Sp 4.5-7.5 x 2.5-4 μm, ellipsoid. In forests and parks; early spring to autumn, with peak in April-May; common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:406, Lud 83.1, M&J 1, R&H 337, ⊙.
S. stephanocystis (Hora) Singer
- On cones of *Picea*; cystidia with narrow necks, crested with crystals, 23-78 x 6-17 μm, rather slender (fig. 263C). Cap 10-40 mm, dark brown, horn grey, occasionally whitish; gills whitish; stem 30-60 x 1-3 mm, whitish at top, downwards ± grey to brownish. Sp 4.5-6.5 x 2.5-4 μm, ellipsoid. In forests, early spring and autumn, with peaks in May and Oct.; very common in temp.-bore., common in coniferous suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:405, Däh 339, Lud 83.2, M&J 1, R&H 337, ⊙.
S. esculentus (Wulfen : Fr.) Singer

Stropharia (Fr.) QuéL.

SVENGUNNAR RYMAN

Frb collybioid to tricholomatoid, with viscid cap and a membranous ring. Cap 10-150(-200) mm, glabrous or white floccose, viscid to slimy, rarely almost dry, white, yellowish, brownish or greenish, not or only slightly hygrophanous. Gills pallid, then usually brownish or blackish, often with a lilac tinge, usually with a white edge. Stem dry or viscid to slimy, with ± distinct ring. Smell usually indistinct. Taste mild. Sp deposit purple brown, lilaceous black or purplish black.

Sp ellipsoid, ovoid to amygdaloid, smooth, thick-walled, with a distinct germ pore, yellow brown. Cheilocystidia present, sometimes as chrysocystidia. Pleurocystidia usually present as chrysocystidia, clavate with mucronate apex or lageniform. Pileipellis usually one-layered, if two-layered subpellis with cylindrical hyphae. Acanthocytes usually present in stem base mycelium, but absent in e.g. *S. luteonitens*. Clamps present.

Saprotrophic on soil, on dung, in grass, among mosses or on rotten wood.

16 species in the Nordic countries, 17 species in the key.

Lit.: Jancke 1984, Kytövuori 1999, Noordeloos in Bas et al. 1999, Watling & Gregory 1987.

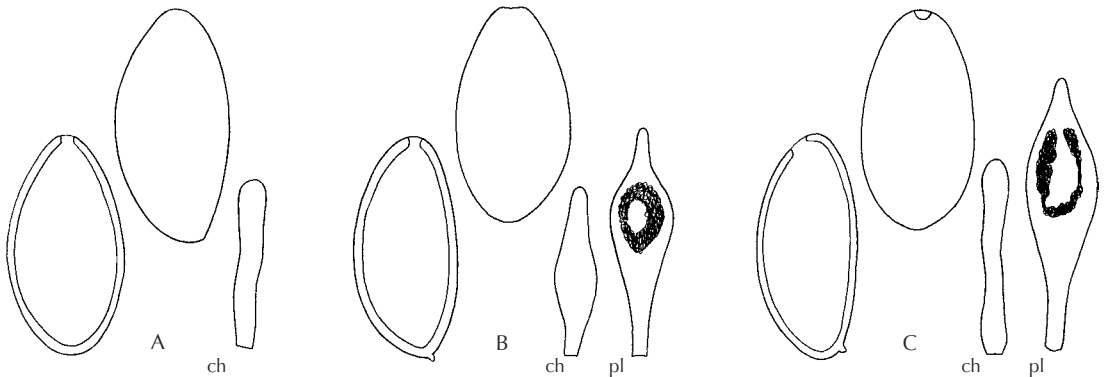


Fig. 851. Spores, cheilocystidia and pleurochrysocystidia: A: *Stropharia luteonitens*, B: *S. semiglobata*, C: *S. dorsipora*.

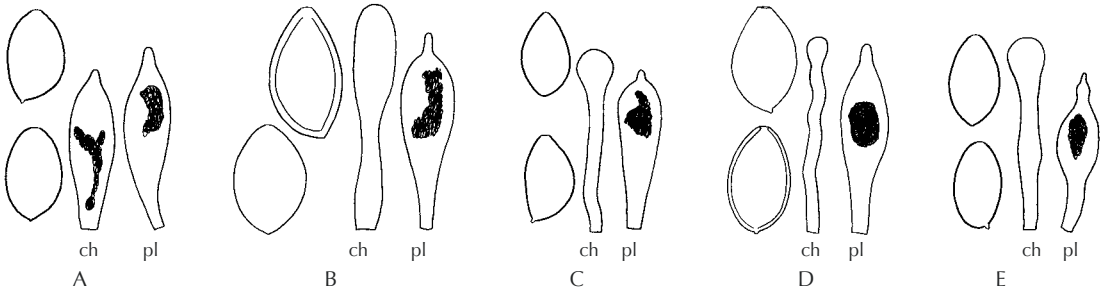


Fig. 853. Spores, cheilocystidia and pleurochrysocystidia: A: *Stropharia cyanea*, B: *S. alpina*, C: *S. aeruginosa*, D: *S. pseudocyanea*, E: *S. inuncta*.

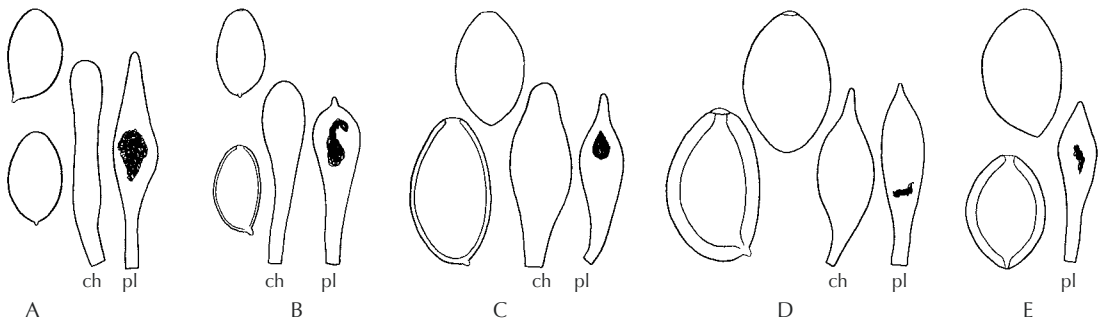


Fig. 855. Spores, cheilocystidia and pleurochrysocystidia: A: *Stropharia albonitens*, B: *S. coronilla*, C: *S. hornemannii*, D: *S. rugosoannulata*, E: *S. melanosperma*.

1. Stem viscid to slimy below ring 2
 - Stem dry below ring 7
2. Basidia 2-spored; cap often reddish yellow at centre. Cap 10-30 mm, conical, later with a papilla or umbo, viscid to slimy, slightly hygrophaneous, striate at margin, honey yellow to reddish yellow at centre, pale straw yellow towards margin; gills brownish-blackish with a white edge; stem 50-100(-150) x 1-3 mm, dry and whitish above, viscid and ochraceous below the often incomplete ring, often somewhat rooting and occasionally with pseudosclerotia; smell unpleasant. Sp 16-20 x 9.5-12 μm , ellipsoid (fig. 851A); cheilocystidia cylindrical to clavate, 3-7.5 μm broad at apex; pleurocystidia absent. Among grasses in pastures, gardens, etc., not on dung; summer to autumn; rare in temp.-suba., in FI only known from three localities; DK (DD), FI (CR), FO, IS, NO (LC), SE (LC). – FAD 141A, K&M 54:1, M&H 4:257, Ri 63:6.
S. luteonitens (Vahl: Fr.) Quél. (*S. umbonatescens* (Peck) Sacc.)
- Basidia 4-spored; cap not reddish yellow at centre 3
3. Chrysocystidia absent. Cap 10-50 mm, subglobose to convex, viscid to strongly slimy, ochraceous at centre, straw yellow towards margin; gills blackish-brownish, with a white edge; stem 20-50 x 2-5 mm, with a clavate, up to 7 mm broad base, dry and whitish pruinose above, slimy and straw yellow below the thin but distinct ring. Sp 13.5-18 x 7.5-10 μm , ellipsoid to slightly ovoid; cheilocystidia narrowly clavate, 4-13 μm broad at apex; pleurocystidia absent. On dung, e.g. horse dung; autumn; rare in suba.; IS.
S. islandica Kytöv.
- Chrysocystidia present 4
4. Sp on av < 8.5 μm broad. Cap 10-55 mm, subglobose to hemispherical, later expanded, viscid to strongly slimy, ochraceous at centre, straw yellow towards margin; gills greenish blackish, with a white edge; stem 30-170(-220) x 2-5 mm, basally widened to up to 7 mm, dry and whitish pruinose above, strongly slimy and pale yellow below the thin, rudimentary ring. Sp 12.5-16.5 x 7-8.5 μm , ellipsoid; cheilocystidia narrowly clavate, 4-7.5 μm broad at apex; pleurochrysocystidia broadly fusiform. On dung of elk, but also collected on hare droppings; late spring to late autumn; common in hemib.-suba.; FI (LC), NO (LC), SE (LC). – Lud 84.12, R&H 441 (as *semiglobata*), Sieniop 275.
S. alcis Kytöv.
- Sp on av > 8.5 μm broad 5
5. Chrysocystidia abundant on stem. Cap 10-45 mm, subglobose to hemispherical, later expanded, viscid to strongly slimy, ochraceous at centre, straw yellow towards margin; gills greenish-blackish to blackish brown with a white edge; stem 30-150 x 2-5 mm, basally widened to up to 7 mm, dry and whitish pruinose above, strongly slimy and pale straw yellow below the thin, rudimentary ring. Sp 15.5-21 x 9-11.5 μm , ellipsoid (fig. 851B); cheilocystidia narrowly lageniform, 3-6 μm broad at apex; pleurochrysocystidia broadly clavate. Mostly on dung of horse and cow, but also on dung of e.g. sheep and elk, and on manured soil; spring to late autumn; very common in temp.-hemib., common in bore.-arc./alp., presumably decreasing in FI; DK (LC), FI (LC), FO, IS, NO (LC, incl. SvB), SE (LC). – FAD 142A, 142D, Lud 84.11, M&H 4:253, 254, Phil 250a, Ves 310, ☉.
- S. semiglobata* (Batsch: Fr.) Quél. (*S. stercoria* (Schumach.: Fr.) Quél.)
- Chrysocystidia absent from stem 6
6. Sp with a central germ pore. Cap 5-30 mm, subglobose to convex, viscid to slimy, straw yellow at centre, paler towards margin; gills blackish brown with a white edge; stem 10-50 x 1-3 mm, basally widened to up to 6 mm, dry and whitish pruinose above, viscid to slimy and pale straw yellow under the very thin ring. Sp 13-16.5 x 8-10 μm , ellipsoid; cheilocystidia


narrowly clavate, 3.5-5.5 μm broad at apex; pleurocystidia fusiform. On dung; autumn; very rare in suba.; IS (Nm).

S. arctica Kytöv.


- Sp with an eccentric and/or dorsal germ pore (fig. 851C). Cap 5-25(-40) mm, hemispherical to convex, viscid to slimy, straw yellow to yellowish-brownish; gills brownish-blackish with a white edge; stem 20-100 \times 2-4 mm, basally widened to up to 5 mm, viscid below the distinct ring, straw yellow. Sp 16-20.5 \times 9-11.5 μm , ellipsoid; cheilocystidia \pm cylindrical, 3-7 μm broad at apex; pleurochryso-cystidia clavate, usually mucronate. Mostly on horse dung, but also on cow dung and manured soil; spring to late autumn; occasional in temp.-hemib., rare in bore.-suba., very rare in NO, only few recent records in FI; DK (DD), FI (CR), NO (DD), SE (LC).

S. dorsipora Esteve-Rav. & Barrasa

- 7. Cap with greenish or bluish colours, often partly fading to yellowish 8
- Cap white, yellow, brown or greyish violet 11


- 8. Cheilochryso-cystidia present (fig. 853A); gill edge not white. Cap 30-100 mm, convex, later expanded, slimy, when young white floccose near margin, green to bluish green, rather soon fading to yellowish, at least in patches; gills pale brownish; stem 30-120 \times 4-15 mm, green to bluish green with a rather ephemeral ring, often with white strings of mycelia at the base. Sp 7-10 \times 4-5.5(-6) μm , ellipsoid to ovoid; cheilochryso-cystidia clavate to broadly fusiform, apex mucronate; pleurochryso-cystidia broadly fusiform. In deciduous forests on rich soil, esp. of *Fagus* and *Alnus*, also on rotten wood and in pastures, but more often in man-made habitats as roadsides, gardens, on compost, etc.; late summer to autumn; common in temp.-suba.; DK (LC), FI (LC), IS (Na, Au), NO (LC), SE (LC). – B&K 4:455, C&D 1268, HJ 194, R&H 442, Ves 308, .

S. cyanea (Bull.) Tuom. (*S. caerulea* Kreisel)

- Cheilochryso-cystidia absent; gill edge white, at least when young 9
- 9. Sp 8.5-11 \times 5.5-7 μm (fig. 853B). Cap 20-60 mm, convex, later expanded, slimy, when young white floccose near the margin, greenish blue, soon fading to greenish yellow; gills dark chocolate brown with a white edge; stem 30-80 \times 3-10 mm, at least when young with a ring-like zone and white floccose below the ring. Sp ovoid; cheilocystidia \pm clavate, 5-11 μm broad at apex; pleurochryso-cystidia clavate with mucronate apex or lageniform. In open *Racomitrium* heathland; summer to autumn; common in suba.-arc. / alp. in IS, elsewhere occasional in arc. / alp.; FO, IS, NO (LC). – .

S. alpina (M. Lange) M. Lange

- Sp 4-5.5(-6) μm broad 10

- 10. Cheilocystidia 8-10 μm broad at apex, clavate-capitate (fig. 853C). Cap 30-60(-100) mm, convex, later expanded, slimy, when young white floccose, especially near the margin, greenish to bluish green, when old often fading yellowish in patches; gills dark brown with a violet tint and a white edge; stem 50-100 \times 4-8 mm, with a prominent ring, smooth and white above, pale green and white floccose below the ring, often with white strings of mycelia from the base. Sp 7-9(-10) \times 4-5.5(-6) μm , ellipsoid to slightly amygdaloid; pleurochryso-cystidia clavate with mucronate apex or lageniform. On soil, debris and wood remnants in both coniferous and deciduous forests, sometimes among mosses in margins of pastures, usually on \pm acid soil; early to late autumn; common in temp.-bore., occasional in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:453, C&D 1267, Däh 601, R&H 442, Ves 308, .

S. aeruginosa (Curtis: Fr.) Quéf.

- Cheilocystidia 2-7 μm broad at apex, \pm capitate (fig. 853D). Cap 20-40 mm, convex, later expanded, often umbonate, slimy, usually not floccose at margin, pale bluish green, fading to whitish; gills pale, milky coffee to grey brown, with a white edge; stem 40-100 \times 2-5 mm,

with a rudimentary, soon disappearing ring, pale and sometimes white floccose below the ring-zone; smell of newly ground pepper. Sp 7-10 x 4-5.5(-6) μm , ellipsoid to ovoid; cheilocystidia often in small clusters; pleurochrysocystidia clavate with mucronate apex or lageniform. Amongst grasses, e.g. tufts of *Deschampsia cespitosa*, and mosses in moist pastures in dry grassland and in open places in forests; autumn to late autumn; occasional, but locally common in temp.-suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – BSMF 85 Atl. 183, C&D 1269, FAD 140B, Lud 84.6, R&H 443, ☉.

S. pseudocyanea (Desm.: Fr.) Morgan (*S. albocyanea* (Fr.) Quél., incl. *S. ochrocyanea* Bon)

11. Sp 7-10 μm long 12
 - Sp 9.5-15(-17) long 14
12. Cap greyish violet, on drying yellowish grey. Cap 20-50 mm, convex, often umbonate to conical, later expanded, slimy; gills greyish with a violet tint, with a white edge; stem 40-100 x 3-7 mm, brittle, white, with a rudimentary ring. Sp 7.5-10 x 4-5 μm , ellipsoid to ovoid (fig. 853E); cheilocystidia clavate to capitate; pleurochrysocystidia clavate with a mucronate apex. Amongst mosses and grasses in pastures and open places in forests; autumn to late autumn; common in temp.-suba., in FI rare but locally occasional in hemib.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 4:457, C&D 1270, FAD 141E, R&H 443, Ves 309, ☉.
S. inuncta (Fr.) Quél.
 - Cap white, pale ochraceous to straw yellow 13
13. Cap viscid, pure white, when old sometimes pale ochraceous at the centre. Cap 30-40(-60) mm, convex, later expanded; gills pale greyish with a violet tint, with a white edge; stem 30-80 x 3-7 mm, slender, white with a rather ephemeral, sometimes striate ring. Sp 7-9 x 4-5 μm , ellipsoid to ovoid (fig. 855A); cheilocystidia clavate to capitate; pleurochrysocystidia clavate with a mucronate apex. In tufts of *Deschampsia cespitosa* and other grasses and mosses in pastures and open places in forests; autumn to late autumn; rare in temp.-arc./alp.; DK (NT), FI (NT), NO (LC), SE (LC). – FAD 141 B, Fr 131.2, Lud 84.3, M&H 4:255, Phil 248d.
S. albonitens (Fr.) Quél.
 - Cap almost dry or slightly greasy, pale ochraceous to straw yellow. Cap 20-40(-60) mm, convex, later expanded; gills pale brown then blackish brown with a violet tint, with a white edge; stem 30-50 x 4-7 mm, rather stout, whitish, with a persistent, grooved ring. Sp 7-9.5 x 4.5-6 μm (fig. 855B); cheilocystidia clavate to broadly clavate; pleurochrysocystidia clavate with mucronate apex. Amongst grass at roadsides, in lawns, dune grassland and stubble fields; summer to late autumn; common in temp.-hemib., occasional in bore.-arc./alp., but rare in IS; DK (LC), FI (LC), IS, NO (LC, incl. Svb), SE (LC). – C&D 1272, Phil 249g, M&H 4:258, R&H 441, Ves 310, ☉.
S. coronilla (Bull.: Fr.) Quél.
14. Ring slightly striate on the upper side; stem especially when young densely scurfy from white, shaggy scales below the ring. Cap 50-150(-200) mm, convex, later expanded, viscid to slimy, brownish with a violet tint, sometimes yellowish or white, at margin often with white remnants of veil; gills whitish, then pale greyish with a violet tint and a white edge; stem 50-200 x 5-20 mm, white. Sp 10-13 x 5-7 μm , ellipsoid to amygdaloid (fig. 855C); cheilocystidia cylindrical to clavate or lageniform; pleurochrysocystidia clavate with mucronate apex or lageniform. In mossy coniferous forests, often on and around decaying stumps, but also in subalpine *Betula* forests; late summer to late autumn; very common in hemib.-bore., occasional in temp., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 599, HJ 191, Phil 249e, R&H 444, Ves 309, ☉.
S. hornemannii (Fr.: Fr.) Lundell (*S. depilata* (Pers.: Fr.) P. Karst.)
 - Ring grooved on the upper side; stem smooth or fibrillose below the ring 14

15. Cheilochrysocystidia absent. Cap 50-120 mm, convex, then expanded, often with depressed centre, slightly viscid, yellow, then whitish from margin; gills dark grey, then dark purple black, with concolorous or slightly paler edge; stem 35-60 x 10-25 mm, often tapering at base and with white strings of mycelia, white in top, yellowish below the well developed ring. Sp 9.5-15.5 x 6-7.5 μm , ellipsoid to amygdaloid; cheilocystidia clavate; pleurochrysocystidia clavate to lageniform. Among *Ammophila arenaria* in sand dunes; NL, UK. – C&D 1274.
S. halophila Pacioni
- Cheilochrysocystidia present 16
16. Cap 60-150(-200) mm, convex, later expanded, almost dry, greyish brown or reddish brown, rarely white or yellowish; gills pale greyish with a violet tint, with a white edge; stem 70-200 x 20-35 mm, white, with a distinct ring. Sp 11-15(-17) x 6-8(-9) μm , ellipsoid (fig. 855D); cheilo- and pleurochrysocystidia clavate with mucronate apex. On manured soil, compost heaps, rotting straw, etc., in gardens and cultivated fields, recently introduced; summer to autumn; rare in temp.-hemib; DK (LC), NO (LC), SE (LC). – B&K 4:459, Däh 600, Lud 84.1, Phil 250b, Svp 41:38. – Edible, and sometimes cultivated for food.
S. rugosoannulata Murrill (*S. ferrii* Bres.)
- Cap 30-70 mm, convex, later expanded, whitish, pale yellow at centre; gills pale grey, then greyish black, with concolorous or slightly paler edge; stem 40-100 x 5-13 mm, white or pale yellowish, with a prominent ring. Sp 10-13 x 6.5-9 μm , ellipsoid (fig. 855E); cheilo- and pleurochrysocystidia lageniform with a rostrate apex. In grass on rich soil; recorded by E. Fries in SE (Uppsala), but apparently not collected in later. – B&K 4:458, Cet 1743, GBW 4:414, K&M 53, Lud 84.10.
S. melanosperma (Pers.: Fr.) Gillet

Stropholoma (Singer) Balletto

SVENGUNNAR RYMAN

Stropharia (Fr.) Quél. p.p.

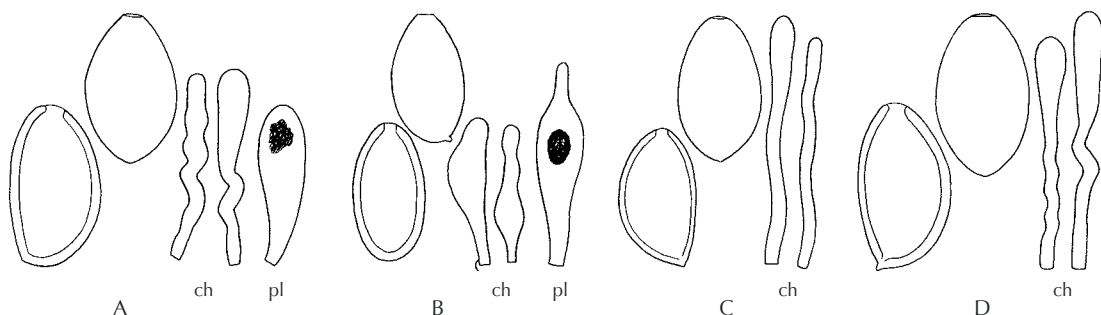
Frb collybioid, with scaly cap and stem. Cap 10-70(-90) mm, viscid, whitish, yellowish, brown or red, hygrophanous or not, usually with small scales and with fibrillose veil remnants at margin. Gills pale brown, then blackish brown, often with a violet or olivaceous tinge. Stem with a prominent ring or ring-like zone, dry, scaly or fibrillose below the ring. Smell and taste indistinct. Sp deposit lilaceous black or purplish black.

Sp ellipsoid to ovoid, thick-walled, smooth, with a distinct germ pore, brown. Cheilocystidia present, often narrow and cylindrical. Pleurocystidia present as chrysocystidia or absent. Pileipellis two-layered, subpellis with globose to elongate cells. Acanthocytes probably always absent from stem base. Clamps present.

Saprotrophic on soil, wood, etc.

Four species in the Nordic countries.

Lit.: Balletto 1989, Kytövuori 1992, Noordeloos in Bas et al. 1999.



Spores, cheilocystidia and pleurochrysocystidia: A: *Stropholoma percevalii*, B: *S. aurantiaca*, C: *S. squamosa*, D: *S. magnivelaris*.

1. Ring absent, stem only with a ring-like zone. Cap 25-70(-90) mm, convex, later expanded, often with an obtuse umbo, slightly greasy, ochraceous yellow to pale brown, with pale yellowish to brownish scales, at margin with fibrillose white or sulphur-yellow veil; gills pale brown, then greyish violet to dark blackish brown with a violet tinge, with a white edge; stem 40-100(-130) x 4-7(-10) mm, whitish to pale yellowish, brownish towards the base or at handling, below the ring zone with darker fibrillose veil patches. Sp 12.5-16 x 7-8.5 μ m, broadly ellipsoid to ovoid (fig. 856A); cheilocystidia cylindrical to narrowly clavate; pleurochrysocystidia scattered or absent. In groups on sawdust, on wood chips in gardens, parks, etc.; late spring to autumn; occasional in temp., rare in hemib.-southern bore., probably increasing; DK (LC), FI (LC), IS, NO (LC), SE (LC). – Jordst 15(1):29, 18(1), Lud 72.1, Sienil 44:101, Svp 19:40, Ves 311.

S. percevalii (Berk. & Broome) Ryman, see p. 913 (*Stropharia p.* (Berk. & Bromme) Sacc.)

- Ring present, but often indistinct 2
2. Chrysocystidia present (fig. 856B). Cap 10-60 mm, conical or convex, later expanded, often with a low umbo, slightly viscid, orange red to dark red, with white floccules of veil at margin when young; gills pale grey, then brown grey with an olivaceous tinge, with a white edge; stem 30-90 x 2-10 mm, up to 15 mm broad at base, whitish, discolouring to orange or orange red from the base, white floccose below the often indistinct ring, often with white strings of mycelia at base. Sp 10-14 x (5.5-)6-8 μ m, ellipsoid to ovoid; leptocystidia cylindrical

cal, sometimes capitate, cheilo- and pleurochrysocystidia broadly clavate with mucronate apex or lageniform. On stumps, wood chips or on rich soil in gardens, parks, etc., probably introduced recently; summer to autumn; rare but probably increasing in temp.-hemib.; DK (NA), NO (AA: Lillesand, Vestf: Re), SE (LC). – C&D 1275, FRIC 1:8, Lud 35.11, Phil 248c, Svp 41:38, ☉.

S. aurantiaca (Cooke) Ryman, see p. 913 (*Stropharia a.* (Cooke) M. Imai, *Psilocybe a.* (Cooke) Noordel.)

- Chrysocystidia absent 3
- 3. Cap slightly or distinctly hygrophanous, with white scales. Cap 10-50 mm, conical to convex, later expanded, slightly viscid, pale yellowish to yellow brownish or orange to reddish; gills first grey brown with an olivaceous tinge, then blackish brown; stem 20-150 x 4-8 mm, pale and pruinose above, darker and densely white floccose below the distinct ring. Sp 11-15 x 6.5-9 μm , ellipsoid to ovoid (fig. 856C); leptocystidia cylindrical; pleurocystidia absent. On rich soil and on rotten wood in deciduous forests; summer to autumn; common in temp., rare in hemib.; DK (LC), NO (LC), SE (LC). – B&K 4:461, C&D 1279, 1280, R&H 444, Sienil 44:100, Ves 311, ☉.
S. squamosa (Pers.: Fr.) Ryman, see p. 913 (*Stropharia s.* (Pers.: Fr.) Quél., *Psilocybe s.* (Pers.: Fr.) P.D. Orton, *Stropharia thrausta* (Schulzer) Sacc., *S. squamosa* var. *t.* (Schulzer) Massee, *Psilocybe s.* var. *t.* (Schulzer) Guzmán)
- Cap not hygrophanous, with yellowish to brownish scales. Cap 20-60 mm, conical to convex, later expanded and then often with a conical umbo, slightly viscid, pale yellowish to yellow brownish, with a paler margin, when young with whitish veil remnants; gills grey brown with a violet tinge, then blackish brown, with a white edge; stem 50-130 x 4-8 mm, up to 15 mm broad at base, white and pruinose above, yellowish fibrillose to scaly below the broad prominent ring. Sp 12-17(-19) x 7-9.5 μm , ellipsoid to ovoid (fig. 856D); cheilocystidia cylindrical to narrowly clavate; pleurocystidia absent. On soil or rotten wood, usually under *Salix* or *Alnus incana* on river banks, but also on refuse heaps in gardens; late spring to early autumn; occasional, but locally common in bore.-suba., in FI with northern distribution, rare in arc./alp.; FI (LC), NO (LC), SE (LC). – Lud 72.5, R&H 445, Sienil 44:97, ☉.
S. magnivelaris (Peck) Ryman, see p. 913 (*Stropharia m.* Peck, *Psilocybe m.* (Peck) Knudsen)

Suillus Adans.

HENNING KNUDSEN & ANDY TAYLOR

Boletinus Kalchbr., *Fuscoboletinus* Pomerl. & A.H. Sm.

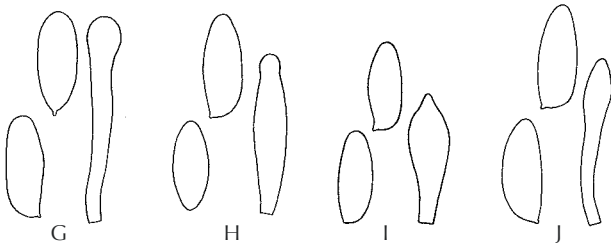
Frb boletoid with yellow to orange tubes. Cap glutinous or viscid, rarely almost dry, smooth or tomentose. Tubes and pores yellow to olivaceous brown, when fresh often exuding whitish droplets. Stem solid or hollow, with or without ring or ring-zone, with glandular dots (sect. *Suillus*) or without glands (sects *Larigni* (Singer) Singer and *Fungosi* (Smotl.) Singer). Sp deposit olivaceous yellow to brown.

Sp elongate, subfusiform, pale melleous to brown, < 15 µm long. Cystidia fasciculate. Pileipellis an ixotrichoderm. Clamps absent in most species.

Ectomycorrhizal with coniferous trees, in sect. *Larigni* (Singer) Singer with *Larix*, in sects. *Suillus* and *Fungosi* (Smotl.) Singer with *Pinus*. Apart from the occurrences in eastern Finland with *Larix*, all species associated with *Larix*, *Pseudotsuga* and 5-needled pines are introduced into the area.

17 species in the Nordic countries.





Lit.: De Jong, Læssøe & Rald 1997, Harmaja 1978b, Muñoz 2005, Rald 2003, Strandberg 1995, Vesterholt 1993.



Spores and hymenial cystidia: G: *Suillus granulatus*, H: *S. variegatus*, I: *S. luteus*, J: *S. grevillei*.

- | | | |
|----|---|---|
| 1. | Stem without a ring or ring-zone | 2 |
| - | Stem with a ring or ring-zone | 7 |
| 2. | Mycorrhizal with 5-needled <i>Pinus</i> | 3 |
| - | Mycorrhizal with 2-needled <i>Pinus</i> | 4 |
| 3. | Cap yellowish with darker brown patches to dark brown. Cap 40-100 mm, convex, sticky to viscid; tubes and pores yellowish, becoming yellowish brown, ± round, adnate; stem 40-120 x 10-25 mm, cylindrical or tapering below, whitish, becoming darker brownish towards the base, at first with milky glandular droplets becoming darker comma-shaped glandular dots, basal mycelium pink; flesh yellow. Sp 8.5-12 x 3.5-4.5 µm, subfusiform. Mycorrhizal in gardens and parks with <i>Pinus wallichiana</i> ; autumn; only known from two records in DK (NE). – B&K 3:49, Sing 1.7, Svp 47:52.
<i>S. plorans</i> (Rolland) Kuntze | |
| - | Cap ± whitish, ivory or yellowish, becoming greyish yellow. Cap 30-100 mm, convex; tubes and pores pale yellowish, fine, round; stem 40-80 x 7-15 mm, cylindrical, with tapering base, whitish to yellowish, especially towards the base, with brownish glandular dots; flesh whitish. Sp 7.5-9 x 3-3.5 µm, subfusiform. Mycorrhizal with <i>Pinus strobus</i> or <i>P. cembra</i> in plantations, parks and gardens on acid as well as more fertile soil; late summer to autumn; very rare in temp., with five records over the last 100 years in DK and one in SE; DK (CR), NO (NE, Busk: Ringerike), SE (LC). – B&K 3:48, Däh 30, Mar 68, Sing 1.6, Svp 31:12, 56:2-3, ⊙.
<i>S. placidus</i> (Bonord.) Singer | |

4. Stem with dark glandular dots; tubes regular, round 5
 - Stem without dark glandular dots; tubes regular or compound and of different size 6
5. Base of stem covered with pink mycelium; mycorrhizal with *Pinus* in dry, sun-exposed, calcareous forests and in gardens. Cap 40-100 mm, convex, sticky to viscid, innately fibrillose, pale to darker brown; stem 50 x 15 mm, golden yellow, all over with darker glandular dots, towards the base more brown; tubes and pores yellow, slightly decurrent, often split in 2-3 smaller pores; flesh whitish, golden yellow in the base, pale yellow over the tubes, pale pink in places when cut. Sp 8.5-9.5 x 3.5-4 μ m. Autumn; very rare in temp.; DK (NT), SE. – B&K 3:43, GBW 2:301, Rim 5:18 (as *flurysi*), Svp 35:24.
S. collinitus (Fr.: Fr.) Kuntze (*Boletus plorans* Rolland var. *eleutheros* Rolland, *Suillus flurysi* Huijsman)
- Base of stem pale yellowish; mycorrhizal with *Pinus* in forests, plantations, parks and gardens on rich, fertile soil. Cap 20-80 mm, convex, viscid, shiny when dry, sienna brown to fulvous, when old more yellowish; tubes and pores pale lemon yellow, exuding whitish milky droplet when young; stem pale yellow to yellow, sometimes darker towards the base, with numerous glandular dots, especially towards top, at first watery-milky, later becoming darker, reddish or brownish; flesh lemon to straw. Sp 8-10 x 2.5-3.5 μ m, subfusiform (fig. 153G). Summer to autumn; occasional in temp.-bore., rare in suba., north to ES in FI, Finnm in NO and Mpd in SE; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:45, Däh 33, Phil 293f, R&H 214, Ves 131, ☉.
S. granulatus (L.: Fr.) Roussel
6. Cap viscid, smooth, 30-100 mm, cinnamon or orange rusty; pores compound, wide, different in size, angular. Cap convex; tubes decurrent, sordid yellow with greyish tinge; stem 40-60 x 5-10 mm, concolorous with cap or slightly paler, without darker glandular dots, tapering and often slightly curved at base; flesh yellow brown. Sp 8-10 x 3-4 μ m, subfusiform. Mycorrhizal with *Pinus* on acid soil, throughout the area where *Pinus* occurs naturally or planted, often in large numbers; summer to autumn; very common in temp.-bore. and coniferous suba.; DK (LC), FI (LC), FO, IS (Su: Fingvellir), NO (LC), SE (LC). – B&K 3:42, Däh 35, Phil 295e, R&H 214, Ves 132, ☉.
S. bovinus (L.: Fr.) Roussel
- Cap dry or greasy, subtomentose or later finely scaly to granulose, 60-130 mm, fulvous, rusty tawny; pores individual, round, fine. Cap convex; tubes adnate or slightly decurrent, at first quite dark olivaceous brown, then paler yellow brown; stem sordid yellow to brownish, when old \pm vinaceous red, 60-100 x 15-20 mm, cylindrical or slightly swollen below; flesh lemon in cap, more fulvous or vinaceous in stem, turning faintly blue in all parts when cut. Sp 7.5-11 x 3-4 μ m, subfusiform (fig. 153H). Mycorrhizal with *Pinus* in dry forests and plantations on acid soil, often solitary or in small numbers; summer to autumn; very common in temp.-coniferous suba.; DK (LC), FI (LC), FO, IS (Su: Fingvellir, Ve: Reykjavík), NO (LC), SE (LC). – B&K 3:52, Däh 35, Phil 293d, R&H 215, Ves 131, ☉.
S. variegatus (Sw.: Fr.) Kuntze
7. Mycorrhizal with *Pinus* or *Pseudotsuga* 8
 - Mycorrhizal with *Larix* 10
8. Mycorrhizal with *Pseudotsuga*. Cap 60-150 mm, convex, finely appressed scaly, greasy or almost dry, yellow brown to rust or rusty tawny; tubes slightly decurrent, yellow to pale ochraceous; stem 60-70 x 10-40 mm, straw to lemon yellow, rust coloured above the ring, darkening below; flesh yellowish to pale, staining greenish below. Sp 8-12 x 3.5-5.5 μ m, subfusiform. In plantations; autumn; DK (NA, Lol: Søllestedgårds Dyrehave 1920). – P&D 16, RdM 38:173, 45:25, 47:121, Sing 1.2.
S. amabilis (Peck) Singer (*Boletinus a.* (Peck) Snell, *S. lakei* (Murrill) A.H. Sm. & Thiers, *Boletinus l.* (Murrill) Singer subsp. *landkammeri* (Pilát & Svrček) Pilát & Dermek)
- Mycorrhizal with *Pinus* 9

9. Ring gelatinous, whitish to yellowish, soon disappering, leaving a narrow band; stem slender, 50-80 x 5-10 mm, above the ring straw to pale ochre, below dull yellowish to brownish. Cap 20-60 mm, \pm umbonate, viscid, sordid yellow, to yellow brown, variegated; tubes and pores yellow, angular; flesh yellow. Sp 8-10 x 3.5-4.5 μ m, subfusiform. Mycorrhizal with *Pinus* in moist, humus-rich places in forests, but even in dry pine heaths, in small groups, also observed above timber-line with *Arctostaphylos*; autumn; common in hemib.-bore., occasional in temp. and coniferous suba., in FI north to InL, in NO to Troms; DK (LC), FI (LC), IS (Ve: Reykjavík), NO (LC), SE (LC). – B&K 3:44, Däh 28, Phil 295d, R&H 212, Ves 132, .
- S. flavidus* (Fr.: Fr.) J. Presl
- Ring thin and broad, membranous, pale violet to brownish, often soon falling off; stem stout, 50-100 x 15-30 mm, cylindrical, above the ring straw, with pale but soon darker brown glandular dots, below the ring whitish with a tinge of violaceous then yellow brown, base darker. Cap 50-110 mm, convex, viscid, fibrillose and shiny when dry, purplish chestnut to yellowish brown; tubes and pores adnate, yellow; flesh white to lemon yellow in cap, vinaceous in stem base. Sp 7-10 x 3-3.5 μ m, subfusiform (fig. 153I). Mycorrhizal in forests with *Pinus*, also planted, often on sandy or acid soil, summer to autumn; very common in temp.-coniferous suba., in FI north to InL, in NO north to Finnm; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:47, Däh 29, Phil 214, R&H 212, Ves 130, .
- S. luteus* (L.: Fr.) Roussel
10. Cap fibrillose or with numerous small to large scales 11
 - Cap smooth, at most with a few scales near the margin 14
11. Cap red 12
 - Cap yellow or brown 13
12. Cap dark carmine red. Cap 30-100 mm, convex, viscid; tubes and pores lemon yellow to pale brown, carmine brown when mature; stem 30-80 x 10-20 mm, yellow above the ring, carmine red below. Sp 11-12 x 4.5-5 μ m, subfusiform; clamps present. Mycorrhizal with *Larix*; summer to autumn; occasional in eastern bore., north to PeP; FI (LC). – Jordst 22(3), M&J Boletinus 1, P&D 15, Sieniop 19, Sing 1.2, .
- S. asiaticus* (Singer) Kretzer & T.D. Bruns (*Boletinus a.* Singer)
- Cap with coarse pinkish grey to reddish brown scales. Cap 40-100 mm, convex, viscid to glutinous beneath the scales, pinkish red to orange red, darkening with age, at margin with gelatinous veil remnants; stem 40-100 x 8-15 mm, solid, yellow and smooth above the gelatinous reddish to reddish brown ring, white beneath, sheathed below by viscid pinkish fibrils; tubes and pores yellow, becoming dull yellowish brown, usually staining pinkish when bruised, angular, elongated and somewhat radially arranged; flesh yellow, slowly staining pinkish, then brown; smell disagreeable or somewhat pungent; taste astringent to acidulous. Sp 9-15 x 4-6.5 μ m, subfusiform, pale yellowish brown; clamps present. Mycorrhizal with *Larix*; summer to autumn; very rare and only known from PeP in FI (DD). – E,D&W 59:11, Jordst 12(3).
- S. spectabilis* (Peck) Kuntze
13. Stem hollow. Cap 30-90 mm, convex, yellowish rusty to sienna; tubes and pores olivaceous yellow; stem 30-80 x 10-20 mm, finely fibrillose or reticulate above the ring, concolorous with cap. Sp 7-10 x 3.5-4 μ m, subfusiform; clamps present. Mycorrhizal with *Larix*, in plantations on nutrient poor, sandy or humus-rich soil, sometimes also on or around stumps or at the base of living trees; early summer to autumn; occasional in temp.-hemib., rare in bore., in NO along the southwest coast north to Sogndal, in SE and FI north to 66°; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:3, Däh 25, P&D 4, MH 1:142, Ves 133, .
- S. cavipes* (Opat.) A.H. Sm. & Thiers f. *cavipes* (*Boletinus c.* (Opat.) Kalchbr.)
 f. *aureus* (Rolland) Singer (var. *aureus* Rolland) differs in the overall bright, golden yellow colour. DK. – Sing 1.2.

- Stem solid. Cap 80-200 mm, convex, dry, covered with pink to reddish, occasionally darker red fibrils and scales, usually overlaid with buff-coloured fibrils when young, margin often bright yellow and appendiculate with veil remnants, incurved at first, becoming decurved and sometimes uplifted with age; tubes and pores yellow to ochre, becoming olive ochre to brownish, angular to elongate; stem 30-50 x 10-30 mm, dry, yellow, often with reddish or brownish stains towards base, veil submembranous, greyish to yellowish, reticulate above ring; flesh pale yellow, unchanging or blueing slightly; smell somewhat acidulous to unpleasant; taste slightly acrid to bitter. Sp 7-10 x 2.5-3.5 μm , subfusiform. Mycorrhizal with *Larix*; summer to autumn; recently recorded from a plantation in easternmost FI (PK). – PhilNA 252 (as *Fuscoboletinus* o.).

S. ochraceoroseus (Snell) Singer (*Fuscoboletinus* o. Snell)

14. Tubes and pores pale ochraceous, then dirty olivaceous grey or grey brown, bruising brownish. Cap 30-100 mm, unequal in size, convex, variegated with sordid light straw, ochraceous and olivaceous grey, turning greenish when bruised; tubes and pores slightly decurrent, compound; stem 50-100 x 10 mm, paler than cap, greenish grey at top, ring olivaceous grey to almost white; flesh yellowish, olivaceous in stem base. Sp 10-13 x 4-5.5 μm , subfusiform. Mycorrhizal with *Larix* on rich soil, most often in gardens and parks; summer to autumn; occasional in temp.-hemib., rare in bore. north to Ks in FI, only known from two localities in NO (Vestf. Re and Hord. Os); DK (LC), FI (LC), NO (NE), SE (LC). – B&K 3:53, Däh 27, Phil 294b, R&H 213, Ves 133, ☉.

S. viscidus (L.) Roussel (*S. aeruginascens* (Opat.) Snell, *S. laricinus* (Berk.) Kuntze)

Note: *S. bresadolae* (Quél.) Gerhold var. *flavogriseus* Cazzoli & Consiglio (*S. nueschii* Singer nom. inval.) has a lemon to darker yellow cap and grey pores developing a yellowish tinge. The relationship between this variety and *S. viscidus* is close but unsettled.

- Tubes and pores yellow or orange 15
15. Tubes and pores orange. Cap 40-160 mm, convex, pale yellowish brown to red brown, towards margin with fine, darker, appressed scales, viscid; stem 40-80 x 10-20 mm, with whitish ring-zone; flesh yellowish to whitish. Sp 9-13 x 4-6 μm , subfusiform. Mycorrhizal with *Larix* in a conifer plantation on acid soil; autumn; DK (NE, WJyl: Marebæk Plt.). – B&K 3:51, GBW 2:309, Mar 231, Sing 1.4, Svp 27:15.

S. tridentinus (Bres.) Singer

- Tubes and pores yellow. Cap uniformly bright yellow, lemon chrome to apricot; pileipellis of smooth hyphae. Cap 30-100 mm, convex, viscid, shiny when dry; tubes and pores slightly decurrent, lemon yellow, rust-coloured when bruised; stem lemon yellow above the whitish membranous ring, below cinnamon to rust-coloured, with an irregular reticulate pattern; flesh whitish to lemon yellow. Sp 8-11 x 3-4 μm , subfusiform (fig. 153J). Mycorrhizal with *Larix*, in plantations, gardens and parks, on sandy, humus-rich or fertile soil, often in large numbers, very rarely associated with *Pseudotsuga*; early summer to autumn; common in temp.-southern bore., occasional in middle bore.-suba., in FI north to InL, in NO north to Finn; DK (LC), FI (LC), FO, IS, NO (LC), SE (LC). – B&K 3:46, Däh 26, Phil 292a, R&H 213, Ves 130, ☉.

S. grevillei (Klotzsch: Fr.) Singer var. *grevillei* (*Boletus elegans* Schumach., *Suillus elegans* (Schumach.) Snell)

var. *clintonianus* (Peck) Singer (*S. clintonianus* (Peck) Kuntze, *S. grevillei* (Klotzsch: Fr.) Singer f. *badius* Singer) differs in the uniformly dark reddish brown cap, the incrustated hyphae in the pileipellis and the possibly slightly larger sp, 8.5-12 x 3.5-4.5 μm . DK, FI (LC), FO, IS, SE. – Jordst 22(3), ☉.

Note: preliminary DNA-results show that the taxonomic differentiation between the two varieties is still unclear.

Tapinella E.-J. Gilbert

HENNING KNUDSEN & ANDY TAYLOR

Paxillus Fr. p.p.

Frb crepidotoid to pleurotoid with yellow-brown gills anastomosing near the stem. Cap felty to velvety, often smooth when old, young margin involute. Gills yellowish, becoming brown, decurrent, separable from flesh. Stem eccentric or absent. Sp deposit rusty brown.

Sp ellipsoid, yellowish, dextrinoid. Cheilocystidia present, but hardly differentiated from basidioles. Pileipellis a cutis. Clamps present.

Saprotrophic on wood of coniferous trees, making a brown rot.

Two species in the Nordic countries.



Spores: A: *Tapinella panuoides*.

1. Stem 20-80 x 15-50 mm, eccentric, short, stout, velvety, dark brown. Cap 80-150 mm, fan-shaped to almost circular, with inrolled margin, sometimes with depressed centre, cinnamon to sienna, sometimes mottled; gills at first pale then ochraceous yellow, finally brown; flesh yellowish; taste acrid. Sp 5-6 x 4 μm, ellipsoid. On decaying coniferous roots and stumps, often solitary or a few together; summer to autumn; common in temp.-southern bore., occasional elsewhere in bore., one record from coniferous suba. in NO; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:63, Däh 104, Phil 208c, 209d, R&H 232, Ves 155, ⊕.
T. atrotomentosa (Batsch: Fr.) Šutara (*Paxillus a.* (Batsch: Fr.) Fr.)
- Stem absent. Cap 20-80 mm, fan-shaped to shell-shaped, with thin and lobed margin, felty, especially towards the base, olivaceous yellow to brownish yellow or brownish; gills yellowish then brownish; flesh pale yellowish. Sp 4-6 x 3-4 μm, ellipsoid (fig. 153A). In coniferous forests, especially on the underside of fallen trunks of *Pinus*, also on mining timber and in moist places in houses; late autumn (indoors all year); common in hemib.-bore., occasional in temp., rare in suba., in FI north to InL; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:68, Däh 105, Phil 208b, R&H 233, Ves 155, ⊕.
T. panuoides (Fr.: Fr.) E.-J. Gilbert f. *panuoides* (*Paxillus p.* (Fr.: Fr.) Fr.)
f. *ionipus* (Quél.) Šutara has a lilac tomentose base. DK.

Tectella Earle

STEEN A. ELBORNE & THOMAS LÆSSØE

Monotypic genus; see description below.

Lit.: Gminder & Krieglsteiner in Krieglsteiner 2001, Singer 1986.

Frb without a true stem, crepidotoid, sessile or attached through a stem-like extension of the cap, with universal veil. Cap 5-20 mm, convex with incurved margin, smooth to scaly or floccose from velar remains, dry to slightly viscid, buff, dull brown to hazel. Gills crowded, radiating from a central to eccentric white spot, ochre to vivid brown. Partial veil membranous, white, at first covering gills completely. Flesh tough, hard when dry, ochre brown, with gelatinous layer. Smell herbaceous. Sp deposit white to cream.

Sp 3-5.5 x 1-1.5 μm , cylindrical to allantoid, smooth (fig. 389G), faintly amyloid. Basidia 4-spored. Cheilocystidia 16-30 x 4-10 μm , clavate to lageniform, subcapitate, thin- to thick-walled. Pileipellis an ixocutis with a gelatinous tramal layer underneath. Hyphae thick-walled with clamps.

Saprotrophic on branches of *Alnus* and *Corylus*; late autumn to spring; rare in bore.-suba.; FI (RE, ES: Lappeenranta), NO (NT), SE. – C&D 155, Cet 1126, GBW 3:520, Lud 60.3, M&J 1, ⊙.

T. patellaris (Fr.) Murrill (*Panellus p.* (Fr.) Konrad & Maubl., *T. operculata* (Berk. & M.A. Curtis) Earle)



ch

Spores and cheilocystidia.

Tricholoma (Fr.) P. Kumm. MORTEN CHRISTENSEN & JACOB HEILMANN-CLAUSEN

Megatracholoma P. Karst.

Frb tricholomatoid. Cap 20-300 mm, convex to plane, often with a broad or in some species acute umbo, glabrous, tomentose or scaly, viscid to dry, whitish, brown, yellow, orange, olive, greenish, greyish to black, not hygrophanous. Gills emarginate, rarely adnate, white, cream or yellow, in some species discoloured to black, brown or yellow at margin. Stem smooth, minutely floccose or woolly banded. Universal veil absent, more rarely present, in one species membranous; partial veil absent, more rarely present. Smell farinaceous in most species, in some species perfume-like, soap-like, honey-like, spicy, gas-like, rancid or indistinct. Taste farinaceous in most species, sometimes rancid or bitter to acrid, more rarely indistinct. Sp deposit white to whitish.

Sp oblong to ellipsoid or subglobose, smooth, hyaline, without iodine reactions. Cheilocystidia mostly present, but little differentiated and of limited taxonomical value. Pleurocystidia absent. Pileipellis an (ixo)cutis or (ixo)trichoderm. Clamps present or absent.

On soil; all species assumed to be ectomycorrhizal with trees and shrubs, several species edible and one species commercially important, few species poisonous. Several species complexes are in need of further studies to be resolved taxonomically; this is e.g. the case for the taxa around *T. saponaceum*, *T. equestre* and *T. pessundatum*. Molecular data show that *T. sulphureum*, including *T. bufonium*, circumscribe several related taxa, but further studies are needed to clarify whether these can be separated based on morphological or ecological characters.

At least 59 species in the Nordic countries, 60 species in the key.

Lit.: Bon 1984, 1991, Christensen & Noordeloos 1999, Comadini et al. 2004, Gulden 1969, Gulden in Hansen & Knudsen 1992, Kalames 2001, Kytövuori 1988, Noordeloos & Christensen in Bas et al. 1999, Riva 1988, 2003.

- | | | |
|----|--|---------------------|
| 1. | Stem with distinct, permanent membranous, woolly or felty ring | Key A p. 413 |
| - | Stem without ring or ring cobweb-like or very thin, indistinct in mature frb | 2 |
| 2. | Cap predominantly white to cream, often yellowing or greying with age, smooth, rarely cracked | Key B p. 414 |
| - | Cap grey, brown, yellow, olivaceous or greenish or densely scaly to felty | 3 |
| 3. | Cap white to grey or almost black, dry and radially fibrillose, finely scaly, felty or scaly | Key C p. 416 |
| - | Cap brown, yellow, olivaceous or greenish, if predominantly grey, then viscid or smooth without radial structure | 4 |
| 4. | Flesh turning pink to red when damaged, especially in stem base; clamps abundant; smell farinaceous or reminding of non-scented soap | Key D p. 421 |
| - | Flesh rarely reddening but then clamps absent; smell farinaceous, gas-like or indistinct | 5 |
| 5. | Cap buff to dark red brown, neither stem nor cap with distinct yellow, olivaceous or greenish tinges | Key E p. 422 |
| - | Cap yellow, olivaceous, greenish or grey; stem often with yellow tinge | Key F p. 426 |

Key A: Large and brownish with a membranous, woolly or felty ring

- | | | |
|----|---|------------------------------|
| 1. | Cap 20-70 mm, whitish to grey, densely felty to faintly scaly; frb fragile | see <i>T. cingulatum</i> C 9 |
| - | Cap 50-200 mm, white to brown, radially fibrillose to scaly; frb firm | 2 |
| 2. | Smell farinaceous to rancid; cap dominantly orange brown. Cap 50-150 mm, convex to plane, with a broad umbo, when young with involute margin, coarsely radially fibrillose, | |

becoming finely scaly in marginal zone, viscid when moist, reddish brown to yellow brown with yellow-olivaceous streaks and spots; gills adnate to emarginate, crowded, first pinkish pallid then pale brownish with darker brownish spots; stem 40-110 x 8-30 mm, cylindrical, usually with pointed-tapering base, with a well developed, woolly ring, white to pale pinkish brown above the ring, with irregular reddish brown, fibrillose belts and scales below ring; flesh white to pale pinkish brown; taste strongly farinaceous. Sp 4.5-5.5(-6) x 3-4 μm , broadly ellipsoid to oblong. Under *Pinus* on nutrient poor, acid and sandy soil; summer to autumn; occasional, but locally common in hemib.-coniferous suba., rare in temp.; DK (VU), FI (LC), NO (LC), SE (LC). – H&M 125, R&H 285, SMT 27(3):16, Svp 42:58, Ves 197, ☉.

T. focale (Fr.) Ricken (incl. *T. robustum* (Alb. & Schwein.) Ricken)

- Smell perfume-like or sweetish, not farinaceous; cap dominantly white, greyish brown, umber, sienna brown, dark reddish brown or cocoa brown 3

- 3. Sp on av > 7 μm long; cap 80-150(-200) mm. Cap convex to plane, finely scaly with large fibrillose scales, at margin with woolly remnants of veil, uniformly brown when young, later with paler margin; gills emarginate, medium spaced to crowded, whitish or cream; stem 80-150 x 20-40 mm, cylindrical or tapering downwards, with a large cottony-woolly ring, white, smooth, granulose or slightly fibrillose above ring, below ring with dark brown bands on whitish background, lower part yellowish; flesh whitish; smell perfume-like; taste perfume-like, acrid or bitter. Sp 6.5-8.5 x 5.5-6.5 μm , broadly ellipsoid to ellipsoid. Under *Pinus* on sandy soil, but also in rocky habitats; summer to autumn; rare, but locally occasional in hemib.-suba., more common towards northeast (continental), very rare in temp.; DK (EN), FI (LC), NO (NT), SE (NT). – FE 3A:84, H&M 125, Nit 375, Sieniop 142, SMT 27(3):14.
T. matsutake (S. Ito & S. Imai) Singer nom. cons. (*T. nauseosum* (A. Blytt) Kytöv.) – Edible and highly appreciated.

 - Sp on av < 7 μm long; cap rarely > 100 mm broad 4

- 4. Cap sienna brown to dark reddish brown, at least in central part; sp on av 6-7 x 5-5.5 μm ; under *Pinus*. Cap 80-100 mm, convex, scaly with cottony-woolly scales, near the margin with remnants of veil, dry, at margin pale brownish; gills emarginate or adnate, medium spaced, whitish or cream; stem 60-100 x 10-20 mm, cylindrical or tapering downwards, with well developed, woolly ring, over the ring whitish, smooth or slightly fibrillose, under the ring rather dark brownish, fibrillose; flesh whitish; smell perfume-like; taste mild, slightly aromatic. Sp 5.5-7.5 x 4.5-6 μm , ellipsoid to broadly ellipsoid. Normally on calcareous soil; DE. – FE 3A:83, Gal 227, GBW 3:527, Phil 105g, Svp 41:47, ☉.
T. caligatum (Viv.) Ricken

 - Cap whitish to cream when young, later greyish to cocoa brown with whitish margin; sp on av 5.5-6.5 x 4.5-5 μm ; under *Picea*. Cap 60-100 mm, convex to slightly depressed, scaly with appressed, thin, large scales, dry; gills emarginate, medium spaced to crowded, whitish; stem 100-130 x 15-20 mm, cylindrical or tapering downwards, with a well developed, woolly, but thin ring, above the ring whitish, smooth to fibrillose, under the ring whitish with darker brown bands and scales, fibrillose; flesh whitish; smell unpleasant, like perfume, burnt plastic or oil; taste mild. Sp 4.5-8 x 4-5.5 μm , subglobose to ellipsoid. In herb-rich, mossy forests on calcareous soil, often solitary or few together;; summer to autumn; rare in hemib.-bore.; FI (NT), NO (EN), SE (EN). – Kar 28:75, SMT 27(3):15.
T. dulciolens Kytöv.

Key B: Dominantly white or cream; smell often strong

1. Cap innately radially fibrillose, \pm shiny, white, sometimes with slight ochre tinge at centre, sometimes with reddish or bluish spots. Cap 40-100 mm, convex or plane, with a low umbo or slightly depressed centre, dry or slightly viscid; gills adnate to emarginate, medium spaced, white to cream; stem 60-140 x 8-20 mm, cylindrical, usually tapering towards base, white, frequently with pinkish spots in upper part and with a glaucous-bluish tinge

in lower part, innately to coarsely fibrillose; flesh white; smell indistinct to farinaceous; taste farinaceous. Sp (5-)5.5-7(-7.5) x (3.5-)4-5(-5.5) μm , broadly ellipsoid to oblong. Under deciduous trees, especially *Quercus*, *Fagus*, *Betula* and *Carpinus*, often on rich soil; summer to autumn; occasional, but locally common in temp.-southern bore.; DK (vU), FI (LC), NO (LC), SE (LC). – B&K 3:417, Däh 173, FE 3:35, Phil 112c, R&H 292, ☉.

T. columbetta (Fr.: Fr.) P. Kumm.

- Cap mat or felty to scaly, without distinct radial structure, whitish to cream, often greying or yellowing with age, but without reddish or bluish spots 2
- 2. Smell indistinct or like celery; cap pale yellow brown to cinnamon buff see key E p. 422
- Smell strong gas-like, rancid or unpleasant flower-like; cap white, cream or beige 3
- 3. Cap strongly yellowing when bruised. Cap 50-100(-120) mm, bell-shaped or convex to plane with a low umbo, dry, mat silky, when old tomentose, white when young, becoming yellow with brown-yellow centre; gills adnate to emarginate, medium spaced, white, yellowing with age; stem 50-100(-120) x 10-20 mm, cylindrical, white, but soon pale yellow to deep yellow; smooth or finely floccose to finely scaly; flesh white, staining lemon yellow to sulphur yellow; smell strong, aromatical-fruity or gas-like; taste somewhat acrid. Sp (5-)5.5-6.5(-7) x (4-)4.5-5(-5.5) μm , broadly ellipsoid. Under *Betula*, *Fagus* and *Quercus* on calcareous soil, northern finds are from rich *Picea* forests and subalpine *Betula* forests; summer to autumn; very rare in temp.-suba., only two records from NO (Finnm: Alta, Troms: Storfjord), in FI with a northern distribution; FI (NT), NO (NT), SE (DD). – B&K 3:436, FE 3:6, Gal 71, GBW 3:573, Sieniop 146.

T. sulphurescens Bres.


- Cap not distinctly yellowing when bruised, but often somewhat yellowing or browning with age 4
- 4. Gills distant to very distant; smell gas-like; sp 9.5-12(-13) x 6-7.5(-8) μm . Cap 25-50(-75) mm, first bell-shaped or hemispherical, convex to plane with an umbo, smooth, dull, white to cream; gills emarginate to adnate, thickish, white to very pale yellow; stem 50-120 x 4-12 (-18) mm, cylindrical or with a broadened base, white to very pale yellow, smooth to innately fibrillose or pruinose; flesh white; smell very strong, reminiscent of that of *T. sulphureum*; taste mild or slightly rancid to slightly bitter. Sp ellipsoid to oblong (fig. 425B). Under *Picea* often in deep moss; summer to autumn; common in hemib.-suba., rare in temp.; DK (vU), FI (LC), NO (LC), SE (LC). – B&K 3:422, R&H 291, Sieniop 142, Svp 45:47, ☉.

T. inamoenum (Fr.: Fr.) Gillet

- Gills distant to crowded; smell rancid, honey-like or aromatical, honey or flower-like; sp < 8(-9.5) μm long 5
- 5. Cap pale greyish yellow, darkest at the centre; mostly under *Fagus*, more rarely under *Quercus* on mull soil; sp 6-8(-9.5) x 3.5-5 μm , ellipsoid to oblong, Qav > 1.6 (fig. 425C). Cap 40-100 mm, convex to plane with a low umbo, smooth, glabrous or dull, dry, pale greyish yellow; gills medium spaced to distant, white to cream; stem 40-80 x 6-15 mm, cylindrical, glabrous to innately fibrillose, white to cream, with yellow-ochre spots when bruised; flesh white; smell rancid, farinaceous when cut, sometimes in addition aromatical-fruity to nauseating-chemical; taste strongly acrid and bitter, mixed with farinaceous; summer to autumn; occasional, but locally common in temp.-hemib., rare in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:423, Pers 17:327, Ves 195, ☉.

T. lascivum (Fr.: Fr.) Gillet

- Cap white to cream, without greyish tinge; mostly with *Betula* or *Quercus* on various soil types; sp 5-7 μm long, ellipsoid, Qav < 1.6 6
- 6. Smell nauseating rancid, flower-like to chemical; mostly under *Betula*, rarely with other deciduous trees; cap often > 70 mm in old frb, at margin usually distinctly ribbed; gills medium spaced to crowded. Cap 40-100 mm, convex to plane with a low umbo, smooth, almost


white when young, soon with yellow-ochre or yellow-brown tinges, often with brownish or ochre spots; gills adnate to emarginate, white to cream; stem 70-100 x 5-15(-30) mm, cylindrical, white or pale yellowish, pruinose to fibrillose-tomentose; flesh white or pale yellowish; taste acrid, sometimes mixed with bitter and farinaceous. Sp 5-7 x 3.5-4.5 μm , broadly ellipsoid to oblong. In mixed deciduous forests on mesic, sandy, sometimes on calcareous soil, outside the area also with conifers; summer to autumn; very common in hemib.-bore., common in temp. and suba.; DK (LC), FI (LC), IS, NO, SE. – B&K 3:435, Pers 17:323, R&H 291 (as *album*), Sieniop 145, Ves 194, .

T. stiparophyllum Fr. & N. Lund (*T. album* (Schaeff.: Fr.) P. Kumm. s. auct. p.p.)

- Smell aromatical to sweet, reminding of honey, more farinaceous when cut; mostly under *Quercus*; cap 30-80 mm, not ribbed at margin; gills thick, medium spaced to distant. Cap convex to plane with small umbo, smooth, white to pale yellowish; gills white to pale yellowish; stem 30-60(-85) x 8-15 mm, cylindrical, white to pale brownish yellow, becoming brownish when handled, glabrous to minutely fibrillose; flesh white; taste unpleasant, subfarinaceous at first, soon acrid mixed with bitter. Sp (5-)5.5-6.5(-7) x 3.5-4.5 (-5) μm , broadly ellipsoid to oblong. In deciduous forests on sandy or loamy soil; summer to autumn; occasional in temp.-hemib.; DK (LC), NO (LC), SE (LC). – Mar 842, Pers 17:323.

T. album (Schaeff.: Fr.) P. Kumm.

Key C: With felty or scaly cap, and white, grey or blackish colours

1. Clamps numerous, easily observed in the pileipellis; gills white to pale yellow, often with a subtle greenish to bluish reflex, without black spots along the edge 2
 - Clamps absent; gills white to grey, sometimes yellow or reddish with age, sometimes with black spots along the edge 4
2. Cap fibrillose to scaly, with distinct radial structure 3
 - Cap appressed scaly in central part, not felty, without radial structure see key D p. 421
3. Cap with broad, concentrically arranged dark grey to fuscous scales, strongly contrasting a whitish, silky-fibrillose background. Cap 50-100(-150) mm, convex to plane, often with a low, broad umbo; gills adnate to emarginate, medium spaced, white to pale yellow; stem 40-80 x 15-30(-45) mm, \pm clavate, mostly with strongly widened base, whitish, sometimes with scattered dark grey to sepia scales in basal part, staining honey-coloured when bruised; flesh white, smell weak sweetish, but more distinctly farinaceous when cut; taste farinaceous. Sp (6.5-)7-9.5(-10) x 5-7 μm , subglobose to ellipsoid. Under deciduous and coniferous trees, mainly *Abies* and *Fagus* on warm calcareous or clayey soil; summer to autumn; DE. – B&K 3:426, C&D 399, Däh 265, FE 3:13, Gal 89, .

T. pardinum (Pers.) Quél. (*T. pardalotum* Herink & Kotlaba, *T. tigrinum* (Schaeff.) Gillet s. auct.)

 - Cap radially fibrose, with age often breaking up in broad, concentrically arranged scales, rather uniformly grey to olivaceous buff, sometimes partly with darker spots or fibrils, but generally with little contrast between scales and background. Cap 40-90(-140) mm, convex to plane, often with a low, broad umbo; gills adnate to emarginate, medium spaced, white to pale yellow, becoming isabelline with age; stem 40-90 x 15-25(-30) mm, cylindrical to \pm clavate, mostly with somewhat widened base, whitish to pale grey, with innately darker grey fibres, becoming clay buff towards base; flesh white; smell farinaceous to spicy; taste rancid farinaceous to slightly acrid. Sp (6.5-)7-9.5(-10) x 5-7 μm , subglobose to ellipsoid. Under deciduous trees, mainly *Quercus* on warm calcareous or clayey soil, south of the area also recorded under conifers; summer to autumn; very rare in temp.-hemib.; NO (vU), SE (EN). – FE 3:14, Gal 91, SMT 26(2):57 (as *paradinum*).

T. filamentosum (Quél.) Alessio (*T. pardinum* (Pers.) Quél. s. auct. p.p.)

4. Cap smooth to radially fibrillose or scaly, mostly \pm shiny; taste often distinctly bitter to acrid after some time 5
 - Cap densely felty to recurved scaly, mat; taste mild to farinaceous, sometimes rancid 8
5. Cap hemispherical to convex with or without low umbo, radially fibrillose-finely scaly with appressed to slightly uplifted fibrillose, concentrically arranged scales; stem with distinct greyish to black scales, often in girdles. Cap 45-110 mm, pale grey or grey brown; gills medium spaced, white to greyish, blackening, especially along edges; stem 50-110 x 10-25 mm, cylindrical or tapering downwards, concolorous with cap, silvery grey to blackish fibrillose-finely scaly, staining reddish brown when bruised; flesh grey; smell indistinct, earthy; taste bitter, with acrid aftertaste. Sp (6-)6.5-8(-8.5) x (4.5-)5.5-6.5(-7) μm , broadly ellipsoid. Under *Quercus* in open forests on calcareous soils; summer to autumn; very rare in hemib.; SE (vu). – FE 3:30, Gal 107, Mar 860.
T. bresadolanium Cléménçon
- Cap conical, bell-shaped or convex, with very distinct umbo, shiny, smooth or fibrillose to scaly; stem without distinct grey to black scales 6
6. Taste mild; gills and stem often with a yellow tinge see *T. portentosum* key F 7
 - Taste acrid to bitter, gills and stem without a yellow tinge 7
7. Under *Picea*, rarely *Pinus* or *Betula*, on rich to nutrient-poor soil, rarely on calcareous soil; cap smooth, innately radially fibrillose, silvery shiny. Cap 30-75(-100) mm, conical or bell-shaped to convex, with acutely conical umbo, uniformly with dark grey fibrils; gills adnate to emarginate, medium spaced to crowded, white to pale grey; stem 50-120(-150) x 8-15 mm, cylindrical, white, usually with darker grey fibrils; flesh white to very pale grey; smell indistinct or somewhat earthy; taste slightly to very acrid or bitterish. Sp 6.5-7.5(-8) x 5-6 μm , broadly ellipsoid. Often solitary; summer to autumn; occasional in temp., common in hemib.-suba.; DK (DD), FI (LC), NO (LC), SE (LC). – B&K 3:442, Däh 258, GBW 3:557, R&H 293, Ves 201.
T. virgatum (Fr.: Fr.) P. Kumm.
- Under *Fagus*, usually on loamy or clayey soil; cap smooth, becoming innately finely scaly with age, fibrillose shiny. Cap (20-)30-100 mm, conical or bell-shaped to convex, usually with a pronounced conical umbo, innately fibrillose shiny to finely scaly, mouse grey to dark grey, often with a violaceous tinge; gills adnate to deeply emarginate, medium spaced to distant, pinkish white to pinkish grey when young, then grey, often with black-dotted edge; stem 50-100 x 10-18 mm, cylindrical or fusiform, white to pale grey or greyish innately fibrillose; flesh white to pale greyish pink; smell indistinct or weak, earthy; taste nasty, at first mild, but soon becoming bitter then acrid. Sp (6-)6.5-7.5(-8) x 5-6.5 μm , broadly ellipsoid (fig. 425D). Summer to autumn; common in temp., rare in hemib.; DK (LC), NO (LC), SE (LC). – B&K 3:432, Däh 257, Gal 105, Ger 01:93, Ves 200.
T. sciodes (Pers.) C. Martín
8. Gills rather thick and distant, distinctly grey to olivaceous buff; cap dark mouse grey to fuscous, becoming paler with age; pileipellis of almost isodiametric hyphae, rarely > 30 μm long. Cap 30-90(-110) mm, conical to convex or plane, mostly umbonate, densely felty to coarsely tomentose-finely scaly; gills adnate to emarginate, often with lilaceous grey to black spots along the edge; stem 40-110 x 7-18 mm, cylindrical, but mostly rather irregular, distinctly tapering to almost rooting at base, coarsely grey to grey brown fibrillose to scaly, especially in upper part, often distinctly yellowish at base; flesh yellowish grey in stem, greyish brown in cap; smell and taste strongly rancid farinaceous, partly reminding of cucumber. Sp 7.5-9(-9.5) x 5-6(-6.5) μm , ellipsoid to oblong. Under *Picea* in herb-rich, mossy, humid, mostly old-grown forests on \pm calcareous soil; summer to autumn; very rare in bore.; FI, NO (STr: Trondheim), SE. – Agar 27:59, SMT 27(3):67-68, ☉.
T. borgsjoeëns Jacobsson & Muskos

- Gills normal, not distant, whitish or pale grey; cap often paler; pileipellis with many hyphae > 30 μm long 9
- 9. Smell of unbroken frb farinaceous; flesh and gills slowly turning yellowish with age or when bruised; sp mostly < 6 μm long 10
 - Smell of unbroken frb indistinct, sweetish or aromatic pepper-like; flesh and gills unchanging, reddening or blueing with age or when bruised; sp often longer 13
- 10. Veil strongly developed, forming a distinct membranous, woolly ring zone on the stem; with *Salix*, mostly on somewhat calcareous soil in forests, scrubs and dunes. Cap 20-50 (-70) mm, conical to convex or plane with a low umbo, tomentose-finely scaly, grey to grey brown with paler margin, rarely white; gills adnate to emarginate, crowded, white to pale grey, staining yellow when old; stem 40-70 x 4-10(-16) mm, cylindrical, whitish above ring, pale brown grey fibrillose below ring; flesh white to pale greyish brown; smell farinaceous; taste farinaceous-rancid. Sp (4.5-)-5-6 x (2-)-2.5-3.5 μm , ellipsoid, oblong to subcylindrical (fig. 425E). Summer to autumn; occasional in temp.-bore., in FI with a southern distribution; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:416, Däh 262, Phil 107e, R&H 295, Ves 201, ☉.
T. cingulatum (Almfelt) Jacobashch
- Veil indistinct or forming a fugacious, cobweb-like annular zone; with other hosts 11
- 11. Cap predominantly convex to plane or subumbonate, distinctly scaly; sp ellipsoid, Q_{av} < 1.55. Cap 25-60(-100) mm, at first tomentose, pale to dark grey brown or almost black, with paler, sometimes slightly woolly margin; gills adnate to emarginate, crowded to medium spaced, white to pale grey, sometimes staining yellow or yellow brown when old; stem 30-70 x 5-15 mm, cylindrical, white to pale greyish, smooth or faintly white punctulate at top, sometimes with a faint white, rarely grey cobweb-like ring zone in young frb; flesh white to pale greyish brown; smell farinaceous; taste farinaceous-rancid. Sp 4-6(-6.5) x (2.5-)-3-4(-4.5) μm . Mainly under *Fagus*, *Quercus*, *Tilia*, *Corylus*, *Betula* and *Carpinus* in deciduous forests on loamy, clayey or calcareous soil, possibly even with *Dryas* in arc./alp.; summer to autumn; common in temp.-hemib., occasional in bore., rare in suba.-arc./alp.; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 260, GBW 3:545 (as *argyraceum*), Ger 01:89 (as *argyraceum*), Phil 108a, Ves 202, ☉.
T. scalpturatum (Fr.) Quél.
- Cap predominantly conical, bell-shaped or umbonate, distinctly scaly or felty; sp oblong to subcylindrical, Q_{av} > 1.6 12
- 12. Veil poorly developed; sp on av 2.9-3.6 μm broad. Cap 20-45(-60) mm, conical to convex or plane with distinct umbo, felty-tomentose, becoming \pm scaly with age, especially in central part, whitish or more often pale to dark grey brown, with paler margin; gills adnate to emarginate, crowded to medium spaced, whitish, staining yellow when old or bruised; stem 25-60 x 5-10(-15) mm, cylindrical, whitish to pale grey brown, smooth, with distinct cobweb-like ring zone, at least in young frb; flesh white to pale greyish brown; smell farinaceous; taste farinaceous-rancid. Sp (4-)-4.5-6.5(-7) x (2-)-2.5-4 μm , ellipsoid to oblong. Mainly under *Betula* and *Populus* on rather nutrient rich soil, typically in somewhat disturbed habitats, e.g. roadsides, parks and gardens; spring to autumn; occasional in temp.-bore.; DK (LC), IS, NO, SE. – FAD 23B, Pers 17:331 (as *argyraceum* var. *inocybeoides*), ☉.
T. alboconicum (J.E. Lange) Cléménçon
- Veil strongly developed, often forming a white to dark grey cobweb-like zone on stem and cap margin in young frb; sp on av 2.6-3.2 μm broad. Cap 25-70 mm, conical to convex or plane with distinct umbo, felty-tomentose, becoming \pm scaly with age, especially in inner part, whitish to cream or more often pale to dark grey brown with paler margin; gills adnate to emarginate, crowded to medium spaced, whitish, staining yellow when old or bruised; stem 25-75 x 5-15(-20) mm, cylindrical, whitish to pale grey brown, smooth; flesh white to pale greyish brown; smell farinaceous; taste farinaceous-rancid. Sp (3.5-)-4-6(-7) x 2-3.5 μm ,

ellipsoid to oblong. Mainly under *Betula*, *Tilia*, *Populus* and *Picea* on rather nutrient rich soil, typically in somewhat disturbed habitats, e.g. roadsides, parks and gardens; spring to autumn; occasional, but locally common in temp., rare in hemib.-bore.; DK (LC), FI (DD), NO (NE), SE (LC).

T. argyraceum (Bull.) P. Kumm. (*T. inocybeoides* A. Pearson)

13. Cap white, grey or almost black, felty or rarely somewhat scaly; smell indistinct or weak farinaceous when cut; flesh unchanging; pileipellis with distinct subpellis of \pm isodiametrical cells 14
- Cap with distinct blackish scales on a paler background, rarely felty; smell distinctly sweetish or aromatic pepper-like, becoming \pm farinaceous when cut; flesh in stem base often pink, red or bluish green with age or when bruised; pileipellis without layer of isodiametric cells 16
14. Stem white to pale grey, without blackish scales or fibrils; sp broadly ellipsoid to oblong, $Q_{av} < 1.7$. Cap 20-60(-80) mm, convex to plane, often slightly umbonate, densely felty to tomentose scaly, with age becoming more distinctly scaly and/or radially fibrillose, sometimes showing white flesh between fibres, grey to brownish black, often with bluish or violaceous tinge, more rarely white; gills adnate to emarginate, medium spaced, white to pale grey, becoming pale yellow brown with age or when bruised; stem 30-70 x 5-15 (-20) mm, \pm cylindrical, somewhat widened towards base, often curved, white to pale grey, smooth or finely white punctulate at top, in young frb mostly with faint white or rarely grey velar zone; flesh white; smell weak, indistinct; taste weak, not distinctly farinaceous. Sp (4.5-)-5-7.5(-8) x 3-5(-5.5) μm . Under conifers, especially *Pinus* on sandy or loamy soil, often at roadsides, in parks and gardens, more rarely with deciduous hosts, e.g. *Fagus* on clayey soil; summer to autumn; common in temp.-bore., rare, but locally occasional in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:438, Däh 263, GBW 3:550, Phil 107g, Ves 202.
T. terreum (Schaeff.) P. Kumm. (*T. myomyces* (Pers.) J.E. Lange)
- Stem grey to black punctulate or fibrillose, especially at top; sp often variable in single collections, but predominantly oblong to subcylindrical, $Q_{av} > 1.7$ 15
15. Cap with a distinct whitish woolly zone at margin. Cap 20-50 mm, convex to plane, mostly umbonate, densely felty to tomentose scaly, dark grey to almost black; gills adnate to emarginate, medium spaced, pale grey, sometimes with black punctulate edge; stem 20-50 x 5-10 mm, \pm cylindrical, white to pale grey, with scattered dark grey scales; flesh white; smell indistinct or weakly farinaceous when cut; taste weakly farinaceous. Sp (5.5-)-6.5-9(-10) x (3-)-3.5-5(-5.5) μm , oblong to subcylindrical. Under conifers, possibly also with deciduous hosts; exact distribution and frequency in the Nordic countries unknown; autumn; probably widespread, but rare, with certainty known from bore.; SE. – FE 3A:25, Gal 127 (bottom).
T. triste (Scop.) Quéf.
- Cap only slightly fibrillose at margin. Cap 10-40 mm, convex to plane, often umbonate, densely felty to tomentose scaly, dark grey to almost black at centre, paler towards margin, rarely white; gills adnate to emarginate, medium spaced, pale grey, sometimes with black punctulate edge; stem 25-60 x 4-8 mm, \pm cylindrical, pale grey, with scattered dark grey fibrillose scales when young, later smooth and more white; flesh white; smell weak, indistinct; taste weak, not distinctly farinaceous. Sp (5.5-)-6-9(-9.5) x 3-5 μm , oblong to subcylindrical. Under conifers, possibly also with deciduous hosts; autumn; distribution and frequency unknown, but not common, with certainty known from temp.-southern bore.; DK (DD), NO. – FE 3A:29, Pers 17:327 (as *triste*).
T. bonii Basso & Candusso
16. Stem white, \pm shiny, often with discrete, scattered blackish scales, often becoming blue-green and sometimes in addition magenta in basal part after picking; smell sweetish, like honey or cedar wood 17

- Stem predominantly white to grey or brownish, often with a ± dense covering of dark scales or fibrils, often becoming reddish in basal part after picking; smell aromatic pepper-like 18
17. Mycelium yellow; cap felty or scaly, but scales not strongly recurved; with or without strong contrast between scales and exposed flesh; under *Fagus*, *Quercus*, *Tilia* and *Corylus*. Cap 30-100 mm, convex to plane, often with a low umbo, at first uniformly felty, but mostly breaking up in minute woolly-fibrillose scales with age, especially in outer half, dark grey brown or blackish brown, with paler grey margin; gills emarginate to adnate, medium spaced, white to pale grey, sometimes reddening when old; stem 30-80 x 10-25 mm, cylindrical, straight or flexuous, sometimes with a broadened base, white, shiny, mostly with blue-green or magenta spots at base; flesh white to very pale grey; smell sweetish, reminding of honey, after cutting farinaceous; taste farinaceous to slightly bitter. Sp 4-6(-7) x 3-4.5(-5) μm , broadly ellipsoid. On clay or calcareous soil; summer to autumn; rare in temp.-hemib.; DK (LC), NO (NE), SE (VU). – B&K 3:425, Däh 259, FE 3:22, Gal 131, Ves 203.
T. orirubens Quél.
- Mycelium white; cap with distinct, upright and recurved scales strongly contrasting the white flesh; under conifers. Cap 30-90 mm broad, convex to plane, sometimes umbonate, at first densely felty, but soon breaking up in dark grey to fuscous or almost black scales, especially in outer half; gills emarginate to adnate, moderately distant, whitish to pale grey, sometimes reddening when old; stem 30-70 x 10-20 mm, cylindrical, straight or flexuous, mostly with a broadened, but tapering base, white, shiny, often with discrete blackish scales in parts, sometimes with small blue-green spots at base; flesh white; smell sweetish, reminding of cedar wood or honey, after cutting farinaceous; taste farinaceous to slightly bitter. Sp (4-)4.5-6.5(-7) x 3-4.5 μm , broadly ellipsoid. On calcareous soil; summer to autumn; rare in hemib.-bore., in FI with a southern distribution; FI (DD), NO (NT), SE (VU). – Däh 264, Gal 133 (top), Mar 851, Nit 373, R&H 294.
T. atrosquamosum (Chevall.) Sacc.
18. In herb rich, mossy *Picea* forests, preferably old grown stands on damp calcareous soil; cap with a distinct olivaceous tinge, especially at margin; sp on av < 5.8 μm long. Cap 35-75 (-120) mm, convex to plane, typically with a small umbo, densely covered with small, recurved, dark olivaceous brown to black scales on a cream to olivaceous grey background; gills emarginate, almost white to pale greyish; stem 30-80(-150) x 6-30 mm, cylindrical, mostly distinctly swollen at base, white to pale brownish grey or pale olivaceous grey, mostly squamulose; flesh whitish to pale olivaceous grey, sometimes becoming darker on exposure; smell weak, sweetish, reminding of honey, often with pepper-like components, farinaceous when cut; taste mild to slightly bitter, distinctly farinaceous. Sp (4-)4.5-6 x 3-4.5(-5) μm , subglobose to broadly ellipsoid. Late summer to autumn; rare, but locally occasional in bore., in FI with a northern distribution; FI (LC), NO (NT), SE. – R&H 295, Sienop 145.
T. olivaceotinctum Mort. Chr. & Heilm.-Claus. in press (*T. squarulosum* Bres. s. Nordic authors)
- In thermophilic deciduous forests on clay or calcareous soil; cap without a distinct olivaceous tinge; sp on av > 5.5 μm long 19
19. Cap margin woolly in young frb; flesh only weakly reddening in stem base. Cap 40-100 (-120) mm, convex to plane with an umbo, tomentose to scaly or recurved scaly, dark grey brown to almost black, but often whitish at margin in young frb; gills adnate to emarginate, medium spaced, pale greyish brown sometimes with black dotted edge; stem 30-80(-100) x 10-25(-30) mm, cylindrical or mostly widened towards base, very pale grey but densely covered with minute brownish to blackish scales or fibres; flesh white to pale grey marbled; smell sweetish with spicy, pepper-like component, more farinaceous when cut; taste farinaceous to slightly bitter. Sp (5-)6-8(-10.5) x (3-)4-5.5(-6.5) μm , subglobose, broadly ellipsoid to

oblong. Under deciduous trees, mainly *Fagus* on clay or calcareous soil; summer to autumn; rare in temp.; DK (NT), SE (VU). – B&K 3:411 (as *atrosquamosum*), FE 3A:21, Gal 135, Phil 109g, Ves 203 (as *atrosquamosum*).

T. squarulosum Bres. (*T. atrosquamosum* (Chevall.) Sacc. s. auct.)

- Cap margin smooth, even in young frb; flesh strongly reddening in stem base and often in entire frb after handling. Cap 40-80(-100) mm, convex to plane, rarely slightly umbonate, at centre felty, dark grey to brownish black, outwards breaking up in distinct, appressed flaky scales on a paler background, in outer half smooth to fibrillose with scattered scales, mostly smoke grey; gills adnate to emarginate, medium spaced, white to pale greyish brown; stem 30-60(-80) x 10-20(-25) mm, ± clavate, mostly with a strongly widened base, white to pale grey, but densely smoke grey punctulate-scaly or fibrillose; flesh white, smell weakly sweetish with spicy, pepper-like component, more farinaceous when cut; taste farinaceous. Sp (4.5)5-7(-7.5) x (3-)3.5-5 μm, subglobose, broadly ellipsoid to oblong. Under deciduous trees, mainly *Fagus* and *Quercus* on warm clay or calcareous soil; summer to autumn; very rare in temp.-hemib.; DK (CR), SE (NA). – B&K 3:413, FE 3:23, FE 3A:23, Galli 129 (top), Jordst 16(3), ☉.

T. basirubens (Bon) A. Riva & Bon

Key D: Cap greyish, greenish or brownish, without radial structure; flesh reddening, especially in stem base; clamps abundant

1. Smell farinaceous to rancid; cap smooth or somewhat woolly-rugulose when old; stem fibrillose, especially in lower part. Cap 35-60(-100) mm, hemispherical to plane, mostly umbonate, pale to moderately dark grey brown, uniformly coloured or with darker centre; gills adnate to emarginate, medium spaced, white, then yellowish grey; stem 50-90 x 6-15(-20) mm, cylindrical or tapering downwards, white, at base sometimes staining ochre-pinkish; flesh white, sometimes staining pinkish; taste farinaceous to rancid. Sp 5.5-7(-7.5) x 3.5-4.5 μm, broadly ellipsoid to oblong. Under conifers, mainly *Pinus* on nutrient-poor sandy soil; autumn; rare in temp.-hemib., occasional in bore.; DK (VU), FI, NO (NE), SE (LC). – FAD 26D, Ves 195.

T. sudum (Fr.) Quél.

- Smell soap-like; stem and cap smooth or breaking up in appressed scales 2
- 2. Stem and often also cap with dark brown to dark olive-grey fibrillose covering, breaking up in appressed scales. In other characters like the main variety (see below). Autumn; occasional in temp.-bore.; DK, FI, NO, SE. – FE 3:2, FE 3A:2, Mar 834, Phil 109e.

T. saponaceum (Fr.) P. Kumm. var. *squamosum* (Cooke) Rea

- Stem and cap smooth or paler 3
- 3. Cap olivaceous green, outwards pale olivaceous to yellow; in moist coniferous and possibly deciduous forests on calcareous soil. In other characters similar to main variety (see below), but cap usually more greasy. Autumn; occasional in temp.-bore.; DK, FI, NO, SE. – Däh 255 (as *saponaceum*), Mar 835.

T. saponaceum (Fr.) P. Kumm. var. *napiques* (Krombh.) J.E. Lange

- Cap greyish brown to olivaceous grey, outwards whitish to pale olivaceous; under coniferous or deciduous trees, in the north mainly with *Picea*, in the south mainly with *Fagus*, but also *Quercus*, *Populus*, *Tilia* and *Pinus*, mostly on dry, rich to nutrient-poor soil. Cap 30-100(-150) mm, hemispherical to plane, mostly umbonate, smooth or slightly scaly at centre, often with dark drop-like spots; gills adnate to emarginate, medium spaced, whitish to pale yellow, sometimes discolouring olivaceous to cinnamon; stem 50-90 x 8-15 mm, cylindrical or tapering downwards, white to pale yellowish, but often pale olivaceous to grey brown striate to faintly scaly, discolouring pinkish buff, especially at base; flesh white to greyish buff, slowly staining pinkish buff; smell distinct like non-scented soap; taste weakly fari-

naceous. Sp (4-)4.5-6(-6.5) x 3-4(-4.5) μm , broadly ellipsoid to oblong. Autumn, common in bore., occasional in temp.-hemib.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:430, FE 3:1, Phil 108c, R&H 292, Ves 194.

T. saponaceum (Fr.) P. Kumm. var. *saponaceum*

Key E: Cap dominantly with brown colours

1. Young frb with veil 2
 - Young frb without veil, but stem sometimes with a distinct white zone at the top 3
2. Ring white, distinctly fibrillose see *T. focale* key A 2
 - Ring thin, membranous, soon attached to the stem as a dark zone. Cap 50-120(-150) mm, hemispherical with involute margin, expanding to low convex or plane, innately fibrillose, slightly viscid when moist, grey brown to red brown with slightly paler margin, in older frb uniformly brown; gills adnate to emarginate, medium spaced to crowded, white to cream, often with darker brown spots; stem 50-100 x 5-25 mm, cylindrical or tapering downwards, white above ring zone, reddish brown below; flesh white, turning pale brownish when bruised; smell farinaceous; taste farinaceous-bitter. Sp 4.5-6(-6.5) x (3.5-)4-5.5 μm , subglobose to ellipsoid. Under *Pinus* on dry, calcareous soil; summer to autumn; rare in temp.-southern bore., very rare in FI; DK (NA, Sj: Herlev), FI (VU, A, V), NO (NT), SE (LC). – B&K 3:419, FE 3:63, GBW 3:531, R&H 282, Svp 56:57,58.
T. batschii Mort. Chr. & Noordel. (*T. fracticum* (Britzelm.) Kreisel s. auct.)
3. Cap orange, apricot orange to cinnamon orange; smell strongly farinaceous or like linseed oil. Cap 90-120 mm, first hemispherical with involute margin, later convex or broadly umbonate, slightly scaly, dry or viscid; gills emarginate, medium spaced to crowded, whitish to pallid; stem 60-120 x 12-20 mm, cylindrical, white at top, often sharply delimited from lower part, downwards with numerous girdles of minute, orange-red scales on paler, almost white background; flesh whitish; taste strongly farinaceous to rancid-bitter. Sp 4.5-5.5 x 3.5-4 μm , ellipsoid. Under *Picea*, *Abies*, *Fagus*, *Quercus*, etc., especially on calcareous soil; summer to autumn; rare but locally occasional in temp.-bore., very rare in FI; DK (EN), FI (NT), NO (NT), SE (LC). – B&K 3:412, FE 3:66, Nit 374, R&H 286, Ves 193, ☉.
T. aurantium (Schaeff.: Fr.) Ricken
 - Cap yellowish brown to reddish brown; smell farinaceous, like celery or indistinct 4
4. Cap dry, scaly or granulose, yellowish brown to reddish brown 5
 - Cap viscid, smooth, appressed scaly or fibrillose, with reddish brown colours 10
5. Smell like celery, bouillon or *Lactarius helvus*. Cap 50-100(-150) mm, first hemispherical to convex with strongly involute margin, expanding to plane with a low, broad umbo, felty or granulose, breaking up in large, angular pieces, almost white when young, later buff to honey yellow; gills adnate to emarginate, medium spaced to crowded, white, then cream to yellowish with ochre-yellow spots when old; stem 18-30 x 50-75 mm, cylindrical or sometimes tapering towards base, whitish or downwards cinnamon buff, often with brownish bands on the top, smooth or fibrillose; flesh white; taste mild, slightly farinaceous, somewhat spicy. Sp 3.5-5 x 3-4 μm , subglobose to ellipsoid (fig. 425F). Under *Pinus* on nutrient-poor, sandy soil, rarely in rocky habitats or on calcareous soil; summer to autumn; rare in hemib.-bore., very rare in temp.; DK (EN), FI (LC), NO (NT), SE (VU). – Däh 250, FE 3:52, R&H 290, Svp 43:41, Ves 197.
T. apium Jul. Schäff. (*T. helviodor* Pilát & Svrček, *T. luteovirens* (Alb. & Schwein.) Ricken s. auct.)
 - Smell indistinct or farinaceous 6
6. Sp on av < 5.5 μm long; stem normally shorter than cap diam. 7
 - Sp on av > 5.5 μm long; stem normally longer than cap diam. 8

7. Cap cream to pale cinnamon buff; under *Quercus* or *Fagus* on calcareous and clayey soil. Cap 100-150(-200) mm, convex with involute margin, expanding to plane, glabrous to slightly fluffy or granulose, dry; gills emarginate to adnate, crowded to very crowded, pale yellowish white to cream, with brown spots when old; stem 50-120(-140) x 15-35(-40) mm, cylindrical or tapering towards base, whitish to cream, towards base often with cinnamon-buff tinges, smooth to floccose; flesh white or pale yellowish; smell weak, indistinct; taste acrid or bitter, at least after some time. Sp 4-6 x 3.5-4(-4.5) μm . Summer to autumn; very rare in temp.-hemib.; DK (CR), NO (EN), SE. – B&K 3:408, Gal 185, Phil 112a, Svp 41:37, Ves 205, ☉.
T. acerbum (Bull.: Fr.) Quél.
- Cap pinkish brown to pale reddish, cap margin pale yellowish or whitish; in Nordic countries in dry heath forests under *Pinus silvestris*. Cap 50-120 mm, smooth or minutely granulose, almost without radial structure; gills emarginate, crowded, whitish to pale yellowish; stem 20-40(-60) x 15-30 mm, white or whitish smooth or slightly fibrillose; flesh white; taste farinaceous to slightly bitterish. Sp 5-6 x 3-4 μm , ellipsoid. Summer to autumn; rare in bore., in FI with a northern distribution; FI (NT), SE. – FE 3:51, FE 3A:64, Gal 185, Siencil 41:78.
T. roseoacerbum A. Riva
8. Cap margin shaggy when young, elsewhere hairy-tomentose, breaking up in rather coarse, fibrillose-hairy scales. Cap 40-80 mm, conical to convex with a low umbo and involute margin, expanding to convex or plane with a low umbo, dry, reddish to pinkish brown, uniformly coloured or paler, more yellow brown towards margin; gills emarginate to sinuate, medium spaced to crowded; cream to pinkish buff, often with darker, reddish brown spots; stem 30-90 x 10-22 mm, cylindrical or tapering towards base, strongly fibrillose, white at top, reddish brown below; flesh whitish to pale brownish or pinkish buff; smell indistinct to strongly farinaceous; taste mild, farinaceous, sometimes bitterish. Sp 5.5-6.5(-7) x 4-5.5 μm , subglobose to ellipsoid. Under *Picea*, more rarely *Pinus* or *Abies* on sandy or calcareous soil; summer to autumn; common in hemib.-bore., occasional in temp., rare in suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:441, Däh 238, FE 3:53, Phil 111e, R&H 287, ☉.
T. vaccinum (Schaeff.: Fr.) P. Kumm.
- Cap margin smooth to minutely felty when young, elsewhere tomentose to minutely scaly
9. Cap yellow brown to ochraceous. Cap 15-50(-80) mm, hemispherical to convex, with or without a low, broad umbo; gills emarginate to almost free, medium spaced, white to pale ochraceous, sometimes with darker brown spots; stem 60-110 x 5-9 mm, cylindrical with tapering base or slightly subbulbose, with white to pale ochre top, often sharply delimited from the ochre or reddish brown middle part, very dark reddish or greyish brown at base; flesh white; smell indistinct. Sp (5-)5.5-6.5(-7) x 4-5(-5.5) μm , subglobose to ellipsoid. Under *Larix*, rarely under *Pinus* and *Abies*, on calcareous soil; summer to autumn; occasional in temp.-suba., in FI north to PeP; DK (LC), FI (LC), IS (Au, Na), NO (LC), SE (LC). – B&K 3:429, GBW 3:537, Phil 113d, R&H 287, Ves 196, ☉.
T. psammopus (Kalchbr.) Quél.
- Cap greyish brown or pinkish brown. Cap 30-100 mm, conical to convex with a low umbo, dry, dull red brown, sometimes darker at centre and with paler pinkish or yellowish brown marginal zone; gills emarginate, crowded to distant, white to pale pinkish brown; stem 40-100 x 5-20 mm, cylindrical, clavate or tapering downwards, whitish at top, downwards pale pinkish brown or yellow brown, often dark red brown towards base, fibrillose, in lower part minutely granulose to fibrillose; flesh white to pale cream pink; smell indistinct or fruity; taste farinaceous, mild or slightly bitter. Sp (5-)5.5-7(-7.5) x 4-5.5(-6) μm , ellipsoid to oblong. Under *Pinus silvestris* on sandy or slightly rich soil; summer to autumn; occasional, but locally common in temp.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:421, Däh 239, Phil

111f, R&H 286, Ves 196.

T. imbricatum (Fr.: Fr.) P. Kumm.

10. Cap 100-200(-250) mm; sp (7-)7.5-9(-10) x 5-6.5 μ m; stem 30-60(-100) mm broad. Cap hemispherical to convex, innately fibrillose when dry, viscid when moist, pale beige brown to darker reddish brown or brick with yellow-brown patches, variegated; gills emarginate, medium spaced to crowded, first white, then pale reddish or vinaceous brown; stem 50-220 mm long, cylindrical to subbulbous, when young with woolly-fibrillose ring zone, which disappears with age, white at top, appressed fibrillose-belted to tomentose with reddish brown fibrils, often with tomentose grey-green streaks and patches in basal part; flesh whitish, turning pale reddish when cut; smell indistinct; taste mild. Sp ellipsoid to oblong. Under *Pinus* on slightly rich, shallow soil, sandy soil or thin humus; summer to autumn; rare in temp.-bore.; DK (NA, Sj: Rude Skov 1974), FI (NT), NO (LC), SE (NT). – Däh 227, FE 3:67, Gal 217, Sienil 41:79, ☉.

T. colossus (Fr.) Quél. (*Megatricholoma c.* (Fr.) G. Kost)

- Cap 30-150 mm; sp < 7.5 μ m long; stem rarely > 30 mm broad 11
11. Flesh yellow or yellowish, at least in stem. Cap 30-120(-150) mm, convex to plane, often with a low umbo, radially fibrillose to appressed scaly, slightly viscid when moist, often with ribbed margin, red brown with paler margin; gills adnate to emarginate, medium spaced, pale yellow, with reddish brown spots; stem 40-120 x 4-20 mm, cylindrical, top white, below fibrillose to \pm scaly with red-brown fibrils; smell weak to farinaceous; taste farinaceous to bitterish. Sp 5-6.5(-7) x 4-5 μ m, subglobose to oblong. In deciduous and mixed forests, parks, scrubs and along roads, under *Betula*, more rarely *Abies* and *Picea*, often on swampy soil; summer to autumn; very common in hemib.-bore., common in temp. and suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – B&K 3:420, GBW 3:532, Phil 110c-d, R&H 285, Ves 198, ☉.

T. fulvum (DC.: Fr.) Sacc. (*T. flavobrunneum* (Fr.) P. Kumm., *T. pseudonictitans* Bon)

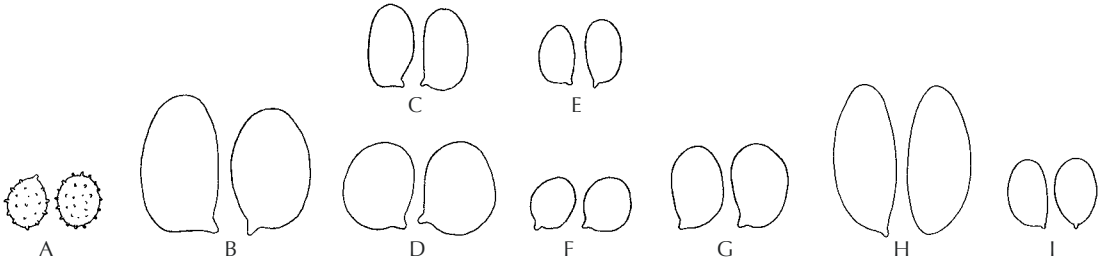
- Flesh in all parts white or whitish 12
12. Stem top with a sharply delimited white zone 13
- Stem top without a sharply delimited white zone 14

13. Cap cuticle mild, farinaceous to slightly bitter; under *Pinus* in nutrient-poor or calcareous coniferous or mixed forests. Cap 35-100 mm, convex to plane with a low umbo, often with ribbed margin, rather strongly innately fibrillose, viscid, shiny, vinaceous-pinkish brown with darker vinaceous brown radial fibrils or more red brown to dark brown at centre with a paler marginal zone; gills adnate, medium spaced, white to pale pinkish brown, often with red brown spots when old; stem 30-100 x 7-20 mm, cylindrical or tapering towards base, whitish at top, pale pinkish brown below, fibrillose to \pm scaly; flesh white to very pale pinkish brown; smell strongly farinaceous. Sp 5-7 x 3-4 μ m, ellipsoid to oblong. Summer to autumn; occasional, but locally common in temp.-bore. DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:434 (as *stans*), FAD 16A (as *striatum*), R&H 284, ☉.

T. albobrunneum (Pers.: Fr.) P. Kumm. (*T. stans* (Fr.) Sacc. s. auct.)

- Cap cuticle bitter; under *Quercus* on nutrient-rich, clayey soil. Cap 40-80 mm, hemispherical to convex with a low umbo or plane, glabrous, strongly glutinous-viscid when moist, shiny, sticky when dry, red brown with slightly paler margin; gills adnate to emarginate, medium spaced, whitish or very pale yellow, often with dark brown stains; stem 40-100 x 10-20 mm, fusiform or cylindrical, white at top, distinctly delimited from red brown fibrillose-ribbed lower part; flesh whitish; smell strongly farinaceous. Sp (5-)5.5-7(-7.5) x 4.5-5.5(-6) μ m, subglobose to ellipsoid. Outside thea area also under *Fagus* and *Carpinus*; summer to autumn; rare in temp.-hemib.; DK (VU), NO (VU), SE (NT). – B&K 3:440, FE 3:65, GBW 3:541, R&H 282, Svp 39:44.

T. ustaloides Romagn.



Spores: A: *Ripartites tricholoma*, B: *Tricholoma inamoenum*, C: *T. lascivum*, D: *T. sciodes*, E: *T. cingulatum*, F: *T. apium*, G: *T. equestre*, H: *Catathelasma imperiale*, I: *Callistosporium luteo-olivaceum*.

14. Under *Populus*; smell strongly farinaceous. Cap 50-120(-230) mm, convex to plane, usually with a low, broad umbo, glabrous or \pm scaly, viscid when moist, pinkish to reddish brown at centre, usually with paler, yellow-pink to yellow-brown margin; gills adnate to emarginate, medium spaced to crowded, whitish to cream, when old with reddish brown spots; stem 40-130 x 12-30 mm, white to sordid white, innately fibrillose to \pm scaly with reddish brown fibrils; flesh whitish to cream; taste mild, farinaceous. Sp (4-)4.5-6(-6.5) x (3-)3.5-4 μ m, subglobose, broadly ellipsoid or oblong. Usually on rich clayey soil, often in large groups or fairy rings; summer to autumn; occasional in temp., rare in hemib.-bore., if FI only north to middle bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:427, FAD 17D, Sieniop 143, Ves 199, \odot .
- T. populinum* J.E. Lange
- Under *Fagus* or conifers; smell farinaceous or indistinct 15
15. Under *Fagus*. Cap 30-100 mm, convex to plane with a low, broad umbo, glabrous, viscid when moist, red brown, paler towards margin; gills medium adnate to emarginate, medium spaced to crowded, cream to pale brown, soon with brown spots; stem 30-90 x 10-25 mm, cylindrical, pale at top, gradually darker brown and fibrillose downwards; flesh white, turning brown when bruised; smell indistinct to slightly farinaceous; taste mild, slightly farinaceous. Sp (5.5-)6-7.5 x (4.5-)5-6 μ m, subglobose to ellipsoid. In forests and parks, preferably on nutrient-rich soil; summer to autumn; common in temp., rare in hemib.; DK (LC), FI, NO, SE (LC). – B&K 3:439, Phil 111g, Svp 39:44, Ves 198, \odot .
- T. ustale* (Fr.: Fr.) P. Kumm.
- Under conifers 16
16. Cap often with dark yellow-brown, drop-like spots, at margin greyish reddish brown, not sulcate. Cap 60-150 mm, convex to plane, sometimes depressed when old, glabrous, without radial structure, viscid when moist, red brown or yellow brown; gills adnate to emarginate, medium spaced to very crowded, whitish, cream to pale brown; stem 30-70 x 10-20 mm, cylindrical, whitish, changing colour after handling to brownish, smooth or slightly fibrillose; flesh white to whitish or pale brownish; smell farinaceous; taste farinaceous to slightly bitter. Sp 3.5-5 x 2.5-3.5 μ m, broadly ellipsoid to oblong. Mostly under *Pinus*, but also under *Picea* and *Abies* on sandy to rich soil, also in rocky habitats; summer to late autumn; occasional, but locally common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Mar 881, Ves 199, \odot .
- T. pessundatum* (Fr.: Fr.) Quél.
- Cap normally not spotted, at margin pale brownish or almost white; \pm sulcate. Cap 50-100 mm, convex to plane, smooth, viscid, radial structure missing or weakly developed, reddish brown to grey brown; gills emarginate, medium spaced to crowded, white to cream; stem


40-60 x 10-30 mm, cylindrical to subbulbose, smooth or slightly fibrillose, white, becoming pale brownish; flesh white, slowly turning brownish when handled; smell indistinct or farinaceous; taste farinaceous, mild. Sp 4-5 x 3-4 μm , ellipsoid to broadly ellipsoid. Under *Pinus* and *Picea* on poor soil; common in bore.; FI (LC), NO (NE), SE (LC).


T. stans (Fr.) Sacc.

Key F: With predominant yellow, greenish or olive colours on cap and/or stem

1. Smell strongly gas-like; sp on av > 8 μm long 2
 - Smell farinaceous, like celery or weak; sp on av < 8 μm long 3
2. Cap and gills pale yellow or pinkish. Cap 20-50 mm, convex; gills deeply emarginate, medium spaced; stem 40-60 x 8-15 mm, cylindrical or subclavate, smooth or minutely fibrillose, top pale pinkish or whitish, yellow below; flesh whitish or pale pinkish in cap, yellow in stem; smell strong, gas-like; taste bitter. Sp 9-12 x 6-7 μm , ellipsoid. With *Dryas* and *Salix*; in the area only with one record in arc./alp. in NO (NE, Hord.: Ulvik). – FE 3A:11, Gal 77.

T. hemisulphureum (Kühner) A. Riva

 - Frb bright yellow in all parts, sometimes partly reddish on cap. Cap 25-70 mm, hemispherical to convex or plane, satiny to minutely felty-tomentose, dry or slightly viscid; gills adnate to emarginate, thick, distant; stem 30-70(-110) x 5-18 mm, cylindrical, bright yellow at top, becoming \pm brownish fibrillose with age in lower part; flesh pale yellow to bright yellow; smell strong, gas-like, also farinaceous when cut; taste unpleasant, farinaceous-rancid to acrid-bitter. Sp (8-)-8.5-11(-12) x 5-6.5(-7) μm , ellipsoid to oblong. Under coniferous and deciduous trees in forests, mostly on calcareous soil; summer to autumn; common in temp.-hemib., rare, but locally occasional in bore.-suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:437, Phil 106a-b, R&H 290, Svp 42:3, Ves 192, .

T. sulphureum (Bull.: Fr.) P. Kumm. s. lato (incl. *T. bufonium* (Pers.: Fr.) Gillet)
3. Gills initially yellow 4
 - Gills initially whitish or cream, but often yellowing with age 7
4. Taste bitter to acrid. Cap 30-100 mm, conical, expanding convex or plane, with a small conical or obtuse umbo, later often entirely brown, innately radially fibrillose, shiny, becoming minutely tomentose-scaly, dry, yellow when young, soon with red-brown centre; gills adnate to emarginate, medium spaced to crowded, pale greenish yellow; stem 50-140 x 7-20 mm, cylindrical or irregularly fusiform, yellow to yellow green, innately fibrillose with slightly darker reddish yellow fibrils; flesh white or pale pinkish or yellowish; smell indistinct. Sp 6.5-7.5 x 4-5(-5.5) μm , ellipsoid to oblong. In coniferous forests with *Pinus* and *Picea*; summer to autumn; common in bore., rare but locally occasional in temp.-hemib., more common towards east/northeast, rare in suba.; DK (NT), FI (LC), NO (LC), SE (LC). – H&M 123, FE 3:32, Sieniop 136, Svp 42:3, Ves 193, .

T. aestuans (Fr.: Fr.) Gillet

 - Taste mild 5

5. Sp 5-6.5 x 3.5-4.5 μm ; cap and gills chrome yellow; under *Populus* on rather rich soil. Cap 50-110 mm, convex to umbonate, appressed scaly at centre, dry to viscid, butter yellow, corn yellow to sulphur yellow or reddish brown; gills emarginate, medium spaced to crowded, pale yellow to sulphur yellow; stem 50-120 x 10-25 mm, cylindrical, often subbulbous, pale yellow to sulphur yellow, smooth to slightly fibrillose; flesh whitish or slightly yellowish; smell farinaceous; taste mild, farinaceous. Sp ellipsoid. Summer to autumn; occasional, but locally common in temp.-bore., in FI with a southern distribution; DK (LC), FI (LC), NO, SE. – FE 3A:51, Pers 17:331, R&H 288 (as *flavovirens*), Svp 42:2.


T. frondosae Kalamees & Shtshukin (*T. equestre* var. *populinum* Mort. Chr. & Noordel.)

 - Sp on av > 6 μm long; cap and gills lemon yellow, straw yellow or sulphur yellow; under *Pinus* 6

6. Frb pale lemon yellow; stem often longer than cap diam.; sp 5.5-7(-8) x 4-5.5 μm . Cap 50-100 mm, convex to plane, viscid, smooth or slightly scaly near centre, with reddish or brownish tinge; gills emarginate, becoming slightly brownish with age; stem 80-100 x 8-15 mm, cylindrical, smooth, pale lemon yellow to almost white; flesh white; smell farinaceous; taste farinaceous, mild. Sp broadly ellipsoid. In dry *Pinus* forests on sandy and rocky ground; autumn; rare, but locally common in continental bore.; FI (LC), SE.
T. ulvinenii Kalamees
- Frb pale sulphur yellow to straw yellow often with reddish cap centre; stem often shorter than cap diam.; sp (6-)6.5-7.5(-8) x 3.5-5 μm (fig. 425G). Cap 40-130 mm, convex, often with a broad umbo, with brown scales, at least at centre, viscid; gills emarginate, medium crowded; stem 40-100 x 10-25 mm, cylindrical, smooth to fibrillose; flesh white to pale yellowish; smell farinaceous; taste farinaceous, mild. Sp ellipsoid. Under *Pinus* on sandy nutrient poor soil and more rarely on calcareous soil; autumn; common in temp.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:418, H&M 122, Phil 105f, Sieniop 139, Ves 192, ☉. – Assumed to be deadly poisonous.
T. equestre (L.: Fr.) P. Kumm. (*T. flavovirens* (Pers. : Fr.) S. Lundell, *T. auratum* (Paulet) Gillet)
7. Cap dark grey brown to almost black at centre, towards margin paler greyish to almost white or rarely yellow, viscid and smooth. Cap 50-110 mm, broadly bell-shaped to convex, with or without a low, broad umbo; gills adnate-emarginate, medium spaced, white but soon turning lemon to sulphur yellow; stem 35-120 x 10-30 mm, cylindrical, white to pale lemon yellow, innately fibrillose, shiny, often slightly pruinose at top, below smooth to coarsely fibrillose; flesh whitish to pale greyish; smell weak or farinaceous; taste rather mild, farinaceous. Sp (5.5-)6-7.5 x (3-)3.5-4.5(-5) μm , ellipsoid to oblong. Under *Pinus* and *Picea* among lichens and mosses, more rarely under *Fagus*, *Tilia* or *Populus*; autumn; common in bore., occasional, but locally common in temp.-hemib. and suba.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:428, Phil 107f, R&H 288, Svp 33:21, Ves 200, ☉.
T. portentosum (Fr.: Fr.) Quél.
- Cap with distinct yellow or greenish colours, dry or viscid, smooth or scaly 8
8. Smell like celery, bouillon or *Lactarius helvus* see *T. apium* key E 5
- Smell farinaceous or weak 9
9. Stem covered with yellow, greenish or olivaceous brown fibrils or floccules 10
- Stem with paler colours, smooth, rarely floccose 11
10. Stem mostly < 15 mm wide; under *Picea* in herb-rich forests, often on calcareous soil. Cap 30-80(-100) mm, conical to convex with an umbo, slightly viscid when moist, radially silky fibrillose and sometimes shiny when dry, olivaceous brown, golden brown, olivaceous green, olive green, darkest at centre, older frb often dark blackish brown or dark olive green, with a slightly to distinctly paler olivaceous brown to yellow tinge at margin; gills adnate to emarginate, medium crowded to rather distant, white to sordid white; stem 40-100 x 6-18 mm, cylindrical to clavate, often deeply rooting in mosses, floccose, fibrillose, with greenish or olivaceous brown fibrils or finely dark punctulate on white to pale yellowish-olivaceous background; flesh white or pale grey, staining brown when bruised; smell slightly to strongly farinaceous; taste sweetish to farinaceous, mild or slightly bitterish. Sp (6-)6.5-8(-8.5) x (4.5)5-7(-8) μm , subglobose to broadly ellipsoid. Summer to autumn; common in bore. in FI, elsewhere occasional in hemib.-bore.; FI (LC), NO (LC), SE (LC). – Mar 871, RdM 42:259, R&H 289, Sieniop 140.
T. fucatum (Fr.: Fr.) P. Kumm.
- Stem mostly > 15 mm wide; in dry *Pinus* forests on shallow calcareous or sandy soil. Cap 50-100 mm, convex to plane, sometimes with a low broad umbo, dry or slightly viscid, golden yellow to yellow brown appressed scaly with darker yellow brown scales; gills emarginate, medium spaced to rather crowded, white; stem 40-80 x 15-25 mm, cylindrical or

subbulbous, upper part whitish lower parts yellow, floccose to fibrillose, with yellow fibrils; flesh white; smell farinaceous; taste farinaceous, mild. Sp 5.5-6.5 x 4-4.5 μm , ellipsoid. Autumn; very rare in hemib. (Gtl); NO (EN), SE (EN). – BCat 998, FE 3:41, Gal 147, Jordst 20(2), Mar 870.

T. joachimii Bon & A. Riva

11. Cap olive greyish, straw yellow or orange; under conifers 12
 - Cap whitish to bright greenish or yellow; under conifers or deciduous trees 13
12. Sp 4.5-6 x 3.5-5 μm ; clamps frequent. Cap 50-120(-170) mm, hemispherical or convex to plane with a large, broad umbo, innately radially fibrillose, dry or slightly viscid, when young deep olive or pale olive, later entirely honey yellow, pale curry yellow, straw yellow or yellowish brown, rarely completely reddish orange; gills adnate to emarginate, crowded, white or pale grey with yellowish margin; stem 40-120 x 8-30 mm, fusiform or cylindrical, white or tinged yellow or sordid brown in lower part, often with pinkish tinge near base, smooth or rather coarsely fibrillose; flesh white to pale greyish, turning reddish near the base after cutting; smell farinaceous to sweetish-unpleasant; taste farinaceous to rancid. Sp subglobose to broadly ellipsoid. Under *Pinus* in forests on poor sandy soil or on rocky ground; summer to autumn; common in bore. in FI, elsewhere occasional in temp.-bore.; DK (VU), FI (LC), NO (LC), SE (LC). – B&K 3:410, FE 3:40, SMT 26(1):46, Ves 204, .
T. arvernense Bon (*T. sejunctum* (Sowerby: Fr.) Quél. s. auct. p.p.)
 - Sp (7-)7.5-10.5(-11) x (5-)6-7.5(-8.5) μm ; clamps absent. Cap 50-80(-100) mm, bell-shaped or conical to convex or plane with a small, sometimes pointed umbo, dry to slightly viscid, innately fibrillose to finely scaly, grey brown or greyish yellow; gills adnate to emarginate, medium spaced to distant, whitish or with a slightly greyish or yellowish tinge; stem 40-100 x 9-20 cm, cylindrical, smooth or innately fibrillose, whitish or pale yellowish, sometimes with distinct, blue-violet patches in lower part; flesh whitish to pale greyish or yellowish; smell weak farinaceous; taste farinaceous, mild. Sp subglobose to ellipsoid. In slightly rich *Picea* forests, more rarely in poor habitats of mixed *Pinus* and deciduous trees; summer to autumn; rare, but locally occasional in hemib.-bore.; FI, NO, SE. – Edible.
T. guldenii Mort. Chr. in press. (*T. luridum* (Schaeff. : Fr.) P. Kumm. s. auct.)
13. Under conifers; cap with blackish fibrils from the centre. Cap 40-60 mm, convex to plane, smooth or slightly fibrillose, yellow to olive green; gills emarginate, medium spaced, white or with a yellow tinge; stem white or yellowish, smooth or minutely fibrillose; flesh white or slightly yellowish; smell weak or farinaceous; taste farinaceous, mild. Sp 6.5-8 x 5.5-6 μm , ellipsoid. In herb-rich forests or on moist nutrient-poor soil; summer to autumn; rare, but locally occasional in hemib.-bore.; FI (LC), NO (NT), SE. – C&D 372, Däh 244, FE 3:39, FE 3A:48, SMT 26(1):47.
T. viridilutescens M.M. Moser
 - Under deciduous trees; cap without blackish fibrils 14
14. Cap with an acute umbo, at margin pale, whitish. Cap 70-90 mm, bell-shaped to convex, dry or slightly viscid, with radial fibrils, at centre brownish or greenish yellow; gills emarginate, rather thick, medium spaced, white; stem 50-70 x 10-20 mm, cylindrical or broadest near base, white or yellowish, smooth or slightly fibrillose, sometimes reddening at base; flesh whitish; smell weak to farinaceous; taste farinaceous, mild. Sp 5.5-7.5 x 4.5-5.5 μm , ellipsoid. Under *Quercus* and *Fagus* on clayey soil; autumn; very rare in temp.; DK (CR). – FAD 19A, Gal 151, Mar 863, Svp 45:47.
T. umbonatum (J.E. Lange) Cléménçon & Bon
 - Cap without an acute umbo, but sometimes with a broad umbo, at margin bright yellow. Cap 30-110 mm, bell-shaped to convex or plane with large, slightly viscid, yellow or greenish yellow or olive yellow, rather strongly innately fibrillose with darker olive fibrils, particularly at centre; frb often with violet spots when decaying; gills emarginate, medium

spaced to distant, white or with yellow tinge like cap, edge on older frb often yellow near the cap margin. Stem 50-130 x 8-25 mm, cylindrical, at very base sometimes pinkish-reddish, smooth, pruinose or slightly fibrillose striate below, white with yellow tinge; flesh white or slightly yellowish; smell weak or slightly sweet and fruity, but strongly farinaceous when cut. Sp (5.5-)6-8(-8.5) x 4-6.5(-7) μm , subglobose to broadly ellipsoid. Under *Fagus*, *Quercus*, *Corylus* and *Carpinus* in forests on clay or calcareous soil; autumn; rare in temp.-hemib.; DK (EN), NO (Østf: Kråkerøy), SE (NT). – FE 3:37, Gal 157, Phil 106c, SMT 26(1):47, Ves 204, ☉.
T. sejunctum (Sowerby: Fr.) Quél.

Tricholomella Kalamees

KUULO KALAMEES

Monotypic genus; see description below.

Lit.: Kalamees 1992, 2004.

Frb tricholomatoid, uniformly whitish, with veil. Cap 30-100 mm, convex to plane, smooth, densely innately cottony-tomentose, slightly viscid, white to pale brownish, often with an olivaceous, yellowish to greyish tint. Gills emarginate to almost free, white, medium spaced to crowded. Stem 30-150 x 3-20 mm, fibrillose-flocculose, dry, white, with a narrow ring at top when young, smooth, sometimes rooting. Veil white, membranous, quickly disappearing. Flesh white. Smell and taste strongly farinaceous. Sp deposit white.

Sp (6-)7-9(-10.5) x 5-6.5(-7) μm , broadly ellipsoid to ovoid, distinctly echinulate to almost smooth, without iodine reactions, cyanophilous (fig. 509E). Basidia strongly siderophilous. Cystidia absent. Pileipellis a cutis. Clamps present.

Saprotrophic on soil in deciduous and mixed forests, meadows, pastures, in disturbed places, often on stale-burnt and urinated spots; summer to autumn; rare in temp.-southern bore.; DK (DD), FI (DD), NO (LC), SE (LC). – Cet 354, 356, FAD 17A, 24A, Phil 105d, R&H 304, ⊙.

T. constricta (Fr.: Fr.) Kalamees (*Calocybe c.* (Fr.: Fr.) Kühner, *C. leucocephala* (Bull.) Singer, *Tricholomella leucocephala* (Bull.) Bon)



Spores.

Tricholomopsis Singer

JAN VESTERHOLT

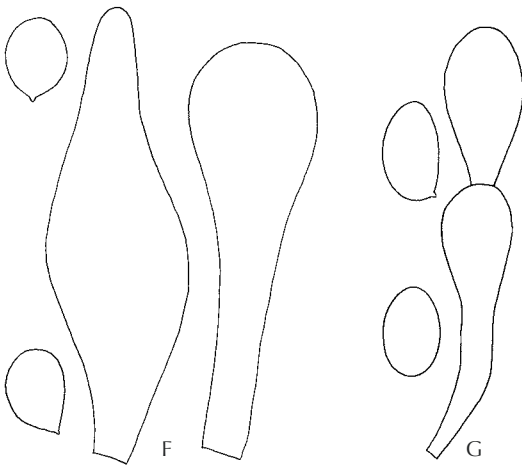
Frb tricholomatoid with yellow gills and flesh. Cap 25-140 mm, fibrillose to scaly, dry. Gills adnate or emarginate, medium spaced to crowded, yellow. Stem dry, appressed fibrillose to scaly. Veil absent. Flesh yellow or yellowish. Smell indistinct. Taste indistinct. Sp deposit white.

Sp broadly ellipsoid to ellipsoid, smooth, hyaline, without iodine reactions. Basidia 4-spored. Cheilocystidia large, cylindrical to clavate or fusiform, sometimes septate, thin- or slightly thick-walled, sometimes with coloured contents. Pleurocystidia absent or inconspicuous. Pileipellis a cutis, a trichoderm or a tomentum. Clamps present.

Saprotrophic on coniferous wood, causing white rot.

Two species in the Nordic countries.

Lit.: Boekhout & Noordeloos in Bas et al. 1999, Ludwig 2001.



Spores and pleurocystidia: F: *Tricholomopsis rutilans*, G: *T. decora*.

1. Cap with purple scales and fibres on a yellow background. Cap 30-140 mm, conical to convex, later expanded, with or without an umbo; gills adnate to emarginate, crowded, yellow; stem 30-120 x 6-25 mm, cylindrical or widened downwards, with purplish fibres and scales on a pale yellow background; flesh yellow. Sp 5-7.5 x 4.5-6 μm , broadly ellipsoid (fig. 333F); cheilocystidia 50-130 x 10-30 μm , cylindrical to clavate or fusiform. On coniferous wood, often on stumps, often fasciculate; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), FO, NO (LC), SE (LC). – B&K 3:445, Lud 85.3, Phil 98a, 99c, R&H 281, Ves 212, ⊙.

T. rutilans (Schaeff.: Fr.) Singer

- Cap with olive brown to blackish scales on a yellow background. Cap 25-60 mm, convex to expanded or slightly depressed; gills adnate to emarginate, medium spaced, yellow; stem 15-80 x 4-15 mm, cylindrical, pale yellow, often with olive brown fibres or scales; flesh yellowish. Sp 6-8 x 4-5.5 μm , ellipsoid (fig. 333G); cheilocystidia 40-90 x 5-20 μm , mostly clavate, less often cylindrical to fusiform, often septate. On coniferous wood; summer to autumn; common in hemib.-suba., rare in temp.; DK (LC), FI (LC), NO (LC), SE (LC). – B&K 3:444, Däh 223, Lud 85.1, Phil 98b, R&H 281, ⊙.

T. decora (Fr.: Fr.) Singer

Tubaria (W.G. Sm.) Gillet

JAN VESTERHOLT

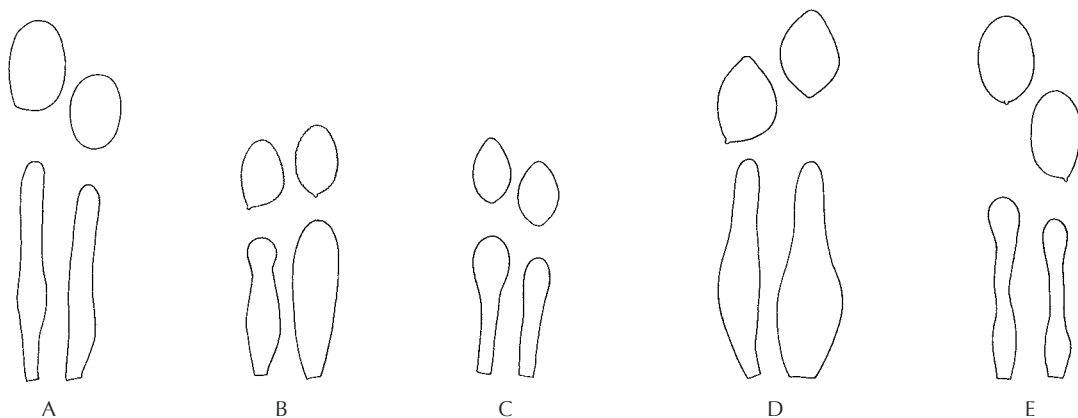
Frb mycenoid to collybioid. Cap 2-60 mm, hemispherical, convex, plane to slightly depressed, fibrillose, velvety to almost smooth, hygrophanous or not. Gills adnate to short decurrent, yellowish or pale to dark brown. Stem 15-80 x 0.5-6 mm, cylindrical. Veil mostly conspicuous, in one species membranous and forming a ring, in other species ± floccose, mainly found at cap margin and lower part of stem. Smell and taste indistinct or faint. Sp deposit cream to buff, greyish brown or vivid brown.

Sp ellipsoid, ovoid or amygdaloid, rarely slightly phaseoliform, smooth or rugulose, thin-walled to thick-walled, without germ pore, hyaline to brownish, without iodine reactions. Cheilocystidia cylindrical, clavate, capitate or lageniform. Pleurocystidia absent. Pileipellis a cutis to a trichoderm. Clamps present.

Saprotrophic on wood, organic litter and soil.

Five species in Nordic countries.

Lit.: Gminder in Kriegelsteiner 2003, Hausknecht & Huhtinen 2003, Ludwig 2001.



Spores and cheilocystidia: A: *Tubaria confragosa*, B: *T. dispersa*, C: *T. minutalis*, D: *T. conspersa*, E: *T. furfuracea*.

1. Stem with a fixed, membranous ring. Cap 20-60 mm, hemispherical to convex, smooth, dry, hygrophanous, orange brown to dark reddish brown, not translucently striate; gills adnate, medium spaced, orange brown to reddish brown; stem 30-80 x 2-6 mm, cylindrical, ± smooth, pale, later becoming orange brown to reddish brown. Sp 6-8.5 x 5.5-6.5 μm, ellipsoid, rarely slightly phaseoliform, smooth (fig. 783A); cheilocystidia 20-50 x 4-8 μm, cylindrical or slightly lageniform. On wood, wood chips or sawdust of conifers; autumn; common in bore.-suba., rare in hemib., very rare in temp.; DK, FI (LC), NO (LC), SE (LC). – Däh 635, Lud 86.1, M&J 1, R&H 464, Ves 383, ⊙.

T. confragosa (Fr.) Harmaja

- Stem without a membranous ring, but often floccose from veil 2
2. Gills buff yellow; on ± buried litter under *Crataegus*. Cap 5-20 mm, convex to plane or slightly depressed, finely velvety, dry, not hygrophanous, not translucently striate, pale buff yellow; gills broadly adnate, distant to medium spaced; stem 15-40 x 1-2 mm, cylindrical, floccose at top, cream to pale buff yellow. Sp 5-7 x 3-4 μm, ellipsoid to amygdaloid, finely rugulose (fig. 783B); cheilocystidia 20-35 x 4-10 μm, cylindrical to clavate, sometimes lageniform. Summer to autumn; common in temp., rare, but locally occasional in hemib.; DK, NO (LC, Akh: Oslo), SE (LC). – GBW 4:423, Lud 86.4, Phil 230c, R&H 465, Ves 383, ⊙.
- T. dispersa* (Pers.) Singer
- Gills brownish; usually not under *Crataegus* 3

3. Sp ± fusiform to rhomboid, tapering towards apiculus see *Flammulaster* p. 778
 - Sp ellipsoid to ovoid, amygdaloid or citriform, not tapering towards apiculus 4
4. Sp 4.5-6.5 × 3-4.5 μm (fig. 783C); cap 2-9 mm; stem 0.3-1 mm broad. Cap convex to plane or slightly depressed, fibrillose, hygrophanous, ochraceous to pale cinnamon, translucently striate; gills short decurrent, distant, cream to pale ochraceous; stem 12-22 mm long, cylindrical, ± smooth, cream to ochraceous. Sp ovoid to amygdaloid, smooth; cheilocystidia 20-35 × 4-8 μm, clavate to utriform. On soil or debris in damp and shady places in deciduous forests; summer to autumn; very rare or overlooked in temp.-hemib.; DK, NO (Akh: Enebakk, Tel: Bamble). – FAD 197B, Lud 86.8A, M&J 2.
T. minutalis Romagn. (*T. minima* J.E. Lange) 4
 - Sp on av > 6.5 μm long; cap 6-35 mm broad; stem 1-5 mm broad 5
5. Cap and most of the stem distinctly floccose from veil; stem 1-2 mm broad; sp amygdaloid to citriform (fig. 783D). Cap 6-20 mm, convex to expanded or slightly depressed, dry, hygrophanous, ± translucently striate, pale buff to yellowish brown; gills adnate, medium spaced, yellowish brown to orange brown; stem 15-40 mm long, cylindrical, sometimes with slightly widened base, pale yellowish brown to reddish brown. Sp 7-9.5 × 4.5-7 μm; cheilocystidia 30-70 × 6-16 μm, cylindrical to clavate or lageniform. On soil, organic debris, twigs and wood chips in deciduous forests, parks and gardens; summer to late autumn; very common in temp., common in hemib.-bore., rare in suba.; DK, FI (LC), FO, NO (LC), SE (LC). – B&K 4:462, C&D 1234, GBW 4:421, Lud 86.5, R&H 465, ☉.
T. conspersa (Pers.: Fr.) Fayod
 - Veil mostly restricted to a zone near the cap margin and a fugacious ring-like zone at the stem top; stem (1-)2-5 mm broad; sp ellipsoid (fig. 783E). Cap 8-35 mm, convex to expanded, smooth, yellowish brown to orange brown, often translucently striate in outer part; gills broadly adnate to short decurrent, medium spaced, buff to yellowish brown; stem 15-40 mm long, cylindrical, smooth, buff to orange brown, at base often whitish tomentose to hairy. Sp 6.5-10 × 4.5-6 μm, smooth; cheilocystidia 20-60 × 5-12 μm, cylindrical, often capitate, sometimes lageniform. On twigs and organic debris on the ground; all year, but most common in winter; very common in temp.-bore., occasional, but locally common in suba.; DK, FI (LC), FO, IS, NO (LC), SE (LC). – Lud 86.2, Phil 230b, R&H 466, Svp 43:55, Ves 382, ☉.
T. furfuracea (Pers.: Fr.) Gillet s.l. (incl. *T. anthracophila* P. Karst., *T. hiemalis* Bon, *T. romagnesia* Arnolds)

Tylophilus P. Karst.

HENNING KNUDSEN & ANDY TAYLOR

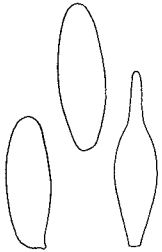
One species in the Nordic countries; see description below.

Frb boletoid with white tubes becoming pink. Cap 50-150 mm, convex, finely felty, becoming glabrous, sienna to fulvous or snuff brown. Tubes and pores white, becoming salmon or vinaceous pink. Stem 70-120 x 20-40 mm, concolorous with cap or more ochraceous with dark brown reticulum. Flesh white to cream. Taste strongly bitter. Smell indistinct. Sp deposit pink to vinaceous.

Sp 11-15 x 4-5 μ m, subfusiform (fig. 173D), hyaline. Cheilo- and pleurocystidia present in tubes and pores. Clamps absent.

Ectomycorrhizal in deciduous and coniferous forests, solitary or a few together; summer to autumn, especially early in the season; common in temp.-middle bore., in FI north to InL, in NO north to Nordl; DK (LC), FI (LC), NO (LC), SE (LC). – GBW 2:314, Phil 286a, R&H 226, Svp 42:15, Ves 129, ☉.

T. felleus (Bull.: Fr.) P. Karst.



Spores and hymenial cystidia.

Volvariella Speg.

LASSE KOSONEN

Volvaria (Fr.) P. Kumm. non DC.

Frb with free, pink gills and a volva. Cap 10-210 mm, at first conical to bell-shaped, then expanding, often with an umbo, dry to slimy, smooth, silky or hairy, not hygrophanous, white, whitish or grey, rarely straw yellow or brownish. Gills free, at first white or whitish, then pinkish to pinkish brown. Stem smooth, pruinose, minutely floccose or hairy, at least at top, whitish or greyish. Universal veil forming a membranous volva at stem base, whitish, greyish or brownish scaly. Flesh white or whitish. Smell ± raphanoid, *Pelargonium*-like or indistinct. Sp deposit pinkish to pinkish brown.

Sp oblong, ellipsoid or ovoid, smooth, thick-walled, pale brownish to rusty brown in KOH. Basidia 4-spored, rarely 2-spored. Cheilo- and pleurocystidia present and common, large, lageniform, rarely clavate or bladder-shaped, often with a short appendix, thin-walled, smooth. Gill trama inverse. Pileipellis an (ixo)cutis to an (ixo)trichoderm. Clamps absent.

Saprotrophic on the ground or decaying wood, exceptionally hothouses or in buildings, mostly in cultural environment, or parasitic on decaying frb of *Clitocybe nebularis*. Several species are considered inedible, but *V. volvacea* is cultured and an economically important edible fungus.

Ten species in the Nordic countries.

Lit.: Boekhout 1986, Kosonen 1992, Kristiansen 1983, Orton 1974, 1986, Shaffer 1957.

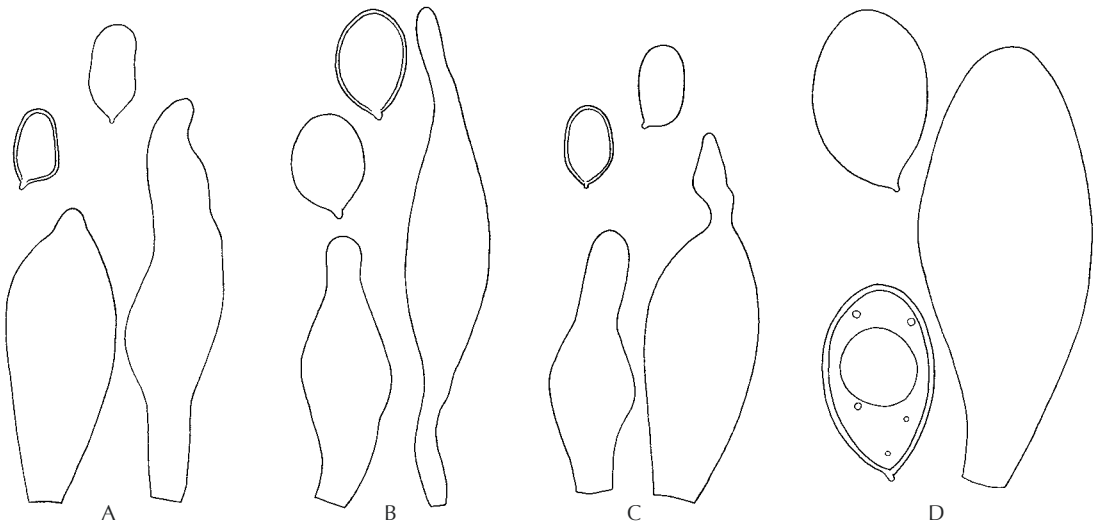


Fig. 345. Spores and hymenial cystidia: A: *Volvariella surrecta*, B: *V. bombycina*, C: *V. caesiointincta*, D: *V. gloiocephala*.

1. On wood or decaying frb of *Clitocybe nebularis* 2
 - On soil, decomposing straw, compost, etc. 4
2. On decaying frb of *Clitocybe nebularis*. Cap 40-120 mm, broadly paraboloid to low convex, finely velvety, dry, white or whitish; gills crowded to very crowded; stem 40-90 x 4-9 mm, cylindrical or with slightly widened base, minutely pruinose or silky, concolorous with cap; volva quite large, concolorous with cap; smell and taste indistinct. Sp 6.5-8.5 x 3.5-4.5 μ m, oblong (fig. 345A); hymenial cystidia 50-90 x 10-30 μ m, lageniform-clavate. Late autumn; rare in temp.-hemib., very rare in southern bore.; DK (VU), FI (VU, U: Porvoo, St: Vammala), NO (NT), SE (NT). – B&K 4:134, Lud 87.2, Nyl 322, R&H 388, Sienil 45(1): cover, ⊙.
V. surrecta (Knapp) Singer (*Volvaria loveiana* (Berk.) Gillet)
 - On living or dead deciduous trees or wood in buildings or other man made constructions 3

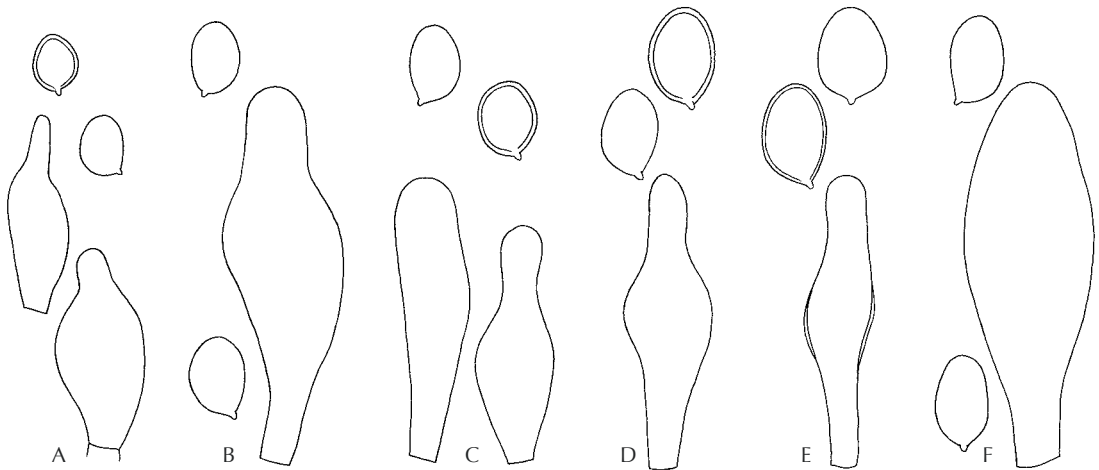




Fig. 347. Spores and hymenial cystidia: A: *Volvariella reidii*, B: *V. pusilla*, C: *V. taylora*, D: *V. hypopithys*, E: *V. volvacea*, F: *V. murinella*.

3. Cap 80-210 mm, whitish to cream or straw yellow, with coarse, silky, hairy scales; pileipellis with up to 1500 μm long, sparsely septate elements. Cap conical to convex, soon low convex, dry; gills crowded; stem 70-190 x 7-20 mm, cylindrical with clavate, up to 35 μm broad base, whitish; volva thick, broad and deep, with brownish scales or whitish; smell aromatic. Sp 7-10 x 4.5-6 μm , ellipsoid (fig. 345B); hymenial cystidia 40-110 x 10-25 μm , lageniform-fusiform, often with elongate apex. On living or dead deciduous trees and in buildings and other man made constructions; summer to late autumn; rare in temp.-southern bore., but possibly increasing in frequency; DK (NT), FI (LC), NO (LC), SE (VU). – Lud 87.3, Nyl 323, R&H 389, Svp 42:38, Ves 263, ☉.
V. bombycina (Schaeff.: Fr.) Singer
 - Cap 40-120 mm, grey or greyish, often with a bluish hue, with hairy-felty centre; pileipellis with up to 200 μm long, septate elements. Cap convex to plane, dry; gills crowded; stem 35-80 x 5-10 mm, cylindrical with clavate, up to 20 mm broad base, whitish, becoming tinged yellowish brown; volva greyish; smell like *Pelargonium* or *Geranium robertianum*. Sp 5.5-7.5 x 3.5-5 μm , oblong (fig. 345C); hymenial cystidia 35-80 x 15-30 μm , bladder-shaped to lageniform, often with a short finger-like appendix. On strongly decayed trunks of deciduous trees or trunks in forests; late summer to autumn; rare in temp.-hemib., very rare in southern bore.; DK (EN), FI (CR), NO (DD, Østf: Fredrikstad), SE (DD). – B&K 4:129, FAD 200B, Lud 87.6C, Svp 42:39.
V. caesiotincta P.D. Orton (*V. murinella* (Quél.) Courtec. var. *unbonata* J.E. Lange)
4. Sp 10.5-17.5 x 6.5-9 μm (fig. 345D); cap slimy, 40-150 mm. Cap conical, later plane or with depressed centre, smooth, white in the summer form, grey brownish with darker centre in the autumn form; gills crowded to very crowded; stem 80-200 x 10-20 mm, cylindrical with a clavate, up to 30 mm broad base, whitish; smell weakly to distinctly raphanoid. Sp ellipsoid to ovoid; hymenial cystidia 50-110 x 20-45 μm , clavate-fusiform, often mucronate. In stubble fields, on manured soil, in pastures, on wood chips, in grass, also in sandy places; summer to late autumn; very common in temp., occasional in hemib.-bore.; DK (LC), FI (LC), NO (LC), SE (LC). – Nyl 322, Phil 155f, R&H 388, Svp 45:36-37, Ves 262, ☉. – Edible.
V. gloiocephala (DC.: Fr.) Boekhout & Enderle (*V. speciosa* (Fr.: Fr.) Singer, *V. media* (Schumacher.: Fr.) Singer)
 - Sp < 10 μm long; cap dry or \leq 30 mm
5. Sp 4-5 x 2.5-4 μm (fig. 347A). Cap 30-50 mm, conical to bell-shaped, later expanded with a

large umbo, smooth, dry to slightly viscid, white; gills crowded; stem 35-90 x 3-5 mm, up to 10 mm broad at base, whitish with arachnoid flocks; volva white; smell indistinct. Sp broadly ellipsoid, pale; hymenial cystidia up to 50 μm long, lageniform to bladder-shaped. In the area recorded from a young *Picea* forest; autumn; very rare, only known in one locality in FI (PH: Äänekoski, Parantala; FI (EN). – FM 9:51, Lud 87.8.

V. reidii Heinem. (*V. parvispora* D.A. Reid non Heinem.)

- Sp on av > 5 μm 6
- 6. Sp rusty brown in KOH, ellipsoid-ovoid, $Q_{av} \leq 1.45$ (figs 347B-C) 7
- Sp light brown in KOH, oblong, $Q_{av} > 1.45$ (figs 347D-F) 8
- 7. Cap 10-30 mm, whitish, sometimes becoming pale grey brown with age, sticky or viscid, at least when young, faintly sulcate. Cap convex, later low convex; gills crowded; stem 15-40 x 1-3(-6) mm, cylindrical with a clavate base, whitish to brownish; volva often deeply lobed, pale grey brown to sepia with age. Sp 5.5-8 x 4-5.5 μm , broadly ellipsoid-ovoid (fig. 347B), rusty brown in KOH; hymenial cystidia 45-80 x 10-20 μm , lageniform-fusiform. On compost, in gardens, etc. in warm places, also in hothouses; late summer to autumn; rare in temp.-hemib.; DK (LC), NO (NE, Oslo), SE (LC). – B&K 4:133, FAD 68C, GBW 4:283, Lud 87.7A-D.
- V. pusilla* (Pers.: Fr.) Singer
- Cap 20-50 mm, brown to ochraceous grey, not sticky or striate. Cap convex to low convex; gills medium spaced to crowded; stem 30-70 x 4-7 mm, cylindrical or with slightly clavate, 7-11 mm broad base, whitish to pale grey, becoming \pm buff; volva brownish. Sp 5-8 x 4-5.5 μm , broadly ellipsoid-ovoid (fig. 347C), in KOH rusty brown; hymenial cystidia 40-70 x 10-30 μm , lageniform. In grassy places; summer to autumn; rare in temp.-hemib.; DK (LC), SE (LC). – Lud 87.7E, GBW 4:284, Nyl 323.
- V. taylorii* (Berk.) Singer (*V. pusilla* (Pers.: Fr.) Singer var. *taylorii* (Berk.) Boekhout)
- 8. Cap white, with silky hairs; stem pubescent. Cap 30-60 mm, white to pale greyish, conical to bell-shaped, later low convex to slightly depressed with an low umbo, dry; gills crowded; stem 30-60 x 2-6 mm, cylindrical with a clavate base, whitish; smell indistinct. Sp 5.5-8 x 4-5.5 μm , ellipsoid (fig. 347D); hymenial cystidia 40-110 x 10-35 μm , clavate-lageniform. On mull soil in pastures and forests, sometimes in disturbed places; late summer to autumn; rare in temp.-bore.; DK (VU), FI (NT), NO (NT), SE (NE). – B&K 4:131, Lud 87.3, Nyl 324, R&H 389, Ves 262, .
- V. hypopithys* (Fr.) M.M. Moser (*V. pubescentipes* (Peck) Singer, *V. plumulosa* (Lasch) Singer)
- Cap grey, fibrillose; stem soon smooth 9
- 9. Cap 30-120 mm, strongly fibrillose, greyish-brownish. Cap conical to bell-shaped, then low convex with or without a small umbo, dry; gills crowded; stem 40-100 x 5-15 mm, cylindrical with a widened base, \pm smooth, white to cream or pale greyish; volva large, saccate, brownish; smell radish-like or unpleasant. Sp 6.5-9.5 x 4.5-6 μm , ellipsoid (fig. 347E); hymenial cystidia 30-80 x 10-25 μm , lageniform-clavate, sometimes mucronate or with finger-like appendix. On compost heaps, in gardens, etc. and in very warm and manured places; summer to autumn; rare in hemib., very rare in southern bore.; presumably introduced; FI (DD, EH: Tammela), NO (NE), SE (LC). – C&D 893, GBW 4:286, M&J 1. – Edible and cultivated.
- V. volvacea* (Bull.: Fr.) Singer
- Cap 20-60 mm, hairy at centre, radially silky fibrillose to slightly scaly towards margin, pale grey to grey. Cap conical to convex, then low convex with or without an umbo, dry; gills crowded; stem 40-90 x 4-7 mm, cylindrical with a widened, up to 10 mm broad base, pubescent when young, but soon smooth; volva quite small, whitish to grey brown; flesh thin; smell *Pelargonium*-like. Sp 5.5-7.5 x 3-4.5 μm , oblong (fig. 347F), light brown in KOH; hymenial cystidia 40-100 x 10-30 μm , lageniform-clavate. On calcareous soil in forests and grassland, sometimes in gardens, parks, etc.; summer to autumn; rare in temp.-hemib.; DK (VU), FI (LC), NO (NE), SE (LC). – FAD 67B, GBW 4:282, Lud 87.6B, Nyl 324, .
- V. murinella* (Quél.) Courtec.

Woldmaria W.B. Cooke

HENNING KNUDSEN

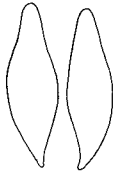
Monotypic genus; see description below.

Lit.: Cooke 1961, Woldmar 1955.

Frb cyphelloid with brown hairy outside. Frb tubular, sessile, 1-4 x 0.3-0.5 mm, hanging from a weak subiculum, golden brown, around the opening with yellow hairs.

Sp 12-13.5(-15) x 4-4.5 μm , distinctly fusiform, smooth (fig. 249D), hyaline. Basidia 4-spored, 24-30 x 6-8 μm . Clamps present. Hairs 100-150 x 4-5 μm , yellow brown, smooth, cylindrical with obtuse apices. Hyphae brown, thin- to slightly thick-walled, 2.5-5.5 μm broad; subhymenial hyphae hyaline, thin-walled.

Saprotrophic at the base of dead fronds of *Matteuccia struthiopteris*, gregarious; autumn and spring; common in temp.-hemib., occasional in bore.; DK (LC), NO (LC), SE (LC). – R&H 342, ☉.
W. filicina (Peck) Knudsen (*Solenia filicina* Peck, *S. crocea* P. Karst., *W. c.* (P. Karst.) W. B. Cooke, *Cyphella struthiopteridis* Pilát)



Spores.

Xerocomus Quél.

HENNING KNUDSEN & ANDY TAYLOR

Incl. *Phylloporus* Quél. and *Pseudoboletus* Štara

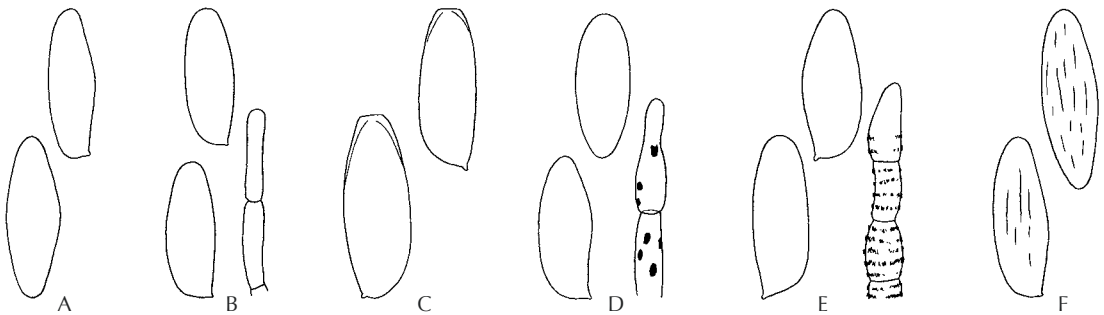
Frb boletoid with yellow tubes, splitting by breaking of the walls. Cap 20-150 mm, mostly 40-80 mm, convex to plane, fleshy, usually dry, exceptionally greasy, glabrous to strongly tomentose, in some species areolately cracking, usually strongly pigmented, with brown, green and red colours predominating. Stem cylindrical to clavate, sometimes tapering below and rooting, smooth to scurfy or granular, some species developing ridges or with a raised irregular and incomplete network. Tubes and pores concolourous or pores rarely slightly differently coloured, yellow to greenish, unchanging or blueing when bruised. Flesh soft, whitish to yellow, sometimes vinaceous to purplish in stem base, in some species blueing when bruised. Smell weak and not distinctive. Taste mild. Sp deposit olive brown.

Sp broadly subfusiform to subfusiform, smooth to finely longitudinally striate, with striation generally very difficult to see in a light microscope, truncate in two species, Q often > 2 and an important character for delimiting some species, without iodine reactions. Basidia 4-spored. Cheilo- and pleurocystidia present. Pileipellis variable, a trichoderm to a palisadoderm, rarely epithelioid. The occurrence and arrangement of pigment incrustations on the walls of the terminal pileipellis hyphae is an important character: pigment may be absent, present as bands (zebra-incrustations) or as incrustations seen as red platelets in congo red. Clamps absent.

All species obligately ectomycorrhizal, including *X. parasiticus*, with most species showing little host or substrate specialization, with the exception of *X. parasiticus* that fruits on *Scleroderma citrinum*. Most species have a southern distribution, but the distribution of many species is unclear due to past confusion with species delimitations. Some species are edible and good, none poisonous.

20 species in the key, 16 known to occur in the area.

Lit.: Engel et al. 1996, Ladurner & Simonini 2003, Peintner et al. 2003, Taylor et al. 2006, 2007.



Spores and pileipellis elements: A: *Xerocomus badius*, B: *X. subtomentosus*, C: *X. porosporus*, D: *X. armeniacus*, E: *X. chrysenteron*, F: *X. pruinaus*.

1. Hymenophore with thick and waxy gills, golden yellow, with varying degrees of transverse connections or anastomoses. Cap 30-80 mm, convex, felty, reddish brown, sometimes with olivaceous tones; stem 30-60 x 7-12 mm, slender, reddish brown, spotted to scurfy on a yellow background; flesh yellowish, sometimes brownish in the cap. Sp 11-13 x 4-5 μ m, subfusiform. In deciduous and coniferous forests on acid soil, occurring in ordinary localities seemingly without specific ecological requirements; summer to autumn; rare in temp.-

hemib.; DK (EN), NO (EN, VA: Lyngdal), SE (EN). – Däh 36, P&D 27, R&H 215, Rim 4:42, Sing 1.11 (as *rhodoxanthus* var. *europaeus*).

X. pelletieri (Lév.) Bresinsky & Manfr. Binder (*Phylloporus* p. (Lév.) Quél., *P. rhodoxanthus* (Schwein.) Bres. subsp. *europaeus* Singer, *Paxillus paradoxus* (Kalchbr.) Cooke)

- Hymenophore with tubes 2
- 2. Growing from the base of *Scleroderma citrinum*. Cap 20-50(-70) mm, convex, smooth, finely felty, finely cracked in dry weather, ochre to yellow or brownish; tubes yellow, unchanging when touched; hymenophore uneven, particularly in young frb; stem 20-70 x 5-10 mm, scurfy, ochre, tapering; flesh yellowish, unchanging. Sp 12-17.5 x 4-5.5 μ m, subfusiform; pileipellis a cutis of very long, regular, hyaline hyphae, 5-8 μ m broad. Under *Quercus* and *Betula*, only fruiting in some years; autumn; rare in temp., in NO rare in hemib., north to Hord; DK (LC), NO (LC), SE (LC). – Däh 38, Phil 285e, R&H 216, Svp 39:5, Ves 139, ☉.
X. parasiticus (Bull.: Fr.) Quél. (*Pseudoboletus* p. (Bull.: Fr.) Šutara)
- On soil, very rarely on old stumps 3
- 3. Stem generally > 20 mm thick; cap (50-)100-150(-200) mm, thick-fleshed and not cracking, resembling a *Boletus*; no part blueing when damaged or cut or only exceptionally in wet specimens; smell of iodine at stem base 4
- Stem usually < 20 mm thick or if larger then also blueing, cap generally 20-120 mm, thin- to thick-fleshed, cracking or not; flesh and tubes unchanging or blueing when bruised or cut; smell not of iodine 5
- 4. Pileipellis epithelioid with terminal cells rounded to ovoid. Cap 50-150(-200) mm, convex, with an uneven, hammered appearance, mat, dry or slightly greasy when wet, smooth, buff to yellow brown; stem 70-150 x (7-)15-40 mm, slender, often curved, cylindrical to tapering towards base; flesh whitish to yellowish. Sp 12-15 x 4.5-6 μ m, subfusiform. Under broad-leaved trees on calcareous soil; summer to autumn; southern species not known from the area; DE. – B&K 3:6, FE 8:54.
X. depilatus (Redeuilh) Manfr. Binder & Besl (*Boletus* d. Redeuilh)
- Pileipellis a trichoderm. Cap 50-200 mm, convex, uneven, minutely fibrillose, mat, initially pruinose, tawny brown to alutaceous, sometimes with olive shades; stem 60-150 x 8-50 mm, stout, bulbous to cylindrical to tapering near base. Sp 11-16 x 4-5 μ m, slender, subfusiform. Under old, broadleaved trees on rich soil; summer to autumn; rare in temp. and hemib., with few records in NO and FI (V: Parainen); DK (EN), FI (CR), NO (VU), SE (VU). – Bon 37, Phil 278b, R&H 224, Rim 4:41.
X. impolitus (Fr.) Quél. (*Boletus* i. Fr., *B. suspectus* Krombh., see note p. 911)
- 5. Cap viscid or greasy when wet, smooth or tomentose when dry. Cap (30-)50-150(-250) mm, convex, bay brown; pores pale yellowish becoming pale greenish yellow, blueing slowly (10-30 sec.) when bruised or damaged; stem 40-120 x (10-)15-30(-40) mm, finely scurfy, then smooth, mottled yellow brown, yellow at top; flesh whitish to pale yellow unchanging or almost so; smell indistinct or slightly pleasant. Sp 12-15 x 4-5 μ m, subfusiform (fig. 177A). In open and dark coniferous forests, more rarely in deciduous forests, mostly on acid soil; summer to autumn; very common in temp.-hemib., common in southern bore., occasional in middle bore. north to 64°; DK (LC), FI (LC), NO (LC), SE (LC). – Däh 39, GBW 2:320, Phil 277b, Sing 1.14, Ves 138, ☉. – Edible, collected and marketed in many countries.
X. badius (Fr.: Fr.) E.-J. Gilbert (*Boletus* b. (Fr.: Fr.) Fr.)
- Cap dry or scarcely greasy when wet 6
- 6. Terminal hyphae in pileipellis without incrustations 7
- Terminal hyphae in pileipellis with \pm zebroid incrustations (fig. 177E) and/or with incrustations seen as red platelets in congo red (fig. 177D) 11

7. Sp hyaline and thin-walled, broadly fusiform, 9.5-11 x 5-5.5 μm , Q = c. 2. Cap 20-80 mm, convex, tawny to fawn, felty, soon finely cracking; tubes at first pale cream, then yellowish, unchanging with pressure; stem 30-80 x 8-30 mm, slender to stout, scurfy to finely ridged at top, cylindrical, but often lageniform-fusiform with pointed base; flesh white, brown under the pileipellis, unchanging. Under broadleaved trees, thermophilic and not known from the area; *DE, UK*. – B&K 3:57, CM 18(4) tab. 54, FE 8:96, P&D 38.
X. moravicus (Vacek) Herink (*Boletus leonis* D.A. Reid)
- Sp coloured and with other characters 8
8. Flesh white or whitish at least just after cutting 9
- Flesh pale to strong yellow on cutting 10
9. Flesh in cap soon becoming yellow when cut. Cap 20-130 mm, convex, reddish yellow to dark brown, typically rich red brown; tubes pale yellow becoming dirty straw yellow, not blueing, but pores spotted red with age; stem 20-70(-130) x 7-33 mm, cylindrical to sub-clavate, always tapering at the very base, often deeply rooting, sometimes with a coarse, irregular reticulum, straw, buff and dull red brown; flesh firm, in stem sometimes with mottled red tones, rarely without colour change, a reddish purple line below the cuticle and above tubes often present; basal mycelium whitish to pale yellow. Sp 9-14.5 x 4-6 μm , Q = c. 2.3, subfusiform to broadly subfusiform. Associated with *Populus* species; recently described and distribution and frequency in the area unknown; *UK*. – MycR 111:407.
X. silwoodensis A.E. Hills, U. Eberh. & A.F.S. Taylor
- Flesh white in cap, unchanging when cut. Cap 20-130(-250) mm, convex, dry, tomentose, the felty surface rapidly restored on damaged areas, from olive brown to pure green to reddish brown; tubes yellow, not or only weakly blueing; stem 30-100 x 5-30 mm, slender, smooth to scurfy, sometimes with a well-developed, coarse net, cream to pale brown; basal mycelium yellow. Sp 10.5-13.5 x 4-5 μm , Q = c. 2.7, slender, subfusiform. Under deciduous and coniferous trees on acid soil; summer to autumn; common in temp.-suba.; DK (LC), FI (LC), IS (Fingvellir), NO, SE. – Mar 209, Sing 1.11 (as *spadiceus*).
X. ferrugineus (Schaeff.) Bon (*X. spadiceus* (Fr.) Quél., *X. leguei* (Boud.) Bon, *Boletus citrinovirens* Watling)
Note: previously often included in *X. subtomentosus*.
10. Basal mycelium mustard yellow when moist, golden yellow when dry; flesh yellow to golden yellow particularly in the lower half of the stem, not blueing. Cap 25-70 mm, convex, finely felty becoming glabrous, mustard to olivaceous yellow, fulvous, sepia, sienna, reddish brown to rich copper brown; stem 30-50 x 5-18 mm, tapering, bright yellow when very young, resembling the pores, soon paling, finally dull straw, finely scurfy with minute reddish brown flecks, occasionally forming an incomplete, stretched network. Sp 9-14.5 x 4.5-7 μm , Q = c. 2.2. Associated with *Quercus*; summer to autumn; recently described and so far not known from the area; *UK*. – MycR 110:284.
X. chrysonema A.E. Hills & A.F.S. Taylor ('*chrysonemus*')
- Basal mycelium whitish, rarely pale yellow; flesh in cap and upper stem pale yellow to yellow, in the lower half of the stem often pinkish to pinkish brown and with a dough-like texture, occasionally blueing, sometimes markedly so. Cap 20-130 mm, convex, tomentose, colour variable, typically olivaceous yellow, olivaceous to olive brown, becoming reddish brown in wet conditions, more rarely pure yellow, or garnet to blood red; tubes weakly to distinctly blueing when damaged; stem 30-100 x 7-20 mm, cylindrical, tapering below, cream to yellow, slender, scurfy, smooth or with ridges or even with a rough net. Sp 11-13 x 4.5-5.5 μm , Q = c. 2.5, subfusiform (fig. 177B). Under deciduous trees; summer to autumn; mainly southern, but distribution uncertain due to the recently described related species; confirmed records from DK (LC), FI (LC), NO (LC), SE (LC), unconfirmed from IS. – Mar 219, SMT 27(3):36.
X. subtomentosus (L.: Fr.) Quél. (*Boletus s.* (L.: Fr.) Quél., *X. lanatus* (Rostk.) E.-J. Gilbert, *X. xanthus* (E.-J. Gilbert) Contu)

11. A significant proportion of the sp truncate (fig. 177C) 12
 - Sp not or only very rarely truncate 13
12. Frb with bright colours. Cap 40-100(-150) mm, convex, initially bright red but fading to brown retaining the red at the margin, finely cracking to reveal the yellow flesh; tubes bright yellow, blueing intensely when bruised; stem 20-70 x 4-15 mm, concolorous with cap, but top paler to yellow, becoming brown with age; flesh yellowish or white, strongly blueing. Sp 9-15 x 4-7 μm , subfusiform, finely but distinctly striate, some truncate, but truncate proportion very variable (5-100 %). Associated with *Betula* and possibly *Alnus glutinosa* in deciduous forests, forest edges, grazed forests, parks and gardens, on mull and clayey soil, often on damp soil; summer to autumn; recently described and distribution largely unknown, so far known as widespread with a southern distribution in FI (LC) and a few records from DK (DD) and SE. – FE 8:169,170, Sieniop 32, SMT 27(3):47.
X. femicus (Harmaja) H. Ladurner & Simonini (*Boletellus* f. Harmaja)
- Frb with dull colours. Cap 20-80 mm, convex, sepia brown, soon cracking, exposing the white, rarely red flesh beneath; tubes yellow, turning blue when bruised or damaged; stem 30-80 x 5-15 mm, concolorous with cap, but at top with a yellow and below that with or without a red band, staining blackish brown at the base; flesh yellowish in stem, purplish to brownish in stem base and whitish in cap, slightly blueing. Sp 13-15 x 5-6 μm , subfusiform, smooth, a variable proportion truncate (fig. 177C). Under broadleaved trees on acid to calcareous soil, in FI in *Quercus* forests; summer to autumn, especially early in the season; common in temp., occasional in hemib., rare in bore., in Finland north to U; DK (LC), FI (LC), NO (NE), SE (LC). – Phil 285c, R&H 217, SMT 27(3):43, Ves 137, ☉.
X. porosporus Imler (*Boletus* p. (Imler) Watling)
13. Pileipellis a trichoderm of terminal filamentous hyphae with incrustations seen as red platelets in congo red (fig. 177D), with scattered zebroid incrustations occasionally also present; pileipellis and flesh at stem base in fresh specimens rapidly dark green blue with FeSO_4 . Cap 25-70 mm, convex, tomentose, red, pink, apricot, sometimes cracking; stem 30-60 x 5-10(-15) mm, ochraceous brown and usually with a \pm striate red band at the middle or at top, cylindrical above, tapering below; flesh yellow in the cap and in the upper part of the stem, at the stem base typically rhubarb or apricot, only slightly blueing in the cap; pores yellow, turning blue when bruised. Sp 11.5-13 x 4.5-5 μm , subfusiform. Under deciduous trees; distribution and frequency unknown due to previous confusion with related species, but confirmed records exist from UK. – Bon 43, FE 8:146,147, FM 6(3):98, Jordst 24(2):31, P&D 36.
X. armeniacus (Quél.) Quél.
- Pileipellis without red incrusting platelets in congo red; flesh not turning dark green blue with FeSO_4 14
14. Sp Qav < 2.5; often amongst grass and associated with deciduous trees in open parks and along woodland margins; flesh frequently with small to extensive orange spots in the stem base (use lens!) 15
 - Sp Qav > 2.5, associated with deciduous and coniferous trees usually in more closed forests; flesh in stem base without orange spots 17
15. Cap and stem when young always with strong, pure red colours that may fade to brownish red, rarely cracking. Cap 15-60(-80) mm, convex; tubes yellow, only slightly and slowly turning blue with pressure; stem 25-60 x 5-10(-15) mm, cylindrical, tapering below; flesh in stem pale to strongly yellow, more dirty yellow in the base, only slightly and slowly turning blue. Sp 11.5-12.5 x 5-5.5 μm , Q = c. 2.3, subfusiform. Most often amongst grass in parks and gardens, outskirts and clearings of deciduous forests on rich soil, summer to autumn; occasional in temp.-hemib., rare in bore. in SE and FI, in FI north to 63°; DK (LC), FI, NO (LC), SE (LC). – Däh 37, Phil 282as, Sing 2.12, SMT 27(3):37, ☉.
X. rubellus (Krombh.) Quél. (*Boletus versicolor* Rostk. non Gray, *B. sanguineus* With. non L.)
- Whole cap never purely red even when young 16

16. Cap in shades of brown, usually pale chamois coloured, often with a pinkish margin, but paling strongly with age to very pale grey brown. Cap 20-80 mm, convex; pores yellow to yellow green, when fresh blueing \pm strongly when damaged; stem cylindrical, often initially strongly coloured in contrast to the cap, streaked vinaceous red becoming concolorous with the cap at the base, later paling like the cap to buff brown; flesh in stem off white to dirty yellow, at base stronger yellow, rarely with orange dots, blueing above tubes and at stem top; cap flesh pinkish white, unchanging. Sp 11.5-12 \times 4.5-5 μm , Q = c. 2.4, subfusiform. Recently described from NL, where it is apparently not uncommon, in the area so far only known from a few records in hemib.; NO, SE. – FE 8:284.
X. bubalinus (Oolbekk. & Duin) Redeuilh
- Very variable species, light grey brown, brown to blackish brown but often with a brown-red margin, rarely cracking or only so at the margin. Cap 25-100 mm, convex; tubes yellow, only slightly and slowly turning blue with pressure; stem cylindrical to stout and bulbous, fawn to dirty yellow, rarely with red tones; flesh pale yellow in cap, occasionally with a strong reddish band extending from the cuticle into the cap, dirty yellow in stem, only blueing slightly. Sp 12-13.5 \times 5-5.5 μm , Q = c. 2.3, subfusiform. Common in deciduous forests, often with *Quercus* and *Tilia*, but distribution and frequency still unclear due to previous confusion with *X. rubellus*. – Bull 393 B, FE 8:180, Jordst 24(2):31, SMT 27:44.
X. communis (Bull.) Bon (*Boletus subtomentosus* (L.: Fr.) Quél. subsp. *declivitatus* C. Martín, *Boletus d.* (C. Martín) Watling, *X. quercinus* H. Engel & T. Brückn. ad int.)
17. In riparian habitats on moist soil and in dunes with *Salix*, *Populus*, *Alnus*. Cap 30-70 mm, convex, red or red brown, fading to almost pale grey with age, often cracking, without any pruinose appearance; pores yellow with some green tinges, slightly and slowly turning blue with pressure; stem 30-60 \times 10-20 mm, usually yellow at the top and reddish at the base; flesh yellow or yellowish, often with vinaceous tones at the stem base, turning blue mostly in the cap. Sp 12.5-14 \times 4.5-5 μm , Q = c. 2.9, striate in Melzer, subfusiform. Recently described species and distribution unknown, but confirmed records from temp.; DK (DD). – FE 8:217-222.
X. ripariellus Redeuilh (*Boletus r.* (Redeuilh) Watling & A.E. Hills)
- In \pm dry deciduous or coniferous forests associated with different hosts 18
18. Cuticle tomentose, 300-400 μm thick; flesh in stem base hardly blueing; sp smooth. Cap 30-120 mm, convex, brownish, greyish brown, sometimes reddish brown, soon cracking, exposing the red flesh beneath, not pruinose; tubes yellow to yellowish green, only slightly and slowly turning blue with pressure; stem 30-100 \times 5-15 mm, with or without red; flesh yellow or yellowish, often with vinaceous to rhubarb colours at the stem base, turning blue, mostly in the cap. Sp 13-14.5 \times 4.5-5.5 μm , Q_{av} = c. 2.9, subfusiform (fig. 177E). Mainly associated with conifers and *Fagus*, common in temp., occasional in hemib.-southern bore., in NO north to 63°, in FI north to 61° (A, V, U); DK (LC), FI (DD), NO (LC), SE (LC). – B&K 3:56.
X. chrysenderon (Bull.) Quél. (see note p. 911)
- Pileipellis 50-200 μm thick, pruinose or tomentose, flesh in stem base blueing slowly but strongly, sp finely striate (difficult to see) 19
19. Pileipellis only exceptionally cracking; flesh distinctly and often bright yellow. Cap 25-100(-150) mm, convex, brown, dark brown, red brown, purple brown to purple, usually distinctly pruinose and having a waxy appearance; tubes short, bright yellow, only slightly and slowly turning blue with pressure, in old specimens often with brownish pores; stem 30-100 \times 5-20 mm, cylindrical to tapering, sturdy, with or without red; flesh in stem base occasionally with vinaceous tones, blueing strongly after some minutes. Sp 13-14.5 \times 4.5-5.5 μm , on av > 5 μm broad, Q_{av} = c. 2.7, subfusiform, finely striate in Melzer (fig. 177F). In coniferous and deciduous forests, under *Fagus* and *Picea*; especially late in the season; very common

in temp., common in hemib., occasional in southern bore.; DK (LC), NO (LC), SE (LC). – Phil 284b, SMT 27(3):45, ☉.

X. pruinatus (Fr.) Quél.

- Pileipellis soon finely cracking with the pink flesh visible, resembling *X. chrysenteron*, but the cracking may be so extensive that cap appears rosy brown. Cap 35-80 mm, convex, very variable, pale ochre brown, greyish brown to olive or darker brown; tubes at first bright yellow with olive tones, later dull greenish yellow, slowly blueing with pressure; stem 45-80 x 4-9 mm, yellow to floccose brownish red; flesh in cap whitish, in stem yellowish to yellow with vinaceous spots in extreme base, blueing strongly after some minutes, especially near the base. Sp 10.5-16 x 4-5.5 μm , on av < 5 μm broad, $Q_{\text{av}} = \text{c. } 2.8$, subfusiform, finely striate in Melzer. With deciduous trees, especially *Quercus*; recently described and distribution and frequency only fragmentarily known with confirmed records from DK (LC) and SE. – FE 8:247-252, SMT 27(3):46.

X. cisalpinus Simonini, H. Ladurner & Peintner

Xeromphalina Kühner & Maire nom. cons. prop. MACHIEL NOORDELOOS

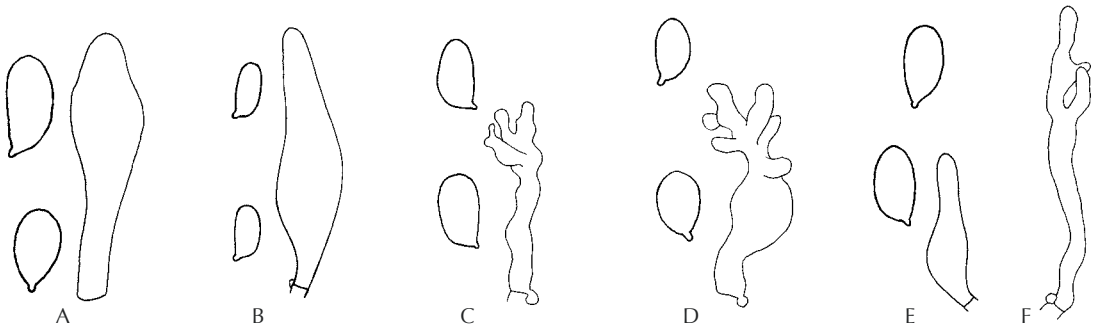
Frb omphalinoid with yellow-brown gills. Cap usually brightly coloured yellow orange to reddish brown, distinctly hygrophanous, translucently striate at margin or not, glabrous. Gills broadly adnate to decurrent, tinged yellow or ochre, sometimes very pale, but not white. Stem filiform, usually rather tough, usually distinctly tomentose-hairy all over, with yellowish or yellowish brownish basal tomentum and radiating hairs. Smell indistinct. Taste mild, unpleasant or bitter. Rhizomorphs usually present. Sp deposit white.

Sp ellipsoid, broadly ellipsoid, oblong, cylindrical or slightly allantoid, smooth, thin-walled, hyaline, amyloid, acyanophilous. Cheilocystidia present. Pleurocystidia present or absent. Pileocystidia present, often in two types: one thin-walled and unbranched, the second type often thick-walled and branched or coralloid (circumcystidia). Tramal hyphae without iodine reactions; context of stem sarcodimitic. Clamps present.

Saprotrophic on coniferous and deciduous wood or on forest litter and in *Sphagnum* bogs.

Five species in the Nordic countries.

Lit.: Antonín & Noordeloos 2004, Gröger 2006, Redhead 1988, Watling & Turnbull in Henderson et al. 1998.



Spores and cheilocystidia: A: *Xeromphalina campanella*, B: *X. brunneola*, C: *X. cornui*, D: *X. cauticinalis* var. *cauticinalis*, E: *X. fraxinophila* var. *fraxinophila*, F: *X. fraxinophila* var. *macrocystidiata*.

1. Lignicolous; pileo- and caulocystidia unbranched 2
 - Terrestrial, on raw humus or in *Sphagnum*; pileo- and caulocystidia often branched or with terminal projections 3
2. Cap vivid orange brown or yellow brown, translucently striate; stem entirely finely pubescent, taste mild; sp (5.5-)6-8(-9.5) × 3-4 μm, cylindrical-ellipsoid to ellipsoid, rarely suballantoid (fig. 241A); context of thin- to slightly thick-walled hyphae. Cap 4-20(-25) mm, hemispherical or bell-shaped, expanding to convex with depressed centre; gills arcuate-decurrent, distant, pale ochre to orange brown; stem 10-35 × 0.5-2 mm, yellowish above, orange brown below. Cheilocystidia 22-60 × 7-18 μm, lageniform, fusiform, subutriform to subclavate. On rotten wood, mainly on *Picea*, also on *Abies*, *Larix* and *Pinus*, exceptionally *Quercus*; spring to late autumn; common in hemib.-bore., occasional in suba., rare in temp.; DK (NT), FI (LC), NO (LC), SE (LC). – A&N 04:53, B&K 3:446, C&D 617, GBW 3:581, Lud 88.3, ⊙.

X. campanella (Batsch: Fr.) Kühner & Maire

 - Cap dull brown, opaque at margin; stem glabrous or with ochre-brown tomentose covering in lower part; taste unpleasant; sp 4.5-7(-7.5) × 2.5-3.5 μm, cylindrical-ellipsoid to suballantoid (fig. 241B); context of thick-walled hyphae with refractive walls. Cap 6-15 mm, convex

with depressed centre; gills crowded, orange buff; stem 30-60 x 1-2.5 mm, concolorous with gills at apex, downwards rusty brown. Cheilocystidia 25-85 x 6.5-19 µm, lageniform, fusiform, subutriform or clavate. On rotten wood and needle litter, especially of *Picea* and *Pinus*; summer to autumn; very rare in hemib.-bore., but poorly known; FI (DD, St: Pori, Yyteri), NO.

X. brunneola O.K. Mill.

3. In damp places among coniferous litter and in *Sphagnum*; cap 7-20 mm; stem 15-60 x 0.5-1 mm, glabrescent, at least in the middle; caulocystidia cylindrical to clavate, irregular to coralloid, forming clusters at stem top only. Cap hemispherical or convex to plane with depressed centre, red brown at centre, pale yellow brown towards margin, finely granulose to rugulose; gills deeply decurrent, medium spaced, dark to pale yellow, red brown when old. Sp 5.5-7.5(-8) x 2.5-4 µm, ellipsoid to subamygdaloid (fig. 241C); cheilocystidia clavate to fusiform with finger-like projections, scattered to abundant. Autumn; occasional in eastern temp.-eastern hemib. and bore., very rare in western temp.-western hemib.; DK (NT), FI (LC), NO (NE, Busk: Hole), SE (LC). – C&D 619, Ger 01:212.

X. cornui (Quél.) J. Favre

- On raw humus in coniferous or deciduous forests; cap 10-30 mm; stem tough, 2-3.5 mm broad, usually entirely tomentose; caulocystidia present over whole length of stem 4
4. Taste bitter or adstringent; in coniferous and mixed forests, also in subalpine *Betula* forests among mosses and lichens, often in damp places. Cap 10-20(-25) mm, convex with depressed centre, finally funnel-shaped, yellow brown with darker centre; gills arcuate-decurrent, distant to medium spaced, L = 14-20, yellow to yellow brown; stem (15-)20-70 x 0.5-1 mm, entirely brown tomentose. Sp 5-7 x 3-4 µm, ellipsoid (fig. 241D); caulocystidia simple to coralloid, often branched at apex, thin-walled, yellow brown to orange brown in KOH; hyphae of stem trama remaining hyaline in KOH. Summer to autumn; occasional in temp.-bore., rare in suba.; DK (LC), FI (LC), IS, NO (LC), SE (LC). – A&N 04:215, B&K 3:346, C&D 620, Lud 88.4, 88.5, ☉.

X. causticinalis (Fr.) Kühner & Maire var. *causticinalis* (*X. fulvobulbilloso* (R.E. Fr.) Kühner & Romagn., *X. amara* E. Horak & J. Peter, *X. fellea* Maire & Malençon)

var. *subfellea* Bon (*Omphalia pubescentipes* Peck) differs in hyphae of stem trama turning orange brown in KOH. Autumn; rare in hemib.-bore.; FI, NO.

- Taste mild; in deciduous forests with e.g. *Populus tremula*, *Fraxinus*, *Alnus* and *Fagus*, rarely in coniferous forests. Cap 10-30 mm, convex with depressed centre, slightly rugulose, dark brown to red brown at centre, paler towards margin, deeply translucently striate; gills deeply decurrent, yellow ochre; stem 20-70 x 1-3.5 mm, red brown or sepia with orange rusty hairy covering. Sp (5.5-)6-7.5(-9) x 3-4(-5) µm, ellipsoid (fig. 241E); cheilocystidia inconspicuous or little conspicuous, (14-)18-31(-41) x (4-)5.5-9 µm, (sub)lageniform, clavate, fusiform, subutriform, rarely subcylindrical, sometimes rostrate, often slightly irregular. Not exclusively on calcareous soil; summer and autumn; very rare in temp.-southern bore.; DK (LC, EJyl: Høstemark), NO. – A&N 04:210.

X. fraxinophila A.H. Sm. var. *fraxinophila*

var. *macrocystidiata* Antonín & Noordel. differs in having conspicuous cheilocystidia, 22-75 x (3.5-)4.5-6 µm, ± cylindrical, branched to coralloid in upper part, sometimes septate (fig. 241F), and in having a preference of calcareous soil. Occasional in hemib.-bore. in FI, one record from NO (Busk: Ringerike); FI (LC), NO.

Xerula Singer

JAN VESTERHOLT

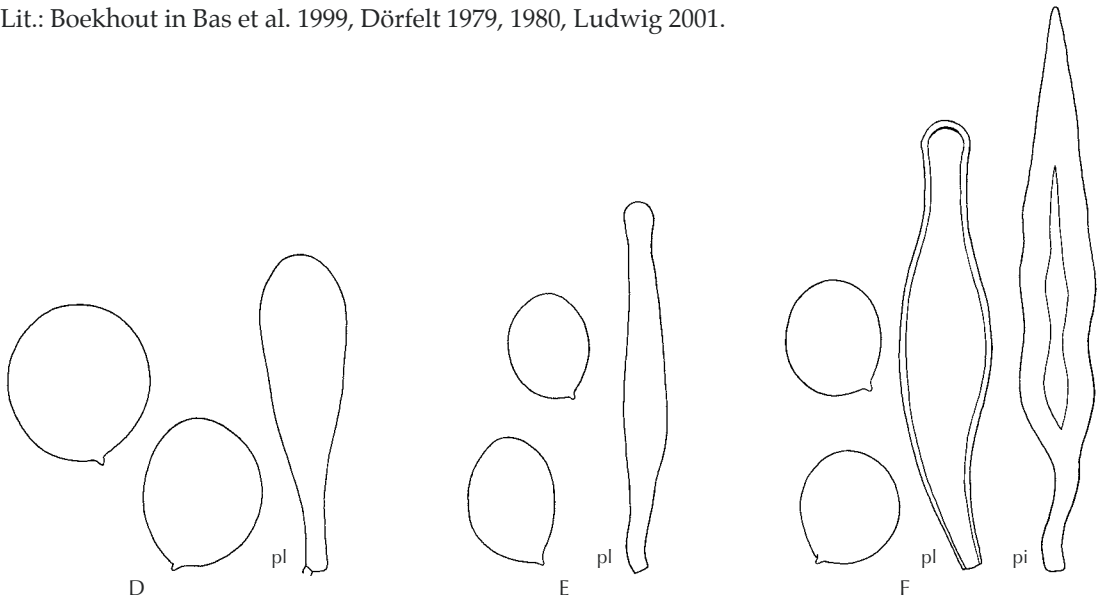
Frb collybioid with a rooting, comparatively long, smooth or velvety stem. Cap 5-120 mm, smooth or velvety, dry or viscid to slimy, brown to blackish. Gills narrowly adnate or emarginate, medium spaced to distant, white. Stem long and cartilaginous, with a long pseudorrhiza. Veil absent. Smell indistinct. Taste indistinct. Sp deposit white.

Sp subglobose to broadly ellipsoid, smooth in included species, hyaline, without iodine reactions. Cheilo- and pleurocystidia clavate to fusiform or utriform, sometimes capitate, thin- or thick-walled, sometimes with apical crystals. Pileocystidia present or absent. Pileipellis a hymeniderm or an ixohymeniderm. Clamps present.

Saprotrophic or weakly parasitic on roots of deciduous trees or conifers, but often apparently on soil.

Four species in the Nordic countries, five species in the key.

Lit.: Boekhout in Bas et al. 1999, Dörfelt 1979, 1980, Ludwig 2001.



Spores, pleurocystidia and pileocystidia: D: *Xerula radicata*, E: *X. causesei*, F: *X. pudens*.

1. Cap smooth, viscid to slimy, shiny; without pileocystidia. Cap 15-120 mm, conical to convex, later expanded, radially rugose-wrinkled, buff to greyish brown; gills distant, white, often with brown edge, at least near cap margin; stem 50-250 x 3-10 mm, cylindrical or widened downwards, up to 20 mm broad at base, fibrillose, whitish to pale greyish brown, long rooting. Sp 12-17 x 9-14 μm , subglobose to broadly ellipsoid (fig. 263D); cheilo- and pleurocystidia 50-140 x 15-40 μm , clavate, thin-walled, sometimes brown. On roots of deciduous trees, especially *Fagus*, but also with *Quercus*; summer to autumn; very common in western temp., occasional in eastern temp. and hemib., very rare in southern bore.; DK (LC), FI (LC), NO (LC), SE (LC). – GBW 3:587, Lud 89.2, Phil 116b, R&H 335, Ves 230, ⊙.

X. radicata (Relhan: Fr.) Dörfelt (*Oudemansiella* r. (Relhan: Fr.) Singer)

- Cap velvety, dry; with hyaline or brown, seta-like pileocystidia

2

2. Sp with up to 3 μm long spines. Cap 5-25 mm, convex with a umbo, later expanded to slightly depressed, dry, whitish pruinose, dark brown to umber; gills distant, white; stem 40-80 x 1.5-3 mm, slightly widened at base, whitish pruinose, concolorous with cap, long rooting. Sp 14.5-17 x 13.5-16.5 μm , globose to subglobose; cheilo- and pleurocystidia 55-85 x 11-16 μm , utriform to fusiform, slightly thick-walled. In deciduous forests on calcareous soil; DE, NL. – BCat 488, Lud 89.6.
X. kuehneri (Romagn.) Bas & Boekhout (*Mycenella k.* Romagn., *Oudemansiella k.* (Romagn.) Singer)
- Sp smooth 3
3. Cap and stem whitish velvety; pileo- and caulocystidia hyaline; sp 9-12 x 5.5-8 μm (fig. 263E). Cap 30-80 mm, convex, later expanded to depressed, dry, brownish grey to blackish; gills medium spaced to distant, white; stem 50-100 x 6-10 mm, gradually widened downwards, up to 15 mm broad at base, fibrillose, whitish at top, dark grey downwards, whitish pruinose, long rooting. Sp broadly ellipsoid; cheilo- and pleurocystidia 55-100 x 7-15 μm , cylindrical to fusiform, sometimes capitate, thin-walled. On roots of deciduous trees on calcareous soil; autumn; very rare in temp.; DK (EN), SE. – FAD 41A (as *Collybia longipes*), GBW 3:583, Lud 89.5, SMT 26(2):9, Ves 231, ☉.
X. causei Maire
- Cap and stem orange brown velvety; pileo- and caulocystidia brown; sp > 8 μm broad 4
4. Cap with up to 1 mm long hairs on cap and up to 0.5 mm long hairs on stem; on roots of deciduous trees. Cap 20-90 mm, convex to bell-shaped, later expanded with an umbo, dry, pale buff, later greyish buff, orange brown velvety; gills medium spaced to distant, white; stem 60-150 x 3-8 mm, widened towards base, densely orange brown velvety, long rooting. Sp 8.5-12.5 x 8-10.5 μm , subglobose to broadly ellipsoid (fig. 263F); cheilo- and pleurocystidia 70-215 x 15-35 μm , fusiform with rounded to subcapitate apex, thick-walled, sometimes with apical crystals. With old trees on \pm calcareous clayey soil, especially with *Quercus*; summer to autumn; rare in temp.-hemib. in SE, very rare in temp. in DK and in hemib. in FI; DK (EN), FI (CR, V: Kaksikerta), SE (NT). – GBW 3:585, Lud 89.4, R&H 334, Svp 32:9, Ves 230, ☉.
X. longipes (Bull.) Maire (*X. pudens* (Pers.) Singer)
- Cap with up to 3 mm long hairs on cap and stem; on roots of conifers, especially *Abies*. Cap 30-70 mm, convex to bell-shaped, later expanded with an umbo, dry, buff to greyish brown; blackish brown velvety; gills medium spaced to distant, white; stem 100-200 x 5-10 mm, widened towards base, densely brown velvety, long rooting. Sp 9-12 x 8-11 μm , subglobose to broadly ellipsoid; cheilo- and pleurocystidia to 150 x 25 μm , fusiform to utriform with rounded apex, thick-walled. PL. – B&K 3:448, C&D 627, Däh 336, GBW 3:585, Lud 89.1.
X. melanotricha Dörfelt