

Keys to the species

KEY TO SECTIONS AND SUBSECTIONS

1. Cortina present but often fugacious; caulocystidia only present at the top of the stem; cheilocystidia with a $\pm$ cylindrical apical part, often widened in lower half (fig. 5A-B); perispore never loosening (P0) 2
 Cortina absent; caulocystidia often continuing to the base of the stem; cheilo-
 cystidia often with a different shape; perispore loosening or not (P0-4) 3
2. Spores ellipsoid to ellipsoid-ovoid, mostly yellowish in water and KOH mounts, indextrinoid or weakly dextrinoid (D0-1).
 Key A - sect. *Hebeloma*, subsect. *Hebeloma*, p. 28
 Spores ovoid-amygdaliform to citriform, mostly brownish, weakly to strongly dextrinoid (D2-5), rarely almost indextrinoid (D1).
 Key B - sect. *Hebeloma*, subsect. *Amygdalina*, p. 29
3. Universal veil forming a membranous ring on the stem; stem continuing into a strongly rooting base; smell of marzipan, rarely weak.
 H. radicosum, (sect. *Myxocybe*, subsect. *Myxocybe*), p. 104
 Universal veil present or absent but never forming a membranous ring on the stem; stem rooting or not; smell not of marzipan 4
4. Smell strong and sweet. **Key F** - sect. *Myxocybe*, subsect. *Sacchariolentia*, p. 32
 Smell different (radish-like, cocoa-like, soap-like, tea-like, fruit-like) or indistinct 5
5. Gills with a distinct pinkish tinge, spore deposit brownish red.
 H. sarcophyllum, (sect. *Porphyrospora*), p. 132
 Gills without a pinkish tinge, spore deposit umber, sepia, dark brick or whitish 6
6. Fruitbodies often $\pm$ rooting; smell never with radish-like components; gills without droplets; cystidia $\pm$ cylindrical or variable in shape.
 Key E - sect. *Myxocybe*, subsect. *Scabrispora*, p. 32
 Fruitbodies never rooting; smell usually with radish-like components; gills with or without droplets; cystidia well differentiated and cylindrical, clavate, capitate or ventricose 7
7. Spore deposit whitish.
 H. domardianum (sect. *Denudata*, subsect. *Hebelomina*), p. 102
 Spore deposit umber to sepia or dark brick 8

8. Cheilocystidia in majority ventricose with a cylindrical, apical part (fig. 5C) 9
Cheilocystidia cylindrical to clavate or capitate, sometimes both widened at apex
and at base (figs 5D-H) 10
9. Stem coarsely floccose in transverse belts, especially in the upper part, not dis-
colouring from the base; nearly all cheilocystidia ventricose.
H. sinapizans (sect. *Sinapizantia*), p. 60
Stem finely pruinose, especially in the upper part, discolouring from the base;
ventricose cheilocystidia are intermixed with clavate cheilocystidia.
H. quercetorum (sect. *Velutipes*, subsect. *Aestivale*), p. 72
10. Spores indextrinoid or weakly dextrinoid (D0-2).
Key D - sect. *Denudata*, subsect. *Denudata*, p. 30
Spores distinctly to strongly dextrinoid (D3-4) 11
11. Spores on average 4.4-5.3 μm broad.
H. theobrominum (sect. *Theobromina*), p. 62
Spores on average > 5.5 μm broad 12
12. Cheilocystidia typically widened both at apex and base (fig. 5 H).
Key D - sect. *Denudata*, subsect. *Denudata*, p. 30
Cheilocystidia cylindrical to subclavate, typically not much widened at apex or
at base (fig. 5 E) 13
13. Perispore never or only slightly loosening (P0-1); stem with a rounded basal
bulb. Key C - sect. *Velutipes*, subsect. *Velutipes*, p. 30
Perispore distinctly loosening in most spores (P3); stem usually without a basal
bulb. *H. aestivale* (sect. *Velutipes*, subsect. *Aestivale*), p. 68

KEY A: Cortina present; cheilocystidia with a $\pm$ cylindrical apical part, often widened
in lower third; spores ellipsoid to ellipsoid-ovoid, indextrinoid or weakly dextrinoid
(sect. *Hebeloma*, subsect. *Hebeloma*).

1. In the arctic or alpine zone, usually with *Salix* species 2
In other types of habitat 5
2. Cap umber to sepia, almost to the margin; exsiccata coriaceous.
See *H. polare*, p. 48
Cap not so dark, but often with a dark centre; exsiccata fragile to fairly tough 3
3. Spores on average longer than 10.3 μm and broader than 5.8 μm ; cap 10-24 mm
broad, not fully expanding. *H. marginatum*, p. 42
Spores on average shorter than 10.5 μm and narrower than 6.0 μm ; cap 15-50
(-70) mm broad, fully expanded with age 4

4. Epicutis mostly about 30 μm thick; stem rather short, only slightly discolouring with age; cap nearly unicoloured clay-buff to Isabella or cinnamon. *H. bruchetii*, p. 40
Epicutis > 50 μm thick; stem usually rather long, distinctly discolouring to brown from the base with age; cap typically bicoloured with a cinnamon to yellowish brown or umber centre and a paler margin. *H. mesophaeum*, p. 34
5. Cap initially fairly pale, $\pm$ unicoloured; stem (4-)6-14 mm broad, often becoming sordid with age; not in sand dunes. *H. sordidum*, p. 38
Cap mostly with a clay-buff to cinnamon or umber centre and a paler, often greyish margin; stem often narrower; in sand dunes or in other habitats 6
6. Spores on average < 10.5 μm long. *H. mesophaeum*, p. 34
Spores on average > 10.5 μm long 7
7. Stem pale from the beginning, but not whitish, soon discolouring to brown from the base; sometimes subfasciculate; under *Salix*, *Betula* or *Populus*, often with *Salix* in coastal dunes. *H. collariatum*, p. 44
Stem white, only weakly discolouring with age; not fasciculate; only recorded with *Salix* in coastal dunes. *H. psammophilum*, p. 46

KEY B: Cortina present; cheilocystidia with a $\pm$ cylindrical apical part, often widened in lower third; spores ovoid-amygdaliform to citriform, weakly to strongly dextrinoid (sect. *Hebeloma*, subsect. *Amygdalina*).

1. Cap umber to sepia, almost to the margin 2
Cap clay-buff to orange-brown with a paler margin 3
2. Spores ellipsoid to ovoid; only found with dwarfish *Salix* species in arctic and boreal habitats; exsiccata coriaceous. *H. polare*, p. 48
Spores ovoid to amygdaloid; with *Salix* in arctic and boreal habitats as well as in lowland bogs and sand dunes; exsiccata rather fragile. *H. nigellum*, p. 52
3. Spores amygdaloid to subcitriform, often papillate, rarely > 12 μm long, strongly dextrinoid, D(3-)4; exsiccata nearly always discoloured to dark brown; under *Betula*, *Corylus*, *Quercus* and possibly *Fagus*. *H. sordescens*, p. 58
Spores amygdaloid to ovoid, non-papillate, often > 12 μm long, dextrinoid but never strongly so, D(1-)2-3; exsiccata typically not discoloured to dark brown; under *Salix*, possibly also other hosts 4
4. Stem 1-3 mm thick; cap 8-24 mm broad; in alpine habitats. *H. kuehneri*, p. 52
Stem (2-)3-8 mm thick; cap 15-50 mm broad; in lowlands as well as in alpine habitats 5

5. Cap margin white, contrasting the orange-brown centre; stem white with an orange-brown base; with *Salix* in humid forest localities. *H. candidipes*, p. 56
Stem and cap less contrasting, appearance *mesophaeum*-like; with *Salix* in arctic/alpine regions, less often with *Salix* or *Betula* in boreal woodland. *H. monticola*, p. 54

KEY C: Cortina absent; fruitbodies not rooting; smell radish-like; cystidia clavate to capitate; cap dominantly pale, not hygrophanous; spores strongly dextrinoid (D3-4), verruculose (O1-2), with a mostly non-loosening perispore (P0-1) (sect. *Velutipes*, subsect. *Velutipes*).

1. Cheilocystidia on average < 6.0 µm broad at apex; only in moss in coniferous forests. *H. incarnatum*, p. 66
Cheilocystidia on average > 6.9 µm broad at apex; under various trees and shrubs 2
2. Cap diameter not exceeding 30 mm; spores on average 6.7-7.1 µm broad; cheilocystidia distinctly clavate, apex on average 8.5-10.1 µm broad; only in alpine habitats. See *H. alpinum*, p. 78
Cap diameter mostly exceeding 30 mm; spores on average 6.0-6.6 µm broad; cheilocystidia distinctly clavate, apex on average 6.9-8.9 µm broad; in lowlands as well as in alpine habitats. *H. velutipes*, p. 64

KEY D: Cortina absent; fruitbodies not rooting; smell radish-like; cystidia clavate to capitate, often in addition widened in the basal part; spore deposit umber to sepia (sect. *Denudata*, subsect. *Denudata*).

1. Species growing in alpine habitats with dwarf *Salix* or *Dryas* 1
Not growing in alpine habitats with dwarf *Salix* or *Dryas* 5
2. Stem 4-8 mm broad 3
Stem 1.5-3.5 mm broad 4
3. Cap < 30 mm broad; spores on average 6.7-7.1 µm broad. *H. alpinum*, p. 78
Cap mostly > 30 mm broad; spores on average 5.5-6.5 µm broad. *H. crustuliniforme*, p. 72
4. Spores ellipsoid-ovoid to subamygdaliform, on average 10.1-11.4 × 6.3-6.7 µm; fruitbody dominated by greyish colours. *H. subconcolor*, p. 86
Spores amygdaliform to citriform, on average 11.4-12.8 × 6.1-6.3 µm; cap clay-buff to yellowish brown and stem whitish. *H. minus*, p. 84

5. Cap dominantly white or whitish, at least in the outer part, in the centre often with yellow or brownish yellow tinges; spores pale yellow in the microscope 6
Cap ±brown or with greyish colours; spores brownish yellow to brownish in the microscope 9
6. Cheilocystidia on average < 7.0 µm broad at apex, median part often remarkably constricted and/or with wall thickenings. *H. fragilipes*, p. 76
Cheilocystidia on average > 7.0 µm broad at apex, median part not remarkably constricted or with wall thickenings 7
7. Stem 2-5 mm wide; spores on average < 5.5 µm broad; cheilocystidia often rather abruptly capitate. *H. helodes*, p. 74
Stem > 5 mm wide; spores on average > 5.5 µm broad; cheilocystidia broadly clavate 8
8. Spores dextrinoid (D2-3); only recorded with *Salix*. *H. lutense*, p. 100
Spores indextrinoid (D0); recorded with a wide range of broadleaved trees and conifers. *H. crustuliniforme*, p. 72
9. Stem 1-3 mm broad; with *Salix*. *H. pusillum*, p. 82
Stem 3-10 mm broad; with *Salix* or other hosts 10
10. Spores indextrinoid or indistinctly dextrinoid (D0-1); some cheilocystidia thick-walled in the median part. *H. hiemale*, p. 80
Spores distinctly to strongly dextrinoid (D2-4); cheilocystidia rarely thick-walled in the median part 11
11. Cheilocystidia on average > 8.7 µm broad 12
Cheilocystidia on average < 8.1 µm broad 13
12. Some cheilocystidia very strongly and abruptly capitate, to 19(-22) µm broad; stem 3-6 mm broad. *H. vaccinum* var. *cephalotum*, p. 90
Cheilocystidia ±clavate, not abruptly capitate and not so broad; stem 4-12 mm broad. • *H. populinum*, p. 92
13. Ixocutis very thin, about 20-30 µm; cap cinnamon coloured to the margin; spores narrowly amygdaloid to fusiform; found in a *Juniperus* alvar with *Pinus sylvestris*. *H. alvarens* var. *alvarens*, p. 94
Ixocutis rather thick, 50-150 µm; cap with less vivid colours, at least in the outer part; spores amygdaloid to citriform; with broadleaved trees or conifers 14
14. Spores on average < 6.5 µm 15
Spores on average > 6.5 µm 16
15. Cheilocystidia often widened at base, not remarkably flexuose; perispore loosening in few to many spores (P1-2). *H. vejense*, p. 98
Cheilocystidia rarely widened at base, often remarkably flexuose in the lower part; perispore not loosening (P0). *H. lutense*, p. 100

16. Flesh clay-buff to greyish buff, dark greyish buff or honey-coloured, subhygrophanous, fragile; stem 2.5-7 mm broad. *H. vaccinum* var. *vaccinum*, p. 88
Flesh whitish, not hygrophanous, not fragile; stem (5-)7-13 mm broad.
H. alvarense var. *hinnuleum*, p. 96

KEY E: Cortina absent; fruitbodies $\pm$ rooting; smell never with radish-like components; cystidia versiform (sect. *Myxocybe*, subsect. *Scabrispora*).

1. Spores $\pm$ cylindrical; in pine forests on poor and sandy soil. *H. cylindrosporum*, p. 114
Spores $\pm$ fusiform, amygdaloid or limoniform; often in different places 2
2. Cap appearing dry; epicutis < 30 μ m thick; in coniferous forests. *H. syrjense*, p. 112
Cap viscid to slimy; epicutis > 50 μ m thick; in different types of habitat 3
3. Perispore loosening in some to all spores (P2-3). *H. birrus*, p. 116
Perispore not loosening or only slightly loosening in few spores (P0-1) 4
4. Under broadleaved trees 5
Under conifers 6
5. Cap yellowish brown. *H. lundqvistii*, p. 108
Cap pale buffish to dark pinkish buff. *H. laterinum*, p. 106
6. Spores on average 5.1-5.9 μ m broad; cap colours $\pm$ marbled; smell like tea. *H. circinans*, p. 110
Spores on average 5.9-6.3 μ m broad; cap colours not marbled; smell like cocoa or "poires belle Helene". *H. laterinum*, p. 106

KEY F: Cortina absent; smell strong and sweetish, penetrating (sect. *Myxocybe*, subsect. *Sacchariolentia*).

1. Cap dry, soon velutinate or cracking up into small scales; cheilocystidia shorter than 35 μ m. *H. hetieri*, p. 126
Cap slightly to distinctly viscid, totally smooth or only slightly velutinate at the margin; cheilocystidia often longer 2
2. Perispore not or only exceptionally loose (P0-1); stem base fusiform. *H. fusipes*, p. 122
Perispore loose in few to all spores (P1-3); stem base typically not fusiform 3

3. Spores slender, Q on average > 1.9; cap 10-28 mm broad, white to pale cream; exsiccata not discoloured to dark brown. *H. fuisporum*, p. 128
Spores not so slender, Q mostly < 1.9; cap 15-60(-85) mm broad, pale pinkish buff to greyish buff, clay-buff or cinnamon; exsiccata often partly discoloured to dark brown 4
4. Spores on average > 13.5 µm long; cap clay-buff or cinnamon, but paler towards the margin; mostly in damp places with *Salix* or *Alnus*. *H. gigaspermum*, p. 124
Spores on average < 13.5 µm long; cap pale pinkish buff to greyish buff; in wet or dry places with broadleaved hosts. *H. sacchariolens*, p. 120

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