

# *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 *T. cingulatum* 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  $\mu$ m, 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  $\mu$ m 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  $\mu$ m, 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  $\mu$ m 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  $\mu$ m; 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  $\mu$ m, 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  $\mu$ m; 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  $\mu$ m, 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)  $\mu\text{m}$ , 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)  $\mu\text{m}$ , 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)  $\mu\text{m}$ . 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)  $\mu\text{m}$  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  $\mu\text{m}$ , 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  $\mu\text{m}$  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  $\mu$ m, 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*), Sienio 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, sub-farinaceous at first, soon acrid mixed with bitter. Sp (5-)5.5-6.5(-7) x 3.5-4.5 (-5)  $\mu$ m, 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  $\mu$ m, 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  $\mu$ m, 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 *pardinum*).

*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)  $\mu$ m, 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  $\mu$ m, 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  $\mu$ m, 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  $\mu$ m 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)  $\mu$ m, 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  $\mu\text{m}$  long 9
- 9. Smell of unbroken frb farinaceous; flesh and gills slowly turning yellowish with age or when bruised; sp mostly < 6  $\mu\text{m}$  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  $\mu\text{m}$ , 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)  $\mu\text{m}$ . 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  $\mu\text{m}$  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  $\mu\text{m}$ , 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  $\mu\text{m}$  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  $\mu\text{m}$ ,

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)  $\mu\text{m}$ . 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)  $\mu\text{m}$ , 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.) Quél.
  - 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  $\mu\text{m}$ , 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  $\pm$  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)  $\mu$ m, 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  $\mu$ m, 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  $\mu$ m 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)  $\mu$ m, 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. squarrulosum* Bres. s. Nordic authors)
- In thermophilic deciduous forests on clay or calcareous soil; cap without a distinct olivaceous tinge; sp on av > 5.5  $\mu$ m 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)  $\mu$ m, 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. squarrulosum* 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) × 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) × (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 × 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) × 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. *napipes* (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 × 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) × 3-4(-4.5)  $\mu\text{m}$ , 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 × 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) × (3.5-)4-5.5  $\mu\text{m}$ , 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 × 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 × 3.5-4  $\mu\text{m}$ , 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 × 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 × 3-4  $\mu\text{m}$ , 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  $\mu\text{m}$  long; stem normally shorter than cap diam. 7
  - Sp on av > 5.5  $\mu\text{m}$  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)  $\mu\text{m}$ . 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  $\mu\text{m}$ , ellipsoid. Summer to autumn; rare in bore., in FI with a northern distribution; FI (NT), SE. – FE 3:51, FE 3A:64, Gal 185, Sienil 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  $\mu\text{m}$ , 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)  $\mu\text{m}$ , 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)  $\mu\text{m}$ , 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  $\mu$ 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. (*Megatracholoma* c. (Fr.) G. Kost)

- Cap 30-150 mm; sp < 7.5  $\mu$ 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  $\mu$ 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)

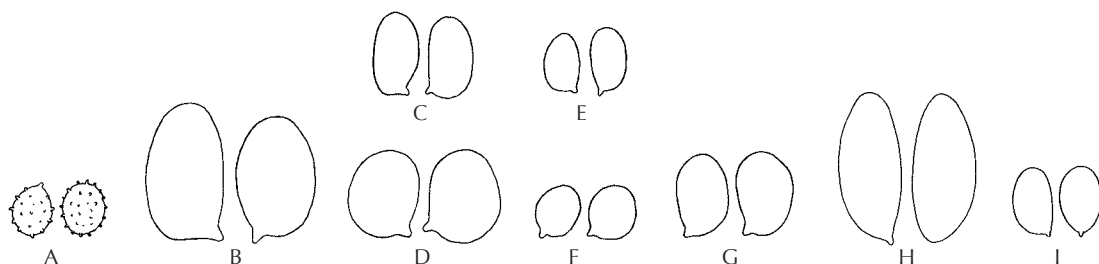
- Flesh in all parts white or whitish 12
12. Stem top with a sharply delimited white zone 13
- Stem top without a sharply delimited white zone 14
13. Cap cuticle mild, farinaceous to slightly bitter; under *Pinus* in nutrient-poor or calcareous coniferous or mixed forests. Cap 35-100 mm, convex to plane 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  $\mu$ 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)  $\mu$ 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  $\times$  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)  $\times$  (3-)3.5-4  $\mu$ 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, Sienio 143, Ves 199, ☉.

*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  $\times$  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  $\times$  (4.5-)5-6  $\mu$ 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, ☉.

*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  $\times$  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  $\times$  2.5-3.5  $\mu$ 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, ☉.



*T. pessundatum* (Fr.: Fr.) Qué.

- 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  $\mu\text{m}$ , 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  $\mu\text{m}$  long 2
  - Smell farinaceous, like celery or weak; sp on av < 8  $\mu\text{m}$  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  $\mu\text{m}$ , 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)  $\mu\text{m}$ , 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)  $\mu\text{m}$ , 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  $\mu\text{m}$ ; 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  $\mu\text{m}$  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  $\mu\text{m}$ . 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  $\mu\text{m}$  (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)  $\mu\text{m}$ , 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)  $\mu\text{m}$ , 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  $\mu\text{m}$ , 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  $\mu\text{m}$ ; 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)  $\mu\text{m}$ ; 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  $\mu\text{m}$ , 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  $\mu\text{m}$ , 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)  $\mu\text{m}$ , 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.