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# NOTULAE AD FLORAM AGARICINAM NEERLANDICAM – XXXIII
## Notes on Agaricus section Spissicaules

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The subsection *Spissicaules* of *Agaricus* section *Sanguinolenti* is raised to section level. It is mainly characterised by the simple annulus, the presence of yellowing rhizomorphs, yellow discolouration of the context or surface at the base of the stipe and a positive Schaeffer-reaction, and the slightly reddening context in the higher part of the stipe. Section *Spissicaules* comprises three species in the Netherlands, viz. *Agaricus lanipes*, *A. litoralis*, and *A. bresadolanus*. Both *A. maskae* and *A. spissicaulis* are considered synonymous with *A. litoralis*; *A. romagnesii* is regarded as conspecific with *A. bresadolanus*. A new species is described from the Netherlands and Great Britain, *A. rufotegulis*, which is tentatively placed in subgenus *Lanagaricus* on account of the covering of the pileus and stipe.

### Section Spissicaules

The group of species related to *Agaricus lanipes* is characterised by the presence of a simple, thin annulus, yellowing rhizomorphs, and the usual yellow discolouration of the context or surface at the base of the stipe, in combination with a positive Schaeffer-reaction (cross-reaction of Anilin and concentrated nitric acid) there. The Schaeffer cross-reaction is negative on the surface of the pileus. Heinemann (1978) considered the group to be a subsection of the section *Sanguinolenti* J. Schaeff. & F. Møller, viz. subsection *Spissicaules*. It differs from section *Sanguinolenti*, however, in the only faintly reddish discolouration of the context, in combination with a yellow discolouration in the base, and the structure of the annulus, which has in section *Sanguinolenti* a double margin or large marginal squames at the underside. It may be regarded as an intermediate between the group in *Agaricus* with reddening context or surface of pileus or stipe, and the group with yellowing context or surface of pileus or stipe. The species have also characters in common with section *Xanthodermi* Sing., viz. the yellow discolouration in the base of the stipe, but have a less persistent annulus which is not double at the margin and, in contrast to the species of *Xanthodermi*, a positive Schaeffer-reaction on the base of the stipe. Because of its separate position, and no clear affinities to other sections, in particular not with *Sanguinolenti*, the subsection is raised to section level here.

**Agaricus section Spissicaules** (Heinem.) Nauta, *stat. nov.*

Basionym: *Agaricus* sect. *Agaricus* subsect. *Spissicaules* Heinem., Sydowia 30 (1978) 11.

Pileus whitish with pale brownish squames or brown to yellowish or reddish brown, occasionally slightly yellowing on handling, Schaeffer-reaction on surface negative; annulus thin, simple and often evanescent; context not discolouring or faintly reddish when cut; in base of stipe usually yellowish; Schaeffer-reaction orange on base of stipe; base of stipe with yellowing rhizoids; lamella-edge heterogeneous with scattered cystidia, or with zone of sterile elements, cheilocystidia inconspicuously basidioliform or clavate and small.

In the Netherlands and adjacent regions three species are recognised within the section *Spissicaules*, to which a key is given below. Bon (1985) considers also the following species to belong to the subsection *Spissicaules*: *Agaricus ludovici* Remy, *A. ducheminii* M. Bon, *A. vinosobrunneus* P.D. Orton and *A. luteolorufescens* P.D. Orton. *Agaricus ludovici* Remy resembles the species of this section in the morphology of the ring, but is more similar to *A. campestris* in other aspects, a.o. the presence of a germpore (Remy, 1964). The name is invalidly published since no type was designated (ICBN, 1994, art. 37.1). *Agaricus ducheminii* M. Bon (1985) probably belongs to section *Spissicaules*, but its identity is uncertain to the author. It may be a synonym of *Agaricus litoralis*. It is characterised by a white, distinctly yellowing pileus, and spores of 7–8.5 µm long. It was, however, originally described as a subspecies of *Agaricus ludovici* (*A. ludovici* subsp. *littoralis* Duchemin, 1979), and therefore also invalidly published (ICBN, 1994, art. 43.1). Types were studied of *Agaricus vinosobrunneus* P.D. Orton, which is a form of *A. silvaticus* J. Schaeff.: Fr., and *A. luteolorufescens* P.D. Orton, which proved to be a clear synonym of *A. lanipes*.

## KEY TO THE SPECIES OF SECTION SPISSICAULES, OCCURRING IN THE NETHERLANDS AND ADJACENT REGIONS

In this key also *Agaricus rufotegulis*, a newly described species, is included because of its strong superficial resemblance with *A. lanipes*. Microscopic examination of the covering of the pileus and lower part of the stipe revealed, however, that this species may be better placed in subgenus *Lanagaricus* Heinem. emend. A.E. Freeman.

1. Pileus predominantly brown to yellowish or reddish brown squamose; lamella-edge with a 50–80 µm broad sterile layer, composed of catenulate cheilocystidia ..... 2
   2. Pileus with dark brown centre, with broad brown to yellowish brown squames on paler background; stipe clavate to regular bulbose, below annulus with brown girdles; annulus narrow, persistent, squamulose at underside; veil composed of hyphae *A. lanipes*
   2. Pileus entirely reddish brown squamulose; stipe irregular subbulbose, below annulus pruinose, without brown girdles; annulus broad, longly attached to pileus, later evanescent; veil composed of hyphae with inflated elements, intermixed with semi-globose elements ..... *A. rufotegulis*
1. Pileus predominantly whitish to pale brownish, usually with appressed brownish squames at centre; lamella-edge usually partly fertile, composed of basidia and inconspicuous cheilocystidia ..... 3
   3. Pileus with appendiculate veil; average spore size (7.1–)7.4–8.0 × 5.5–6.0 µm *A. litoralis*
   3. Pileus without appendiculate veil; average spore size 6.0–6.7 × 4.2–4.7 µm *A. bresadolanus*

## DESCRIPTIONS AND NOTES ON THE SPECIES

**Agaricus lanipes** (F. Møller & J. Schaeff.) Sing., Lilloa 22 (1951) 432 — Fig. 1

*Psalliota lanipes* F. Møller & J. Schaeff., Ann. mycol. 36 (1938) 65; *Psalliota lanipes* var. *verecunda* F. Møller, Friesia 4 (1950) 26. — *Agaricus luteolorufescens* P.D. Orton, Trans. Br. mycol. Soc. 43 (1960) 182.

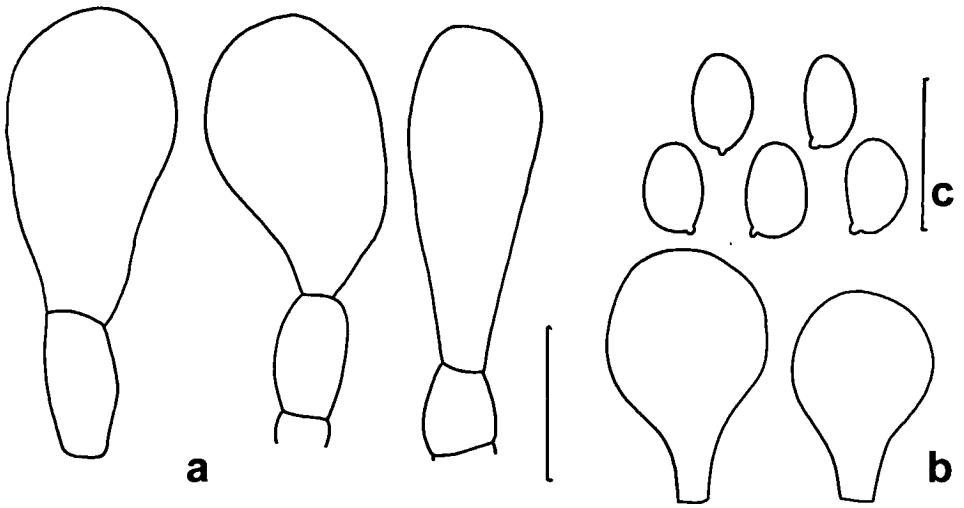


Fig. 1. *Agaricus lanipes*. a. Cheilocystidia, coll. *Brand 8433*; b. cheilocystidia, coll. *Nauta 7445*; c. spores, coll. *Nauta 7445*. Bar = 10 µm.

Pileus 50–100(–140) mm, at first convex, expanding to plano-convex, often with depressed centre, with broad, appressed, fibrillose, brown to yellowish brown squames on a paler background, in centre densely dark brown fibrillose-squamose, not discolouring on handling; veil present when young as whitish appendiculate fringe. Lamellae crowded, free, up to 9.5 mm broad, at first beige to pinkish grey, later blackish brown, with whitish serrulate to denticulate edge. Stipe 40–70(–87) × (8–)10–18 mm, annulate, regularly broadly clavate to bulbose, at base up to 29 mm broad, usually with one or a few short to long whitish to yellowing rhizomorphs, stuffed, whitish, not discolouring, but often yellow or brownish yellow at base on handling, sometimes slowly pale brownish red on scratching; above annulus white then greyish, smooth to very minutely squamulose, below annulus velutinous or fibrillose to floccose, towards base usually with some girdles of brownish, fibrillose, appressed squames, often at base smooth; sometimes entire surface of stipe brownish. Annulus at (0.58–)0.70–0.76 of height of stipe, (5–)10–18 mm wide, descending, slightly spreading to patent, thin, relatively persistent, whitish to yellowish brown (10 YR 6/4), with smooth to striate upperside; underside floccose to squamose or lanate. Context whitish to pale brownish, hardly discolouring to discolouring slowly and slightly reddish or brown when cut in upper part of stipe and pileus, occasionally yellowish in base of stipe. Smell like nuts to somewhat like almonds when cut, especially in base of stipe. Taste not tried.

Macrochemical reactions — KOH/NaOH negative on surface of pileus, yellowish on base of stipe; P-cresol red (context, surface of pileus, stipe); Schaeffer-reaction negative on surface of pileus and stipe, often orange on surface of base of stipe, usually in connection with a yellow discolouration there.

Spores (5.4–)5.6–8.0(–8.2) × (3.3–)3.5–5.4(–5.6) µm, av. l × av. b = (5.8–)6.6–7.1 × (3.6–)4.4–4.7(–5.0) µm, Q = 1.30–1.77(–2.00), av. Q = (1.42–)1.47–1.59(–1.62),

ellipsoid, without germpore. Basidia 16–17.5 × 5.5–6.5 µm, usually 4-spored, often some 2-spored also present. Lamella-edge with a 75–80 µm broad sterile layer; cheilocystidia usually in short chains of more or less rounded rectangular elements, with globose to clavate hyaline terminal elements, (12–)14–30 × 9–16(–22) µm. Pileipellis a cutis of 4–9.5 µm wide hyphae with cylindrical, slightly inflated elements, gradually passing into pileitrama, with pale brownish, parietal pigment. Squames consisting of curved, up to 11 mm wide hyphae with cylindrical, up to 11 mm wide terminal elements, with parietal or intracellular pale brownish pigment. Stipitipellis a cutis of slightly gelatinised, 3.5–4.5 µm wide hyphae with cylindrical elements, with parietal yellowish pigment. Clamp-connections absent in all tissues.

Habitat & distribution — Gregarious to sometimes caespitose, in mixed woods or gardens on nutrient-rich sandy or clayey soil. Rather rare in the Netherlands, more or less restricted to the regions on nutrient-rich soil as the new polders, southern Limburg, river region and the western part of the country. Rare in the rest of Europe.

*Collections examined.* THE NETHERLANDS (all L): prov. Flevoland, Noordoostpolder, Kuinderbos, 1 Sept. 1980, *A.M. Brand 8433*; ibid. 7 Oct. 1981, *A.M. Brand 19601*; prov. Gelderland, Wilp, 19 Aug. 1987, *G. & H. Piepenbroek 1613*; Oosterbeek, De Lichtenbeek, 7 Oct. 1978, *R. van Crevel*; prov. Noord-Brabant, Eindhoven, 27 Sept. 1989, *H. Huyser*; prov. Noord-Holland, Amsterdam, Amsterdamse Bos, 29 Oct. 1958, *H.J. van der Laan*; prov. Zuid-Holland, Oegstgeest, 23 Sept. 1997, *E. Schlatmann (Nauta 7445)*.

The name *Psalliota lanipes* F. Møller & Schaeff. is here regarded as validly published, since it was accepted by the authors as a new species (ICBN, 1994, art. 34.1), even though it was presented as "*Psalliota lanipes* n.sp. (vel subsp. *P. silvaticae*) Møller et Schaeffer." (Schaeffer & Møller, 1938).

*Agaricus lanipes* var. *verecunda* (F. Møller) F. Møller, differing according to Møller in paler colours and more gracile habit, is considered a synonym here.

The type of *Agaricus luteolorufescens* was studied from Herbarium Kew (Sussex, Friston, 17-11-1957, *P.D. Orton 1112*). The macroscopical features show strong resemblance with *Agaricus lanipes*, something Orton himself already noticed. Also, the spores, measuring 5.8–7(–7.5) × 4–5 µm, and the lamella-edge with a broad sterile layer of short chains of globose, up to 12 µm wide, cheilocystidia, fall within the range of *A. lanipes*. Therefore this taxon is considered synonymous with *Agaricus lanipes*.

**Agaricus litoralis** (Wakef. & A. Pears.) Pilát, Klíč urc. hub hřib. bedl. (1951) 403 — Fig. 2

*Psalliota litoralis* Wakef. & A. Pears., Trans. Br. mycol. Soc. 29 (1946) 206. — *Psalliota spissa* F. Møller, Friesia 4 (1950) 53; *Agaricus spissicaulis* F. Møller, Friesia 4 (1952) 203. — *Agaricus maskae* Pilát, Česká Mykol. 8 (1954) 165.

Pileus (52–)60–112(–125) mm, at first hemispherical, expanding to irregularly convex with flattened centre to plano-convex, white to whitish, often with greyish, brownish or, sometimes, reddish tinges, later often with yellowish or brownish spots, also on handling; margin appendiculate; surface fibrillose, with usually faintly delimited, large, light grey to greyish brown or yellowish brown appressed fibrillose squames at centre; veil sometimes present as arachnoid flocks at margin. Lamellae free, 5–10 mm broad, at first pink to pinkish brown or brownish grey, only later dark blackish brown, with paler, entire edge. Stipe shorter

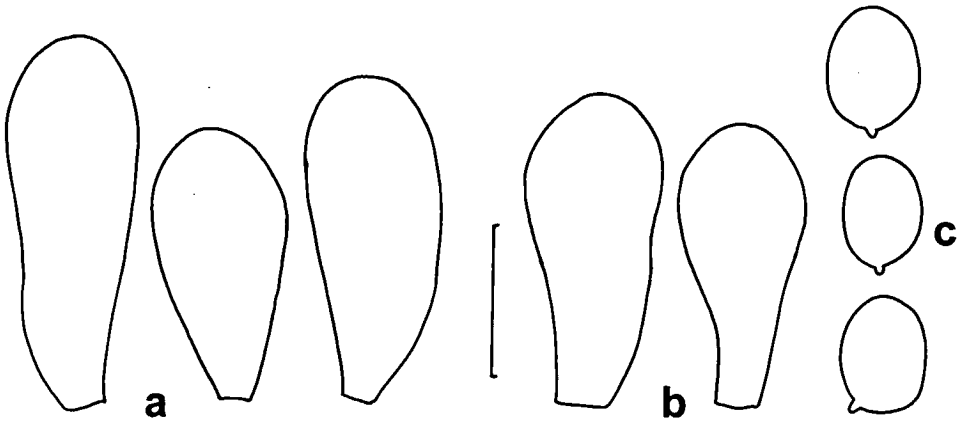


Fig. 2. *Agaricus litoralis*. a. Cheilocystidia, coll. *Loerakker 219*; b. cheilocystidia, coll. *Brand 10545*; c. spores, coll. *Loerakker 219*. Bar = 10 µm.

than pileus diameter, 35–70 × 11–19(–23) (top) mm, annulate, fusoid to irregularly cylindrical, tapering at base, at widest up to 28 mm broad, usually with 1–3, thick, white, yellow discolouring rhizomorphs, white, at base usually faintly ochraceous, often with brownish ochre tinge, above annulus minutely fibrillose-striate and sometimes greyish or brownish, below annulus merely fibrillose to lanose-fibrillose, sometimes floccose-squamulose. Annulus at 0.5–0.6(–0.8) of height of stipe, 3–5 mm wide, descending, pending, thin, easily torn, simple, white, not discolouring, with smooth to slightly striate upperside; underside smooth to fibrillose. Context relatively firm, white, often with brownish tinge, sometimes with a reddish tinge, usually discolouring slowly and faintly to faintly pale pinkish brown to brownish-reddish or slightly orange-red when cut; often at first slightly yellowish (brown) in base of stipe, later there pinkish orange to brownish or reddish. Smell faint, often indistinct, sometimes like anise, of context when freshly cut slightly to almonds, later faintly unpleasant. Taste faintly like nuts.

Macrochemical reactions — KOH negative (all parts); Schaeffer-reaction usually negative on surface of pileus and stipe, sometimes slightly reddish on surface of pileus, often positive (orange) on surface of base of stipe and rhizomorphs.

Spores (6.5–)7.0–8.5 × (4.5–)5.0–6.5 µm, av. l × av. b = (7.1–)7.4–8.0 × 5.2–5.8 µm, Q = (1.17–)1.22–1.55(–1.67), av. Q = 1.34–1.46, ellipsoid, without germpore. Basidia 20.5–27.5(–31) × 7–10(–11) µm, usually 4-spored, sometimes also 2-spored present. Lamella-edge heterogeneous, usually composed of basidia and few, usually inconspicuous, basidioliform, clavate cheilocystidia of (14–)16.5–22(–28) × (4.5–)6–10(–13) µm; sometimes lamella-edge almost sterile; rarely with scattered, conspicuous, clavate, up to 13 µm wide, cheilocystidia. Pileipellis a cutis of 4–5.5 µm wide hyphae with cylindrical elements, with slightly ascending, clavate terminal elements, with pale yellow parietal and intracellular pigment. Stipitipellis a slightly irregular cutis of 3–6.5 µm wide hyphae with cylindrical elements, with up to 8 mm wide, cylindrical terminal elements; with yellowish parietal pigment. Clamp-connections absent in all tissues.

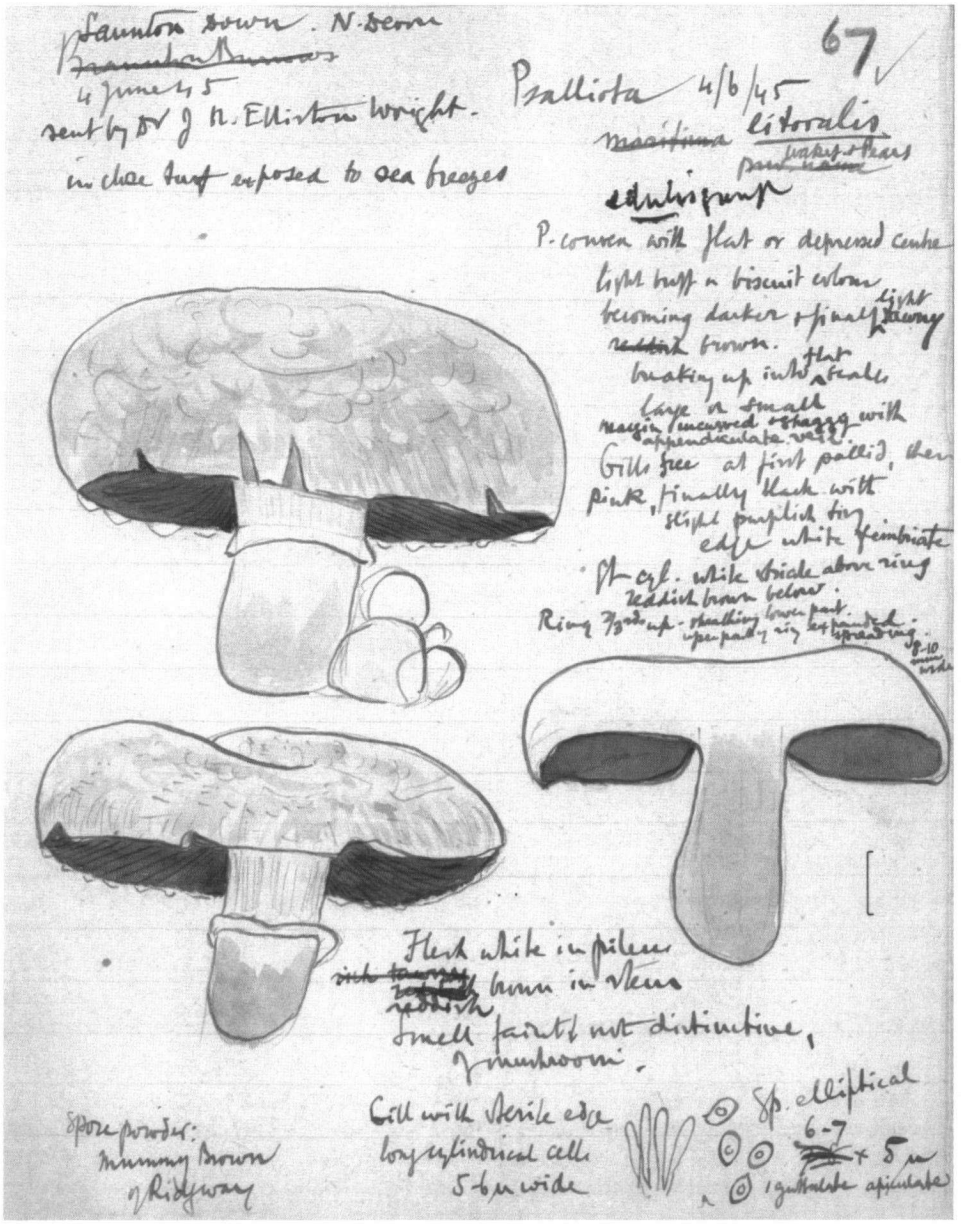


Fig. 3. *Psalliota litoralis* Original notes made by Pearson. Bar = 1 cm. Published with permission of the Royal Botanic Gardens, Kew.

Habitat & distribution — Solitary or in groups, often in dry pastures, or lawns on sandy soil, in mossy areas in dry coastal dunes; sometimes along roads in grass. Widespread in the Netherlands and elsewhere in Europe, in the Netherlands rather rare, probably in Europe more common in the Balkan area.

*Collections examined.* HUNGARY: Hortobagy, Szolnok, 16 Sept. 1981, *A.M. Brand 10545* (L, as *A. spissicaulis*); Kölesd, Kajdacs-Nagydorog, com. Tolna, 22 Aug. 1959, *G. Bohus & L. Imreh* (L, as *A. maskae*, duplicate of Bud.). — GERMANY: Meppen, Meppener Weiden, 30 Oct. 1978, *B.W.L. de Vries 3622* (WBS; as *A. arvensis*). — GREAT BRITAIN: England, Surrey, Richmond, Royal Botanic Gardens, Kew, 5 Sept. 1997, *E. Brown* (*Nauta 8047*; L; as *A. maskae*); ibid. (*Nauta 8048*). — THE NETHERLANDS (all L): prov. Noord-Holland, Texel, De Slufter, 7 Nov. 1979, *A.M. Brand 8289* (as *A. spissicaulis*); Texel, Loodmansduinen, 24 Sept. 1998, *M. Nauta 7496*; prov. Gelderland, Wageningen, Bosrandweg, 14 June 1979, *W.M. Loerakker (Brand 8048)*; prov. Utrecht, Amersfoort, 9 July 1984, *J. Wisman*; Leusden, 1 Oct. 1978, *J. Wisman* (as *A. romagnesii*); prov. Zuid-Holland, Oostvoorne, Heveringen, 18 Oct. 1978, *W.M. Loerakker 219* (as *A. spissicaulis*); ibid., 7 Oct. 1989, *A.M. Brand 8493* (as *A. spissicaulis*); Vogelenzang, 16 Sept. 1965, *C. Bas 4528* (as *A.* aff. *spissicaulis*).

The lamella-edge was never entirely sterile in the examined collections. The amount of cheilocystidia on the lamella-edge seems to be rather variable, but they are always narrow and resemble young basidia. In dried fruit-bodies the cystidia are often inconspicuous, in fresh fruit-bodies the cheilocystidia are more easily seen, and are even shortly catenate sometimes. Also, in dried material, the lamella-edge is very often agglutinated.

Some authors (a.o. Bon, 1985; Cappelli, 1984; Knudsen, 1992) considered *Agaricus litoralis* merely a form of *A. devoniensis* P.D. Orton. Study of the type material of *Agaricus litoralis* (K, Saunton Down, North Devon, 4 June 1945, leg. F.R. Elliston Wright) revealed that the spores are slightly larger than stated in the type description (Pearson, 1946), i.e. 7.7–8.4 × 5.5–6.4 µm, and the lamella-edge is only partly sterile with inconspicuous basidioliform cheilocystidia which measure 16–24 × 5–7 µm. *Agaricus devoniensis,* which belongs to section *Edules*, has a sterile lamella-edge with conspicuous globose, 9–13 µm wide, cheilocystidia, and spores which are in general smaller than those of *A. litoralis*, viz. 5.6–7.4 × 4.3–5.7 µm. Also, the original notes and drawings of Pearson (Fig. 3) show a much sturdier fruit-body, which much resembles the plate of *Psalliota spissa* by Møller (1950).

*Agaricus spissicaulis* was described by Møller as a species with spores 5–7 × 4–5.5 µm. Two collections present in Herbarium Kopenhagen which were identified by Møller have, however, average spore sizes of 6.9–7.1 × 5.2 µm resp. 7.6 × 5.1 µm (pers. comm. M. Brand), much closer to those given of *Agaricus maskae* (Pilát, 1954: 7.2–7.8 × 3.8–4.3 µm). Wasser (1979) also noticed that the spores of these collections were larger than mentioned in the type description.

The difference between *Agaricus maskae* Pilát and *A. spissicaulis* F. Møller is, apart from the supposed difference in spore size, the size of the pileus which is larger in *A. maskae*. This is here considered of no taxonomical importance but due to ecological circumstances. The two species are considered conspecific. *Agaricus litoralis* is regarded as a synonym because of the strong macroscopical resemblance and the similarity in microscopical characters. Since it is the oldest name it has priority.

**Agaricus bresadolanus** Bohus, Ann. Hist.-Nat. Mus. Natl. Hung. 61 (1969) 154 (as '*A. bresadolianus*') — Fig. 4

*Agaricus campestris* β *radicatus* Vittad., Fungi Mang. (1835) 42; *Agaricus radicatus* (Vittad.) Romagn., Bull. trimest. Soc. mycol. Fr. 53 (1937) 129 (nom. illeg., a later homonym of *A. radicatus* Relh.: Fr.). — *Agaricus romagnesii* Wasser, Ukr. Bot. J. 34 (1977) 305. — *Psalliota infida* Alessio, Micol.

ital. 4 (2) (1975) 21 (invalidly published); *Agaricus infidus* (Alessio) M. Bon, Doc. mycol. 11 (44) (1981) 28 (invalidly published, based on an invalidly published name); *A. romagnesii* var. *infidus* (Alessio) M. Bon & Cappelli, Doc. mycol. 13 (52) (1983) 16 (invalidly published, based on an invalidly published name).

Pileus 36–85(–100) mm, convex to plano-convex, sometimes with depressed centre, at first white, later greyish white with light brown centre, fibrillose, later at centre with indistinct, darker greyish brown, lanate squames; slightly yellowing on handling, later with yellowish spots; veil present when young as appendiculate fringe, disappearing with age. Lamellae crowded, free, up to 10 mm broad, at first greyish pink, finally blackish brown, with concolorous, entire edge. Stipe 30–70(–80) × 7.5–16(–20) mm, annulate, clavate to cylindrical with bulbous base, at base up to 30 mm broad, stuffed, straight, with one thick rhizomorph, white, discolouring yellow to yellowish brown at base, above annulus striate, below annulus fibrillose to fibrillose-squamulose. Annulus at 0.67–0.75 of height of stipe, 3 mm wide, descending, pending, simple, thin, often evanescent, white, with striate upperside; underside smooth. Context white, discolouring faintly reddish when cut, in base of stipe faintly yellow. Smell indistinct or sometimes faintly like iodine.

Macrochemical reactions — Schaeffer-reaction negative (surface of pileus), or orange (surface of base of stipe).

Spores 5.5–7.5 × 4.0–5.0(–5.5) µm, av. l × av. b = 6.0–6.7 × 4.2–4.7 µm, Q = 1.22–1.63(–1.75), av. Q = (1.29–)1.38–1.50, ellipsoid, without germpore. Basidia 17–25 × 7–9 µm, 4-spored, sometimes with some 2-spored. Lamella-edge not sterile, usually in majority composed of basidia, with a variable amount of sterile elements; cheilocystidia usually inconspicuous and resembling young basidia, usually clavate, rarely more globose, hyaline, rarely with faint brownish contents, sometimes in very short chains, 13–25 × 7–11(–13) µm. Pileipellis a regular cutis of radially arranged, 4.5–7 µm wide hyphae with cylindrical, sometimes inflated up to 8.5 µm, elements, with clavate, slightly ascending terminal elements, gradually passing into pileitrama, with parietal pale yellowish pigment. Stipitipellis a cutis of sometimes curved, 4–8.5 µm wide hyphae with cylindrical elements, with pale yellowish, parietal pigment. Clamp-connections absent in all tissues.

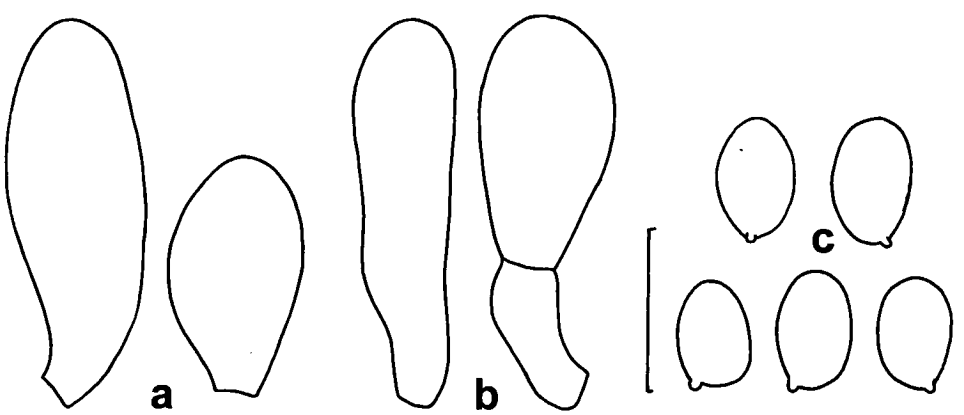


Fig. 4. *Agaricus bresadolanus*. a. Cheilocystidia, coll. *Brand 11316*; b. cheilocystidia, coll. *Brown* 17 Aug. 1997; c. spores, coll. *Brown* 17 Aug. 1997. Bar = 10 µm.

Habitat & distribution — Solitary or in small groups on (nutrient-rich and calcareous) soil. Along paths or on grassy spots in deciduous woods or in gardens, sometimes in meadows. Rare in the Netherlands, and in the whole of Europe, probably not occurring in northern Europe. April, Aug.–Nov.

*Collections examined.* HUNGARY: Ócsa, Com. Pest, 2–6 Sept. 1964, *I. Ferencz & E. Véssey* (L, duplicate of BP; as *A. campester* var. *radicatus*). — GREAT BRITAIN: England, Berkshire, Abindon, Kingston Bagpuize, 2 Oct. 1969, *G. McLean* (K); Kent, Beacon wood country park, 30 Sept. 1994, *B. Bullen* (K); Horton Kirby, 30 Aug. 1992, *J. Weightman* (K, 20490); Oxford, 2 Oct. 1989, *A. Lack* (K); Surrey, East Ewell, Howell hill nature reserve, 17 Aug. 1997, *E. W. Brown* (L); Fetcham Downs, 19 April 1998, *E. W. Brown* (K, 42288). — THE NETHERLANDS: prov. Zuid-Holland, Leiden, 20 Oct. 1980, *A. M. Brand* (L).

*Psalliota infida* Alessio (1975) is invalidly published since no type was cited (ICBN, 1994, art. 37.1), therefore also *Agaricus infidus* (Alessio), M. Bon (1981) and *A. romagnesii* var. *infidus* (Alessio) M. Bon & Cappelli (1983) are invalidly published (ICBN, 1994, art. 43.1). Apart from this, *Agaricus infidus* (Alessio) M. Bon would also have been a later homonym of *A. infidus* Peck.

According to Romagnesi (1937) *Psalliota campestris* var. *radicata* Vittad. differed from *Agaricus campestris* in the presence of marginal cystidia and the yellow discolouration of the pileus. Consequently, he raised the taxon to species level and named it *Agaricus radicatus,* unfortunately a later homonym of *A. radicatus* Relh.: Fr. Bohus (1961) noticed that material collected in Hungary resembled this taxon but differed in the absence of cystidia and the yellowing of the pileus. Also, the base of the stipe is more or less bulbous. Later a new species was described, based on the material from Hungary, named *A. bresadolanus* Bohus (1969; as *A. bresadolianus*), but the surface of the pileus was also said to discolour slightly yellow.

Wasser created a new species, *Agaricus romagnesii* Wasser (1977), based on Ukrainian material, differing from *A. bresadolanus* only in the presence of cystidia and a less bulbous base of the stipe. Wasser refers, in so doing, also to the interpretation of Romagnesi (1937) of *Agaricus radicatus*. Remarkable is that Wasser says that the cheilocystidia are absent and that the pleurocystidia are 30–40 × 8–15 µm. Wasser also refers to the interpretation of Reid (1972) of *A. bresadolanus*, who describes and depicts a collection from Kingston Bagpuize in England with clavate sterile elements on the lamella-edge of 20–32 × 5.75–8.75 µm. But, as Reid already stated, it may be that the discrepancies between the descriptions of *A. bresadolanus* and the British material are caused by a different interpretation of the nature of the elements on the lamella-edge. The collection which was cited by Reid was studied from Herbarium Kew, but the lamella-edge was agglutinated and the sterile elements could not be seen clearly, suggesting a heterogeneous lamella-edge with scattered sterile, up to 8 µm wide, clavate elements.

The collections which were examined in this study show a variable amount of sterile elements on the lamella-edge, sometimes only dispersed narrow sterile elements are found, sometimes the edge is almost sterile and the elements are up to 14 µm wide. Also, some collections seem to have a sterile lamella-edge when studied fresh, but have a minority of sterile elements when studied after drying. Since this only possible distinguishing character proved to be that variable, all collections are considered to belong to the same species, *A. bresadolanus*, and *A. romagnesii* is considered to be synonymous.

**Agaricus rufotegulis** Nauta

In June 1997 Mr. J. Wisman found an *Agaricus* on a rotting heap of leaves in Amersfoort, the Netherlands, and sent it to the author at the Rijksherbarium. No name for the specimens could be found then. Shortly after, a similar collection of *Agaricus* was shown to the author during a visit to the Kew Herbarium. It was collected by Mr. E. Brown from a rotting heap of leaves in Claremont landscape park, Surrey, Great Britain, in August 1997. The two collections proved to belong to the same taxon, and a thorough research did not provide a name for it. Therefore it is described here as new.

*Agaricus rufotegulis* superficially resembles *A. lanipes*, but differs in the more evanescent annulus and the absence of the brown girdles at the base of the stipe, the smaller reddish squamules on the pileus and the pruinose stipe. It also reminds somewhat of the brownish form of *Agaricus moelleri*, because of the remarkable small fibrillose reddish brown squames on the pileus. It differs from this taxon a.o. in the large but non-persisting annulus, and the positive Schaeffer-reaction on the base of the stipe. The species may show some similarity with old fruit-bodies of *A. porphyrizon*, which has a more persistent, narrower annulus with smooth underside and more vinaceous brown squames on the pileus.

This taxon is macroscopically characterised by the reddish brown squamulose pileus, the large annulus remaining for long attached to the margin of the pileus with a brown, squamose underside, the presence of yellowing rhizoids and the yellow discolouration of the base of the stipe, and the pruinose surface of the lower part of the stipe.

Close examination of the pruinose covering of the lower part of the stipe showed loosely connected chains of almost globose elements, similar to the elements at the underside of the annulus, which are remnants of the general veil (Fig. 5d). Most species occurring in northwestern Europe have a pileus covering composed in majority of cylindric, up to 8 µm wide elements, intermixed with some broader, inflated elements. In most examined species veil or squames on the pileus or stipe cannot be distinguished microscopically from the pileipellis which is a cutis.

Subgenus *Lanagaricus* is distinguished from subgenus *Agaricus*, to which most European species belong, by the presence of a cottony general veil, covering the pileus and lower part of the stipe (Heinemann, 1956). According to the interpretation of Freeman (1979), the general veil is composed of inflated, up to 11 µm wide, elements.

The structure of the general veil of this species is so strikingly different from the other species, that it is tentatively placed in the subgenus *Lanagaricus* section *Laeticolores* Heinem., close to *A. ficophilus* Heinem. or *A. rufoaurantiacus* Heinem., even though the pileus is not covered with cottony veil. The subdivision into subgenera within *Agaricus* needs careful evaluation, preferably based on morphological as well as molecular data.

**Agaricus rufotegulis** Nauta, *nov. spec.* — Fig. 5, Plate 13, 14

Pileus 80–115 mm latus, irregulariter convexus, dense fibrillo-squamulatus squamis rubro-brunneis; velum plerumque pileus et stipes conjungens, demum fimbriis albis margine appendiculatis. Lamellae liberae, initio pallide subrosae brunneae. Stipes 60–95 mm longus, 12–23 mm latus, plerumque annulatus, albus, infra annulum pruinosus, basi luteola ubi scalpturata vel laesa, mycelii flavidi caespite magno, rhizomorphis lutescentibus. Annulus ad 25 mm latus nutans saepe evanescens, infra flocculoso-brunneus. Caro alba, stipitis basi lutescens. Pileus post reactionem Schaefferi luteolus, stipitis basi aurantiaca.

Sporae 5.0–6.6 µm longae, 3.6–5.1 µm latae, Q = 1.17–1.64, ellipsoideae, sine poro germinativo. Basidia 4-sporigera. Cheilocystidia catenulata partibus terminalibus globosis ad clavatis, 9–21 µm longis,

(6–)8–13 µm latis. Pileipellis ab cute hyphis 4–8 µm latis, partibus inflatis ad 19 µm latis. Stipitipellis ab cute hyphis 4.5–7.5 µm latis, infra annulum partim fasciculis laxe connatis partibus fere globosis 10–20 µm longis, 10–17 µm latis obtecta. Annulus e hyphis of 6.5–9.5 µm latis compositus, partibus brevibus inflatis ad 13 µm latis, localiter partibus subglobosis (8.5–)11–16 µm longis, (7.5–)11–14 µm latis.

Holotypus: The Netherlands: prov. Utrecht, Amersfoort, 11 June 1997, *J. Wisman* (L 988.202-263).

Pileus 80–115 mm, at first hemispherical, expanding to slightly irregularly convex, sometimes with depressed centre, with margin exceeding lamellae, at centre reddish brown (5 YR 4/4 diluted), smooth, otherwise densely covered with small reddish brown to brown fibrillose squames on paler background, not discolouring to slightly yellowish orange on handling; veil for a long time connecting pileus and stipe, later present as white fringe. Lamellae free, up to 10 mm broad, at first pale pinkish brown, later dark brown, with slightly paler, entire edge. Stipe 60–95 × 12–23 mm, with broad annulus or without annulus, cylindrical to subclavate, young subbulbose, at base up to 25 mm broad, often with large clump of yellowish mycelium, usually with more or less yellowing relatively thick rhizomorphs, straight to curved, stuffed, white, at base yellowish when scratched, below annulus pruinose to minutely squamulose. Annulus at 0.75–0.85 of length of stipe, up to 25 mm wide, de-

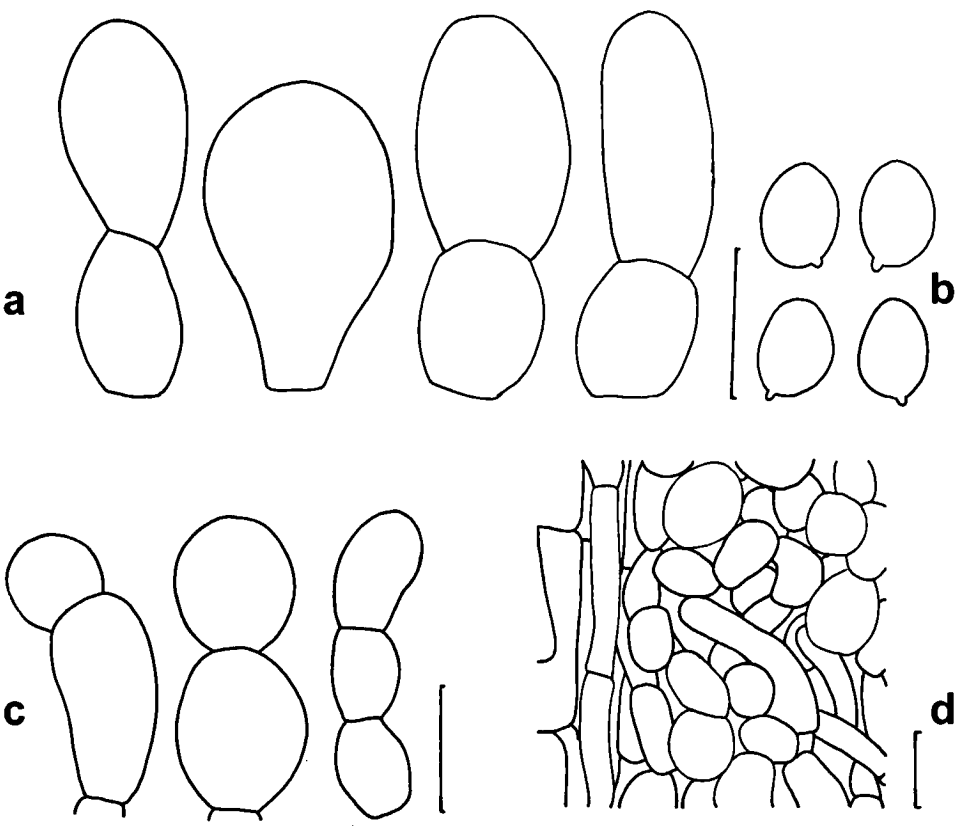


Fig. 5. *Agaricus rufotegulis*. a. Cheilocystidia; b. spores; a & b from type coll. (L 988.202-263) c. cheilocystidia, coll. *KM 53683*; d. stipitipellis, type coll. Bar = 10 µm.

scending, pending to slightly spreading, for a long time partly attached to pileus, often evanescent, white, with smooth upperside; underside with numerous, whitish to often brownish floccose squames. Context 7–10 mm thick in pileus, white, not discolouring when cut, except for a yellowish discolouration in base of stipe. Smell slightly to almonds or anise when cut, sometimes unpleasant. Taste not tried.

Macrochemical reactions — Schaeffer-reaction yellowish (surface of pileus) to orange (surface of base of stipe).

Spores 5.0–6.6 × 3.6–5.1 µm, av. l × av. b = 5.7–6.1 × 4.0–4.6 µm, Q = 1.17–1.64, av. Q = 1.32–1.44(–1.51), ellipsoid, without germpore. Basidia 18–24 × 7–8.5 µm, 4-spored. Lamella-edge with a 45–50 µm broad sterile layer; cheilocystidia in chains of rounded rectangular to globose elements, 7–12 × 4.5–11 µm, with globose to clavate terminal elements, 9–21 × (6–)8–13 µm. Pileipellis a cutis of radially arranged, 4–8 µm wide hyphae with often inflated elements of 16–47 × 11–19 µm, with slightly ascending clavate terminal elements of 20–40 × 20–23 µm, gradually passing into pileitrama, with pale yellowish, parietal pigment. Squames not distinguishable. Stipitipellis a regular, slightly gelatinized cutis of 4.5–7.5 µm wide hyphae with cylindrical, sometimes slightly inflated elements, with pale yellow, parietal pigment, below annulus intermixed or partly covered with clusters of loosely connected, almost globose elements of 10–20 × 10–17 µm. Annulus composed of irregularly arranged, somewhat curved, 6.5–9.5 µm wide hyphae with short, inflated elements up to 13 µm wide, in places resulting in chains of subglobose elements of (8.5–)11–16 × (7.5–)11–14 µm which are often detached. Clamp-connections absent in all tissues.

Habitat & distribution — Gregarious on heaps of rotting dead leaves in deciduous woods. Very rare, known from the Netherlands (type locality, Amersfoort) and England (Surrey, Esher, Claremont landscape park). June–Nov.

*Collections examined.* THE NETHERLANDS: prov. Utrecht, Amersfoort, 11 June 1997, *J. Wisman* (holotype L 988.202-263); ibid., Aug. 1997 (L). — GREAT BRITAIN: England, Surrey, Claremont Park, 10 Aug. 1997, *E. W. Brown* (K, 53683); ibid., 20 Aug. 1997 (L); ibid., 21 Sept. & 4 Nov. 1998 (L).

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