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NOTULAE AD FLORAM AGARICINAM NEERLANDICAM—XVI

New taxa, new combinations in Melanoleuca Pat. and notes on rare species in the Netherlands

T. BOEKHOUT

*Rijksherbarium, Leiden**

The genus *Melanoleuca* (Pat.) Pat. is divided in three subgenera based on the morphology of the cystidia, viz. (i) subgen. *Macrocystis*, consisting of the sections *Alboflavidae, Cognatae* and *Strictipedes*, (ii) subgen. *Melanoleuca* and (iii) subgen. *Urticocystis* comprising two sections, viz. *Grammopodiae* and *Humiles*.

Melanoleuca brevipes, M. cognata, M. exscissa, M. grammopodia, M. melaleuca, M. polioleuca, M. politoinaequalipes, M. rasilis, and *M. turrita* are redescribed. The following new combinations are introduced: *M. exscissa* var. *iris, M. polioleuca* f. *oreina, M. rasilis* var. *leucophylloides*, and *M. rasilis* var. *pseudoluscina. Melanoleuca nivea* Métrod (nom. nud.) is validated and the following new taxa are described: *Melanoleuca atripes, M. cognata* var. *nauseosa, M. grammopodia* f. *macrocarpa* and *M. albifolia*.

During a study of the representatives of the genus *Melanoleuca* in the Netherlands we became aware of the confusing taxonomic knowledge of that genus. Recognizing a *Melanoleuca* as such is generally no problem for experienced agaricologists, but beyond that, many controversies exist concerning the distinction of species and infraspecific taxa and the interpretations of descriptions in old literature, e.g. those of Persoon (1801) and Fries (e.g. 1821).

This problem is complicated by the lack of a modern monograph of the genus and the existence of many short, taxonomically and geographically limited and therefore fragmentary publications. Although this latter holds true also for this contribution, I feel it necessary to publish a part of my observations, because the names of some very well recognizable species described by Métrod have to be validated and a number of new combinations turned out to be required.

In the here following descriptions is referred to three different colour codes: Mu. = Munsell soil colour charts; K. & W. = Kornerup & Wanscher, Methuen handbook of colour; Expo. = Cailleux & Taylor, Code expolaire.

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* Present address: Centraalbureau voor Schimmelcultures, Yeast division, Julianalaan 67, 2628 BC Delft, Netherlands.

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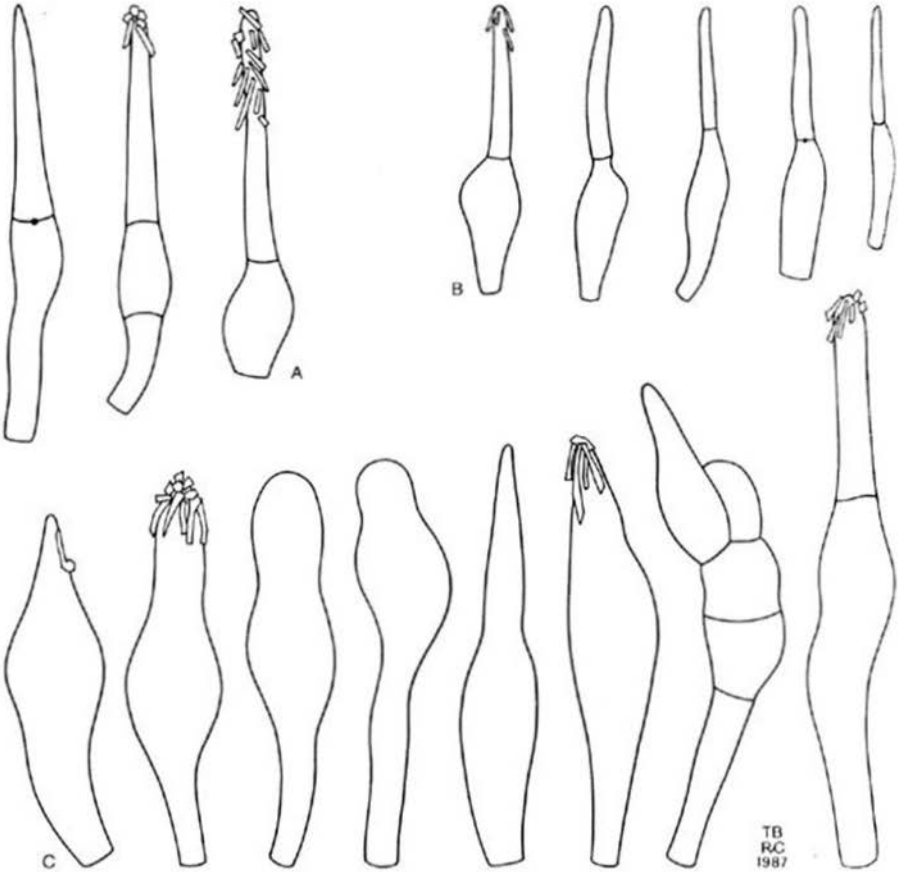

Fig. 1. Types of cystidia in *Melanoleuca*. — A. *Exscissa*-type (from *M. exscissa*). — B. *Brevipes*-type (from *M. brevipes*). — C. Lageniform to fusiform type (from *M. cinereifolia*). (All figs. ×1000).

DESCRIPTION OF THE GENUS **MELANOLEUCA** PAT.

(nom. prop. cons. against *Psammospora* Fayod (1893: 91), Taxon 35: 377–378. 1985)

Basidiocarps tricholomatoid, small, medium-sized or large. Pileus convex or applanate, frequently with low umbo and involute margin, mostly somewhat or distinctly hygrophanous, whitish, yellowish, grey-brown, yellow-brown or blackish brown. Lamellae mostly very crowded to crowded, adnexed, sinuate, adnate or even subdecurrent, ventricose to c. triangular-ventricose, whitish, cream, grey, pale brown, yellowish, with concolorous and entire edge. Stipe central, slender or obese, short or long cylindrical, frequently with a clavate base, stuffed or solid, white, yellowish, grey, brown or blackish brown, frequently longitudinally striate or fibrillose, smooth, with apex mostly pruinose or flocculose. Context whitish to beige-brown, sometimes turning yellow-brown to blackish brown in part of stipe. Smell and taste fungoid, sometimes sweetish or somewhat adstringent. Spore print white or pale yellow.

Spores ellipsoid, covered with amyloid warts, usually with suprahilar plage. Cystidia on lamellae absent or present, often with crystals of apex. Caulocystidia, if present, more or less similar to cystidia on lamellae. Clamps absent.

Cystidia occurring in two main types: (i) Urticiform cystidia ('en poil d'ortie' in French literature), only found at the edge of lamellae, thin-walled, with ventricose base and narrow cylindrical or attenuate neck, to be subdivided into two subtypes: the *exscissa*-type (Fig. 1A), with rather wide upper part attenuating towards apex and the *brevipes*-type (Fig. 1B), with narrow cylindrical upper part. (ii) Lageniform, fusiform to conical cystidia (Fig. 1C), found both at edge and sides of lamellae, usually somewhat thick-walled with ventricose to fusiform body without distinct upper part.

Type species: *Melaleuca vulgaris* Pat. ≡ *Melanoleuca melaleuca* (Pers.: Fr.) Murrill.

INFRAGENERIC CLASSIFICATION

Singer (1943, 1975, 1986) distinguished four sections in the genus, viz. (i) sect. *Alboflavidae* Sing. containing the white species, (ii) sect. *Humiles* Sing. comprising the pigmented species with a furfuraceous-pubescent or a squamulose stipe, (iii) sect. *Melanoleuca* Sing. with the large pigmented species with a pruinose stipe and (iv) sect. *Oreinae* Sing. with similar species as the preceding section but with small basidiocarps.

Kühner (1978) proposed a division in three sections, viz. (i) sect. *Alboflavidae* Sing., (ii) sect. *Cognatae* Kühner, containing species with more or less ochraceous basidiocarps and sect. *Melanoleuca* Sing. emend. Kühner, characterized by a blackish, brown or yellow-brown pileus, greyish or white lamellae and a white or brown stipe. The latter section has three stirps: stirps *Melanoleuca*, without cystidia, stirps *Grammopodia* with urticiform cystidia and stirps *Polioleuca* with lageniform or fusiform cystidia.

Bon (1978) presented an infrageneric classification based on both macroscopical and microscopical characters. He divided the genus in seven sections. Sect. *Oreinae* and sect. *Melanoleuca* of Singer are united in (i) sect. *Melanoleuca* Sing. emend. Bon (non emend. Kühner) and (ii) sect. *Humiles* of Singer is restricted to species with urticiform cystidia and slender basidiocarps. Besides sect. (iii) *Alboflavidae* Sing. and (iv) sect. *Cognatae* (Sing.) Kühn., Bon distinguished the following new sections: (v) sect. *Acystidiae* Bon, comprising the acystidiate species, (vi) sect. *Grammopodiae* Bon containing species with urticiform cystidia and non-squamulose stipes and (vii) sect. *Strictipedes* Bon characterized by lageniform cystidia and a grey-brown colour of the pileus.

I do not believe that the classifications of Singer and Kühner are consistent from an evolutionary point of view. In their opinion section *Melanoleuca* contains non-cystidiate species as well as species with urticiform and lageniform-fusiform cystidia. It seems improbable that colour and size of basidiocarps are more important characters than features and behaviour of the very typical cystidia. Therefore I propose the following subdivision of the genus *Melanoleuca* in three subgenera (Table I).

Table I. Comparison of infrageneric classifications of the genus *Melanoleuca*.

Singer (1962, 1986)	Kühner (1978)	Bon (1978)	Boekhout
sect. *Alboflavidae*	sect. *Alboflavidae*	sect. *Alboflavidae*	subgen. *Macrocystis* sect. *Alboflavidae*
	sect. *Cognatae*	sect. *Cognatae*	subgen. *Macrocystis* sect. *Cognatae*
sect. *Oreinae*			
	sect. *Melanoleuca* stirps *Polioleuca*	sect. *Strictipedes*	subgen. *Macrocystis* sect. *Strictipedes*
		sect. *Melanoleuca*	
	sect. *Melanoleuca* stirps *Melanoleuca*	sect. *Acystidiae*	subgen. *Melanoleuca*
sect. *Melanoleuca*			
sect. *Humiles*	sect. *Melanoleuca* stirps *Grammopodia*	sect. *Grammopodiae*	subgen. *Urticocystis* sect. *Grammopodiae*
		sect. *Humiles*	subgen. *Urticocystis* sect. *Humiles*

1. MELANOLEUCA SUBGEN. MELANOLEUCA

Melanoleuca sect. *Melanoleuca* stirps *Melaleuca* Kühner in Bull. mens. Soc. linn. Lyon 47: 12. 1978. — *Melanoleuca* sect. *Acystidiae* Bon in Doc. mycol. 33: 45. 1978.

Characterized by the absence of cystidia.

Types species: *M. melaleuca* (Pers.: Fr.) Murrill sensu Kühner ≡ *Melaleuca vulgaris* Pat. = *M. graminicola* Velen.

2. MELANOLEUCA SUBGEN. URTICOCYSTIS BOEKHOUT, *subgen. nov.*

Melanoleuca sect. *Melanoleuca* stirps *Grammopodia* Kühner in Bull. mens. Soc. linn. Lyon 47: 12. 1978.

Subgenus *Melanoleucae* cystidiis urticiformibus.

Characterized by the presence of urticiform cystidia.

Type species: *M. grammopodia* (Bull.: Fr.) Pat.

Two sections of Bon's classification (1978) belong here, viz. sect. *Humiles* Sing. and sect. *Grammopodiae* Bon. The latter can be divided in two subsections:

Melanoleuca subsect. **Grammopodiae** Boekhout, *subsect. nov.*

Melanoleuca sect. *Grammopodiae* stirps *Brevipes* Bon. in Doc. mycol. 33: 52. 1978. — *Melanoleuca* sect. *Grammopodiae* stirps *Rasilis* Bon in Doc. mycol. 33: 54. 1978. — *Melanoleuca* sect. *Grammopodiae* stirps *Grammopodia* Bon in Doc. mycol. 33: 57. 1978.

Subsectio *Melanoleucae* cystidiis urticiformibus typi *brevipedis*.

Characterized by urticiform cystidia of the *brevipes*-type.

Type species: *M. grammopodia* (Bull.: Fr.) Pat. Other species which belong here are among others *M. brevipes* and *M. rasilis*.

Melanoleuca subsect. **Exscissae** Boekhout, *subsect. nov.*

Melanoleuca sect. *Grammopodiae* stirps *Exscissa* Bon in Doc. mycol. 33: 56. 1978.

Subsectio *Melanoleucae* cystidiis urticiformibus typi *exscissae*.

Characterized by urticiform cystidia of the *exscissa*-type.

Type species: *M. exscissa* (Fr.) Sing. Another species which belong here is *M. politoinaequalipes*.

3. MELANOLEUCA SUBGEN. **MACROCYSTIS** BOEKHOUT, *subgen. nov.*

Melanoleuca sect. *Melanoleuca* stirps *Polioleuca* Kühner in Bull. mens. Soc. linn. Lyon 47: 12. 1978.

Subgenus *Melanoleucae* macrocystidiis fusiformibus vel lanceolatus vel lageniformibus.

Characterized by the presence of fusiform to lageniform cystidia.

Type species: *M. polioleuca* (Fr.) Kühn.

Three sections in the classification of Bon (1978) are accepted here in this subgenus, viz. sect. *Alboflavidae* Sing., sect. *Cognatae* (Sing.) Kühn. and sect. *Strictipedes* Bon. I include sect. *Melanoleuca* sensu Sing. (1986: 301) and Bon (1978: 45) in sect. *Strictipedes* Bon, because I noted a great variability of the morphology of the cystidia in this group. *Melanoleuca cinereifolia* is claimed to have lageniform cystidia (Bon, l.c.). Frequently, however, also fusiform to lanceolate cystidia are observed in that species. On the contrary, *M. polioleuca* which is claimed to have fusiform to lanceolate cystidia sometimes also has lageniform cystidia. Because of this variability I do not accept Bon's (l.c.) separation of sect. *Strictipedes* Bon and *Melanoleuca* Sing. emend. Bon. However, as different types of cystidia do occur in sect. *Strictipedes*, I think that a subdivision in subsections probably can be based on these types of cystidia.

DESCRIPTIONS OF SPECIES

Subgen. Melanoleuca

Melanoleuca melaleuca (Pers.: Fr.) Murrill

Agaricus melaleucus Pers., Syn. meth. Fung.: 355. 1801. — *Agaricus melaleucus* Pers.: Fr., Syst. mycol. 1: 114. 1821. — *Tricholoma melaleucum* (Pers.: Fr.) Kumm., Führ. Pilzk.: 133. 1871. — *Gyrophila melaleuca* (Pers.: Fr.) Quél., Fl. mycol. France: 267. 1888. — *Melanoleuca melaleuca* (Pers.: Fr.) Murrill in Mycologia 3: 167. 1911. — *Melaleuca vulgaris* Pat. (change of name for *Agaricus melaleucus* Pers.), Hyménomyc. Eur.: 96. 1887. — *Melanoleuca vulgaris* (Pat.) Pat., Catal. rais. pl. cellul. Tunésie: 22. 1897.

Misapplied name. — *Melanoleuca graminicola* (Velen.) Kühner sensu Kühn. & Romagn., Fl. anal. Champ. sup.: 147. 1974.

Selected illustrations. — Fries, Ic. sel. Hymenomyc.: pl. 44. 1867.

Selected descriptions. — Bon in Doc. mycol. 33: 49. 1978; Honrubia, Moreno & Bon in Collect. bot. 13: 551. 1982; Kühner in Bull. mens. Soc. linn. Lyon 47: 13. 1978.

Basidiocarps medium-sized. Solitary. Pileus 35–65 mm, applanate with low broad umbo, finally with centre becoming somewhat depressed, at first with involute margin, slightly exceeding lamellae, rather thin-fleshed, hygrophanous, when moist rather dark yellowish to reddish brown (Expo. 64 DE, Mu. 10 YR 6/6), becoming paler on drying, dull, smooth, occasionally with striate margin. Lamellae crowded (L = 45–65, l = 3–7), adnate to subdecurrent, thin, up to c. 5.0 mm broad, whitish, sometimes with a pale pink tinge, with entire and concolorous edge. Stipe 55–90 × 5–8 mm, cylindrical, becoming slightly broader towards base, sometimes becoming also broader towards apex, stuffed, at first whitish, soon becoming pale beige to brown-grey, longitudinally fibrillose, with pruinose apex. Context whitish. Smell indistinct. Taste indistinct, mild to fungoid.

Spores (5.6–)6.4–8.3 × 4.1–5.8 μm, Q = 1.15–1.65, ellipsoid to broadly ellipsoid, moderately densely ornamented with rather large amyloid warts, with plage. Basidia 25–40 × 7–10 μm, clavate, 4-spored. Cystidia absent. Pileipellis a cutis, made up of 3–5 μm wide hyphae with brown pigment. Stipitipellis at apex of stipe covered with lumps of clavate cells, 25–35 × 6–9 μm in size, and basidia.

Habitat & distribution. — Terrestrial in coniferous forests (e.g. *Pinus* and *Juniperus*). Very rare in the Netherlands, only known from the provinces Drenthe and Noord-Brabant.

Collections examined. — NETHERLANDS: prov. Drenthe: Dwingeloo, 30 Nov. 1976, *Th. W. Kuyper 524* (WAG-W); Nieuw Balinge, state forest 'Gees', 17 April 1977, *K. Booy s.n.*: prov. Noord-Brabant, Dorst, 18 Oct. 1974, *P. B. Jansen 74–291* (both L). — WEST GERMANY: Niedersachsen, Wilsede, *B. de Vries 1942*, 12 Oct. 1974; ditto 14 Oct. 1974, *B. de Vries 1941*: Nordrhein-Westfalen, Alstätte, 9 Nov. 1972, *B. de Vries 1313*, ditto, 24 Oct. 1974, *J. J. Barkman 9793* (all WAG-W).

Melanoleuca melaleuca is interpreted here in the sense of Kühner (1978: 13). We agree with Kühner's opinion that *Agaricus melaleucus* Pers.: Fr. represents most probably a non-cystidiate species, because of the described smooth stipe (Persoon 1801: 216 'stipite elongati basi incrassato glabro livido'; Fries 1867, pl. 44 'stipes nudus (non pulverulentes)'), contrary to the descriptions of the stipes of *A. humiles*, *A. polioleucus* and *A. turritus* (Fries 1874: 74 and 75). No authentic material of *A. melaleucus* exists in the herbarium Persoon (L).

It must be noted that both the specimens studied by Kühner (l.c.) and us have a somewhat pruinose apex of the stipe (cit. Kühner 'non poudré, à peine finement pruineux sous la loupe tout en haut seulement') caused by the presence of clavate cells. Cystidia are, however, absent. The specimen we studied agree well with Kühner's description. Related species are *M. stridula* (Fr.) Métrod, *M. striimarginata* Métrod (nom. nud.) and *M. graminicola* (Velen.) Kühner & Maire.

Melanoleuca stridula (Fr.) Métrod (1949: 154) differs by a dark pileus ('bistre foncé') and the presence of subcylindrical cystidia-like cells at the apex of the stipe. *Melanoleuca stridula* (Fr.) Métrod sensu Bresinsky & Stangl (1977: 147) differs by its yellowish lamellae.

Melanoleuca graminicola (Velen.) Kühner & Maire differs mainly from our specimen by small basidiocarps (20–30 mm according to Velenovsky 1920: 244). The spores of a specimen of *M. graminicola* in the Velenovsky collection measure (7.6–)8.0–8.6(–8.8) × (4.8–)5.0–5.7 µm, Q = 1.5–1.8 and are covered by small amyloid warts (Kuyper, unpubl. observations).

Melanoleuca striimarginata Métrod (1942a: 94, nom. nud.) has a striate margin of the pileus and a glabrous stipe. *Barkman 9793* (WAG-W) has a striate margin of the pileus and thus agrees in that aspect with *M. striimarginata*. The lamellae of that specimen are, however, pale beige (K. & W. B61) to pale ochraceous yellow-brown (K. & W. C61–C72). This latter character fits *M. stridula* (Fr.) Métrod.

Subgen. Urticocystis sect. Grammopodiae subsect. Grammopodiae

Melanoleuca brevipes (Bull.: Fr.) Pat.

Agaricus brevipes Bull., Herb. France, pl. 521, fig. 2. 1791. — *Agaricus brevipes* Bull.: Fr., Syst. mycol. 1: 53. 1821. — *Tricholoma brevipes* (Bull.: Fr.) Kumm., Führ. Pilzk.: 133. 1871. — *Gyrophila brevipes* (Bull.: Fr.) Quél., Enchir. Fung.: 18. 1886. — *Gyrophila grammopodia* var. *brevipes* (Bull.: Fr.) Quél., Fl. mycol. France: 267. 1888. — *Melanoleuca brevipes* (Bull.: Fr.) Pat., Essai taxon.: 159. 1900. — *Tricholoma melaleucum* var. *grammopodium* subvar. *brevipes* (Bull.: Fr.) Maire, Étude synth. Genre *Tricholoma*: 30. 1916.

Selected illustrations. — Dähncke & Dähncke, 700 Pilze: 203. 1979; Konrad & Maublanc, Ic. sel. Fung. 3: pl. 270. 1927.

Selected descriptions. — Bon in Doc. mycol. 33: 52. 1978; Bon & Chevassut in Doc. mycol. 9: 44. 1973; Bresinsky & Stangl in Z. Pilzk. 43: 150. 1977; Kühner in Bull. mens. Soc. linn. Lyon 47: 21. 1978.

Basidiocarps medium-sized, solitary or connate. Pileus (25–)40–90 mm, convex to plano-convex, finally becoming irregular convex with depressed centre, with low broad umbo, with involute margin when young, rather fleshy, weakly hygrophanous, pale to dark grey-brown (Mu. 10 YR 3/2–3, 5–6/4) when moist, pallescent on drying, when moist satiny-shiny, but soon becoming dull and innately radiating fibrillose or minutely felted (under lens!). Lamellae crowded (L = 55–80, l = 1–7), adnate, emarginate, sinuate or even subdecurrent, thin, up to 6(–11) mm broad, triangular-ventricose or ventricose, when young pale grey-cream (Mu. 2.5 Y 7/2–4), but soon becoming rather dark greyish brown (Mu. 10 YR 7/3), with an entire concolorous edge. Stipe 25–60 × 5–18 mm, short cylindrical, obese, solid, at first pale brownish grey, but soon becoming grey-brown (Mu. 10 YR 4/2–4, 3/3), occasionally at apex with faint bluish tinge, entirely longitudinal fibrillose and apex subflocculose. Context in pileus sordid white or pale yellowish brown, in stipe isabella-brown, towards base of stipe dark brown. Smell weak, fungoid or sweet, fruity. Taste fungoid or acrid-herbaceous. Spore print yellowish white (Romagnesi, Les Russules, 1b–2a).

Spores (6.9–)7.4–9.7 × 4.2–5.8 µm, Q = 1.3–1.8(–2.0), ellipsoid to elongate, mostly with largest width above the middle, rather densely ornamented with fine to rather coarse amyloid warts, with suprahilar plage. Basidia 30–40 × 7–10 µm, clavate, (2–3–)4-spored. Cheilocystidia 25–50 × 5–10 µm, urticiform and of the *brevipes*-type, frequently with resinaceous contents in upper part. Pileipellis an (ixo-)trichodermium, up to c. 70 µm thick, made up of slender, 2–6 µm wide hyphae. Cells of upper part of the pileitrama with pale brown intracellular pigment and cell walls also partly encrusted by yellowish brown pigment. Stipitipellis a cutis, sometimes somewhat gelatinized, at apex of stipe with lumps of clavate cells, 30–50 × 6–9 µm in size, among them some urticiform caulocystidia.

Habitat & distribution. — Terrestrial on humus rich soils, in both broad-leaved and coniferous forests, in grasslands (lawns) and on compost; basidiocarps occurring mainly in spring, but occasionally also in autumn; rather common, seems to occur in all parts of the Netherlands.

Collections examined. — NETHERLANDS: prov. Friesland, Ameland, near Hollum, 27 Oct. 1973, *C. Bas 6240*; prov. Flevoland, Oostelijk Flevoland, de Abbert, 20 March 1977, *H. J. W. Langevoort-Dul s.n.*; prov. Gelderland, Apeldoorn, Berg en Bos, 4 May 1958, *A. N. Koopmans 141*; prov. Utrecht, Baarn, garden of phytopathological laboratory Willie Commelin Scholten, 3 Dec. 1981, *H. A. van der Aa s.n.*; prov. Zuid-Holland: Leiden, near Academic Hospital, 23 March 1977, *F. Bas-Moes s.n.*; ditto, Telderskade, 6 April 1983, *C. Bas 8095*; Katwijk, Pan van Persijn, 12 Oct. 1957, *R. A. Maas Geesteranus 12388*; Voorschoten, estate 'Ter Horst', 14 April 1972, *C. Bas 5993*; Wassenaar, 'Kijfhoek', 30 Oct. 1952, *R. A. Maas Geesteranus 9250* (all L); prov. Zeeland, Veere, 29 Oct. 1976, *P. B. Jansen s.n.*; prov. Noord-Brabant, Dorst, 8 Sept. 1975, *P. B. Jansen s.n.* (herb. Jansen); prov. Limburg, Wijlre, 28 Oct. 1979, *C. Bas 7611* (L). — FRANCE: *Métrod 1343; 1886; 2798* and notes of *Métrod 1343; 1343.2; 1886; 2029; 2172; 2426; 2798; Métrod s.n.*, 27 Aug. 1951; *Métrod s.n.*, 7 Aug. 1960 (all PC).

Melanoleuca brevipes differs from *M. grammopodia* by the medium-sized basidiocarps, the less pronounced longitudinal fibrillosity of the stipe and the brown context of the stipe. *Melanoleuca rasilis* differs by shorter spores covered by coarse warts. Most of the specimens studied have a short stipe, although in some collections some basidiocarps were present with a stipe as long as the diameter of the pileus. *Melanoleuca brevipes* sensu J. Lange (1935: 65) (sub *Tricholoma brevipes*) is a different species because of its fusiform to lageniform cystidia.

Melanoleuca grammopodia (Bull.: Fr.) Pat.

Agaricus grammopodius Bull., Herb. France: pl. 548. 1791. — *Agaricus grammopodius* Bull.: Fr., Syst. mycol. 1: 93. 1821. — *Tricholoma grammopodius* (Bull.: Fr.) Quél. in Mém. Soc. Emul. Montbéliard, sér. II, 5: 83. 1872. — *Gyrophila grammopodia* (Bull.: Fr.) Quél., Enchir. Fung.: 17. 1886. — *Melanoleuca grammopodia* (Bull.: Fr.) Pat., Essai taxon.: 159. 1900. — *Tricholoma melaleucum* var. *grammopodium* (Bull.: Fr.) Maire, Étude synth. genre *Tricholoma*: 28. 1916.

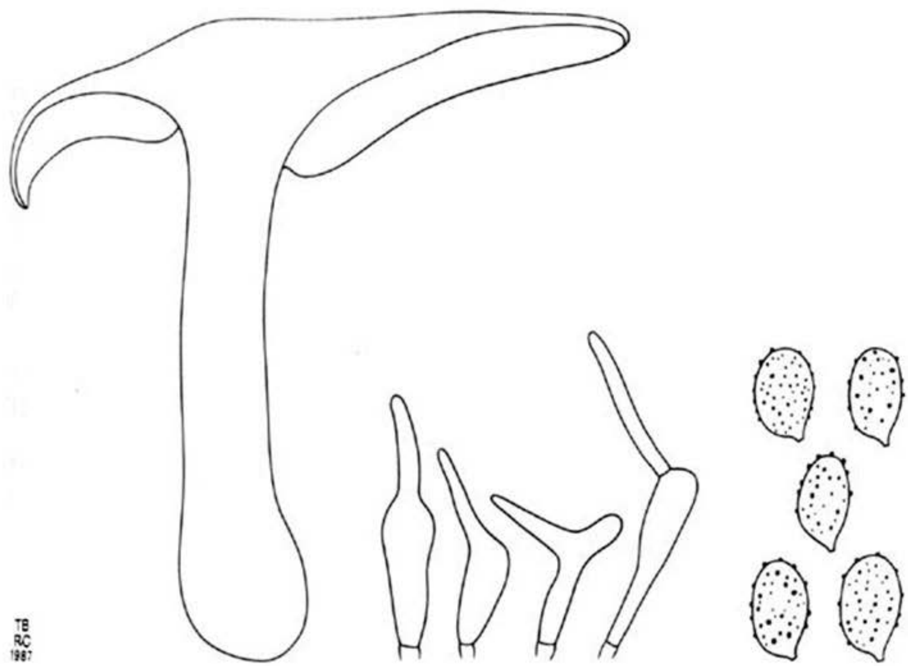

Fig. 2. *Melanoleuca grammopodia*. — Habit (×1). — Cheilocystidia (×1000). — Spores (× 1500).

forma **grammopodia** — Fig. 2

Selected illustrations. — Cetto, Funghi Vero 1: pl. 146. 1975; Konr. & M., Ic. sel. Fung. 3 pl. 269. 1927; Lange, Fl. agar. dan. 1: pl. 29C. 1935; Michael, Hennig, Kreisel, Handb. Pilzfr. 3: pl. 202. 1979; Phillips, Mushr. other Fungi: 45. 1981.

Selected descriptions. — Bresinsky & Stangl in Z. Pilzk. 43: 152. 1977.

Basidiocarps medium-sized to large, solitary. Pileus 60–105 mm, plano-convex, mostly with depressed centre, with low broad umbo, with involute margin, thick-fleshed, greyish brown to dark grey-beige (Mu. 10 YR 4–6/3), becoming paler on drying; somewhat paler towards margin, dull, sometimes with centre somewhat shiny, innately radially fibrillose, with outermost margin somewhat pruinose. Lamellae crowded (L = c. 70, l = 1–5), sinuate, rather thick, up to 9.0 mm broad, triangular-ventricose, pale cream-beige (Mu. 10 YR 7/3–4), with entire concolorous edge. Stipe 60–105 × 8–13 mm, cylindrical with clavate base, solid, pale beige to beige-brown (Mu. 10 YR 5/4, 7/3), distinctly longitudinal striate, with pruinose apex. Context greyish white (Mu. 10 YR 8/2), in stipe loosely fibrillose. Smell weak, just after cutting somewhat spermatic. Taste unpleasant, acrid-fungoid. Spore print pale cream (Romagnesi, Les Russules, 1b–2a).

Spores 8.0–9.8 × 4.2–6.0 μm, Q = 1.5, ellipsoid to elongate, rather densely ornamented with small to medium-sized, amyloid warts, with suprahilar plage. Basidia 30–

40 × 8–13 μm, clavate, 4-spored. Cheilocystidia 30–40 × 5–9 μm, urticiform and of *brevipes*-type, mostly transversely septate. Pileipellis a thin, somewhat gelatinized cutis made up of slender hyphae. Stipitipellis a cutis, at apex of stipe basidia present.

Habitat & distribution. — Terrestrial in broad-leaved forests and bushes; rather rare, in the Netherlands known from the coastal dunes and from calcareous rich soils in the provinces of Limburg and Flevoland.

Collections examined. — NETHERLANDS: prov. Flevoland, Oostelijk Flevoland, 'Spijkbos', 11 Sept. 1980, *Th. W. Kuyper 1429*; prov. Zuid-Holland, Wassenaar 'Meyendel', 6 Oct. 1951, *R. A. Maas Geesteranus 8058*; ditto, 7 Nov. 1951, *C. Bas s.n.*; ditto, 'Duinrell', 25 Sept. 1981, *C. Bas 7788*; Westvoorne, 'Quakjeswater', 19 Oct. 1982, *T. Boekhout 1044*; prov. Limburg, St. Pieter, 'Sint Pietersberg', 18 Oct. 1950, *R. A. Maas Geesteranus 7543* (all L). — FRANCE: (notes on) *Métrod 39; 39.2; 1495; 1739* (all PC).

Melanoleuca grammopodia is closely related to *M. brevipes*. It differs from the latter species by a relatively long, coarsely, longitudinally striate stipe with a pale grey context and less grey lamellae.

Melanoleuca grammopodia as described by Kühner (1978: 26) differs from the specimen studied by me by a more yellow ochraceous pileus (Mu. 2.5 Y 8/6–7).

Melanoleuca subbrevipes Métrod (1942a: 90, nom. nud.) is closely related to *M. grammopodia*. The only differences mentioned by Métrod in his notes of his collection 560 (PC) are the pale and large pileus and shorter cystidia of *M. subbrevipes*.

In Table II we summarize the colour of the pileus of collections seen by Métrod of both *M. subbrevipes* and *M. grammopodia*.

Métrod mentioned a diameter of up to 20 cm for *M. grammopodia* (in his notes on *Métrod 39*, PC) and his drawings of the cystidia of both *M. grammopodia* and *M. subbrevipes* do not indicate a difference between these taxa. Therefore we agree with Kühner (1978: 26), who reduced *M. subbrevipes* to forma under *M. grammopodia*.

The name *M. subbrevipes* Métrod, however, was not published in full accordance with the International Code of Botanical Nomenclature (Voss & al. 1983) and therefore Kühner's new combination was not validly published either. As, moreover, the original collection (*Métrod 50*, PC) of *M. subbrevipes* is very poor, I prefer to describe a new forma with a better type collection for this large variant of *M. grammopodia*.

Table II. Colour of the pileus of collections of *M. subbrevipes* and *M. grammopodia* seen by Métrod (all in PC).

species	collection	colour of pileus
M. subbrevipes	Métrod 560	- gris beige, brunâtre au centre
	Métrod s.n.	- ocracé grisâtre, brun au centre
M. grammopodia	Métrod 39	- brun bistre très plus foncé au centre
	Métrod 1739	- bistre très foncé; la couleur pâlis à l'ocracé brunâtre

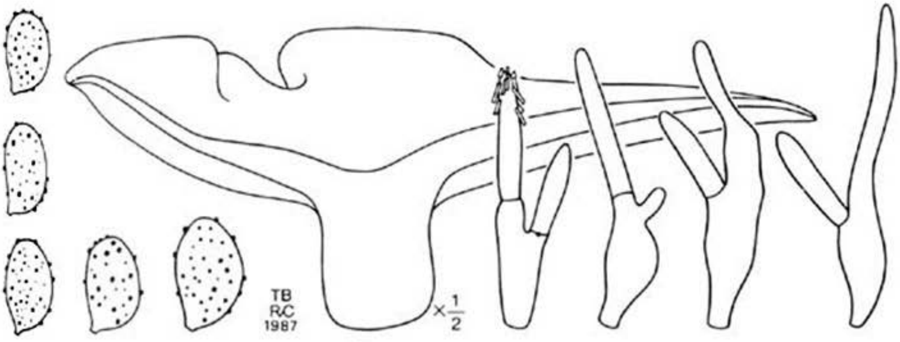

Fig. 3. *Melanoleuca grammopodia* f. *macrocarpa*. — Habit (× ½). — Spores (×1500). — Cheilocystidia (×1000).

Melanoleuca grammopodia forma **macrocarpa** Boekhout, *f. nov.* — Fig. 3

Melanoleuca subbrevipes Métrod (nom. nud.) in Rev. Mycol. 7: 90. 1942. — *Melanoleuca grammopodia* var. *subbrevipes* (Métrod) Kühn. & Romagn., Fl. anal. Champ. sup.: 147. 1953. — *Melanoleuca grammopodia* f. *subbrevipes* (Métrod) Kühn. in Bull. mens. Soc. linn. Lyon 47: 26. 1978.

Selected illustration. — Cetto, Funghi Vero 2: pl. 595. 1975.

Selected description. — Bon in Docum. mycol. 33: 52. 1978.

Differt a forma grammopodia basidiocarpis magnis et fere brevistipitatis. Pileus ad 30 cm diam., in medio ochraceogriseus. Stipes dilute griseus fibris longitudinalibus fuscis praeditus. Lamellae ochraceo-griseae. Contextus albidus, in stipite brunneus.

Holotypus: *Erkelens s.n.*, 2 Nov. 1977, Netherlands, prov. Utrecht, Leusden (L).

Basidiocarps large, solitary. Pileus up to 200(–300) mm, finally slightly infundibuliform, with lobed margin, pale grey-brown (Expo. 33D), dry. Lamellae moderately crowded, subdecurrent, up to c. 8.0 mm wide, pale clay-coloured (Expo. 82-83B), with pinkish reflex. Stipe 30–100 × 10–35 mm, cylindrical, solid, dark brown (Expo. 72 F–H), longitudinally fibrillose and ribbed. Context isabella, becoming brown in base of stipe. Smell somewhat acrid, sourish herbaceous. Taste unpleasant, bitterish herbaceous. Spore print unknown.

Spores 7.7–9.8 × 4.8–6.2 μm, Q = 1.4–1.85, ellipsoid to elongate, moderately densely ornamented with small to medium-sized amyloid warts, with suprahilar plage. Basidia 25–35 × 9–13 μm, clavate, 4-spored. Cheilocystidia 30–55 × 6–8 μm, urticiform, with 2–4 μm wide upper cell, with apex encrusted by crystals. Pileipellis made up of slender ascending hyphae, upper part of pileitrama compact, with intracellular brown pigment. Stipitipellis at apex of stipe with clavate cells and urticiform cystidia.

Habitat & distribution. — Terrestrial in broad-leaved forests (*Acer* and *Populus*) and in mixed forests, also in dry meadows. In the Netherlands very rare.

Collections examined. — NETHERLANDS: prov. Utrecht, Leusden, 2 Nov. 1977, *Erkelens s.n.* (holotype, L). — FRANCE: *Métrod 560*, 26 Sept. 1935 (PC, containing only scanty fragments).

The specimen from the Netherlands agrees well with Métrod's *M. subbrevipes* Métrod (nom. nud.), because of similar large basidiocarps with a brown context of the stipe and similar spores and cheilocystidia. Métrod supposed a relationship to both *M. grammopodia* and *M. brevipes* (in notes *Métrod 560*, PC). Because of the size of the basidiocarps and the longitudinally ribbed stipe we agree with Kühner (1978: 26), who regards this form as an infraspecific taxon of *M. grammopodia.*

Melanoleuca rasilis (Fr.) Sing.

Agaricus rasilis Fr., Epicr.: 54. 1836–1838. — *Gyrophila rasilis* (Fr.) Quél., Fl. mycol. Fr.: 269. 1888. — *Tricholoma rasile* (Fr.) Sacc., Syll. Fung. 5: 140. 1887. — *Melanoleuca rasilis* (Fr.) Sing. in Schweiz. Z. Pilzk. 17: 56. 1930.

Melanoleuca rasilis var. *leucophylloides* Bon in Docum. mycol. 9: 46. 1973. — *Melanoleuca leucophylloides* (Bon) Bon in Docum. mycol. 41: 40. 1980.

Melanoleuca pseudoluscina Bon in Docum. mycol. 37: 89. 1980.

Excluded. — *Melanoleuca rasilis* sensu Métrod in Bull. trimest. Soc. mycol. Fr. 64: 156. 1948 (= *M. brevipes*).

var. **rasilis** — Fig. 4A

Selected illustration. — Bres. in Iconogr. mycol. 3: pl. 130. 1928.

Selected description. — Bon in Docum. mycol. 33: 54. 1978.

Basidiocarps small to medium-sized, solitary or subgregarious. Pileus 20–60(–75) mm, convex to plano-convex, finally with centre becoming depressed, with low broad umbo, with margin slightly exceeding lamellae, moderately thick-fleshed, hygrophanous, when moist dark brown (Mu. 10 YR 3/4, 7.5 YR 3/2), slightly paler towards margin, pallescent on drying (Mu. 10 YR 4/3), when moist shiny, subviscid, when dry dull, glabrous, but with outermost margin greyish pruinose. Lamellae rather distant (L = (30–) 40–70, l = 1–7), sinuose to emarginate, rather thick, triangular, when young greyish white (Mu. 10 YR 8/2), but soon becoming greyish beige (Mu. 10 YR 6/2–4), with entire, concolorous edge. Stipe (15–)30–60 × 3–6(–8) mm, cylindrical, terete or somewhat flattened, stuffed, greyish beige to dark grey (Mu. 10 YR 3–4/2, 5/4), innately longitudinal striate, glabrous but with minutely pruinose apex. Context of pileus whitish, yellowish or brown (Mu. 10 YR 4/4, 7/6), occasionally with dark line over lamellae, in stipe yellowish brown, turning ochraceous brown in extreme base. Smell weak, reminding of *Lycoperdon perlatum*. Taste weak, somewhat rancid.

Spores 5.8–7.9 × 4.2–6.0 μm, Q = 1.2–1.65, broadly ellipsoid to ellipsoid, rather densely ornamented with large, amyloid warts, with suprahilar plage. Basidia 30–45 × 6–11 μm, (2–)4-spored. Cheilocystidia 30–50 × 5–9 μm, urticiform and of *brevipes*-type, usually septate, with apex frequently encrusted by crystals. Pileipellis a slightly gelatinized, 70–90 μm thick trichodermium, made up of 3–6 μm wide hyphae, sparsely encrusted with lumps of yellowish pigment, upper part of pileitrama compact and cells with intracellular pale brown pigment. Stipitipellis near apex of stipe with lumps of clavate cells and scattered urticiform caulocystidia.

Habitat & distribution. — Terrestrial in grasslands, also near *Salix repens* and coniferous trees. Rather common in coastal dunes.

Collections examined. — NETHERLANDS: prov. Noord-Holland: Aerdenhout, 'Koningshof', 27 Dec. 1982, *A. G. Becker s.n.*; Bergen, 'Duinvermaak', 13 Nov. 1982, *Th. W. Kuyper 2329*; Castricum, watersupply dunes, 10 Aug. 1952, *R. A. Maas Geesteranus 8910 & H. J. van der Laan*; Santpoort, 'Duin en Kruidberg', 14 Dec. 1982, *A. G. Becker s.n.*; Vogelenzang, watersupply dunes, 25 Nov. 1982, *C. Bas s.n.*; prov. Zuid-Holland: Wassenaar, 12 Dec. 1982, *C. Bas 8088 & E. Arnolds*; Westvoorne, 'Voorne's duin', 18 Oct. 1982, *T. Boekhout 1046* (all L).

Melanoleuca rasilis is related to *M. brevipes*. It differs from that species mainly because of its broadly ellipsoid and coarsely ornamented spores. Other smaller differences are smaller basidiocarps, fruiting in autumn and the length of the stipe equalling the diam-

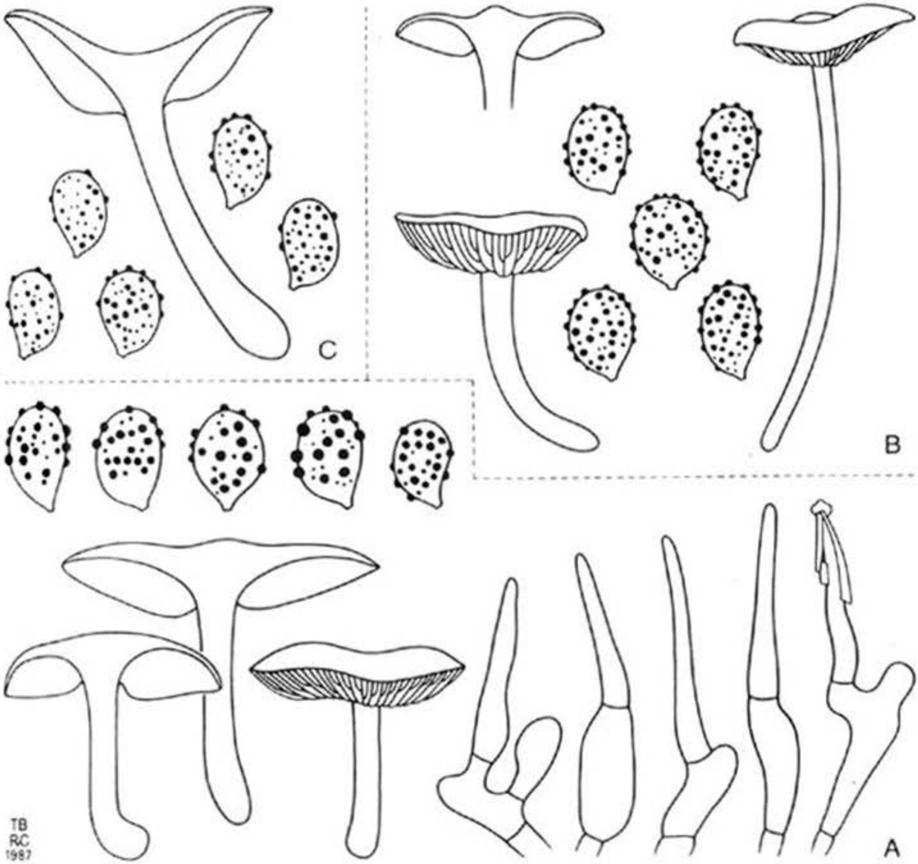

Fig. 4. *Melanoleuca rasilis*. — A. Var. *rasilis*. — Habit (× 1). — Spores (× 1500). — Cheilocystidia (× 1000). — B. Var. *pseudoluscina*. — Habit (× 1). — Spores (×1500). — C. Var. *leucophylloides*. — Habit (× 1). — Spores (× 1500).

eter of the pileus. Specimens of *M. rasilis* in the herbarium of Métrod belong partly to this species (e.g. *Métrod 2275*, PC) and partly to *M. brevipes* (e.g. *Métrod 1395* and *2030*). The description given by Métrod (1949: 156) seems to represent specimen belonging to *M. brevipes*.

Besides typical *M. rasilis* two varieties can be distinguished:

Melanoleuca rasilis var. **pseudoluscina** (Bon) Boekhout, *comb. nov.* — Fig. 4B

Melanoleuca pseudoluscina Bon in Docum. mycol. 37: 89. 1980 (basionym).

Selected description. — Honrubia, Moreno & Bon in Collect. bot. 13: 551. 1982.

Differs from the type variety by the colour of the lamellae, which are first greyish white (Mu. 10 YR 8/2), but soon become yellowish (Mu. 10 YR 7/6).

Habitat & distribution. — Terrestrial in grasslands in coastal dunes. Very rare in the Netherlands; known only from the isle of Terschelling and from Wassenaar.

Collections examined — NETHERLANDS: prov. Friesland, isle of Terschelling, Formerum aan Zee, 25 Oct. 1982, *Boekhout 1055* (L); prov. Zuid-Holland, Wassenaar, Meyendel, 'Kijfhoek', 6 Nov. 1957, *R. A. Maas Geesteranus 12451* (L).

var. **leucophylloides** Bon.—Fig. 4C

Melanoleuca rasilis var. *leucophylloides* Bon in Docum. mycol. 9: 46. 1973. — *Melanoleuca leucophylloides* (Bon) Bon in Docum. mycol. 41: 40. 1980.

Selected description. — Bon in Docum. mycol. 33: 55. 1978.

Differs from the typical variety by its whitish (Mu. 10 YR 8/1–2, 2.5 Y 8/2) lamellae, which sometimes have a faint yellow or pink reflex.

Habitat & distribution. — Terrestrial, near coniferous trees in coastal dunes, but also in broad-leaved forests on calcareous rich loam. In the Netherlands known from coastal dunes, in Belgium known from the Ardennes.

Collections examined. — NETHERLANDS: prov. Noord-Holland: Bloemendaal, Kennemerduinen, 'Brederodeberg', 1 Dec. 1982, *A. G. Becker s.n.*; Vogelenzang, watersupply dunes, 'Pannenland', 24 Oct. 1981, *C. Bas 7854* and *7855* (all L).

Subgen. Urticocystis sect. Grammopodiae subsect. Exscissae

Melanoleuca exscissa (Fr.) Sing.

Agaricus exscissus Fr., Syst. mycol. 1: 114. 1821. — *Tricholoma exscissa* (Fr.) Quél. in Mém. Soc. Emul. Montbéliard, sér. II, 5: 344. 1872. — *Melanoleuca exscissa* (Fr.) Sing. in Cavanillesia 7: 125. 1935.

Melanoleuca iris Kühner in Bull. mens. Soc. linn. Lyon 25: 178. 1956.

Melanoleuca cinerascens Reid in Coll. Icon. rare interest. Fungi 2: 16. 1967.

Selected illustrations. — Bresadola, Ic. mycol. 3: pl. 131. 1928; Fries, Ic. sel. Hymenomyc., pl. 44. 1871; Lange, Fl. agar. dan. 1: pl. 31c. 1935; Reid, l.c.: pl. 13b. 1967.

Selected descriptions. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands, 3: 400. 1982; Kühner in Bull. mens. Soc. linn. Lyon 25: 177. 1956.

Basidiocarps medium-sized, solitary. Pileus 20–70 mm, plano-convex, with depressed centre, mostly with low umbo, when young with inflexed margin, sometimes with outermost margin slightly exceeding lamellae, rather thin-fleshed, not hygrophanous, whitish, grey or grey-brown (Mu. 10 YR 6/2, 8/3), with centre slightly to distinctly darker (Mu. 10 YR 5/2, 6/3), dull, dry with centre satiny-sericeous, sometimes somewhat arachnoid around umbo, innately radially fibrillose, when young with outermost margin pruinose. Lamellae crowded (L = 40–60, l = 1–7), emarginate, sinuate or subdecurrent, ventricose or triangular-ventricose, 3–6 mm broad, thin, whitish, becoming pale pinkish beige (Mu 7.5 YR 8/2–3), with entire or somewhat irregular concolorous edge. Stipe 20–60 × 3–7 mm, cylindrical, attenuate towards base, occasionally with slightly clavate base, solid, whitish, becoming pale isabella (Mu. 10 YR 8/3), slightly longitudinally fibrillose or glabrous, when young with apex flocculose. Context whitish to pale greyish brown. Smell absent or weak, fruity. Taste indistinct, mild or somewhat unpleasant, adstringent. Spore print cream (Romagnesi, Les Russules, 2a).

Spores 7.5–10.5 × 5.0–6.5 μm, Q = 1.5–1.9, ellipsoid to elongate, densely ornamented with small, amyloid warts, with suprahilar plage. Basidia 30–40 × 10–13 μm, clavate, 4-spored. Cheilocystidia 30–55 × 5–10 μm, of *exscissa*-type, mostly transversely septate and upper cell frequently with resinaceous contents. Pleurocystidia very sparse, similar to cheilocystidia. Pileipellis a sometimes slightly gelatinized 20–50(–100) μm thick trichodermium, made up of 3–6 μm wide, somewhat ascending hyphae with obtuse or clavate terminal cells, occasionally at apex encrusted with crystals. Upper part of pileitrama with yellowish cell walls.

Habitat & distribution. — Terrestrial in grasslands and in broad-leaved and coniferous forests; rather common, specially in coastal dunes and on rich soils.

Collections examined. — NETHERLANDS: prov. Friesland: isle of Terschelling, West Terschelling, 19 Oct. 1981, *M. E. Noordeloos 1616*; ditto, Hoorn, 'Hoornse Bos', 20 Oct. 1981, *M. E. Noordeloos 1622*; prov. Drenthe, Zuidlaren, 23 Aug. 1967, *Jansonius s.n.*; prov. Overijssel, Ommen, 'Eerder Achterbroek', 14 Oct. 1962, *E. Kits van Waveren s.n.*; prov. Utrecht, Bunnik, 'Fort bij Rhijnauwen', 3 July 1972, *E. Arnolds 664*; prov. Zuid-Holland: Leiden, 'Leidse Hout', 4 June 1981, *Th. W. Kuyper 1574*; Overschie, 10 Nov. 1959, *J. A. Schravezande s.n.*; Rotterdam, 'Groenendaal', 23 Dec. 1965, *N. P. W. Balke s.n.*; prov. Zeeland: Aardenburg, 'Elderschans', 9 Oct. 1980, *A. de Meyer 158*; ditto, 12 April 1981, *A. de Meyer 158b*; prov. Limburg, Bunde, 'Bunderbos', 14 Sept. 1980, *Th. W. Kuyper 1446* (all in L).

Within the specimens studied the colour of the pileus varies from whitish, grey to grey-brown. Therefore I do not agree with Reid (1967: 17) who considers the species pictured by Fries (1871: pl. 44) as different from his *M. cinerascens*. Also the clitocybioid habitus of *M. cinerascens* falls within the observed morphological range of *M. exscissa*.

Noordeloos 1622 (L) differs from the other specimens because of the orange-ochre context of its stipe (close to Mu. 7.5 YR 7/8). Probably this specimen represents an infraspecific taxon on its own. However, more material is necessary to come to a final decision. *M. iris* Kühner differs from *M. exscissa* only by its peculiar smell. Therefore we reduce this taxon to variety under *M. exscissa*.

Melanoleuca exscissa var. **iris** (Kühner) Boekhout, *comb. nov.* — Fig. 5

Melanoleuca iris Kühn. in Bull. mens. Soc. linn. Lyon 25: 178. 1956 (basionym).

Selected descriptions. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 3: 400. 1982; Klán in Česká Mykol. 37: 52. 1983.

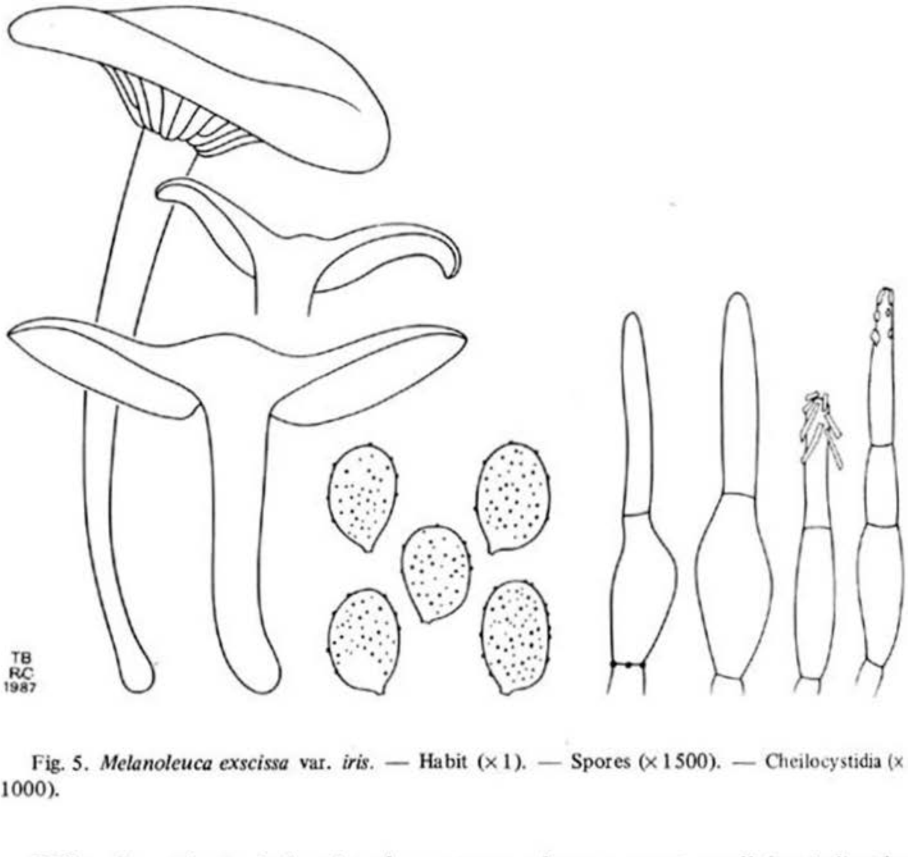

Fig. 5. *Melanoleuca exscissa* var. *iris*. — Habit (× 1). — Spores (× 1500). — Cheilocystidia (× 1000).

Differs from the typical variety by a strong, pleasant, sweet smell (reminding the smell of *Lepista irina*).

Habitat & distribution. — Terrestrial in grasslands and in broad-leaved and coniferous forests; rather common, seems to occur in all parts of the Netherlands.

Collections examined. — NETHERLANDS: prov. Friesland: isle of Terschelling, West Terschelling, 'Kroonpolders', 27 Oct. 1982, *Boekhout 1062*; Appelscha, 24 Oct. 1970, *G. Stobbe*; prov. Overijssel: Deventer, estate 'Wijtenhorst', 25 Oct. 1969, *G. & H. Piepenbroek s.n.*; ditto, 2 Nov. 1969, *G. & H. Piepenbroek*; Diepenveen, near estate 'Nieuw Rande', 11 June 1972, *G. & H. Piepenbroek s.n.*; Ommen, 'Mataran', 18 Oct. 1971, *P. Haxe*; Wichmond, 4 Nov. 1982, *T. Boekhout 1080* and *1083*; prov. Gelderland: Gietelo, 'Gietelse Bos', 22 April 1972, *G. & H. Piepenbroek s.n.*; Nunspeet, 27 Sept. 1958, *C. Bas 1560*; Overasselt, 'Hatertse vennen', 21 Oct. 1969, *E. Arnolds 423*; prov. Utrecht: Amersfoort, 'Birkhoven', 7 July 1984, *J. Wisman s.n.*; Bunnik, 4 Nov. 1982, *J. Schreurs s.n.*; Veenendaal, near 'Trekpot', 15 Oct. 1967, *F. Tjallingii s.n.*; prov. Noord-Holland, Vogelenzang, watersupply dunes, 19 Oct. 1969, *E. Arnolds 415*; prov. Zuid-Holland, Leiden, 30 Nov. 1982, *C. Bas s.n.* (all L).

Melanoleuca politoinaequalipes (Beguet) Bon

Melanoleuca grammopodia var. *politoinaequalipes* Beguet in Docum. mycol. 5: 37. 1972. — *Melanoleuca politoinaequalipes* (Beguet) Bon in Docum. mycol. 33: 59. 1978.

Basidiocarps small to medium-sized, solitary. Pileus 20–60 mm, applanate, but soon with depressed centre, frequently with low broad umbo, with margin involute and slightly exceeding the lamellae, rather thin-fleshed, hygrophanous, when moist rather dark olivaceous brown (Mu. 10 YR 3–4/4), becoming pale greyish brown on drying (Mu. 10 YR 5/3), glabrous, smooth, innately radiating fibrillose, near margin somewhat tomentose. Lamellae crowded ($L \cong 110$, $l = 3$), emarginate to subdecurrent, rather thick, triangular or concave, pale yellowish beige (Expo. B72, Mu. 10 YR 8/3); edge entire and concolorous. Stipe 40–60 × 5–13 mm, attenuate towards base, stuffed, pale beige (Mu. 10 YR 7/4), innately longitudinally fibrillose, with pruinose apex. Context whitish to pale isabella, sometimes with pinkish reflex in lower half of stipe after cutting. Smell indistinct but after cutting somewhat rancid. Taste rancid or sourish. Spore print unknown.

Spores 7.0–9.3 × 4.1–5.9 μm, Q = 1.5–1.9, ellipsoid to elongate, rather densely ornamented with rather coarse amyloid warts. Basidia 30–40 × 7–11 μm, clavate, (2–) 4-spored. Cheilocystidia 35–65 × 5–8 μm, urticiform of *exscissa*-type, usually septate, upper cell mostly with resinaceous content, at apex frequently encrusted with crystals. Pleurocystidia very sparse, similar to cheilocystidia. Pileipellis a trichodermium, up to 280 μm thick, made up of 3–4 μm wide hyphae with obtuse or slightly clavate apex, upper part of pileitrama compact, with pale brown intracellular pigment. Stipitipellis a cutis, covered with lumps of clavate cells. Caulocystidia urticiform, 30–45 × 5–9 μm.

Habitat & distribution. — Terrestrial in grass-land, but also known from tulip-border of 'Keukenhof' park. In the Netherlands known from only three locations.

Collections examined. — NETHERLANDS: prov. Friesland, isle of Terscheling, West Terschelling, 19 Oct. 1981, *M. E. Noordeloos 1609*; prov. Zuid-Holland: Leiden, 16 Nov. 1982, *M. A. Brand s.n.*; Lisse, 'Keukenhof', 23 April 1961, *C. Bas 2321* (all L).

Melanoleuca politoinaequalipes as described by Beguet (1972: 37) and Bon (1978: 59) differs from our specimen by slightly larger basidiocarps, fungoid smell, and somewhat larger spores (9–10.5(–11) × (5.5–)6–7(–7.5) μm, but agrees by a similar grey-brown pileus and similar cheilocystidia of the *exscissa*-type. *Melanoleuca politoinaequalipes* differs from *M. exscissa* by its hygrophanous, dark olivaceous brown pileus, its attenuating stipe and its pileipellis, which is a well-developed trichodermium. *Melanoleuca exscissa* sensu Métrod (1949: 157, pl. 1 fig. 3) also has a dark pileus, but differs clearly by lageniform cystidia.

Subgen. Macrocystidia sect. Cognatae

Melanoleuca cognata (Fr.) Konr. & M.

'Agaric arqué' Bull., Herb. France: pl. 589. 1793; non *Agaricus arcuatus* Bull. in Bull. & Ventenat, 1812; non *Agaricus arcuatus* Bull.: Fr., 1821.

Agaricus arcuatus var. *cognatus* Fr., Epicr.: 46. 1836. — *Tricholoma cognatum* (Fr.) Gill. Hyménomycètes: 124. 1878. — *Tricholoma arcuata* var. *cognatum* (Fr.) Sacc., Syll. Fung. 5: 127. 1887. — *Melanoleuca cognata* (Fr.) Konr. & M., Ic. sel. Fung. 3, pl. 217. 1927.

Excluded. — *Agaricus arcuatus* Bull. in Bull. & Ventenat, Hist. Champ. France 2: 595. 1812. — *Agaricus arcuatus* Bull.: Fr., Syst. mycol. 1: 109. 1821. — *Gyrophila arcuata* (Bull.: Fr.) Quél., Fl. mycol. France: 267. 1888. — *Tricholoma melanoleucum* var. *arcuatum* (Bull.: Fr.) Maire, Étude, synth. Genre *Tricholoma*: 27. 1916. — *Melanoleuca arcuata* (Bull.: Fr.) Sing. in Cavanillesia 7: 128. 1935.

var. **cognata** — Fig. 6

Selected illustrations. — Cetto, Funghi Vero 1, pl. 144. 1975; Bres., Iconogr. mycol. 3, pl. 120. 1928; Konr. & M., l.c.; J. Lange, Fl. agar. dan. 1, pl. 30A. 1935; R. Phillips, Mushr. other Fungi: 45. 1981.

Selected descriptions. — Bresinsky & Stangl in Z. Pilzk. 43: 512. 1977; Kühner in Bull. mens. Soc. linn. Lyon 47: 31. 1978.

Basidiocarps medium-sized to large, solitary. Pileus 50–105 mm, at first convex, becoming applanate, with low broad umbo, with margin long staying inflexed, fleshy, orange-yellow to rather dark brown (Mu. 10 YR 4–8/6), slightly darker brown at centre,

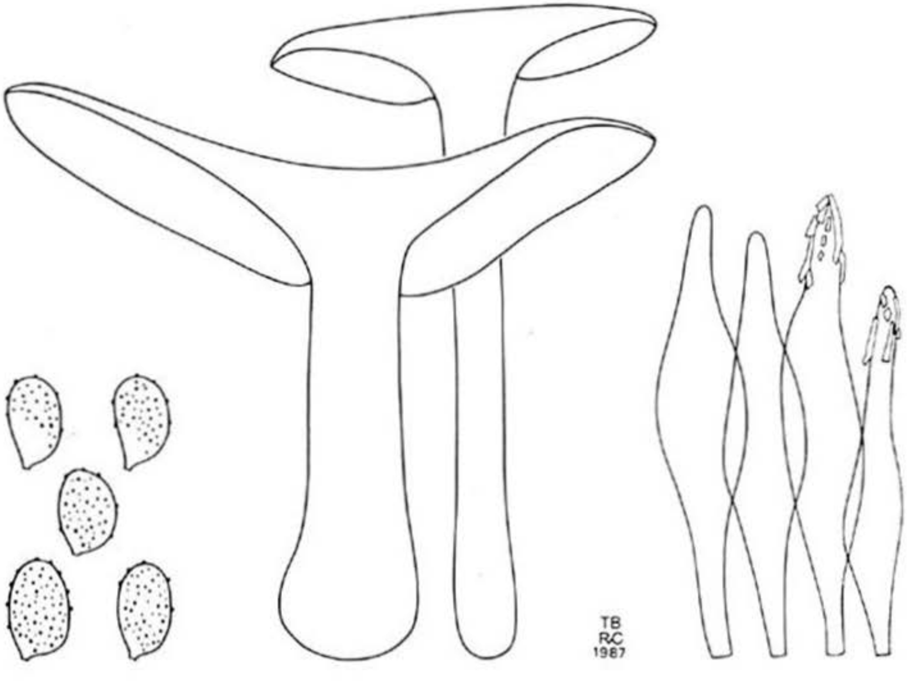

Fig. 6. *Melanoleuca cognata*. — Habit (× 1). — Spores (× 1500). — Cheilocystidia (× 1000).

becoming greyish tinged with age, dry or slightly viscid, glabrous, but when young finely pruinose at margin, translucently striate when moist. Lamellae crowded (L ≅ 65, l = 1–3), emarginate or sinuose, triangular or ventricose, thin, up to c. 10 mm wide, orange-yellow to salmon buff (Mu. 7–8/6–8), with edge entire or occasionally somewhat eroded. Stipe 50–140 × 6–11 mm, cylindrical, with up to 18 mm wide clavate base, stuffed, with loose fibrillose medulla, ochraceous brown (Mu. 10 YR 7/6), fibrillose-striate, at apex white flocculose. Context of pileus pale yellowish brown (K. & R. 3A2), of stipe yellow-brown (Mu. 10 YR 6/6). Smell weak, pleasant, herbaceous or fungoid. Taste mild or somewhat adstringent-herbaceous. Spore print pale cream (Romagnesi, Les Russules, 1b–2a).

Spores (6.8–)7.1–9.5 × 4.1–5.8(–6.2) μm, Q = 1.4–1.9, ellipsoid to elongate, densely ornamented with small amyloid warts, sometimes with some smooth areas. Basidia 25–40 × 8–10 μm, clavate, 4-spored. Cheilocystidia 40–75 × 10–15 μm, fusiform, sometimes somewhat lageniform, with acute or occasionally obtuse apex, with thickened cell wall and with apex usually encrusted by crystals. Pleurocystidia similar to cheilocystidia. Pileipellis somewhat intermediate between a cutis and a trichodermium, made up of slender hyphae; upper part of pileitrama compact, made up of 5–15 μm wide hyphae, with intracellular pale brown pigment. Apex of stipe with lumps of clavate cells and fusiform caulocystidia, 45–90 × 8–13 μm.

Habitat & distribution. — Terrestrial in both broad-leaved and coniferous forests on rich soils, at roadsides and also on somewhat disturbed places. Basidiocarps occur mainly in spring. In the Netherlands not very rare, known from calcareous dunes, from the Flevopolders and from some places in the central and eastern parts of the country.

Collections examined. — NETHERLANDS: prov. Overijssel: Deventer, estate 'Wijtenhorst', 16 Nov. 1969, *G. & H. Piepenbroek s.n.*; Markelo, 18 April 1971, *G. & H. Piepenbroek s.n.*; prov. Flevoland, Oostelijk Flevoland, de Abbert, 15 April 1984, *F. & G. Tjallingii s.n.*; prov. Noord-Holland, Hilversum, 'Anna's Hoeve', 13 May 1973, *P. van Winden s.n.*; prov. Zuid-Holland, Naaldwijk, estate 'Staalduin', 7 April 1974, *C. Bas 6306*; Wassenaar, Meyendel, 14 Oct. 1979, *C. Bas 7567A* (all L). — FRANCE: *Métrod 2744* and notes on *Métrod 626, 1429, 2046* and *Métrod s.n.*, 14 May 1939 (all PC).

Melanoleuca cognata is easily recognized by its ochraceous brown colours, its long stipe, its pleasant smell and its main occurrence in spring. Plate 271 of Konrad & Maublanc (l.c.) differs considerably from the other cited plates of Lange (l.c.) and Bresadola (l.c.). The former showing sordid coloured basidiocarps, while the basidiocarps depicted on the plates of Lange and Bresadola have bright orange-yellow colours. However, within the material studied we observed the entire range from orange-yellow (Mu. 10 YR 4–8/6) to rather dark yellowish brown basidiocarps. According to Bon (1978: 64) *M. cognata* sensu Konrad & Maublanc has fusiform cystidia, while *M. cognata* sensu Lange and sensu Bresadola has more lageniform cystidia. This is in contradiction with the morphology of the cheilocystidia as given by both Lange and Bresadola. The cystidia of *M. cognata* as depicted by these authors differ only slightly from those present by Konrad & Maublanc in having the broadest width just below the middle.

Bulliard's plate of *Agaricus arcuatus* (pl. 589, 1793), published under the name 'Agaric arqué' and without descriptive notes, seems to represent our *M. cognata*. Whereas his later descriptions (1812: 595) of *A. arcuatus* seems to concern a different species with a very dark pileus ('son chapeau est ordinairement de couleur bistré, quelquefois d'un gris-bistre ou d'un bistre un peu lie-de-vin, quelquefois entièrement d'un brun-noirâtre ou seulement brunâtre dans le centre et bistre sur ses bords').

Agaricus arcuatus Bull.: Fr. sensu Fr. (1821: 109) is also not identical with our *M. cognata* because of its reddish, squamulose pileus ('pileo testaceo subrufescente, disco squamuloso').

Melanoleuca adstringens (Pers.) Métrod sensu Kühn. & Romagn. (1953: 146) is related to *M. cognata* because of its isabella coloured pileus, its salmon tinged ochre lamellae and similar spores and cystidia. It differs, however, by a strong, unpleasant smell and taste.

The original *Agaricus adstringens* Pers. (1801: 350), however, is a different species, because of its very dark pileus (according to Persoon's description 'pileo fuligineo-cinereo'). Konrad (1923: 29) also described the pileus of *Tricholoma adstringens* as 'fuligineux-cendré-olivâtre'. For these reasons and because we believe *M. adstringens* sensu Kühner & Romagnesi to be an infraspecific taxon of *M. cognata* we propose the following variety:

Melanoleuca cognata var. **nauseosa** Boekhout, *var. nov.* — Fig. 7

Misapplied names. — *Gyrophila adstringens* (Pers.) Quél., Fl. mycol. France: 267. 1888 — *Melanoleuca adstringens* (Pers.) Métrod in Bull. trimest. Soc. mycol. Fr. 64: 163. 1948.

Selected descriptions. — Bon & Chevassut in Docum. mycol. 9: 48. 1973; Kühn. & Romagn., Fl. anal. Champ. sup.: 146. 1953.

A var. *cognata* differt stipite breviore et odore forti suavi, ingrato, *Tricholoma sulfureum* vel *Clitocybem nebularem* simulante.

Holotypus: *A. N. Koopmans 409*, 11 Sept. 1962 (L).

Collections examined. — NETHERLANDS: prov. Gelderland, locality unknown, 11 Sept. 1962, *A. N. Koopmans 409* (L).

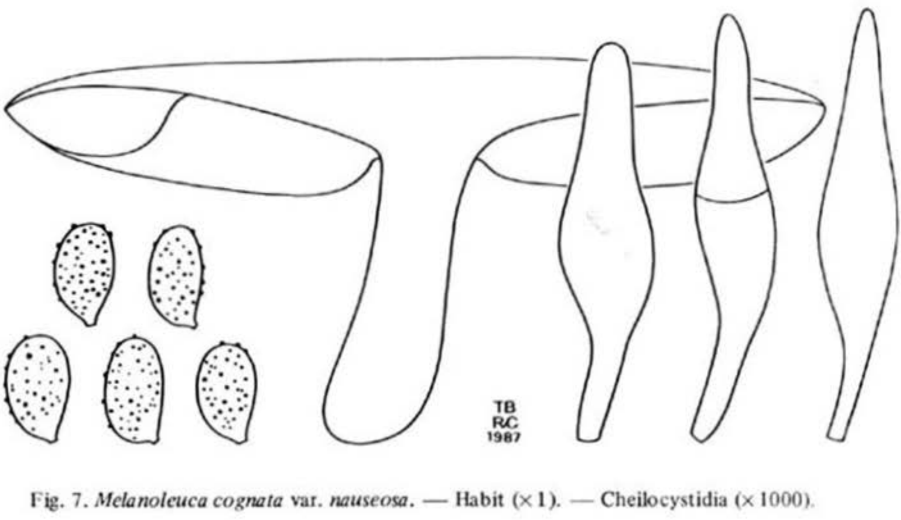

Fig. 7. *Melanoleuca cognata* var. *nauseosa*. — Habit (×1). — Cheilocystidia (×1000).

Differs from the typical variety by a short stipe, which is shorter or equal to the diameter of the pileus, a strong sweet smell with unpleasant components, which reminds of coal-gas and the smell of *Tricholoma sulfureum* or *Clitocybe nebularis* and an unpleasant taste which strongly reminds the smell.

Habitat & distribution. — Terrestrial in coniferous forest, basidiocarps occurring in autumn. In the Netherlands very rare, only known from one locality in the prov. Gelderland.

Subgen. Macrocystis sect. Alboflavidae

Melanoleuca nivea Métrod ex Boekhout, *spec. nov.* — Fig. 8

Melanoleuca nivea Métrod (nom. nud.) in Bull. Soc. Nat. Oyonnaux 14-15: 140. 1960-1961.

Misapplied. — *Tricholoma media* (Paul.) Brébinaud in Bull. trimest. Soc. mycol. Fr. 42: 121. 1926. — *Melanoleuca media* (Paul.) Bon in Docum. mycol. 33: 60. 1978.

Selected illustrations. — Cooke, Ill. Brit. Fungi 1, pl. 219. 1883 (sub *Agaricus (Tricholoma) subpulverulentus* Fr.).

Basidiocarpus parvus. Pileus 30–50 mm, convexus vel applanatus, umbone humili praeditus, albus, nonnumquam in maculis ochraceus. Lamellae densae, ventricosae, tenues, albae vel dilute cremeae. Stipes 30–55 × 4–7.5 mm, albidus vel dilute bubalinus, ad apicem pruinosus. Contextus albidus, in stipite brunneus vel aurantio-brunneus, ad ultimam basim fuscissimus. Odor et sapor indistincti. Sporae in cumulo luteo-albae, 6.8–9.1 × 4.0–4.9 μm, verrucis fere grossis amyloideis dense ornamentatae. Cheilocystidia et pleurocystidia fusiformia. Species terrestris, in pratis dunensibus crescit.

Holotypus: *Métrod 2434* (PC).

Basidiocarps small, solitary or in small groups. Pileus 30–50 mm, convex to applanate, mostly with low broad umbo, with the margin somewhat inflexed and slightly exceeding lamellae, white, sometimes with some ochraceous spots, slightly viscid when moist, shiny, glabrous. Lamellae crowded (L = 45–60, l = 2–7), emarginate to sinuose, triangular or ventricose, thin, up to 8 mm wide, whitish or pale cream, occasionally with a faint pinkish reflex, with concolorous, entire to minutely flocculose edge. Stipe 30–55 × 4–7.5 mm, cylindrical, somewhat broadening towards base, occasionally somewhat flattened, stuffed, whitish to pale greyish beige (Mu. 10 YR 7/3), finally becoming greyish in upper part and brownish towards base (Mu. 10 YR 4/4), entirely longitudinal striate, when young whitish pruinose, soon glabrous in lower part. Context of pileus whitish, brown to orange-brown in upper part of stipe, turning dark brown towards base. Smell faint, somewhat rancid. Taste weak, unpleasant. Spore print yellowish white (Mu. 2.5 Y 8/2).

Spores 6.8–8.4(–9.1) × 4.0–4.9 μm, Q = 1.5–2.0, elongate, moderately densely ornamented with rather coarse amyloid warts, with suprahilar plage. Basidia 23–33 × 7–9 μm, clavate, 4-spored. Cheilocystidia (35–)40–65 × 9–15(–20) μm, fusiform, partly tending to lageniform, mostly with the apex acute and encrusted by crystals. Pleurocystidia similar to cheilocystidia. Pileipellis a c. 40 μm thick ixotrichoderm, made up of 3–4 μm wide hyphae, upper part of the pileitrama compact and without pigment. Apex of stipe with lumps of clavate cells and fusiform to lageniform caulocystidia, 70 × 10–15 μm in size.

Habitat & distribution. — Terrestrial in grasslands on coastal dunes. Rather rare: in the Netherlands only known from coastal regions.

Collections examined. — NETHERLANDS: prov. Friesland: isle of Terschelling, Midsland, 21 Oct. 1981, *M. E. Noordeloos 1629*; ditto, 25 Oct. 1982, *T. Boekhout 1059*; ditto, West Terschelling, 19 Oct. 1981, *M. E. Noordeloos 1610*; prov. Noord-Holland, Santpoort, 'Duin en Kruidberg', 28 Nov. 1981, *A. G. Becker s.n.*; prov. Zuid-Holland: Westvoorne, 'Weevers Duin', 5 Nov 1927, *H. S. C. Huysman 326*; ditto, 20 Oct. 1963, *C. Bas 4007* (all L). — FRANCE: 3 Nov. 1951, *Métrod 2434* (type, PC).

Melanoleuca nivea is well characterized by its small whitish basidiocarps with grey-brown stipe, fusiform cystidia and rather small spores.

Brébinaud (1926: 121) presented a description of *M. nivea* under the name *Tricholoma media* (Paul.) Brébinaud. But the original plate of *Hypophyllum medium* Paul. (cf. Leveillé, 1855: pl. 96 figs. 1, 2) shows a rather coarse fungus with a grey-brow pileus and a white stipe and therefore hardly comparable to *M. nivea*. For that reason I prefer to validate Métrod's name (published without a Latin diagnosis) which is based on a good type collection.

Bon (1978: 60) transferred Brébinaud's *Tricholoma media* to *Melanoleuca*, but ignored Brébinaud's description of the cystidia ('cystides caracteristiques en lancette avec le sommet chevelu, 50 × 12–13 μm') by placing it into stirps *Grammopodia* which is characterized by urticiform cystidia.

Melanoleuca nivea belongs to subgenus *Macrocystis* section *Alboflavidae*. It differs from other whitish *Melanoleuca* species mainly by its small basidiocarps (see Table III).

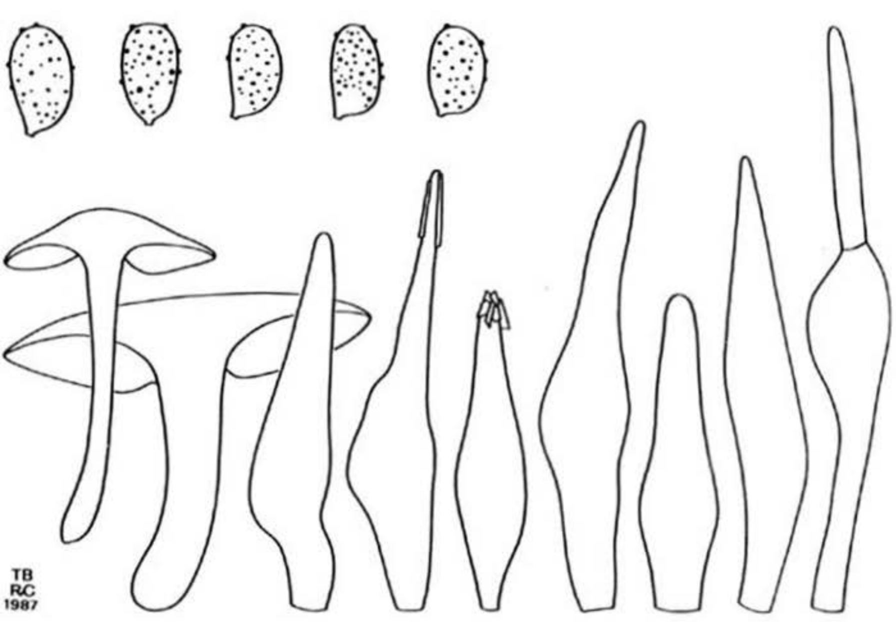

Fig. 8. *Melanoleuca nivea*. — Habit (× 1). — Spores (× 1500). — Cheilocystidia (× 1000).

Table. III. Diameter of the pileus of species from section *Alboflavidae* Sing.

species	diameter of pileus in mm	reference
M. alboflavidum	50–140	Weaver & McLaughin 1980: 49
M. cnista sensu Quélet	80–100	Bon 1978: 61
M. evenosa sensu Métrod	50–80(–100)	Bon 1978: 61
M. kavinae	60–140	Pilát & Veselsky 1932: 476
M. nivea	30–50	(own observations)
M. parisianorum	(50–)60–80	Bon 1978: 61
M. pascua ad. int.	60–115	Malençon & Bertault 1975: 81
M. strictipes sensu Bresinsky & Stangl	90	Bresinsky & Stangl 1977: 156
M. subalpina	120	Bresinsky & Stangl 1977: 160
	80–120(–140)	Bon 1978: 61

Subgen. Macrocystis sect. Strictipedes

Melanoleuca atripes Boekhout, *spec. nov.* — Fig. 9

Melanoleuca nigripes Métrod (nom. nud.) in Bull. trimest. Soc. mycol. Fr. 64: 164. 1948.
Selected illustration. — Métrod l.c., pl. 1, fig. 9.
Selected description. — Pázmaný in Beitr. Kenntn. Pilze Mitteleur. 3: 131. 1987.

Basidiocarpus magnitudine parvus vel medius. Pileus 20–70 mm, convexus vel applanatus, modice depressus, hygrophanus, humidus obscure fuscus, desiccans pallidior, glaber. Lamellae fere densae, ventricosae, brunneo-bubalinae, margine concolori. Stipes 35–50 × 4–5(–8) mm, cylindricus, primum dilute et sordide luteo-bubalinus, deinde fuscescens, sursum albidus flocculosus. Contextus dilute bubalinus, in stipite luteolo-brunneus. Odor et sapor indistincti. Sporae in cumulo albidae, sporae 6.2–7.7 × 4.0–4.8 μm, ellipsoideae, verrucis fere grossis amyloideis praeditae. Basidia 30–40 × 8–10 μm, 4-spora. Cheilocystidia et pleurocystidia 45–70 × 10–20 μm, fusiformia.
Holotypus: '*J. Schreurs s.n.*, 22 XI 1982, Winterswijk' (L).

Basidiocarps small to medium-sized, solitary. Pileus (20–)30–70 mm, at first convex, soon becoming applanate, finally with depressed centre, when young with inflexed margin, rather fleshy hyhrophanous, when moist dark blackish brown (Mu. 10 YR 2/1), becoming paler on drying, then with centre dark brown (Mu. 5 YR 3/2) and margin yellowish brown (Mu. 7.5 YR 3–4/4), with waxy surface, becoming dull when dry, glabrous, when young with margin greyish pruinose. Lamellae rather crowded (L ≅ 45, l = 3–6), sinuose, triangular-ventricose to ventricose, rather thick, up to c. 7 mm wide, brownish beige (Mu. 10 YR 6/4), with entire, concolorous edge. Stipe 35–50 × 4–5 (–8) mm, cylindrical, stuffed, at first pale sordid yellowish beige (Mu. 10 YR 7/3), becoming dark brown (Mu. 10 YR 4/3), longitudinally striate, at apex whitish flocculose. Context of pileus pale beige, yellowish brown in stipe, when young in lower part of stipe yellowish (Mu. 10 YR 6/8). Smell indistinct, fungoid. Taste indistinct. Spore print whitish (Romagnesi, Les Russules, 1a-b).

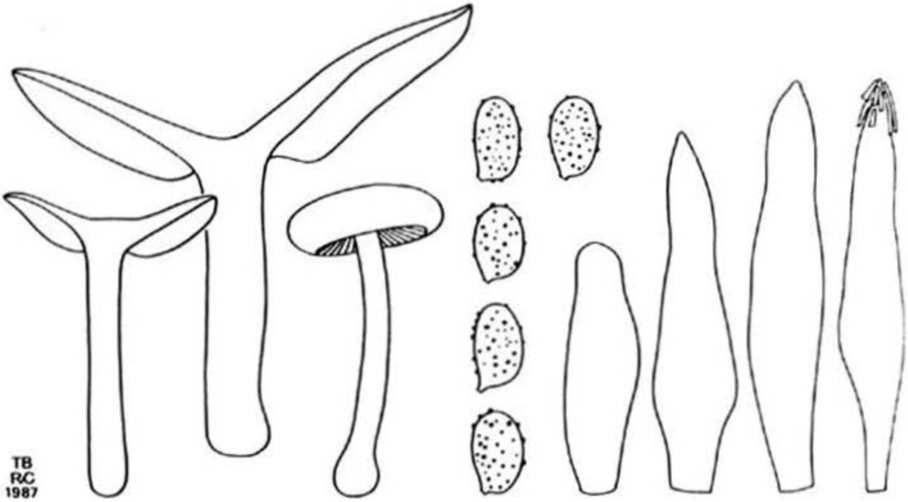

Fig. 9. *Melanoleuca atripes*. — Habit (×1). — Spores (×1500). — Cheilocystidia (×1000).

Spores 6.2–7.7 × 4.0–4.8 µm, Q = 1.5–1.8, ellipsoid, densely ornamented with rather coarse, amyloid warts, with small suprahilar plage. Basidia 30–40 × 8–10 µm, clavate, 4-spored. Cheilocystidia 45–70 × 10–20 µm, fusiform, with apex subacute and encrusted by crystals. Pleurocystidia similar to cheilocystidia. Pileipellis somewhat intermediate between a cutis and a trichoderm, up to c. 40 µm thick, made up of 8–12 µm wide hyphae with intracellular, yellow-brown pigment. Apex of stipe with fusiform to lageniform caulocystidia, 50–70 × 6–13 µm in size.

Habitat & distribution. — Very rare, in the Netherlands only known from type locality (a kitchen garden).

Collections examined. — NETHERLANDS: prov. Gelderland, Winterswijk, 22 Nov. 1982, *J. Schreurs s.n.* (L). — FRANCE: Jura, Champagnole, 19 Oct. 1943, *Métrod 1388* (PC).

Melanoleuca atripes is characterized by a hygrophanous blackish brown pileus, a dark brown stipe, yellowish beige lamellae, rather short ellipsoid spores and fusiform cystidia. In these aspects the Netherlands' specimen agrees well with the description of *M. nigripes* Métrod (1949: 164), with the exception of the colour of the context described by Métrod as nearly black. In his illustration of the species (l.c.: pl. 1 fig. 9) the context, however, is sordid isabella brown, which agrees again with the Netherlands' material.

As Métrod's original collection of his *M. nigripes* is very poor, I prefer to describe a new species with better type material.

Pázmány's description (l.c.) agrees well with ours except that the spores of the Rumanian specimen are larger, viz. 8–9 × 5.2–6 µm and the context of its stipe is blackish.

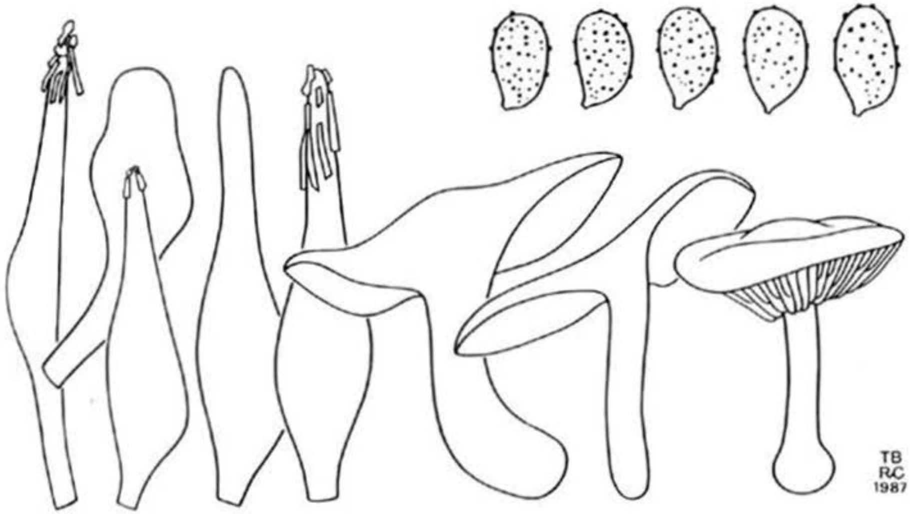

Fig. 10. *Melanoleuca albifolia.* — Habit (×1). — Spores (×1500). — Cheilocystidia (× 1000).

Melanoleuca albifolia Boekhout, *spec. nov.* — Fig. 10

Melanoleuca leucophylla Métrod (nom. nud.) in Bull. trimest. Soc. mycol. Fr. 64: 161. 1948.
Selected illustration. — Métrod l.c.: pl. 1, fig. 8. 1948.
Selected descriptions. — Bon in Docum. mycol. 3: 39. 1972; Docum. mycol. 33: 66. 1978; Pázmány in Beitr. Kenntn. Pilze Mitteleur. 3: 130. 1987.

Basidiocarpus magnitudine parvus vel medius. Pileus 25–50 mm, convexus vel plano-convexus, umbone humili praeditus, hygrophanus, humidus obscure rubello vel olivaceo-sepiaceus, desiccans pallidior. Lamellae densae, ventricosae, albae vel dilutissime cremeae. Stipes 15–65 × 4–7 mm, cylindricus, primum dilute bubalinus, deinde ad griseo-brunneum fuscescens. Contextus dilute luteo-brunneus, ad basim stipitis fuscescens. Odor et sapor indistincti. Sporae in cumulo albae, sporae 7.0–9.5 × 4.3–5.1 µm, ellipsoideae vel elongatae, verrucis grossis amyloideis praeditae. Basidia 4-spora. Cheilocystidia et pleurocystidia 45–70 × 10–16 µm, lageniforma, ad apicem subacuta.
Holotypus: '*C. Bas s.n.*, 25 Nov. 1982, Vogelenzang (L).'

Basidiocarps small to medium-sized, solitary or in small groups. Pileus 25–50 mm, convex to plano-convex, finally with depressed centre, with low broad umbo, when young with involute margin, sometimes slightly exceeding lamellae, hygrophanous, when moist dark reddish to olivaceous sepia-brown (Mu. 10 YR 2–3/2), paler towards margin, finally becoming pale yellowish brown (Mu. 10 YR 6–7/3), when moist subviscid and shiny, when dry dull, glabrous. Lamellae rather crowded (L = 30–55, l × 1–5), emarginate to sinuose, triangular-ventricose to ventricose, c. 6 mm wide, white to very pale cream, with entire, concolorous edge. Stipe (15–)25–65 × 4–7 mm, cylindrical, stuffed, when young pale greyish beige (Mu. 10 YR 7/4–8/3), becoming dark grey-brown (Mu. 10 YR 2–4/2) with age, longitudinally striate, with whitish flocculose apex. Context of pileus pale yellowish brown, in upper part of stipe brown, becoming dark brown towards base, with cortex greyish in upper part. Smell weak, fungoid or faintly rancid. Taste weak. Spore print white (Romagnesi, Les Russules, 1a-b).

Spores 7.0–9.5 × 4.3–5.1 µm, Q = 1.5–1.9, ellipsoid to elongate, densely ornamented with rather coarse amyloid warts, with small suprahilar plage. Basidia 25–35 × 8–10 µm, (2–)4-spored. Cheilocystidia (35–)45–70 × 10–16 µm, lageniform with subacute apex, partly also fusiform, at apex encrusted with crystals. Pleurocystidia similar to cheilocystidia. Pileipellis a c. 40 µm thick ixotrichoderm made up of 2–4 µm wide hyphae, upper part of pileitrama compact with intracellular yellow-brown pigment. Apex of stipe with clusters of clavate cells and lageniform caulocystidia, 55–70 × 10–20 µm in size.

Habitat & distribution. — Terrestrial in grasslands on dunes. Rare in the Netherlands, only known from the coastal area.

Collections examined. — NETHERLANDS: prov. Friesland, isle of Terschelling, Boschplaat, 'Stuifduik', 26 Oct. 1982, *T. Boekhout 1060*; prov. Noord-Holland, Vogelenzang, water-supply dunes, 24 Oct. 1981, *C. Bas 7853*; ditto, 25 Nov. 1982, *C. Bas s.n.* (type L). — FRANCE: Jura, Champagnole, 1 Nov. 1943, *Métrod 1407* (PC).

Melanoleuca albifolia is well characterized by rather small basidiocarps with a dark pileus, white lamellae, a grey-brown stipe and lageniform cystidia.

Because *M. leucophylla* was not correctly published and the original collections of Métrod contains only very poor fragments I prefer to describe this taxon as a new species under the name *M. albifolia*.

Melanoleuca polioleuca var. *fragillima* (Bon, 1978: 73, sub *M. humile* var. *fragillima*) is related, but differs by a less dark pileus, a more whitish stipe and more fusiform cheilocystidia.

Melanoleuca subpulverulenta sensu Bresinsky & Stangl (1977: 161) seems related too, but that species differs by a more grey pileus and shorter spores (viz. 6.5–7.0 × 5.0–5.5 µm).

Melanoleuca turrita (Fr.) Sing. — Fig. 11

Agaricus turritus Fr., Epicr.: 51. 1836–1838. — *Gyrophila turrita* (Fr.) Quél., Fl. mycol. France: 266. 1888. — *Tricholoma grammopodia* var. *turrita* (Fr.) Maire, Étude synth. Genre *Tricholoma*: 29. 1916. — *Tricholoma turrita* (Fr.) Nuesch, Die Ritterlinge: 146. 1923. — *Melanoleuca turrita* (Fr.) Sing. in Ann. mycol. 41: 55. 1943.

Tricholoma humile f. *robusta* Bres., Iconogr. mycol. 3: pl. 128. 1928. — *Melanoleuca humile* var. *robusta* (Bres.) Bon in Docum. mycol. 33: 75. 1978.

?*Melanoleuca humile* (Pers.: Fr.) Pat. sensu Métrod in Bull. trimest. Soc. mycol. Fr. 64: 158. 1948.

Selected illustrations. — Bresadola, l.c.

Selected description. — Mal. & Bert., Fl. Champ. sup. Maroc 2: 83. 1975.

Basidiocarps medium-sized, solitary or connate. Pileus up to 70 mm, at first convex, becoming convex with undulating margin, finally with depressed centre, when young with inflexed margin, thick-fleshed, hygrophanous, when moist with centre dull olivaceous brown with a faint reddish tinge (Mu. 10 YR 3/4, 4/3), towards margin dark greyish-bluish black (Mu. 5 YR 2.5/1–2), outermost margin whitish, on drying becoming grey-brown (Mu. 10 YR 5–6/3), glabrous, dry, with margin sulcate and greyish pruinose. Lamellae crowded (L ≅ 70, l = 7–11), sinuose, ventricose, thin, c. 7 mm wide, greyish white with a faint yellowish pink or pink tinge (Mu. 5 Y 8/1), with entire, concolorous

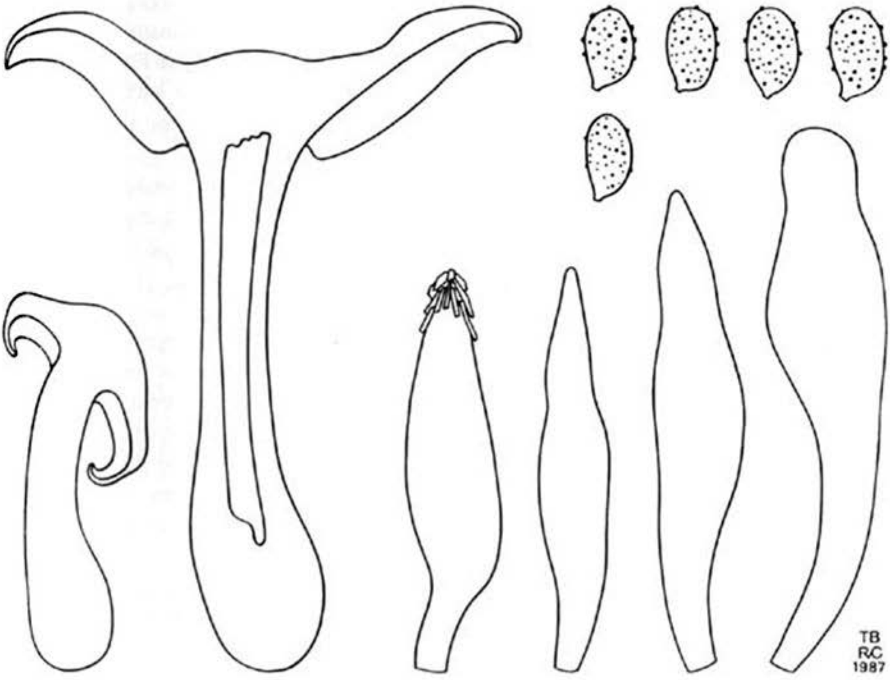

Fig. 11. *Melanoleuca turrita*. — Habit (×1). — Spores (×1500). — Cheilocystidia (×1000).

edge. Stipe 40–70 × 9 mm, cylindrical, with up to 20 mm wide, clavate base, stuffed, becoming fistulose, dark grey-brown (Mu. 10 YR 4–5/3), longitudinally striate, at apex densely flocculose, less densely flocculose towards base, at base with appressed white mycelium. Context when young white, becoming yellowish to greyish white, just under pileipellis blackish, in base of stipe dark ochraceous brown, finally with cortex of stipe becoming dark ochraceous brown (Mu. 10 YR 6/6). Smell weak, fungoid. Taste slightly rancid. Spore print white.

Spores 7–8 × 4–5 μm, Q = 1.4–1.8, ellipsoid to elongate, densely ornamented with small, partly somewhat elongate warts, with suprahilar plage. Basidia 30–40 × 7–9 μm, clavate, 4-spored. Cheilocystidia 50–70 × 10–14 μm, fusiform to conical with acute or occasionally obtuse apex encrusted with crystals. Pleurocystidia similar to cheilocystidia. Pileipellis a c. 50 μm thick ixotrichoderm, made up of slender hyphae with clavate terminal cells, measuring 25–35 × 2–5 μm, upper part of pileitrama compact, with intracellular pale brown pigment. Apex of stipe with fusiform caulocystidia, 70–90 × 10–15 μm.

Habitat & distribution. — On wood chips of ornamental shrub. Very rare; in the Netherlands only known from one locality. Because of the abundance of the substrate, nowadays commonly used in gardening, probably more common.

Collections examined. — NETHERLANDS: prov. Zuid-Holland, Leiden, railway station Lammenschans, 2 Nov. 1982, *T. Boekhout 1077 & C. Bas 8048* (L).

Melanoleuca turrita as described here, fully agrees with Bresadola's plate 128 (1928) of *Tricholoma humile* f. *robusta* Bres. and is well characterized by connate basidiocarps, a dark pileus with a peculiar dull aspect, a grey-brown stipe and conical to fusiform cystidia.

Melanoleuca humile sensu Métrod (1949: 158) agrees fairly well with our specimen, although the surface of the pileus is described by that author as tomentose, whereas in our specimen it is peculiar waxy.

As stated by Métrod (l.c.) several interpretations exist of *Agaricus humilis* Pers.: Fr. *Agaricus humilis* as described by Persoon (1801: 360) is a robust, short-stiped fungus with a dark ('fuscescente'), slightly squamulose ('obsolete squamuloso') pileus, more or less greyish lamellae and a short (c. 27 × 9 mm), greyish pruinose stipe. This reminds very much the morphology of e.g. *M. brevipes* (Bull.: Fr.) Pat. According to Fries (1815: 11; 1821: 51) *A. humilis* Pers.: Fr. also is a short-stiped, robust fungus, but he described the lamellae as whitish. No authentic material is present in the herbarium Persoon (L). Several interpretations of *M. humilis* mainly differ in their microscopical characteristics e.g. those of Singer (1943: 51), Métrod (1949: 158), and Bresinsky & Stangl (1977: 153). It is hardly possible to select one of these interpretations as representing the true *A. humilis* of Persoon, because they all more or less agree with Persoon's macromorphological concept of this species. Therefore we consider *A. humilis* an ambigous name.

Melanoleuca turrita (Fr.) Sing. (1943: 55; Moser 1978: 143) is identical with our fungus. *Tricholoma turrita* sensu Nuesch (1923: 146), however, differs from our fungus by the soon very soft, blackish context. Moreover, the two plates from Britzelmayr (1881: plates 304 and 429) cited by Nuesch seem to represent two different species. I do not understand why Bon (1978: 53) placed *M. turrita* (Fr.) Sing. in section *Grammopodiae*, which is characterized by urticiform cystidia. Singer (l.c.) described the cystidia as 'spindelformig' and he referred to *Tricholoma humile* sensu Bresadola (1928: 128), which has fusiform cystidia too.

Melanoleuca polioleuca (Fr.: Fr.) Kühn. & Maire

Agaricus melaleucus var. *polioleuca* Fr.: Fr., Syst. mycol. 1: 115. 1821. — *Tricholoma melaleuca* var. *polioleuca* (Fr.: Fr.) Gillet, Hyménomycètes: 128. 1874. — *Melanoleuca polioleuca* (Fr.: Fr.) Kühn. & Maire in Bull. trimest. Soc. mycol. Fr. 50: 18. 1934.

Melaleuca vulgaris Pat., Hyménomycètes d'Europe: 96. 1887. — *Melanoleuca vulgaris* (Pat.) Pat., Essai tax. Hyménomycètes: 159. 1900.

Excluded. — *Melanoleuca polioleuca* sensu Mos., Blätter- und Bauchpilze, 4. Aufl.: 141. 1978.

Misapplied names. — *Tricholoma arcuata* sensu Rick., Blätterpilze: 356. 1915. — *Melanoleuca arcuata* sensu Sing. in Cavanillesia 7: 128. 1935. — *Melanoleuca arcuata* sensu Mos., Blätter- und Bauchpilze, 1. Aufl.: 69. 1953. — *Tricholoma melaleuca* sensu Maire, Étude synth. Genre *Tricholoma*: 23. 1916. — *Melanoleuca melaleuca* sensu Mos., Blätter- und Bauchpilze, 1. Aufl.: 69. 1953.

forma **polioleuca**

Selected illustrations. — Däncke & Däncke 700 Pilze: 204. 1979; J. Lange, Fl. agar. dan. 1, pl. 29A. 1935; R. Phillips, Mushr. other Fungi: 45. 1981 (as *M. arcuata* and *M. melaleuca*).

Selected descriptions. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 3: 402. 1982 (as *M. melaleuca*); Bon in Docum. mycol. 33: 74. 1978 (as *M. vulgaris*); Bresinsky & Stangl in Z. Pilzk. 43: 150 (as *M. arcuata*), 155 (as *M. melaleuca*). 1977; Kühner in Bull. mens. Soc. Linn. Lyon 47: 28. 1978; Métrod in Bull. trimest. Soc. mycol. Fr. 64: 162. 1948 (as *M. vulgaris*).

Basidiocarps medium-sized, solitary. Pileus 25–70(–85) mm, at first convex, becoming plano-convex to applanate, finally with somewhat depressed centre, mostly with low broad umbo, with margin somewhat involute but at age uplifted, rather fleshy, somewhat hygrophanous, dull, when moist yellowish brown to dark grey-brown (Mu. 10 YR 4/3–5/3), frequently with slight olivaceous or reddish tinge, paler towards margin, becoming paler on drying on to greyish brown (Mu. 10 YR 5/3), with surface dry or slightly viscid, glabrous but with margin whitish pruinose and occasionally translucently striate. Lamellae crowded, L = 40–75, l = 1–7, adnate to sinuose, mostly with subdecurrent toothlet, ventricose to triangular, thin, (2–)4–9 µm wide, whitish, becoming pale cream (Mu. 2.5 Y 8/2–4) or somewhat greyish white (Mu. 10 YR 8/1–2), with entire, concolorous edge. Stipe 35–85(–150) × 3–8(–11) mm, cylindrical with up to 16 mm wide clavate base, stuffed, at first whitish, becoming pale to sordid grey-brown (Mu. 10 YR 7/2–4, 6/4), towards base becoming brown, dark grey-brown or blackish brown (Mu. 10 YR 3/2–3, 4/3), innately longitudinal striate, at apex white flocculose. Context of pileus whitish, occasionally yellowish brown, just below pileipellis brown, becoming brownish towards base of stipe and nearly blackish brown in extreme base, very rarely entirely whitish. Smell weak, pleasant, farinaceous or somewhat raphanoid. Taste weak, mild, farinaceous rancid or somewhat bitterish. Spore print whitish with a faint cream tinge (Romagnesi, Les Russules, 1a-b).

Spores (5.7–)6.3–9.0(–9.5) × 4.0–5.0(–5.4) µm, Q = 1.3–1.9, ellipsoid to elongate, rather densely ornamented with rather coarse, amyloid warts, with suprahilar plage. Basidia 25–40 × 6–10 µm, clavate, 4-spored. Cheilocystidia 45–75(–90) × 8–15 µm, fusiform with subacute apex, but partly also lageniform, at apex mostly encrusted with crystals. Pleurocystidia similar to cheilocystidia. Pileipellis an up to c. 100 µm thick ixotrichoderm, made up of slender hyphae with obtuse or cystidioid terminal cells. Upper part of the pileitrama compact, with pale brown pigment. Apex of stipe with lumps of clavate cells and fusiform caulocystidia, 50–80(–95) × 7–14 µm.

Habitat & distribution. — Terrestrial in both broad-leaved and coniferous forests, in grasslands, mainly on rather rich sandy, clayey or loamy soils. Common in the Netherlands, occurring frequently in coastal dunes, in forests on clay in fluviatile phytogeographical district and in Flevo-polders.

Collections examined. — NETHERLANDS: prov. Friesland: Kootstertille, 19 Oct. 1982, *J. Wisman s.n.*; Leeuwarden, 22 Sept. 1972, *J. Wisman s.n.*, isle of Terschelling, Formerum, 25 Oct. 1982, *T. Boekhout 1058*; ditto, 'Kroonpolders', 27 Oct. 1982, *Th. W. Kuyper s.n.*; ditto, 'Noordvaarder', 27 Oct. 1982, *T. Boekhout 1064*; ditto, Formerum, 25 Oct. 1982, *T. Boekhout 1058*; prov. Gelderland: Apeldoorn, 'Berg en Bos', 18 Oct. 1958, *A. N. Koopmans 178*; Bennekom, 28 Sept. 1960, *J. Doorenbos s.n.*; prov. Utrecht, Bunnik, estate 'Oud Amelisweerd', 22 July 1954, *C. Bas 536*; prov. Flevoland: Noordoostpolder, 'Kuinderbos', 27 Oct. 1982, *L. Laarman s.n.*; Oostelijk Flevoland, 'Bremerbergbos', 5 Oct. 1981, *E. Jansen s.n.*; ditto, 7 Oct. 1981, *M. E. Noordeloos 1492*; ditto, 8 Oct. 1981, *M. E. Noordeloos 1495* and *1496*; ditto, 20 Nov. 1982, *G. Tjallingii-Beukers s.n.*; prov. Noord-Holland: Hilversum, 'Anna's Hoeve', 4 Dec. 1972, *P. van Winden 341*; Hilversum, 'vliegveld', 17 Oct. 1957, *J. Daams s.n.*; Wieringermeer, 'Robbenoord', 5 Oct. 1968, *J. Geesink s.n.*; prov. Zuid-Holland: Leiden, 'Leidse Hout', 25 July 1954, *R. A. Maas Geesteranus 10.005*; Scheveningen, 'de Hartenshoek', 2 Nov. 1981, *M. A. Brand s.n.*; Voorschoten, estate 'Ter Horst', 12

Oct. 1982, *E. C. Vellinga s.n.*; Westvoorne, Rockanje, 'Quackjeswater', 19 Oct. 1982, *T. Boekhout 1043*; Wassenaar, 'Rust en Vreugd', 6 Nov. 1983, *Th. W. Kuyper 2498*; prov. Zeeland: Kruiningen, 28 June 1985, *W. D. J. Kuys s.n.*; prov. Noord-Brabant: Dorst, 26 June 1972, *P. B. Jansen s.n.*; prov. Limburg, Gronsveld, 'Savelsbos', 11 Oct. 1970, *C. Bas 5459* (all L). — FRANCE: Notes of Métrod on the following specimens: *Métrod 265* (sub *M. friesii* Bres.); *478* (sub *M. phaeopodia* Bulliard); *616* (sub *M. phaeopodia* Bulliard); *697* (sub *M. vulgaris* Pat.); *1543* (sub *M. vulgaris* Pat. var. *phaeopodium*); *1985* (sub *M. vulgaris* Pat. var. *phaeopodium*); *1993* (sub *M. phaeopodia* Bulliard); *2034* (sub *M. polioleuca* Fr.); *2201* (sub *M. vulgaris* var. *phaeopodium*).

Melanoleuca polioleuca is interpreted here as a variable species. Within this complex many varieties (see Métrod 1949: 163) or even species (see Bon 1978: 74-75) have been distinguished. According to Bon (l.c.) *M. polioleuca* differs from *M. vulgaris* mainly by the brown context of the stipe in the former species, whereas *M. vulgaris* is claimed to have a white context. However, I observed within one population both specimen with a brown and with a white context of the stipe. Regarding other characters both forms are similar. Therefore we agree with Kühner & Romagnesi (1953: 147) that this character cannot be used to separate species in this complex. Consequently I include *M. vulgaris* sensu Bon in my concept of *M. polioleuca*.

In the literature *M. vulgaris* sensu Bon has often been referred to as *M. melanoleuca* (a.o. Arnolds 1982: 402). However, we follow Kühner (1978: 13), who pointed out that *Agaricus melaleucus* Pers.: Fr. (Persoon 1801: 355; Fries 1821: 114) most probably is an acystidiate species, because of its glabrous stipe (according to Persoon l.c. 'stipe glaber').

Melanoleuca polioleuca sensu Clémençon & Sing. (1972: 322) and Moser (e.g. 1978: 141) differs from our species by a pruinose pileus. This, however, is not reported by Fries (l.c. and 1874: 75).

Melanoleuca arcuata sensu Bresinsky & Stangl (1977: 150) differs mainly by a very dark pileus, but this I noticed also frequently in the specimen I studied (e.g. *Boekhout 1000* (L)), without finding any further differences. Therefore, I regard *M. arcuata* sensu Bresinsky & Stangl conspecific with *M. polioleuca*.

We studied notes and exsicatae of specimen belonging to this complex from the collection Métrod (PC). *Melanoleuca vulgaris*, *M. vulgaris* var. *phaeopodium*, *M. phaeopodia* and *M. polioleuca* sensu Métrod all belong to the *M. polioleuca*-complex.

Among the specimens studied some aberrant forms occur, which have a remarkable short stipe or tiny basidiocarps. These are known in the literature as *M.* (*Tricholoma*) *brevipes* sensu J. Lange and *M. humile* var. *fragillima* (Fr.) Bon respectively. In my opinion both belong to *M. polioleuca* and are best regard as forms of that species.

Melanoleuca polioleuca f. **langei** Boekhout, *f. nov.* — Fig. 12

Misapplied names. — *Melanoleuca arcuatum* sensu Ricken, Blätterpilze: 356. 1915. — *Tricholoma brevipes* sensu J. Lange, Fl. agar. dan. 1: 65. 1935.

Selected illustration. — J. Lange, l.c., pl. 29 D.

Selected description. — Arnolds, Ecol. Coenol. Macrofungi Grassl. Heathl. Drenthe, Netherlands 3: 399. 1982.

Differt a forma *polioleuca* stipite brevi, diametro pilei longitudine aequali vel breviore. Holotypus: *M. E. Noordeloos 1612*, Terschelling, 19 Oct. 1981 (L).

Differs from the typical form, mainly by its short stipe, which mostly is distinctly shorter than or equal to the diameter of the pileus. Besides the fusiform cystidia sometimes a second type occurs, which strongly reminds the urticiform type of cystidia (Fig. 12).

Habitat & distribution. — Terrestrial in grasslands and in stands of *Populus*. According to Arnolds (1982: 186) also in not or weakly fertilized grasslands on dry, moderately acid to neutral sand rather poor to moderately rich in humus. Frequent in coastal dunes, but also in grasslands in the province of Drenthe.

Collections examined. — NETHERLANDS: prov. Groningen: isle of Rottumeroog, 26 Oct. 1977, *E. Arnolds 3916* and *3962* (WAG-W); prov. Friesland: isle of Terschelling, West Terschelling, 19 Oct. 1981, *M. E. Noordeloos 1612* (L); prov. Drenthe: Wijster, 2 Sept. 1960, *J. J. Barkman 6657* (WAG-W); prov. Zuid-Holland: Wassenaar, 'Meyendel', 28 Oct. 1981, *M. Brand s.n.*; ditto, 2 Nov. 1981, *M. Brand s.n.*; Westvoorne, north of Tenellaplas, 14 May 1983, *C. Bas 8112*; ditto, 'Weevers duin', 18 Oct. 1982, *T. Boekhout 1045*; prov. Noord-Brabant: Bergen op Zoom, estate 'Zoomland', 1 and 2 Nov. 1973, *P. B. Jansen s.n.* (all L).

Melanoleuca polioleuca f. *langei* is similar to *M. arcuatum* sensu Ricken (1915: 356) and *M. brevipes* sensu J. Lange (1935: 65). As already stated by Arnolds (l.c.) the latter differs from the Netherlands' specimens by a whitish, thicker stipe. Within the specimens studied by me the colour of the stipe varied from pale grey-brown to dark brown (Mu. 10 YR 4–8/3). The other differences mentioned by Arnolds (l.c.) between *M. polioleuca* (as *M. melaleuca*) and *M. polioleuca* f. *langei* (as *M. brevipes* sensu J. Lange), viz. the paler, more ochraceous pileus, the slender stipe and broader cystidia in the first species, intergrade to a large extend among those forms. In this respect it is significant that J. Lange (l.c.) wrote for his *Tricholoma brevipes*: 'Rather common, ... but often less typical than the figured species, more *melaleucum*-like.'

Melanoleuca contracta Métrod (1949: 159, nom. nud.) is related to *M. polioleuca* f. *langei*, but differs by smaller basidiocarps, pale brown lamellae and more lageniform cystidia. One of the specimens studied by me (*Boekhout 1045* (L)) differs from the others by greyish beige lamellae (Mu. 10 YR 6/4), thus agreeing in this aspect with *M. contracta*.

Other relatives are *M. phajopodia* sensu Singer & Clémençon (1972: 326) based on an interpretation of *A. phaeopodius* Bull.: Fr. We are not sure that this taxon in the original Friesian sense (l.c.) represents a species of *Melanoleuca*, because Fries placed it in *Agaricus* subgenus *Collybia*. The specimens described by Singer & Clémençon (l.c.) as *M. phajopodia* differ from *M. polioleuca* f. *langei* by basidiocarps becoming almost black after drying, ochraceous lamellae, slightly wider spores and the occurrence in coniferous forests.

Probably *Agaricus oreinus* Fr. (1821: 51) is also related to *M. polioleuca* f. *langei*, as Fries in 1838 (: 46) referred to a plate of *Agaricus testudineus* Pers. (Persoon, 1828: 218, pl. 23 fig. 1, 2), which represents an obese fungus with a short stipe, a grey-brown pileus, whitish lamellae and a whitish context.

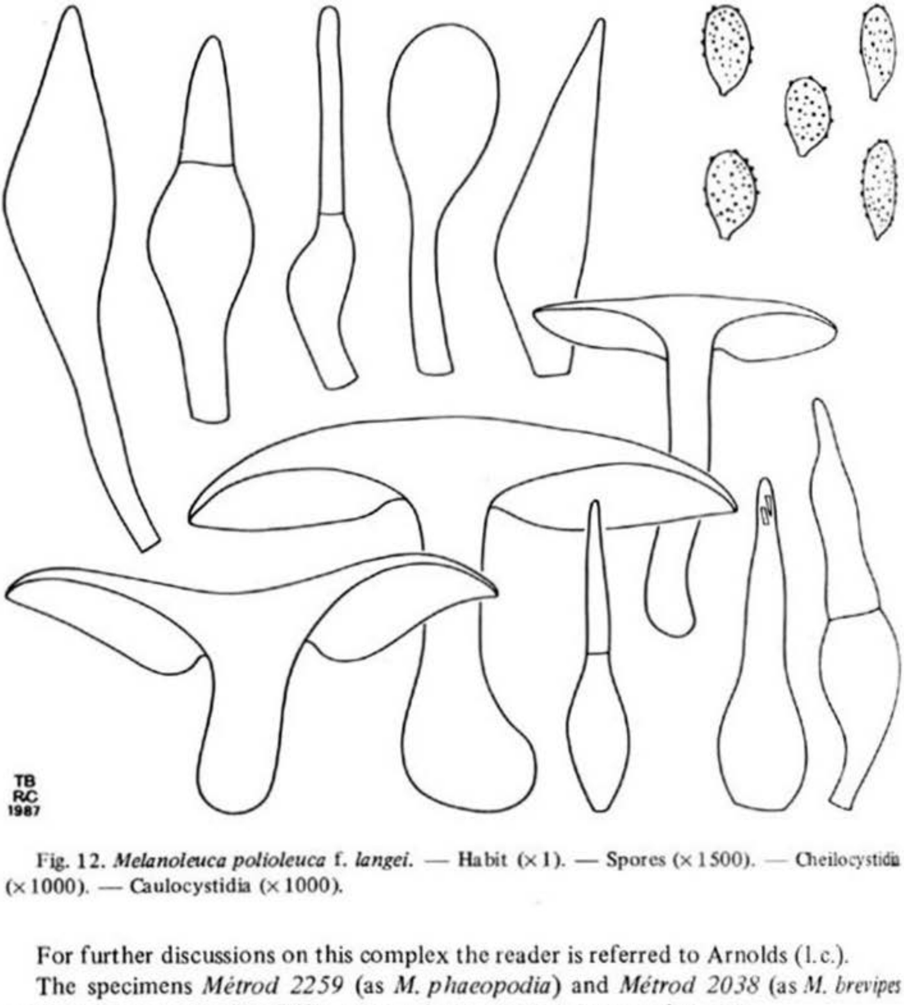

Fig. 12. *Melanoleuca polioleuca* f. *langei*. — Habit (× 1). — Spores (× 1500). — Cheilocystidia (× 1000). — Caulocystidia (× 1000).

For further discussions on this complex the reader is referred to Arnolds (l.c.).

The specimens *Métrod 2259* (as *M. phaeopodia*) and *Métrod 2038* (as *M. brevipes* sensu Romagnesi; both in PC) are very similar to *M. polioleuca* f. *langei*.

Melanoleuca polioleuca f. **oreina** (Fr.) Boekhout, *comb. nov.*

Agaricus oreinus Fr., Observ. mycol.: 98. 1815 (basionym). — *Gyrophila oreina* (Fr.) Quél., Enchir. Fung.: 16. 1886. — *Tricholoma oreina* (Fr.) Rick., Blätterpilze: 357. 1914. — *Melanoleuca oreina* (Fr.) Kühn. & Maire in Bull. trimest. Soc. mycol. Fr. 50: 18. 1934.

?*Agaricus humilis* var. *fragillima* Fr., Epicr.: 52. 1838. — *Tricholoma humile* var. *fragillima* (Fr.) J. Lange, Fl. agar. dan. 1: 65. 1935. — *Melanoleuca humile* var. *fragillima* (Fr.) Bon in Docum. mycol. 33: 78. 1978.

Differs from the typical form mainly by smaller basidiocarps. Pileus 17–35(–45) mm, thin-fleshed, pale greyish brown (Mu. 10 YR 5/3–4), with somewhat darker centre, becoming paler on drying. Lamellae crowded to rather distant, emarginate to sinuate or occasionally even subdecurrent, whitish. Stipe 25–75 × 2–4 mm, whitish, becoming pale brown to grey-brown (Mu. 10 YR 5/4, 3/3), at apex whitish flocculose. Context of pileus whitish to pale beige, in upper part of stipe pale beige to greyish brown, towards base dark brown. Microscopical characters similar to those of typical form.

Habitat & distribution. — Terrestrial, mainly in grasslands, also in broad-leaved forests on rich soils. In the Netherlands rather common on coastal dunes, but also occurring inland in the provinces of Limburg, Utrecht, and Zuid-Holland.

Collections examined. — NETHERLANDS: prov. Friesland: isle of Vlieland, 1 Nov. 1976, *E. Arnolds 3717* (WAG-W); prov. Zuid-Holland: Leiden, 'Hortus Botanicus', 25 Nov. 1953, *C. Bas s.n.*; Westvoorne, Oostvoorne 'Voorne's Duin', 18 Oct. 1982, *T. Boekhout 1047* and *1048*; prov. Noord-Holland: Bergen, 'Duinvermaak', 13 Nov. 1982, *Th. W. Kuyper 2330*; Castricum, watersupply dunes, 2 Nov. 1982, *Th. W. Kuyper 2669* (all L); prov. Noord-Brabant: Dorst, 8 Aug. 1963, *P. B. Jansen s.n.* (herb. Jansen); prov. Limburg: Bemelen, 'Bemeler Berg', 30 Oct. 1982, *J. Schreurs s.n.* (L); Eijsden, 'Savels bos', 12 Aug. 1974, *P. B. Jansen s.n.* (herb. Jansen).

The specimens studied differ considerably from each other in respect to the length of the stipe and the colour of the pileus and stipe. Probably the observed differences are habitat-dependent (e.g. the length of the stipe) or age-dependent (e.g. the colour of the pileus).

Melanoleuca humile var. *fragillima* sensu J. Lange (l.c., as *Tricholoma*) agrees well with my specimens. An illustration of *M. humilis* var. *fragillima* made by Métrod (present in PC) represênts our specimens very well. As stated before (see discussion on *M. turrita*). *Agaricus humilis* Persoon is considered a doubtful name. As a consequence the interpretation of Fries' *Agaricus humilis* var. *fragillima* (1838: 52, 1874: 75) is also problematic.

The description of Fries (1815: 98) of *A. oreinus* fits our specimen well. The only contradiction seems to be that according to Fries (l.c.) *A. oreinus* grows in mountainous heathlands ('Ericetis montosis'). Several authors (e.g. Quélet, 1888: 269; Kühner & Romagnesi, 1953: 148) have referred to *M. oreina* as a species related to *M. melaleuca* (non sensu Kühner) = *M. polioleuca*. *Melanoleuca oreina* (Fr.) Kühn. & Maire sensu Métrod (1942: 89) agrees fairly well with our specimens. According to Métrod's description (l.c.) the context contains hyphae with resinaceous contents. Specimens studied from the Métrod herbarium (PC), are very similar to those cited above. Only Métrod 1018,1 (PC) differs from the Netherlands' as well as from the other Métrod specimen studied by the presence of hyphae with resinaceous contents.

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STUDIES IN COPRINUS-I
Subsections Auricomi and Glabri of Coprinus section Pseudocoprinus

C. B. ULJÉ* & C. BAS**

A key is given to the Netherlands' species of subsect. *Auricomi* Sing. and *Glabri* J. Lange of *Coprinus* sect. *Pseudocoprinus* (Kühn.) Orton & Watling. All species concerned are concisely described and amply discussed. *Coprinus plicatilis* var. *microsporus* Kühn. is raised to species level as *C. kuehneri* and described in detail.

Although much has been written about the *Coprinus hemerobius*-group (inclusive or exclusive of *C. auricomus*), quite a few taxonomic problems in this fairly well-defined complex of species and varieties remain to be solved. In this paper we want to expound our present views, based on many observations, on these problems, hoping to contribute to the solvation of at least a few of these.

New concepts, the raising to the rank of species of *C. plicatilis* var. *microsporus*, and the inclusion of our recently described *C. hercules*, necessitated the construction of a new identification key which is presented here.

As most of the accepted taxa have been extensively described and illustrated elsewhere, we restrict ourselves to giving concise diagnostic descriptions and illustrations of the most important characters, simultaneously referring to the selected descriptions in literature.

This study is based on examination by the first author of all the collections of species concerned present in his own herbarium, at the Rijksherbarium Leiden and of collections from several private herbaria of members of the Nederlandse Mycologische Vereniging. In addition a number of collections borrowed from institutes in Great Britain and West Germany have been investigated.

PRESENTATION

In the descriptions is referred to the colour codes of Munsell (1975) and Kornerup & Wanscher (1978), respectively indicated as Mu. and K. & W. Other abbreviations used are: L = length, W = width of the spores in side view, B = breadth of the spores in frontal view and Q = length divided by breadth. The sizes of the spores, given in the descriptions of the species, relate to L × B or L × B × W. The colour of the spores, as indicated, gives the colour as seen under the microscope. A notation like (80/8/2) stands for '80 spores from 8 basidiocarps from 2 collections measured'. The enlargement of the drawings is × 1000 for the spores and × 800 for the other microscopical details.

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*Van Dijkstraat 21, 2405 XE Alphen a/d Rijn.
**Rijksherbarium, Leiden.

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COPRINUS (Pers.: Fr.) S. F. Gray

Section **Pseudocoprinus** (Kühn.) Orton & Watling

KEY TO THE SUBSECTIONS

1. Stipe and pileus with setulae (not treated here) . . . . Subsection *Setulosi*
1. Stipe glabrous; pileus glabrous or with scattered, microscopical, long, brown hairs.
   2. Stipe and pileus glabrous. Spores with excentric germ pore . . . . Subsection *Glabri*
   2. Stipe glabrous; pileus under microscope with scattered, long, brown hairs (> 200 μm). Spores with central germ pore . . . . Subsection *Auricomi*

Subsection **Auricomi** Sing. 1948

Long (up to 350 μm), brown, thick-walled hairs present on pileus; spores ellipsoid with central germ pore . . . . *C. auricomus*

Subsection **Glabri** J. Lange 1915

KEY TO THE SPECIES

1. Average breadth of spores < 10 μm.
   2. Average breadth of spores < 7.8 μm; average length < 10 μm; spores 7.5–10 × 6–8 μm, not or weakly lemon-shaped, rounded-triangular or quadrangular in frontal view . . *C. kuehneri*
   2. Average breadth of spores > 7.8 μm or average length > 12 μm.
      3. Pileus small, < 10 mm; spores 7–10.5 × 6.5–10 μm; pleurocystidia absent; on dung *C. miser*
      3. Pileus usually larger; if growing on dung then length of the spores > 12 μm; pleurocystidia present.
         4. Average length of spores < 11 μm.
            5. Spores in frontal view heart-shaped or weakly to strongly lemon-shaped with rounded angles (usually 5) . . . . *C. leiocephalus*
            5. Spores in frontal view subglobose to globose, without angles *C. galericuliformis* Watling
         4. Average length of spores > 11 μm.
            6. Average length of spores 11–13 μm, average breadth 8.1–9.5 μm; spores usually somewhat heart-shaped or ovoid and subangular, more rarely ellipsoid . *C. plicatilis*

6. Average length of spores 14–15.5 µm, average breadth 9.5–10 µm; spores conspicuously ellipsoid . . . . *C. megaspermus*

1. Average breadth of spores > 10 µm.
    7. Basidiocarps small: pileus c. 13 mm in diam., stipe up to 1.5 mm thick; spores 12–17 × 11.5–15 µm, average breadth 11.8–13.3 µm; up to 8 pseudoparaphyses around each basidium *C. hercules*
    7. Basidiocarps usually larger: stipe 1.5–3 mm thick; average breadth of spores 9.5–11.6 µm; up to 7 pseudoparaphyses around each basidium.
        8. Average Q of spores < 1.3; spores 11–15 × 10–13 µm, usually broadly heart-shaped *C. nudiceps*
        8. Average Q of spores c. 1.5; spores 12–17 × 8.5–11 µm, distinctly ellipsoid *C. megaspermus*

Subsection **Auricomi** Sing.

Notwithstanding the macroscopical similarities between *C. auricomus*, the sole species of this subsection, and species of the *plicatilis*-group, we think that a separate subsection for the former is justified by its microscopical characters. Not only the brown thick-walled hairs on the pileus, but also the ellipsoid spores with a central germ pore warrant its classification outside subsect. *Glabri*.

Coprinus auricomus Pat. — Figs. 1 & 12

Coprinus auricomus Pat., Tab. anal.: 200. 1886.

Coprinus hansenii J. Lange in Dansk bot. Ark. 2(3): 48. 1915.

Misapplied names. — *Coprinus crenatus* s. Rick., Blätterpilze: 66. 1915; *Coprinus hemerobius* s. J. Lange, Fl. agar. dan. 4: 118. 1939.

Selected descriptions. — Kühn. & Joss. in Bull. trimest. Soc. mycol. Fr. 50: 53. 1934; Bender & al. in Z. Mykol. 50: 34–39. 1984; Donelli & Simonini in Boll. Grup. micol. G. Bres. 29: 106. 1986.

Young pileus ellipsoid, often somewhat conical, expanding to 2–60 mm in diam., chestnut-colour, red-brown or orange-brown (Mu. 2.5 YR 2.5/2, 3/2, 2.5/4, 3/4; 5 YR 2.5/2, 3/3, 3/4, 4/4, 4/6, 4.5/7.5; 7.5 YR 5.5/4, 4/6, 5/8; 10 YR 4/6, 5/6; K. & W. 7 F G) at centre, paler at margin, glabrous. Lamellae free but not remote from apex of stipe, first whitish, then brown (Mu. 5 YR 2.5/1, 3/1, 3/3), finally black. Stipe 70–120 × 2–3 mm, with subbulbous base, sordidly white to sordidly yellow-brown (Mu. 10 YR 8/1).

Spores (340/17/17) 10–14.3 × 5.8–8.2 µm, average L. 10.8–13.1 µm, average B. 6.8–7.5 µm, Q = 1.36–2.07, average Q = 1.47–1.93, ellipsoid with central germ pore. Basidia 4-spored. Cheilo- and pleurocystidia as in Figs. 7 and 8, but slightly larger and somewhat slenderer. Pileipellis hymeniform with scattered long, brown, thick-walled hairs. Clamps present.

Habitat. — Terrestrial at grassy places, road-sides, etc., but also locally very abundant on woodchips used to pave paths and tracks.

In discussions concerning *C. auricomus* frequently the names *C. hansenii* J. Lange (1915) and *C. hemerobius* Fr. (1838: 253) are mentioned.

Although Lange (l.c.) did not describe the presence of hairs on the pileus we are convinced that his *C. hansenii* is a younger synonym of *C. auricomus* for the following reasons: (i) Lange's illustration of *C. hansenii* fits *C. auricomus* perfectly. (ii) Spore-shape and size given by Lange for *C. hansenii* agree very well with *C. auricomus*. (iii) Lange's mentioning of *C. crenatus* s. Rick. as identical with *C. hansenii*. Ricken's description and particularly his coloured illustration (1911: 66) under that name leave little room for doubt about the identity with *C. auricomus*. (iv) Although *C. auricomus* is a fairly common species, it is not described elsewhere in Lange's work.

It is sometimes argued that it is improbable that an excellent mycologist as J. Lange would have missed the hairs on the pileus. It is our experience, however, that because of their scarcity these hairs are often not found in a radial section of the pileipellis and sometimes are lacking even in scalps, notwithstanding the fact that, probably contrarily to Lange, we know what we are looking for. Besides, these hairs can be rather short and pale and then difficult to detect. It happened several times that in a collection of a *C. plicatilis*-like fungus with ellipsoid spores and central germ pore we did not immediately find hairs on the pileus. Because of the characters of the spores we then nevertheless supposed that we were dealing with *C. auricomus* and until now never failed to find hairs on the pileus in a further number of scalps.

Coprinus hemerobius s. Lange (1939: 118) too is identical with *C. auricomus*. Lange himself remarked upon its resemblance to small *C. hansenii* and the similarity of the microscopical characters to those of that species and thus to *C. auricomus*. No collarium is mentioned in connection with the attachment of the gills. In fact it is only the small size that seems to differentiate *C. hemerobius* s. Lange from *C. auricomus*. In this context it seems useful to mention that a locality is known to one of us, where several tens of basidiocarps of *C. auricomus* have been found with caps between 2 and 10 mm in diameter.

A discussion on the original *C. hemerobius* Fr. is to be found at the end of this paper.

Agaricus subtilirugatus Secr. (1883: 423; invalid name) resembles *C. auricomus* very much. Particularly the red-brown colour of the pileus and the fact that the lamellae are said to reach the stipe are indicative.

Coprinus sociatus Fr. (1838: 252), also sometimes mentioned in connection with *C. auricomus*, has a pileus described as subsquamulose and farinaceous, which hardly seems to apply to *C. auricomus* or any member of subsection *Glabri* J. Lange.

Other names possibly relating to *C. auricomus:*

Agaricus campanulatus Bolt.	(1788)	*C. hemerobius* s. Cooke	(1886–1888)
C. hemerobius s. Quél.	(1872)	*C. hemerobius* s. Rea	(1922)
C. hemerobius s. Britz.	(1883)	*C. hemerobius* s. Bres.	(1931)

Subsection **Glabri** J. Lange

Macroscopical characters. — All species in this subsection have a glabrous pileus which is radially sulcate up to the centre and a glabrous hollow stipe attenuate towards the apex and usually subbulbous at the base. The size of the basidiocarps differs from collection to collection. Although for each species a maximum size can be given, that is hardly possible for a minimum size (see discussion on *C. auricomus*).

The lamellae are free and remote, which means that they do not reach the stipe so that a circular empty space is visible around the apex of the stipe. In literature it is often said that the lamellae are attached to a collarium, but that is an incorrect interpretation of the situation. When the pileus expands, its membranous part becomes slightly elevated above the somewhat fleshy central disc. The result is then that the proximal end of the lamellae seems to be attached to the more or less vertical side of the disc (Fig. 4), a situation quite different from that in e.g. species of *Marasmius* where the proximal ends of the lamellae are united, forming a small tube around the apex of the stipe.

Most species of subsection *Glabri* grow terrestrial or on woody fragments, but *C. nudiceps* and *C. megaspermus* sometimes grow on dung and *C. miser* always. The basidiocarps usually grow singly, but in some species occasionally they are fasciculate, particularly when growing on woodchips. No special smell or taste is known.

Microscopical characters. — All species of subsection *Glabri* known to us have spores with an excentric germ pore. Orton & Watling (1979) stated that *C. hemerobius*, *C. megaspermus* and *C. nudiceps* have a central germ pore. As the original *C. hemerobius* is unknown to us (see elsewhere in this paper), we leave that species out of consideration. But examination by one of us (C.B.U.) of the type of *C. megaspermus* and *C. nudiceps* have shown that both species have an excentric germ pore. The drawings of the spores of *C. megaspermus* given by Orton & Watling (but note that the illustrations of the spores of *C. megaspermus* and *C. hemerobius* have been interchanged) show indeed a centric, but those of *C. nudiceps* an excentric germ pore, this in contradiction with the description. The spores in subsection *Glabri* are usually strongly lentiform (in other words: in frontal view they are much broader than in side view). Sometimes, however, the spores in *C. plicatilis* are very narrow and rather long and then they are only weakly lentiform (Fig. 13C). In *C. megaspermus* the spores are more or less ellipsoid. The degree of shifting of the germ pore towards the abaxial side of the spores varies from one collection to another from weakly to strongly excentric.

The basidia are nearly always 4-spored, but in some collections of *C. miser* they are 2-spored.

The pileipellis is hymeniform. The pedicels of the cells of the pileipellis are long at the centre and gradually shorter towards the margin of the pileus. The pedicels are often brownish and have slightly thickened walls. In *C. miser* the cells of the pileipellis have short pedicels at the centre and almost none at the margin of the pileus and thus vary to almost globose (Figs. 2 and 3).

Clamps are present in all species.

Cheilocystidia are usually lageniform (Fig. 7) and very similar in most species, but somewhat more cylindrical to ellipsoid or at least have a somewhat broader apical part in *C. kuehneri*, *C. nudiceps* and *C. hercules* (Fig. 6). Of both *C. kuehneri* and *C. nudiceps* collections have been found with practically only globose to ellipsoid cheilocystidia. *Coprinus miser* only has always c. globose cheilocystidia.

Pleurocystidia are present in all species but *C. miser*.

So far little attention has been paid to the pseudoparaphyses. The number of these sterile hymenial cells may vary from 3–6 to 5–8 around each basidium and is given here for each species separately as it seems to have some taxonomic value.

Coprinus kuehneri Uljé & Bas, *spec. nov.* — Figs. 2, 6, 9

C. plicatilis var. *microsporus* Kühn. in Bull. trimest. Soc. mycol. Fr. 50: 57. 1934.
Selected description. — Donelli & Simonini in Boll. Grup. micol. G. Bres. 29: 115. 1986 (as *C. leiocephalus* P. D. Orton).

Pileus ad 35 mm latus, sulcatus, obscure rubrobrunneus, interdum aurantiobrunneus vel flavobrunneus, postea cinerascens, glaber. Lamellae stipite remotae, primo albidae, dein griseobrunneae vel atrogriseae. Stipes ad 100 × 3 mm, sordide albidus vel sordide flavobrunneus. Sporae 6.5–10.5 × 5.5–8 × 5–6 μm, Q = 1.05–1.6, $\overline{Q}$ = 1.16–1.45, cordiformes, ad rhombeae vel mitriformes inclinatae, 3-4-, raro 5-angulatae, poro germinali excentrico praeditae. Cheilocystidia 30–80 × 12–28 μm, collo 11–23 μm lata, cylindrica vel utriformes, interdum sublageniformes vel elongato-ellipsoidea, raro fere solum globosa. Pleurocystidia 40–100 × 22–40 μm, collo 21–32 μm lata, plus minusve cheilocystidiis similia. Fibulae adsunt.

Typus: '*C. B. Uljé*, 31 V 1987, Netherlands, prov. Zuid-Holland, Leiden, park Leiden-Noord (L)'.

Pileus in bud-stages up to 16 × 11 mm, later expanding to paraboloid or convex, rarely becoming flat, up to 35 mm in diam., sulcate-striate up to centre, at first rather dark red-brown, less frequently orange- or yellow-brown, later with greyish tinges (at centre Mu. 2.5 YR 2.5/2–4, 3/2–4; 5 YR 3/2–4; 7.5 YR 3/2–4, 4/4, 5/4; 10 YR 7/4; at margin Mu. 5 YR 4/4–8, 5/4; 7.5 YR 4/2–6, 5/4, 6/5; 10 YR 4/1–3, 5/2–3, 6/2–3, 7/3–4; K. & W. 7F7, 8F4, 7E/F5, 8E/F4, 7F5, 6E6, 6E/F7, 6D4, 6C6, 5C4). Lamellae free, remote from stipe, first whitish, then greyish brown (Mu. 10 YR 5/3, 6/3–4), finally blackish grey, L = 32–50, l = 1–3. Stipe up to 100 × 3 mm, sordid white to sordid yellowish brown.

Spores (500/25/25) 6.6–10.8 × 5.5–8.2 × 5.1–6.0 μm, average L 7.9–9.9, average B 6.3–7.7, Q 1.07–1.58, average Q 1.16–1.45, heart-shaped, tending to rhomboid or mitriform, 3–4-, rarely 5-angular, not or weakly lemoniform, rather pale to rather dark red-brown, with excentric germ pore. Basidia 19–38 × 8–12 μm, 4-spored. Cheilocystidia (Fig. 6) 30–80 × 12–28 μm, with 11–23 μm wide neck, cylindrical to utriform, sometimes weakly lageniform, or elongate-ellipsoid, rarely almost exclusively globose. Pleurocystidia 40–100 × 22–40 μm with neck 21–32 μm wide, more or less similar to cheilocystidia. Pileipellis made up of spheropedunculate cells up to 100 × 25 μm. Clamps present. Number of pseudoparaphyses around each basidium (3–)4–6.

Habitat. — Usually terrestrial on naked soil under trees or shrub, more rarely at grassy places. Basidiocarps single or subfasciculate. Rather common in the Netherlands.

Collections examined. — NETHERLANDS: prov. Overijssel, Delden, 4 mei 1956, *H. S. C. Huijsman 4004*; 1 Oct. 1979, *E. Kits van Waveren*; prov. Gelderland, Buren, 18 Oct. 1970, *H. S. C. Huijsman 70–168*; prov. Noord-Holland, Amsterdam, Amsterdamse Bos, 29 June 1960, 29 July 1962, *E. Kits van Waveren*; 28 May 1985, 17 June 1985, *C. B. Uljé*; Vondelpark, 1 May 1957, *E. Kits van Waveren*; prov. Zuid-Holland, Leiden, Hortus Botanicus, 25 Oct. 1943, *A. C. Perdeck 110*; 26 June 1956, *G. A. Leygraaf*; 5 May 1960, *C. Bas 1863*; Wandelpark Leiden-Noord, 18 June, 5 July, 27 July 1985 and 31 May 1987 (type), *C. B. Uljé*; Voorschoten, Noord-Hofland, 24 June 1985, *C. B. Uljé*; Oegstgeest, Oud Poelgeest, 11 June 1954, *C. Bas*; Poelgeesterweg, 18 May and 21 May 1986, *C. B. Uljé*; Alphen a/d Rijn, Zegerplas, 31 July 1985, *C. B. Uljé*; Gouda, de la Reijstraat, 27 May 1979, *C. den Held-Jager*; prov. Limburg, Slavante, Sint Pietersberg, 9 Nov. 1951, *R. A. Maas Geesteranus*. — FRANCE: Coye, North of Paris, 1953, *H. Romagnesi*; Villeret 'Rockefort', 9 Oct. 1965, *H. S. C. Huijsman*. (All collections of C. B. Uljé in herbarium Uljé, except type: type and other collections in L.)

Macroscopically *C. kuehneri* can usually be distinguished from its closest relative *C. leiocephalus* by the dark red-brown colour of the pileus, which is paler and yellow-brown in the latter. Microscopically *C. kuehneri* is characterized by the narrower, 3–4-angular spores with a tendency to being rhomboid or mitriform and the more cylindrical cheilocystidia. In collections of *C. kuehneri* in which the cheilocystidia are predominantly lageniform, these cells have a broader upper part than those of *C. leiocephalus*.

Although Orton (1969: 88) considers *C. plicatilis* var. *microsporus* Kühn. identical with his *C. leiocephalus*, we have come to a different conclusion. In Kühner's original description of *C. plicatilis* var. *microsporus* (1934: 57), the breadth of the spores is given as 5.5–7.5 μm. Moreover, the shape of the spores in his drawings leaves no doubt about the fact that Kühner's variety is identical with *C. kuehneri* as described here.

Orton gives the breadth of the spores of his *C. leiocephalus* as 7–8.5 μm and the spores in his drawings differ markedly from those of Kühner for *C. plicatilis* var. *microsporus*.

In Kühner's publication (l.c.: figs. 10a, c–h and 13a–c) the spores are illustrated of 9 collections attributed to *C. plicatilis* (1934: 56, fig. 3a–i). In our opinion this set of collections is a mixture of *C. plicatilis* var. *plicatilis* and *C. leiocephalus*. The spores of the type of *C. leiocephalus* (Fig. 10 D in the present publication) agree perfectly with those in Kühner's fig. 3a. Therefore it is clear that *C. plicatilis* var. *microsporus* Kühn. and *C. leiocephalus* P. D. Orton are not identical.

It is very well possible that *C. velaris* Fr. as described and illustrated by Patouillard (1886: 194) represents *C. kuehneri* as the spores as drawn by Patouillard for that species are very similar to those of *C. kuehneri*. We cannot say with certainty that *C. velaris* s. Pat. is identical with *C. velaris* Fr. (1838), which agrees with almost any species in the *C. plicatilis* group on account of the very brief original description.

Coprinus miser P. Karst. — Figs. 3, 5, 15

Coprinus miser P. Karst. in Symb. mycol. fenn. 9: 61. 1882.
Selected description. — Joss. in Bull. trimest. Soc. mycol. Fr. 78: 247. 1962.

Pileus very small, up to 8 mm in diam. when expanded, first orange-brown to greyish brown (rarely whitish), later grey and transparent with brownish centre (Mu. 5 YR 4.5/6; 7.5 YR 6/8, 7/8, 8/2; 10 YR 3.5/2; K. & W. 5B5-B2). Lamellae free, reaching stipe, L = 9–16, l = 0–1. Stipe up to 50 × 0.5 mm, glabrous but at base often with loose fibrils.

Spores (120/6/6) 7.0–10.5 × 6.6–10.1 μm, average L 7.7–9.6 μm, average B 7.5–9.2 μm, Q 0.94–1.17, average Q 1.02–1.05, heart-shaped (Fig. 15). Basidia 4-spored, rarely all 2-spored (in the 2-spored form spores not noticeable larger). Cheilocystidia (sub)globose (Fig. 5). Pleurocystidia absent. Number of pseudoparaphyses around each basidium 4–6. Pileipellis composed of spheropedunculate cells with short stalk at centre and sessile globose cells at margin. Clamps present.

Habitat. — Always growing on dung from several animals.

Coprinus miser is easy to recognize because of the very small basidiocarps always growing on dung, the heart-shaped rounded triangular spores almost as broad as they are long, the absence of pleurocystidia and the globose cheilocystidia, but the cheilocystidia are not always easy to detect. The shape of the spores is sometimes somewhat aberrant, more rounded quadrangular and with a slightly elongate apex (Fig. 15B), more or less like the spores of *C. patouillardii* Quél., but with excentric germ pore.

Coprinus leiocephalus P. D. Orton — Figs. 2, 7, 8, 10A, C–H

Coprinus leiocephalus P. D. Orton in Notes R. bot. Gdn Edinb. 29: 88. 1969.

Pileus expanded up to 50 mm in diam., sordid yellowish to reddish-brownish (Mu. 7.5 YR 4/6–5/8; 10 YR 4/6, 5/5–6; 2.5 Y 6/4). Lamellae free, c. 1 mm remote from stipe, whitish to blackish; L = 21–48, l = 1–3. Stipe up to 140 × 3 mm, sordid whitish to sordid yellowish-brownish.

Spores (940/47/47) 8.1–11.8 × 7.1–10.5 × 5.3–7.0 μm, average L 9.0–10.7 μm, average B 8.1–9.8, Q 0.97–1.42, average Q 1.07–1.32, rather variably shaped, mostly 5-angular and heart-shaped with slightly elongate apex (Fig. 10), dark red-brown to almost black. Basidia 20–40 × 9.5–12 μm, 4-spored. Cheilocystidia 30–80 × 14–30 μm with 6–15(–18) μm wide upper part, most lageniform. Pleurocystidia 50–110 × 25–35 × 16–23, lageniform to weakly utriform (Figs. 7, 8). Number of pseudoparaphyses around each basidium 4–6(–7). Pileipellis hymeniform. Clamps present.

Habitat. — Terrestrial on bare soil or at grassy places, particularly under trees and shrub, but also on open lawns and meadows; moreover rather frequent on paths covered with woodchips.

Morphologically *C. leiocephalus* is intermediate between *C. kuehneri* and *C. plicatilis*, but closer to the second than to the first of these two species. The only reliable character is the shape and the size of the spores but there is also a somewhat different ecology, particularly between *C. plicatilis* and *C. leiocephalus*. Although the latter sometimes grows on lawns and meadows, it shows a great preference for habitats under trees and shrub, whereas the former grows mainly on open grassy places and rarely under trees and shrub. On woodchips used for covering paths and tracks, *C. plicatilis* has never been found by us; in contrast *C. leiocephalus* is fairly common there.

We found the shape of the spores of the type of *C. leiocephalus* to be the most common one in other collections of this species.

It should be mentioned here that mature spores of *C. plicatilis* and *C. leiocephalus* are very dark red-brown, frequently even almost black under the microscope. The spores of *C. kuehneri* are usually distinctly paler. For further notes on the differentiation of *C. leiocephalus* from *C. plicatilis* and *C. kuehneri*, see also the discussions under these two species.

On woodchips we have found what probably is a variant of *C. leiocephalus*, in which the young basidiocarps have a lilacinous tinge. This tinge is probably caused by oily contents of cells of the pileipellis, also noted by Mr. H. Bender (pers. comm.) who collected and studied the same variant in Germany. It has slightly larger spores than typical *C. leiocephalus* and its cheilocystidia are ellipsoid to subellipsoid-subcylindrical. The pileus is rather strongly cylindrical and measures up to 30 × 12 mm when still closed and becomes up to 50 mm wide and greyish brown when expanded. Further collections have to proof that these characters are constant and if so whether this is indeed a form of variety of *C. leiocephalus* or should be described as an independent species.

Names possibly relating to *C. leiocephalus:*

C. superiusculus Britz.	(1883)	*C. plicatilis* Fr. s. Bres.	(1931)
C. rapidus Fr. s. Quélet	(1888)	*C. plicatilis* Fr. s. Lge.	(1939)
C. plicatilis Fr. s. Rick.	(1911)	*Pseudocoprinus lacteus* Smith	(1946)
C. plicatilis Fr. s. Sacc.	(1916)	*P. brunneolus* McKnight & Allison	(1969)

Coprinus galericuliformis Watl. — Fig. 10B

Coprinus galericuliformis Watl. in Notes R. bot. Gdn Edinb. 18: 42. 1967.

The characters of *C. galericuliformis* agree with those of *C. leiocephalus*, with the exception of the shape of the spores. Among the in frontal view almost globose spores of *C. galericuliformis* (Fig. 10B), however, one can find also spores with a shape very close to that of the spores of *C. leiocephalus*. That was clearly the case in a Netherlands' collection studied by us (Breda, 15 Sept. 1980, *P. B. Jansen 80-215*). Moreover, in contradiction with Watling's description, the type of *C. galericuliformis* turned out to possess pleurocystidia. Therefore it seems possible that *C. galericuliformis* Watl. represents a rare aberrant variant of *C. leiocephalus*.

Watling (1967: 42) validated for his taxon the invalid name *C. galericuliformis* Losa (1943: 154). But in Losa's rather poor original description the spore size is given as 10 × 6 μm, which would fit *C. kuehneri* better. As Watling described *C. galericuliformis* with a Latin diagnosis and a new type, it seems better to suppress the notation 'Losa ex'.

Coprinus plicatilis (Curt.: Fr.) Fr. — Figs. 2, 7, 8, 13A–C

Agaricus plicatilis Curt., Fl. londin. Fasc., 57. 1787.

Agaricus plicatilis Curt.: Fr., Syst. mycol. 1: 313. 1821. — *Coprinus plicatilis* (Curt.: Fr.) Fr., Epicr.: 252. 1838.

Selected descriptions. — Kühner in Bull. trimest. Soc. mycol. Fr. 50: 55–59. 1934; Donelli & Simonini in Boll. Gruppo micol. G. Bres. 29: 111. 1986.

Pileus expanded up to 35 mm diam., sordid yellow-brown (Mu. 7.5 YR 3/4, 4/4–6; 10 YR 4/4–5, 5/5, 6/6, 7/3, 6/2). Lamellae free and remote from stipe; L = 24–40, l = 0–3. Stipe up to 120 × 2.5 mm, sordid whitish to sordid yellow-brown. Spores (280/14/14) 9.9–14.3 × 7.2–10.3 × 6.5–8.1 μm, average L 11.1–12.8, average B 8.1–9.5 μm, Q 1.07–1.81, average Q 1.17–1.54, rather variably shaped, mostly angularly ovoid with five rounded angles, sometimes almost ellipsoid (Fig. 13A–C). Basidia 20–42 × 9–12 μm, 4-spored. Cheilo- and pleurocystidia as in *C. leiocephalus*. Number of pseudoparaphyses around each basidium (4–)5–6(–7). Pileipellis hymeniform. Clamps present.

Habitat. — On lawns and other grassy places, seldom in the shade.

As mentioned before, we consider *C. plicatilis* and *C. leiocephalus* very closely related and wonder if they do not represent variants of one species. If one studies, however, a great many collections of both taxa simultaneously it appears that the most common type of the complex is not found in the middle of the range of variation, but that there are two main types that occur very frequently and that other variants are rarer in proportion to their degree of deviation from these main types. The shape and size of the spores that belong to the main type that represents *C. leiocephalus* (Figs. 10D–F) can easily be distinguished from the shape and size that belong to the spores of the type representing *C. plicatilis* (Fig. 13A).

As one of these two types has been described by P. D. Orton as *C. leiocephalus* and we are far from sure that this taxon should be reduced to variety of *C. plicatilis*, we prefer to treat *C. leiocephalus* as an independent species.

There is a rather general consensus in literature about the application of the name *C. plicatilis* to the taxon with the large spores (c. 10–14 µm long).

Other names possibly relating to *C. plicatilis:*

Agaricus striatus Bull.	(1809)	*C. velaris* s. Quél.	(1886)
Coprinus hemerobius s. Pat.	(1886)		

Coprinus megaspermus P. D. Orton — Figs. 2, 7, 8, 14

Coprinus megaspermus P. D. Orton in Notes R. bot. Gdn Edinb. 32: 141. 1972.

Pileus 25–30 mm in diam. when expanded, at first rusty tawny, then fulvous, sienna or cinnamon, outer part clay buff. Lamellae free, slightly remote from stipe, L = 30-50, l = 1–3, white to blackish. Stipe up to 100 × 2.5 µm, whitish to pale greyish brown.

Spores (80/4/2) 12.3–17.3 × 8.8–11.3 × 7.5–10 µm, average L 14.3–15.3 µm, average B 9.5–10 µm, Q 1.32–1.68, average Q 1.48–1.53, more or less ellipsoid. Basidia 20–40 × 9–12 µm, 4-spored. Cheilocystidia 40–60 × 13–24 µm, lageniform to weakly utriform, sometimes ellipsoid (as in Fig. 7). Pleurocystidia 55–75 × 20–24 µm, shape like cheilocystidia (as in Fig. 8). Number of pseudoparaphyses around each basidium 5–7.

Habitat. — Terrestrial but also on dung. Rare.

Coprinus megaspermus distinguishes itself from the other species of subsection *Glabri* by its large ellipsoid spores. Of the two collections studied, one (the type) was terrestrial and the second (*R. A. Maas Geesteranus 3601*, Netherlands, 24 August 1944, prov. Zuid-Holland, Oegstgeest) growing on horse dung.

Although Orton & Watling (1979: 100) indicate a central germ pore for his species, examination of the type has shown that in that collection the germ pore is excentric albeit not strongly. In *Maas Geesteranus 3601* the germ pore is even strongly excentric.

Coprinus hercules Uljé & Bas — Figs. 2, 6, 16

Coprinus hercules Uljé & Bas in Persoonia 12: 483. 1985.

Pileus usually 8–14(–20) mm in diam. when expanded, orange-brown to red-brown (Mu. 5 YR 3/4–4/6, 7.5 YR 4–5/6, 10 YR 5/3; K. & W. 6D/E6, 6E/F6, 5D5). Lamellae free, not distinctly remote from stipe, L = 16–24, l = 0–1(–3), whitish to blackish. Stipe up to 70 × 1.5 mm, whitish to pale watery brown.

Spores (400/20/8) 12.4–17.2 × 11.3–15.2 × 8.2–10.8 µm, average L 13.6–15.7 µm, average B 11.8–13.3 µm, Q 1.04–1.28, average Q 1.07–1.19, very dark red-brown to almost black. Basidia 22–51 × 13–16 µm, 4-spored. Cheilo- and pleurocystidia more or less like in *C. kuehneri*, 40–70 × 10–28 and 50–105 × 22–30 µm. Number of pseudoparaphyses around each basidium 5–8. Clamps present.

Habitat. — Terrestrial on lawns.

Coprinus hercules is recognized by its small basidiocarps and large, lentiform spores. The pseudoparaphyses around each basidium frequently reach the number of eight. The diameter of the pilei of this rather common species very rarely exceeds 15 mm. Recently we were enabled to study two collections with larger basidiocarps. The first of these two (*P. B. Jansen 85-490*, Canarian Islands, La Palma, El Paso, 1 Dec. 1985, herb. Jansen) had pilei up to 20 mm in diam. (estimated on the basis of the size in dried condition as the size in fresh condition was not recorded). The spores of this collection are somewhat larger than usual in *C. hercules*, viz. 12.6–19.3 × 11.6–17.3 (4-spored basidia!), but the other characters agree fairly well with those of *C. hercules*, including the small number of lamellae, viz. 20–24.

The second collection (*Uljé 722b*, 19 Sept. 1986, herb. Uljé, Netherlands, prov. Gelderland, Lochem) with pilei up to 20 mm wide has spores fitting well in the range of spore sizes found thusfar in *C. hercules*, but here the number of lamellae is larger than normal, viz. up to 30 whereas until now the highest number found in *C. hercules* was 24.

Although the number of collections with larger pilei is still restricted, it is possible that in other (warmer?) regions basidiocarps of this species are normally larger. We would be very grateful for records of such collections.

Since its publication *C. hercules* has been recorded frequently from various parts of the Netherlands, once from West Germany and once from the Canarian Islands.

Coprinus nudiceps P. D. Orton — Fig. 2, 6, 11

Coprinus nudiceps P. D. Orton in Notes R. bot. Gdn Edinb. 32: 142. 1972.

Pileus up to 30 mm wide when expanded, ochraceous brown, yellow-brown, greyish red-brown (Mu. 7.5 YR 4/4; 10 YR 6–8/6 as far as 5/1–2). Lamellae free, somewhat remote from stipe, L = 24–36, l = 1–3, white, grey-brown to blackish. Stipe up to 80 × 2 mm, white to yellowish or pale greyish brown.

Spores (280/14/10) 10.1–15.1 × 9.0–13.0 × 8.0–8.6 µm, average L 11.5–13.6 µm, average B 10.2–11.6 µm, Q 1.03–1.32, average Q 1.11–1.21, rounded triangular, dark red-brown to almost black. Basidia 22–48 × 10–14 µm, 4-spored. Cheilo- and pleurocystidia as in *C. kuehneri*, 30–70 × 14–32 and 45–100 × 16–38 µm. Number of pseudoparaphyses around each basidium 5–7. Clamps present.

Habitat. — On dung, also terrestrial. Rather rare.

Coprinus nudiceps differs from *C. hercules* in smaller spores, larger basidiocarps, a larger number of lamellae and a preference for dung.

In a former publication by one of us (C.B.U.) *C. longipes* Buller (Bisby & al., 1929: 118) is mentioned as a species with a strong resemblance to *C. nudiceps*. It turned out to be impossible to trace the type of *C. longipes*. We received on loan, however, spore-prints on slides under this name, from which W. F. Hanna made mono spore-cultures. The spores of these prints are 6-angular and measure 9.8–14.3 × 6.4–8.7 µm. Therefore they probably belong to *C. marculentus* Britz. (1883) (= *C. hexagonosporus* Joss.). But it should be noted that these spore sizes do not agree with those given by Buller. We think that *C. longipes* Buller has to be declared a nomen dubium.

It seems to us that *C. galericuliformis* s. Locq. (1947: 86) and s. Kühn. & Romagn. (1953: 377) are identical with *C. nudiceps*. Descriptions, drawings and the spore size all plead in favour of this view.

According, however, to H. Bender (pers. comm.), who knows *C. nudiceps* fairly well, this species and *C. galericuliformis* s. Locq. are not identical. Although he agrees that both have the same size and shape of the spores, Bender mentions the following differences: (i) habitat (*C. nudiceps* on dung, *C. galericuliformis* s. Locq. terrestrial) and in *C. nudiceps*, (ii) the lamellae more crowded, (iii) more lamellulae present and (iv) the margin of the pileus crenate.

The following names possibly relate to *C. nudiceps:*

C. hemerobius s. Quél.	(1888)	*C. hemerobius* s. Ricken	(1911)
C. pseudonycthemerus Britz.	(1893)	*C. longipes* Buller	(in Bisby & al. 1929)
C. rimosus Copeland	(1905)		

ON THE IDENTITY OF COPRINUS HEMEROBIUS FR.

Besides *C. plicatilis*, *C. hemerobius* is perhaps the most frequently mentioned name in the *C. plicatilis-auricomus* complex. Unfortunately, however, the rather vague and concise protologue of *C. hemerobius* by Fries (1838: 253) has led to various interpretations.

In the original description we hardly find characters distinguishing *C. hemerobius* from other members of the *C. plicatilis-auricomus* complex except the indistinct collarium ('lamellis ... collario obsolete adnexis' = 'with lamellae ... adnexed to an indistinct/rudimentary collarium' and 'collarium vix manifestum' = 'collarium hardly evident') and the fairly large size ('habitus omnino praeced sed stipes longior 4–5 unc' = 'habit entirely like that of the preceding (*C. plicatilis*) but stipe longer, 10–12.5 cm'). The centre of the pileus is described as 'spadiceus', which is a dark reddish brown usually called date colour.

Thus *C. hemerobius* Fr. emerges as a species with basidiocarps resembling those of *C. plicatilis*, but in general larger, with lamellae not or hardly remote from the stipe and a dark reddish brown centre of the pileus. Judging strictly from these characters, *C. auricomus*, *C. kuehneri* (in which the collarium is not always very distinct) and *C. megaspermus* are the most likely candidates for the classical name *C. hemerobius*.

It is remarkable that the description of *C. auricomus* by Patouillard in 1886 remained long unnoticed. Presumably, however, most mycologists of the second half of the past and the first half of the present century did know this rather common species. Where this is evident in literature they often named it *C. hemerobius* (see under *C. auricomus*).

In 1915 J. E. Lange described the new species *C. hansenii* which we firmly believe to be identical with *C. auricomus* (see the discussion under that species), although Lange did not mention the microscopical hairs on the pileipellis. The same author accepted in his Flora agaricina danica (1939: 118) a *C. hemerobius* side by side with *C. hansenii*. This *C. hemerobius* was said to be similar to *C. plicatilis* but with a much more brownish cap, without a distinct collarium and very similar to *C. hansenii* but smaller. The tradition to describe *C. hemerobius* as a small species contrary to Fries' original diagnosis seems to have started then.

Kühner & Josserand (1934: 53) rediscovered and redescribed Patouillard's *C. auricomus*. With the acceptance of this species by Kühner & Romagnesi (1953: 376) in the Flore analytique and by Dennis & al. (1960: 37) in the British Check List the use of the name became well established. It should be mentioned here that Kühner & Romagnesi considered both *C. hansenii* Lange and *C. hemerobius* sensu Lange as identical with *C. auricomus*.

In the British Check List and later by Orton & Watling (1979: 99) in the British Fungus Flora and also by Moser (e.g. 1978: 263) *C. hemerobius* is accepted in the concept of Lange. For the British authors it is a species without microscopical hairs and with ellipsoid spores, 11.5–12.5 × 7–8 × 6.5–7 µm, with a central germ pore. As we do not know such a species the first author of this paper examined all the material under the name *C. hemerobius* in the herbaria at Edinburgh, Kew, München and Leiden and in some private herbaria in the Netherlands; altogether 32 collections. He found these to represent:

12 × *C. plicatilis*
5 × *C. auricomus*
4 × *C.* spp. (*Setulosi*)
3 × *C. leiocephalus*
2 × *C. nudiceps*
2 × *C. micaceus*
2 × *Psathyrella* spp.
1 × *C. domesticus*
1 × *C. callinus*

We think therefore that there are solid grounds to believe that a *C. hemerobius* as described in modern literature does not exist. We are also inclined to believe that *C. auricomus* Pat. is the true *C. hemerobius* but cannot exclude *C. kuehneri* or *C. megaspermus*. Moreover, it is not a very attractive idea to replace a well-known and well-founded name like *C. auricomus* by one so variously applied in the past as the name *C. hemerobius*. If nevertheless considered necessary it should be done only in a European or Scandinavian monograph on *Coprinus* by indicating a well-annotated Swedish collection of *C. auricomus* as neotype of *C. hemerobius*.

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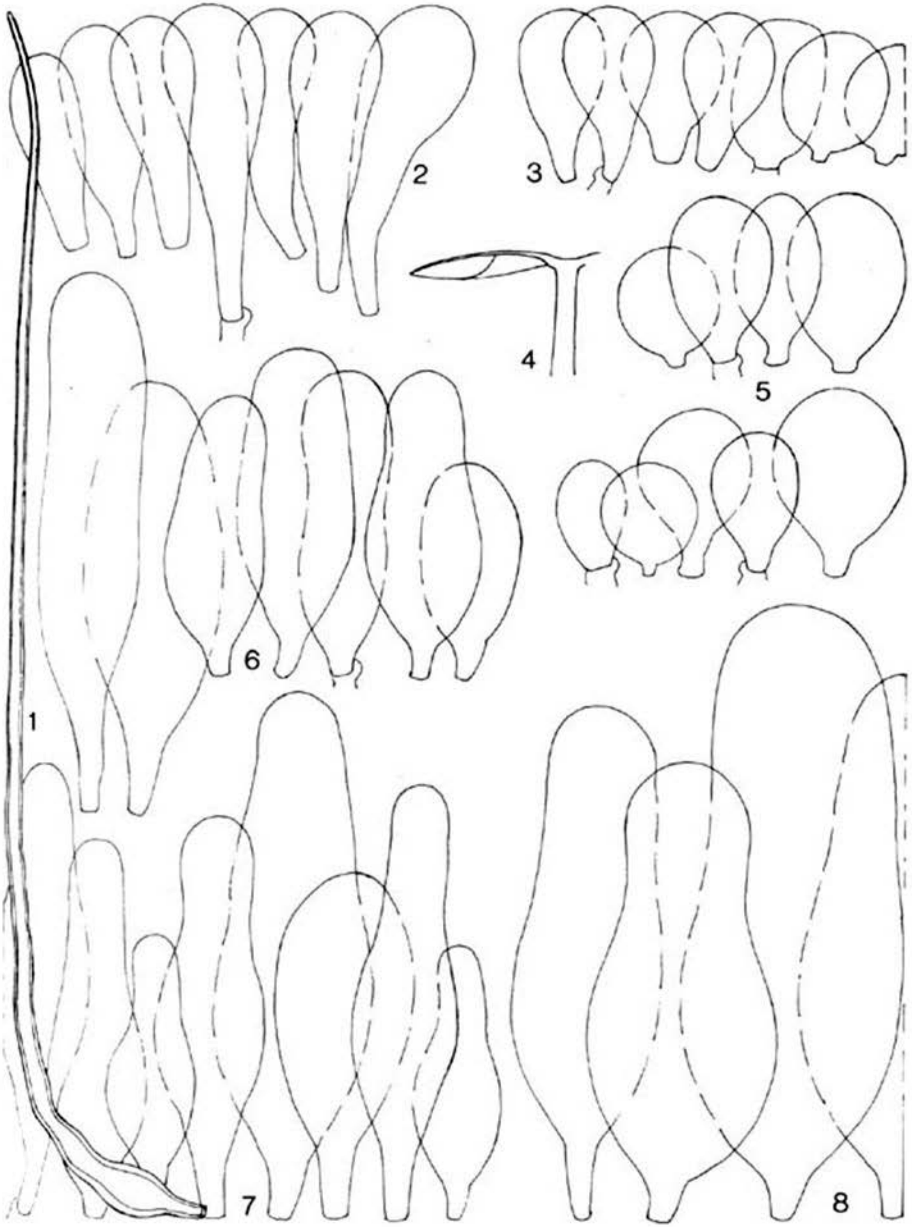
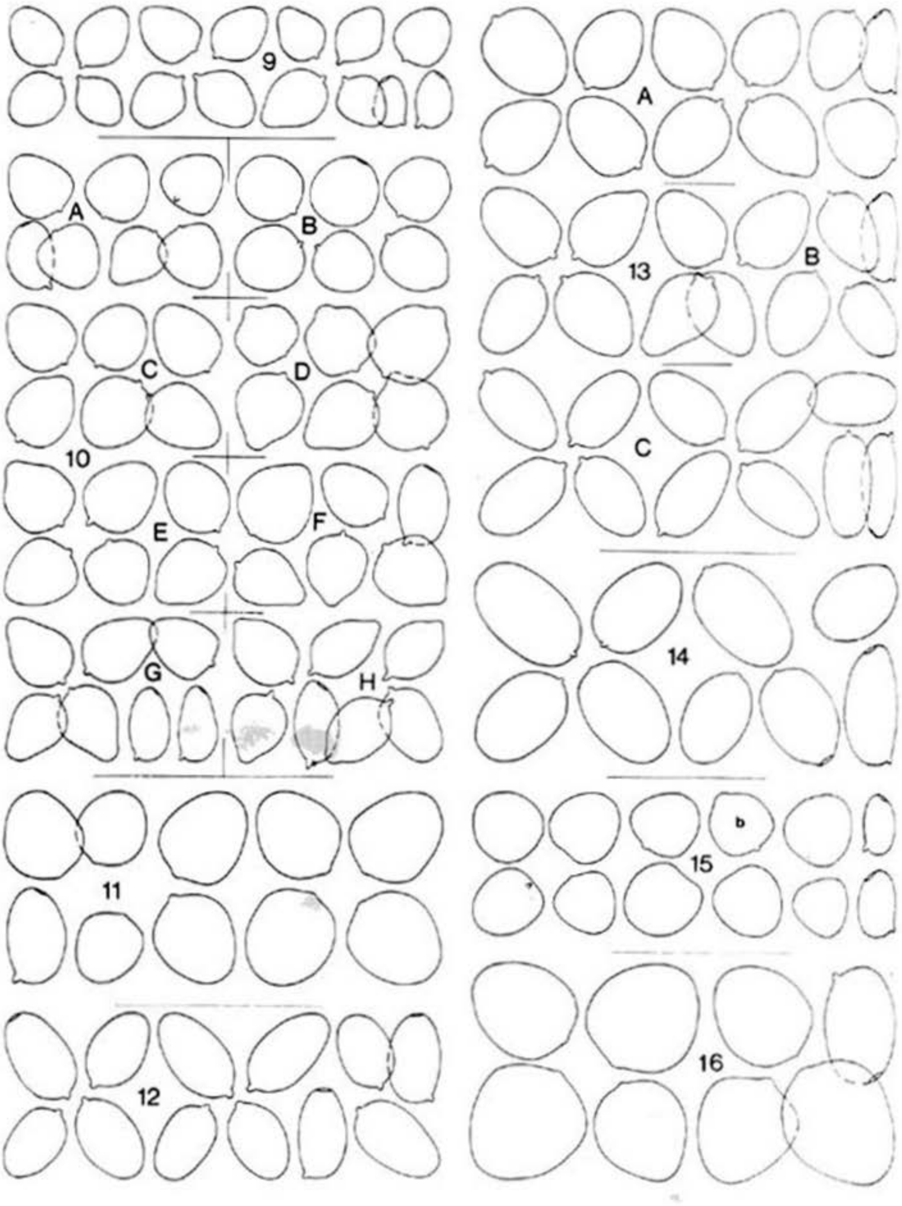


Figs. 1–8. *Coprinus* subsections *Auricomii* and *Glabri*. — 1. Hair in pileipellis of *C. auricomus*. — 2. Pileipellis in most species. — 3. Pileipellis in *C. miser*. — 4. Attachment of lamellae in species with 'collarium'. — 5. Cheilocystidia of *C. miser*. — 6. Cheilocystidia of *C. kuehneri*. — 7. Cheilocystidia of *C. plicatilis* and *C. leiocephalus*. — 8. Pleurocystidia of all species except *C. miser*. (All Figs. × 800, but Fig. 4 × 1.)



Figs. 9–16. Spores in *Coprinus* subsections *Auricomi* and *Glabri*. — 9. *C. kuehneri*. — 10. A, C–H. *C. leiocephalus* (D. from type); B. *C. galericuliformis* (from type). — 11. *C. nudiceps*. — 12. *C. auricomus*. — 13. *C. plicatilis*. — 14. *C. megaspermus*. — 15. *C. miser*. — 16. *C. hercules*. (All Figs. × 1000.)

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STUDIES ON ECTOMYCORRHIZAE—XV*

Mycorrhizae formed by Rhizopogon luteolus on Pinus silvestris

M. UHL

University of Munich
*Institute for Systematic Botany***

The mycorrhizae of *Rhizopogon luteolus* on *Pinus silvestris* are comprehensively described. They are characterized by a coralloid habit, ochre to yellow colour, highly differentiated rhizomorphs, a two-layered mantle and a differentiated autofluorescence in mantle, Hartig net and rhizomorphs. The literature on anatomical and morphological features of the mycorrhizae of *R. luteolus* and other species of *Rhizopogon* is reviewed and the features of the latter are compared with those of *R. luteolus*.

In this series ectomycorrhizae are described comprehensively, because the interpretation of physiological and ecological research on ectomycorrhizae depends on having well-known, unequivocally characterized species e.g. for studies of the application of mycorrhizae for wood production. In addition it will be essential for taxonomic and systematic reasons as data in Brand & Agerer (1986), Agerer (1987b), and Godbout & Fortin (1985) indicate common characters for genera or sections of genera.

MATERIALS AND METHODS

The method for isolation of ectomycorrhizae from soil and methods of documentation are given by Agerer (1986, 1987). Methods for examining ectomycorrhizae anatomically and morphologically and the value of features observed are discussed in detail also by Agerer (1986, 1987a).

Abbreviations.

TCt: the average of tangential dimensions of Tannin cells.

TCq: the quotient of the average of tangential dimensions divided by the average of radial dimensions of Tannin cells.

CCt: the average of tangential dimensions of cortical cells.

CCq: the quotient of the average of tangential dimensions divided by the average of radial dimensions.

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*Studies on Ectomycorrhizae XIV, see Agerer (1987c).

**Address: Menzingerstrasse 67, D-8000 München, FRG.

DESCRIPTION OF MYCORRHIZAE OF RHIZOPOGON LUTEOLUS FR.: FR. ON PINUS SILVESTRIS

Morphological characters (Fig. 1a).

Mycorrhizal system coralloid: mycorrhizae dichotomously branched: tips usually straight but sometimes bent; length of mycorrhizal system varying between 3 and 5 mm; length of unramified ends varying, up to 1 mm long and 0.35–0.4 mm in diam.; surface rough, partly warty; unramified ends dark ochre to yellow with rusty spots; tips somewhat brighter ochre; older parts dark ochre to brownish.

Anatomical characters of surface.

Outer surface of mantle. — (Figs. 1b, c; 3a–c; 4f) Plectenchymatous, densely woven like a net formed by unbranched and multiple-branched hyphae; hyphae 2–4 μm in diam.; cell-wall inconspicuous; hyphae yellowish from membranal and plasmatic pigment. Some hyphae with droplet-like incrustations. Cystidia not found.

Inner layer of mantle. — (Fig. 3b) Plectenchymatous, loosely woven, multiple branched hyphae not as frequent as in outer surface, hyphae 2–4 μm in diam.; cell-wall inconspicuous; hyphae yellowish from membranal and plasmatic pigments.

Inner surface of mantle. — (Figs. 1d, 4e) More densely plectenchymatous than outer parts of mantle, with patches of shorter cells somewhat resembling epidermal cells; hyphae 3–5 μm in diam.

Rhizomorphs. — (Figs. 2b, d; 3d–f; 4b) Growing out of from mycorrhizae at a flat angle; running along surface of mantle; diameter up to 150 μm; hyphae of rhizomorphs differentiated in three types; outer hyphae: 3–4 μm in diam.; distance between septa 12–25 μm; cell-wall up to 1.5 μm thick, reddish brown; contents of hyphae yellowish from plasmatic pigments; inner hyphae: 3–5 μm in diam.; distance between septa 10–25 μm; cell-wall up to 0.5 μm; yellowish from membranal and plasmatic pigments; central hyphae: 5–18 μm in diam.; distance between septa (8–)10–25 μm; cell-wall up to 0.5 μm; yellowish from membranal and plasmatic pigments.

Anatomical characters observed in cross sections (Figs. 3d; 4c, d).

Mantle. — In outer part plectenchymatous, 20–45 μm thick; two layers recognizable, divided by a layer of collapsed residues of calyptra cells: hyphae in outer regions loosely woven, in inner parts of mantle more or less compact; in outer layer of mantle hyphae radially 2–3 μm, tangentially 5–10(–20) μm; in inner layer of mantle hyphae radially 3–5 μm, tangentially 4–10(–12) μm.

Tannin cells. — Very rare, tangentially elongate, heavily compressed, in one row, tangentially 5–25 μm, radially 4–10 μm; TCt = 13 μm; TCq 2.2.

Cortical cells. — Roundish, in 4 rows, tangentially (10–)15–35(–60) μm, radially (5–)20–35(–50) μm; CCt = 25 μm; CCq 1.1.

Hartig net. — (Figs. 2c, 4c) Number of rows of hyphae around cortical cells: 1; around Tannin cells not found (the very rare Tannin cells are embedded in inner part of mantle); Hartig net hyphae round to radially elongated, (2–)3–5(–7) μm thick; Hartig net often reaching endodermis.

Anatomical characters observed in median-longitudinal sections (Fig. 4a).

Hyphae of mantle. — Radially 2–5(–6) µm,tangentially 3–5(–10) µm; Tannin cells irregularly compressed, radially 4–10 µm, tangentially 35–70 µm; TCt = 53 µm; TCq 7.

Cortical cells. — More or less round, a few radially elongated ovoid; radially (5–) 20–35(–50) µm; tangentially (10–)15–25(–30) µm; CCt = 20 µm; CCq 0.8.

Hartig net. — Of palmetti type; lobes 2–3 µm broad (Fig. 2c).

Colour-reactions in different reagents.

Acetic Fuchsine: –; Aniline: dark brown drops in hyphae; Brilliant Cresyl Blue: –; Cotton Blue: –; Formaline 40%: –; Guaiac: –; Iron-sulfate: –; KOH: –; Melzer's reagent: –; Phenol: –; Phenol-Aniline: –; Sulfovanillin: cell-walls brown, not becoming red.

Autofluorescence (Figs. 4b, d–f).

Whole mycorrhizae: UV 254 nm: –; UV 366 nm: –. Hyphae of mantle and Hartig net: (observed in lactic acid) UV-filter 340–380 nm; outer layer of mantle and Hartig net only slightly yellow; inner layer of mantle bright yellow, with a reddish tinge in the triangular areas were hyphae of mantle penetrate in between outermost cortical cells; blue-filter (450–490 nm): all parts of mantle yellow; green-filter (530–560 nm): all parts of mantle pale reddish. Rhizomorphs: (observed in lactic acid) UV-filter 340–380 nm: outer hyphae: yellow to brownish red; inner and central hyphae pale blue; blue-filter (450–490 nm): outer hyphae: dark yellow to brownish; inner and central hyphae very pale yellow; green-filter 530–560 nm: –.

Staining of nuclei (Fig. 2a).

Two nuclei per cell (method: aceto-carmine); nuclei lying closely together (distance mostly 5–10 µm), round, 1.5–2.5 µm in diam., without siderophilous granulation.

Material studied and method of identification.

Reference specimen: Germany, Bavaria, Kelheim, Siegenburg, pine-forest, 25.9.1986 (fruit-body and mycorrhizae UD-50, both in M); there were direct connections between fruit-body and mycorrhizae via rhizomorphs; determination of fruit-body with Jülich (1984).

MYCORRHIZAE OF RHIZOPOGON LUTEOLUS IN LITERATURE

Pachlewski & Pachlewska (1974) synthesized ectomycorrhizae of *R. luteolus* on *Pinus silvestris* seedlings in agar-media using a pure fungal culture. They described the mycorrhizae of *R. luteolus* as frequently dichotomously furcate and often coralloid with shortened and thickened ends. The colour is given as creamy white to rusty brown. Moreover they mentioned a secretion that turns from colourless to brownish and an indistinctly two-layered mantle 30 to 60 µm thick. The Hartig net is described as well developed and reaching the endodermis.

With exception of the secretion, all features observed by Pachlewski & Pachlewska can be corroborated in the present study. Two points are noteworthy: (i) mycorrhizae described in the present study are merely yellowish to reddish brown; (ii) the mantle of the here described mycorrhizae is distinctly two-layered, an observation confirmed by autofluorescence data. Both differences might be due to the more advanced age of the mycorrhiza here described.

Malajczuk & Cromack (1982) identified the mycorrhizae of *R. luteolus* on *Pinus radiata*, but did not describe them. They found calcium-oxalate deposits on the hyphae. Such crystals could not be found in our specimen. According to Malajczuk & Cromack this could be due to different soil-conditions.

Baxter (1928) identified but did not characterize the mycorrhizae of *R. luteolus* on *Pinus silvestris*.

MYCORRHIZAE OF THE GENUS RHIZOPOGON IN LITERATURE

Noteworthy is the description of the mycorrhizae of *R. vinicolor* A.H. Smith on *Pseudotsuga menziesii* given by Zak (1971). *Rhizopogon vinicolor* forms a tubercle-like mycorrhiza with differentiated rhizomorphs. Rhizomorph organisation is like that of *R. luteolus* as characterized above. In addition Zak found that the envelope of the tubercles consisted of hyphae similar to the outer hyphae of rhizomorphs. The colour of the rind of the tubercle of *R. vinicolor* turned green, the colour of the mantle and of the hyphae inside the tubercles turned a pale pink in KOH. Pure culture synthesis of *R. vinicolor* with *Pseudotsuga menziesii* gave a pinnate mycorrhiza without ensheating fungal mantle.

Short descriptions of mycorrhizae of *R. subsalmonius*, *R. parksii*, *R. colossus* on *Abies concolor* and *R. villosulus* on *Pseudotsuga menziesii* are given by Acsai (1983) but his descriptions are too concise to be comparable with the description above or with that of Zak (1971).

The mycorrhizae of *R. rubescens* Tul. on *Pinus silvestris* have been described by Fontana & Centrella (1967). These mycorrhizae should have a two-layered mantle with the outer part loosely and the inner part more densely woven; a 24 to 32 μm thick mantle and 1.6 to 3.2 μm wide hyphae; emanating hyphae without clamps and with incrustations. Identification was based on the analogy of hyphal features in fruit-bodies, pure-culture, and mycorrhizae.

The characteristics of a pure culture-mycorrhiza of *R. rubescens* on *Pinus silvestris*, described in Pachlewski & Pachlewska (1974) corroborate the description of Fontana & Centrella (l.c.).

Baxter (1928) identified the mycorrhiza of *R. rubescens* on *Pinus silvestris* by tracing connecting hyphae between fruit-body and mycorrhizae but did not give descriptions.

Totten (1923) described a parasitic species of *Rhizopogon*, *R. parasiticus* Coker & Totten (Smith & Zeller, 1966), which absorbs completely the root of its host, which is entirely enclosed by a peridium of the species mentioned. A drawing of a longitudinal section shows a two-layered mantle and a well-developed Hartig net of the palmetti type. The two layers of the mantle are divided by small compressed cells. This arrangement strikingly resembles the mycorrhizae described in the present publication. Unfortunately Totten (l.c.) gave no descriptions or drawings of details of the rhizomorphs although he obviously had seen them.

CONCLUSION

Summarizing the descriptions discussed the following features may be considered as common for the mycorrhizae of the genus Rhizopogon characterized up to now: (i) a plectenchymatic, two-layered mantle, (ii) highly differentiated and thick rhizomorphs, (iii) incrustations at least at some hyphae. The fact, that the mycorrhizae of *Rhizopogon luteolus* do not show a colour-reaction to KOH can be a special character of *R. luteolus*, because fruit-bodies of this species do not show this reaction either, whereas fruit-bodies of other species of this genus show reactivity to KOH (Smith & Zeller, 1966).

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LEGENDS

Fig. 1. *Rhizopogon luteolus*. — a. Habit of mycorrhizae. — b. Outer surface of mantle with multiple branched and unbranched hyphae forming hyphal net. — c. Outer surface of mantle at very tip of mycorrhiza. — d. Inner surface of mantle with elongate and epidermoid cells. (All figs. from UD-50.)

Fig. 2. *Rhizopogon luteolus*. — a. Nuclei of emanating hyphae and rhizomorphs stained with acetocarmine. — b. Rhizomorph organization as seen in longitudinal section; young rhizomorph without ensheating, thick-walled hyphae. — c. Hartig net; plan view of tangential section of mycorrhiza showing palmetti type. — d. Cross section of thick rhizomorph with thick-walled ensheathing hyphae; thin-walled inner hyphae enclosing thin-walled central hyphae with large lumena. (All figs. from UD-50.)

Fig. 3. *Rhizopogon luteolus*. — a. Outer surface of mantle with multiple branched and unbranched hyphae forming a net. — b. Plan view of middle layer of mantle, 10 μm deeper than 'a'. — c. Inner surface of mantle with elongate and epidermoid cells. — d. Young rhizomorph still embedded in outer layer of mantle. — e. Cross section of rhizomorph. — f. Thick rhizomorph; central hyphae with diameter up to 18 μm. (All figs. from UD-50; bar represents 10 μm.)

Fig. 4. *Rhizopogon luteolus*. — a. Longitudinal section of mycorrhiza from mantle to Hartig net and first row of cortical cells. — b. Longitudinal section of a rhizomorph with autofluorescence bright in outer hyphae and faint in inner part of rhizomorph (description of colours of autofluorescence see text). — c. Cross section of mycorrhiza with Hartig net hyphae and compressed calyptra cells dividing mantle into two layers. — d. Cross section of mycorrhiza showing autofluorescence; same details as 'c', but in addition outer and inner part of mantle show different degree of brightness of autofluorescence; notice bright autofluorescence of triangle-shaped tannin cell surrounded by hyphae of inner part of mantle. — e. Autofluorescence of inner surface of mantle. — f. Autofluorescence of outer surface of mantle. (All figs. from UD-50; bar represents 10 μm.)

Fig. 1

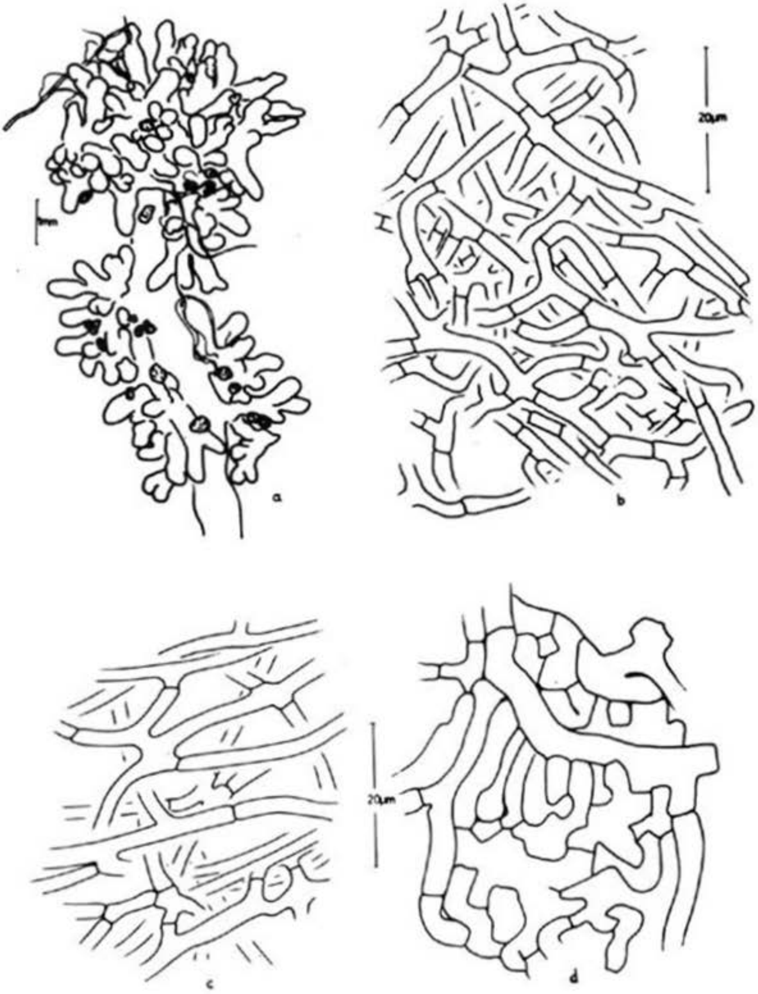


Fig. 2

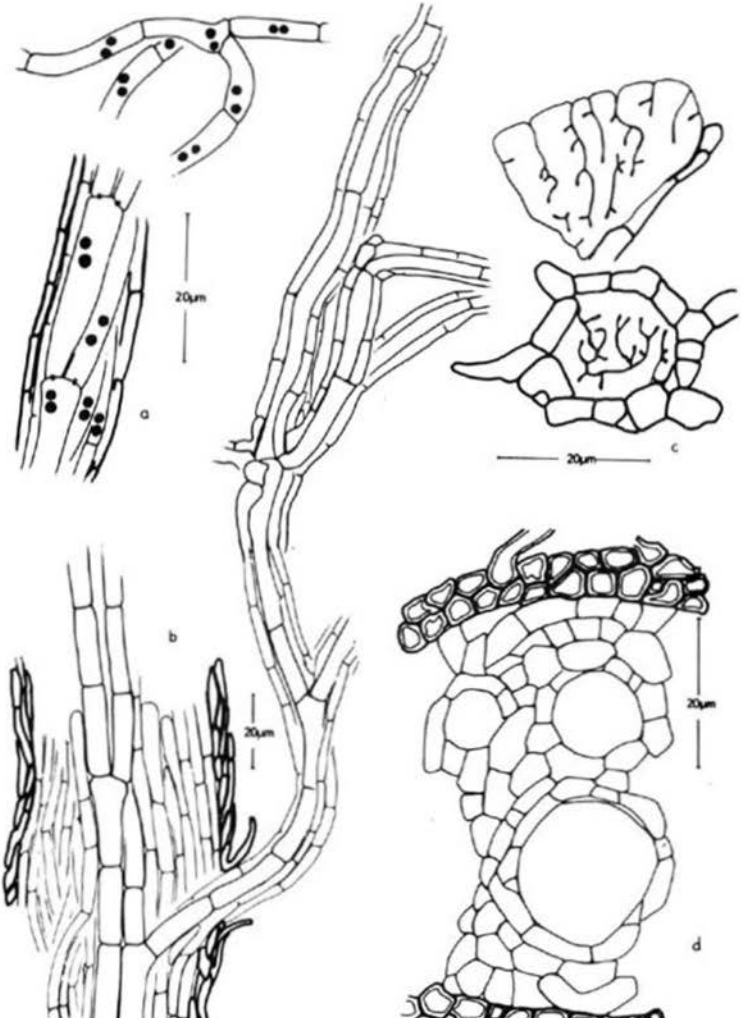


Fig. 3

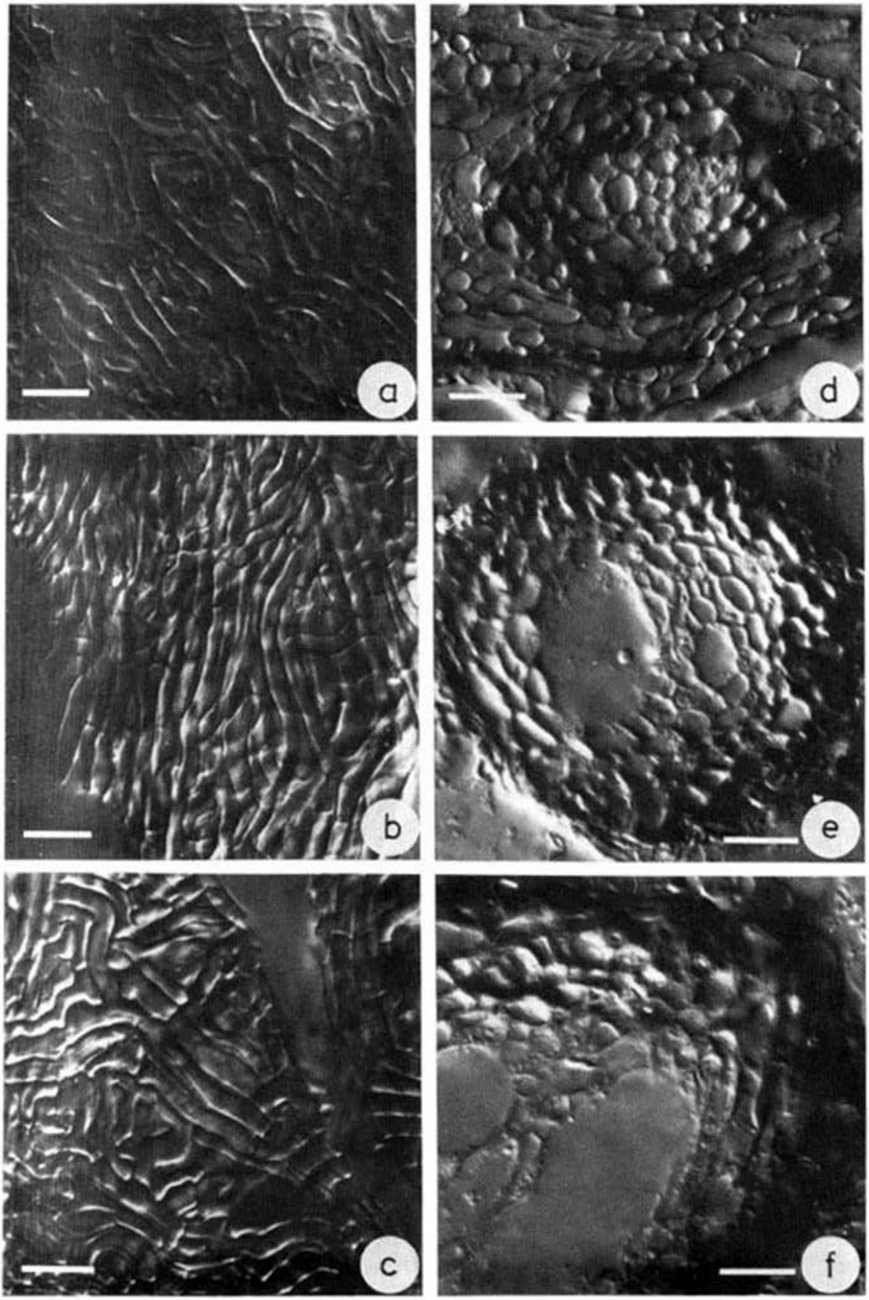
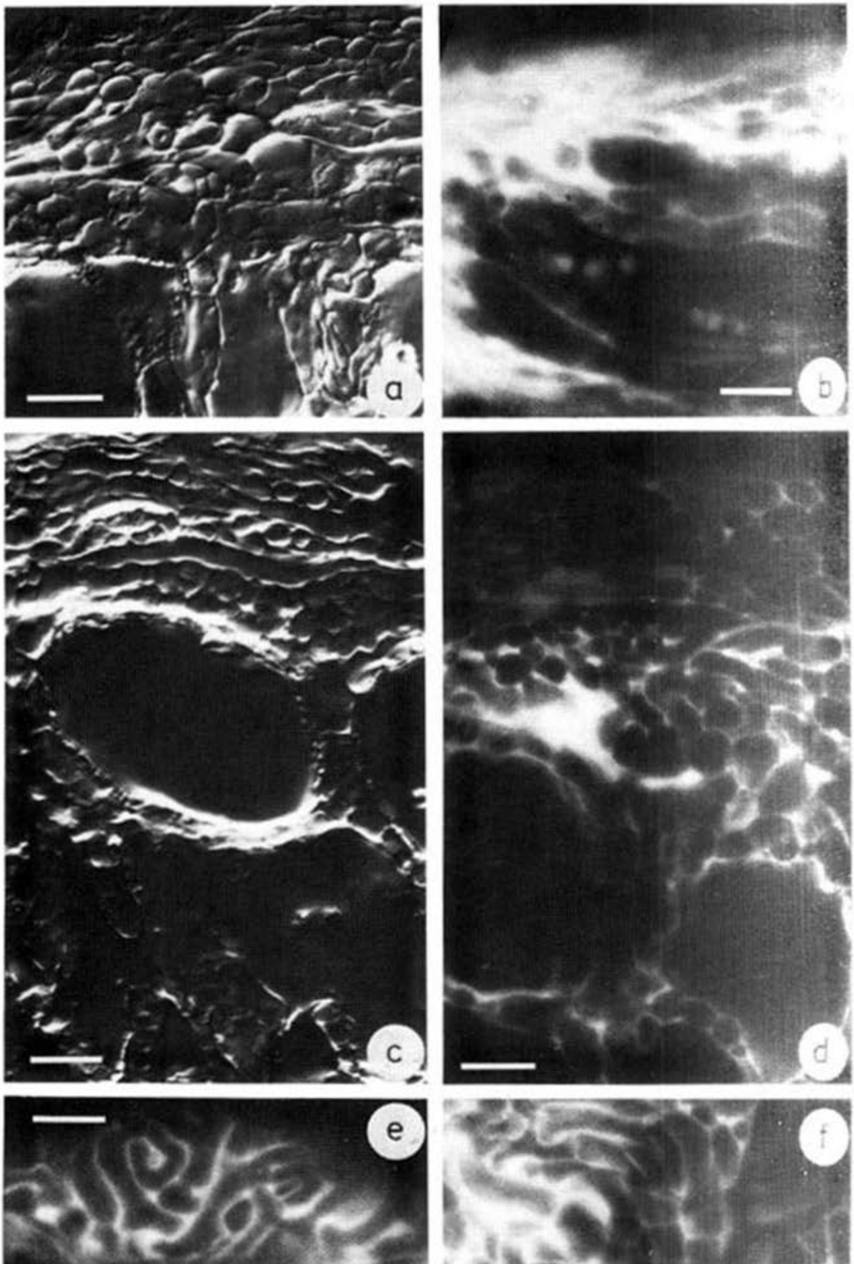


Fig. 4



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SQUAMANITA SQARRULOSA, A NEW SPECIES FROM NEW ZEALAND

GEOFFREY S. RIDLEY

*Botany Department, Victoria University of Wellington**

Squamanita squarrulosa, spec. nov., is described from New Zealand. This is the only species of *Squamanita* to combine both a fleshy outer universal veil forming a volva limb, with an inner universal veil forming squamules on the pileus and stipe.

Over two consecutive years an unknown species of *Squamanita* Imbach was collected from under *Nothofagus truncata* (Col.) Ckn. In total four basidiocarps were collected, of these three were immature and partially decomposed. Despite their condition, publication is justified as the collections exhibited characteristics intermediate between *S. odorata* (Cool) Bas and *S. tropica* Bas nom. prov.

Bas (1965) recognised in *S. odorata* both an outer and an inner universal veil. According to this author the outer universal veil is continuous with the protocarpic tuber and consists of a thin layer of hyphae, which gelatinises and disappears early in development. Occasionally it leaves a faint limb. The inner universal veil covers the primordial cap, and is attached to the base of the stipe. In the mature basidiocarp the remnant of this inner universal veil forms the squamules on the pileus and stipe.

In contrast, *S. tropica* possesses a fleshy outer universal veil forming in the mature basidiocarp a substantial volval limb. The inner universal veil consists of a tawny yellow layer sheathing the pileus and stipe. Its remnant forms appressed, membranous scales on the pileus, and the arachnoid ring on the stipe.

Squamanita squarrulosa Ridley, *spec. nov.* — Fig. 1

Basidiocarpia sola. Pileus 4–9 mm latus, conicus, senatus-umbrinus, squarrosus. Lamellae adnexae, albae. Stipes 25 × 5 mm, solidus, pileo concolor, cum squamulis erectis. Bulbus subglobsus vel elongatus, 16–19 × 20–26 mm, albidus cum colore subvinoso vel vinoso, superatus a volva carnosa. Sporae 7.5–8.5 × 4.5–6 μm, ellipsoideae vel elongato-ellipsoideae, hyalinae, inamyloideae. Cystidia nulla. Trama lamellarum regulare. Basidia 37–50 × 8.5–10.5 μm, clavata, cum fibulis in fundamento. Holotypus: PDD49071, in umbria *Nothofagi truncatae*, Novazelandia.

Basidiocarps solitary. Pileus 4–9 mm wide, conical, sienna-umber (Rayner 8–9), dry squarrose, in immature basidiocarps pileus and upper part of stipe sheathed by a buff (Rayner 45) tissue layer beneath the pileal squamules that disappears with maturation. Lamellae adnexed, moderately crowded, white, intercalated with lamellulae; edge concolorous, entire. Stipe 25 × 5 mm, narrowing slightly at apex, solid, concolorous with pileus, squamulose; squamules narrow and erect, particularly crowded between base of

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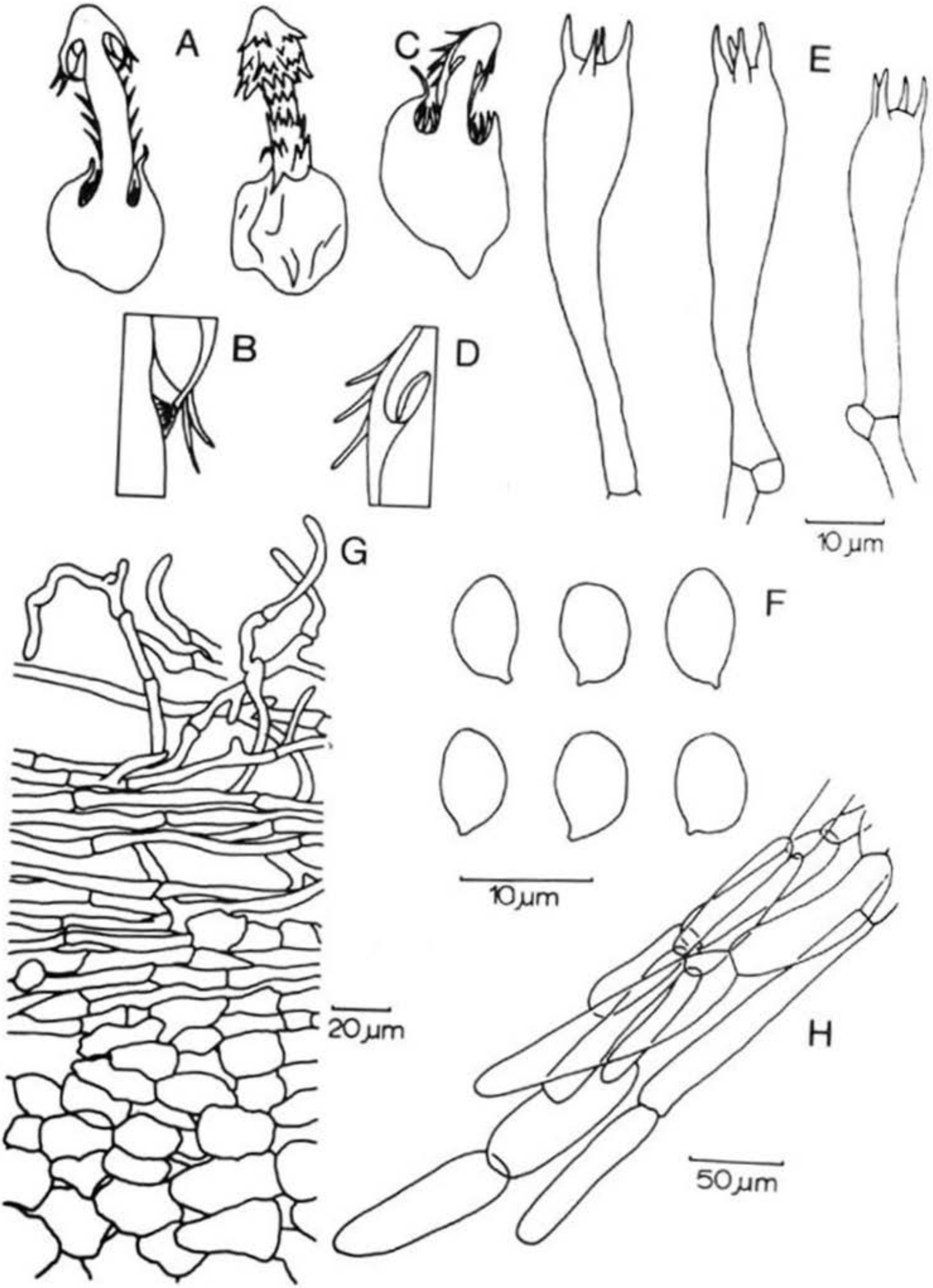
* Botany Dept., Victoria University of Wellington, Private Bag, Wellington, New Zealand.


A
C
E
B
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10 µm
G
F
10µm
20µm
H
50µm

stipe and volval limb. Protocarpic tuber 16–19 mm wide and 20–26 mm high, whitish with pale vinaceous to vinaceous flush (Rayner 85 to 57), smooth, firm, partially buried in humus, surmounted by a fleshy, sheathing volva, tearing irregularly and forming a 4–5 mm deep cup. Context of pileus white, 4 mm thick at centre, firm, fibrillose. Context of tuber pithy, white with some vinaceous stains (Rayner 57), distinct from the fibrillose context of stipe.

Spores 7.5–8.5 × 4.5–6 μm, ellipsoid to elongate-ellipsoid, with small apiculus, thin-walled, smooth, hyaline, inamyloid, not metachromatic in Cresyl Blue, not accumulating Congo Red. Basidia 4-spored, 37–50 × 8.5–10.5 μm, clavate, with basal clamp. Cystidia absent. Trama of lamellae regular, made up of hyphae 8–12 μm wide, narrowing in subhymenium to 3–6 μm wide, hyaline, walls appearing very finely verrucose; clamps abundant. Squamules on pileus and stipe consisting of hyphae 10–25 μm wide and up to 120 μm long, sienna (Rayner 8), constricted at septa, with indistinctly verrucose walls. Pileipellis structure similar to that of squamules. Protocarpic tuber: suprapellis composed of loosely intertwinted hyphae 2.5–6 μm wide, hyaline, often with subseptal swelling, no clamps observed: subpellis similar to suprapellis but hyphae repent and parallel; trama cellular; cells up to 45 μm diam. and hyaline.

Habitat & distribution. — Under *Nothofagus truncata*, known only from type locality, southern North Island, New Zealand.

Collections examined. — NEW ZEALAND: southern North Island, Rimutaka Forest Park, Orongorongo track, 4 Sept. 1986, *G. S. Ridley 234* (holotype; PDD 49071) & 8 July 1987, *G. S. Ridley 554* (PDD 49072).

Squamanita squarrulosa possesses a distinct, fleshy, outer universal veil which is continuous with the protocarpic tuber, and forms the pronounced limbate volva when ruptured. The pileus and upper stipe are covered by squamules subtended by a buff tissue layer (Fig. 1D). Before stipe elongation this buff layer may be connected to the protocarpic tuber. As the pileus expands this tissue becomes confined to it, and finally disappears. In the angle between the outer universal veil and the stipe are a number of erect squamules, which as the stipe elongates, become distributed along its length. Thus the inner universal veil can be interpreted as consisting of two parts. The first part is the outer squarrose layer, which becomes distributed over the mature pileus and stipe. The second part consists of the inner buff layer covering the basidiocarp primordium, which in the expanding basidiocarp, becomes indiscernible. The two layers combined are interpreted as homologous with the tawny yellow layer of *S. tropica* (Bas, 1965).

In the most mature basidiocarp the margin of the pileus is connected to the stipe by a small amount of fibrous tissue (Fig. 1B). Whether this can be interpreted as an independent partial veil or merely a remnant of the inner universal veil is not clear.

Fig. 1 *Squamanita squarrulosa.* — PDD 49071: A. Habit and longitudinal section (× 1); B. Detail of pileus margin (× 5); E. Basidia; F. Spores; G. Section through pellis of tuber; H. Hyphae from squamule on pileus. — PDD 49072: C. Longitudinal section of basidiocarp (× 1); D. Detailed diagram of inner universal veil (× 3).

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ABSENCE OF PSILOCYBIN IN SPECIES OF FUNGI PREVIOUSLY REPORTED TO CONTAIN PSILOCYBIN AND RELATED TRYPTAMINE DERIVATIVES

T. STIJVE* & Th. W. KUYPER**

Seven taxa of agarics reported in literature to contain psilocybin (viz. *Psathyrella candolleana, Gymnopilus spectabilis, G. fulgens, Hygrocybe psittacina* var. *psittacina* and var. *californica, Rickenella fibula, R. swartzii*) have been analysed for psilocybin and related tryptamines with negative results.

The presence of psilocybin, psilocin and/or baeocystin has been well established in the following families of gill-fungi: Strophariaceae (mainly *Psilocybe* (Fr.) Kumm.; see Guzmán, 1983, for a review), Coprinaceae (*Panaeolus* (Fr.) Quél.; Ola'h, 1969; Stijve & Kuyper, 1985), Bolbitiaceae (*Conocybe* Fay.; Benedict & al., 1962), Pluteaceae (*Pluteus* Fr.; Saupe, 1981; Stijve & Bonnard, 1986), and Cortinariaceae (*Inocybe* (Fr.) Fr.; Stijve & al., 1985; Gartz & Drewitz, 1985).

There are (unconfirmed) reports on the occurrence of psilocybin in members of the genus *Gymnopilus* P. Karst. (Cortinariaceae; Hatfield & al., 1978; Ott & Bigwood, 1978), *Psathyrella* (Fr.) Quél. (Coprinaceae) and *Agrocybe* Fay. (Bolbitiaceae; Koike & al., 1981). Recently, Gartz (1986) reported the presence of significant quantities of the hallucinogen in *Rickenella fibula* (Bull.: Fr.) Raithelhuber and *R. swartzii* (Fr.) Kuyp. (Tricholomataceae), *Hygrocybe psittacina* (Schaeff.: Fr.) Wünsche (Hygrophoraceae), *Inocybe calamistrata* (Fr.: Fr.) Gillet, and *Psathyrella candolleana* (Fr.: Fr.) R. Maire. A further collection of that latter species was found to be exempt of psilocybin, however (Gartz, pers. comm.).

The present authors were rather surprised by these findings, because they had already analysed some of these species with negative results. In order to establish the absence or presence of psilocybin in the said fungi beyond reasonable doubt, recent collections of various origin, in some cases from both sides of the Atlantic Ocean, were analysed.

MATERIALS AND METHODS

Specimens of the species of interest were gathered in Switzerland, the Netherlands, Canada (Ottawa), and several sites in the USA. The material was dried and analysed as described previously (Stijve & al., 1984).

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* Central Quality Assurance Laboratory of Nestec Ltd., Avenue Nestlé 55, 1800 Vevey, Switzerland.
** Biologisch Station Wijster, Landbouwuniversiteit Wageningen, Kampsweg 27, 9418 PD Wijster (Dr.), Netherlands. (Communication 342, Biologisch Station Wijster.)

RESULTS AND DISCUSSION

Psilocybin, baeocystin, and related tryptamines were found to be absent in the collections of all species listed in Table I.

The limit of detection was 0.005 percent on dry weight. Besides tryptophan, a widely occurring amino acid, the only tryptamine derivative encountered was 5-hydroxytryptophan in the three collections of *Rickenella fibula*. This compound may probably be considered a waste product of the species' ammonia metabolism. 5-hydroxytryptophan is also widely encountered in Panaeoloideae (Stijve, 1985), where it is an intermediary in the biosynthesis of serotonin which may have a similar function.

Rickenella swartzii on the other hand does not contain any 5-OH-tryptophan, yielding additional chemotaxonomic support for the autonomy of both species, which also differ in colour of the basidiocarp and spore-form. Contrary to the opinion of Gartz (l.c.), this situation cannot be compared with bluing and non-bluing variants of *Psilocybe semilanceata*.

Our analytical results contradict those reported by Koike & al. (1981) and by Gartz (1986).

The reason for this is hard to explain, especially since the analytical methodology of the Japanese scientists includes several confirmatory procedures. However, they describe a screening method by HPLC with UV detection at 220 nm, which may not be sufficiently selective. Using their technique on *Psathyrella candolleana*, we found indeed absorbing material with about the same retention time as psilocybin, but the result could not be confirmed by thin-layer chromatography.

Table I. Species analysed for psilocybin and related tryptamines with negative results

Species	N	Origin
Psathyrella candolleana	5	Switzerland, Washington DC (USA), and Ottawa (Canada)
Gymnopilus spectabilis	3	Switzerland, Netherlands, and USA
Gymnopilus fulgens	1	Netherlands
Hygrocybe psittacina var. *psittacina*	5	USA, Switzerland
H. psittacina var. *californica* (Hesl. & Smith)	1	USA
Rickenella fibula	3	Netherlands, Switzerland
Rickenella swartzii	1	Netherlands

On the other hand, our negative result for *Gymnopilus spectabilis* is in agreement with that of Koike & al. who found only traces of psilocybin in *G. liquiritiae*, a species not available for analysis in this laboratory.

Gartz's finding of psilocybin in the 5 mentioned species, which we found to be exempt of the compound, is rather puzzling. It is worth noting that the author did not report exact quantitative results, but only mentioned that the fungi contain about 0.05 percent on dry matter or even less. It is also remarkable that he failed to note tryptophan in several collections studied.

Gartz's concentration range is uncomfortably close to the limit of detection of his method. Indeed, TLC of crude extracts on commercially available, pre-coated silica gel sheets using Ehrlich reagent for detection will do for psilocybin concentrations of 0.05–0.5 percent. Detection of lower levels is, however, hampered by the need for higher sample loading and the limited selectivity of the chromogenic reagent, since much extraneous material may turn up as Ehrlich-positive spots. Under such conditions there may indeed be a risk of false-positive results.

The higher sensitivity (0.005%), reported in this paper was attained by using different layers (silica gel and cellulose), and the more sensitive and selective pDMCA-reagent (Stijve & al., 1984).

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NOTES ON BEAUVERIA

J. A. VON ARX

*Baarn**

Relationship between *Beauveria* and some other genera is discussed. SEM-micrographs of the conidiophores of *B. nivea* are given. Synonymy of *Tolypocladium* with *Beauveria* is emphasized. The orthographic error *B. arenarium* (Petch) v. Arx (1986) is corrected and should be read *B. aranearum*.

The hyphomycetous genus *Beauveria* Vuill. includes fungi occurring either on living or dead insects, or isolated from litter, soil, or from soil-inhabiting animals. In culture all species form expanding or restricted colonies which are white, lanose, floccose or powdery. The hyphae are delicate and hyaline. The conidiogenous cells develop either directly on the hyphae, or on large, swollen cells and are then clustered. Typical conidiogenous cells are swollen, ampulliform or nearly spherical, and form a narrow conidiogenous rhachis which usually elongates percurrently or sympodially. The conidia are small, obovate and hyaline, with a small but distinct scar at the base.

In 1986 a fungus was encountered on living larvae of an unknown insect found on litter collected in a 'snow valley' at the Gemmi-Pass (2300 m) in Switzerland. The fungus was identified as *Beauveria nivea* (Rostr.) v. Arx. Its clustered conidiogenous cells are ovate. In young states the rhachis is short; at first it elongates percurrently, but later it becomes cicatrized by sympodial elongation. The rhachis is not geniculate, but slightly protuberant scars were visible. SEM micrographs from a similar fungus were received from Dr. M. M. Dreyfuss (Basle) as *Tolypocladium inflatum* W. Gams. These micrographs are made from the cyclosporin-producing strain S 79391F, referred to by Dreyfuss (1987). This strain has conidiogenous cells with a very distinct, long, often geniculate rhachis with sessile or slightly protuberant scars (Fig. 1).

Beauveria (including *Tolypocladium*) is closely related to other entomogenous fungi (von Arx, 1986) and also to *Nomuraea* Maubl. sensu Samson (1974). Only two species, *N. rileyii* (Farlow) Samson and *N. atypicola* (Yasuda) Samson, were treated, but several further species now classified in the closely related genus *Isaria* Fr. or in the unrelated genus *Paecilomyces* Bainier, have to be added. In *Nomuraea* species conidiogenesis is considered to be 'phialidic', but it should be studied more carefully by SEM and TEM.

The related genus *Culicinomyces* Couch should be restricted to water-inhabiting species, parasitizing mosquito larvae. Morphological characters are not available for an adequate distinction from *Beauveria*, *Isaria*, *Diheterospora* Kamyschko and other relatives. Some Hyphomycete specialists do not accept the synonymy of *Tolypocladium* with *Beauveria*. This synonymy, however, was required, because *B. nivea* (= *T. inflatum*

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* Address: Bruglaan 7, 3743 JB Baarn, Netherlands.

W. Gams) and *B. bassiana*, the type species of the two genera, are more closely related to each other than to other species classified in *Beauveria* and *Tolypocladium*. Young cultures of the two species cannot be distinguished by morphological characters; the small differences in old cultures may be a consequence of temperature requirements.

Teleomorphs are unknown in *Beauveria* species. Only the Clavicipitales, however, include fungi with such particular anamorphs and cultural characters.

The name *Beauveria arenarium* (Petch) v. Arx (in Mycotaxon 25: 2157, 1986) is an orthographic error. It should be read: *Beauveria aranearum* (Petch) v. Arx (basionym: *Acremonium aranearum* Petch in Trans. Br. mycol. Soc. 16: 242, 1932).

The author thanks Dr. M. M. Dreyfuss (Basle, Switzerland) for the permission to publish the SEM micrographs and Dr. J. P. van der Walt for useful remarks.

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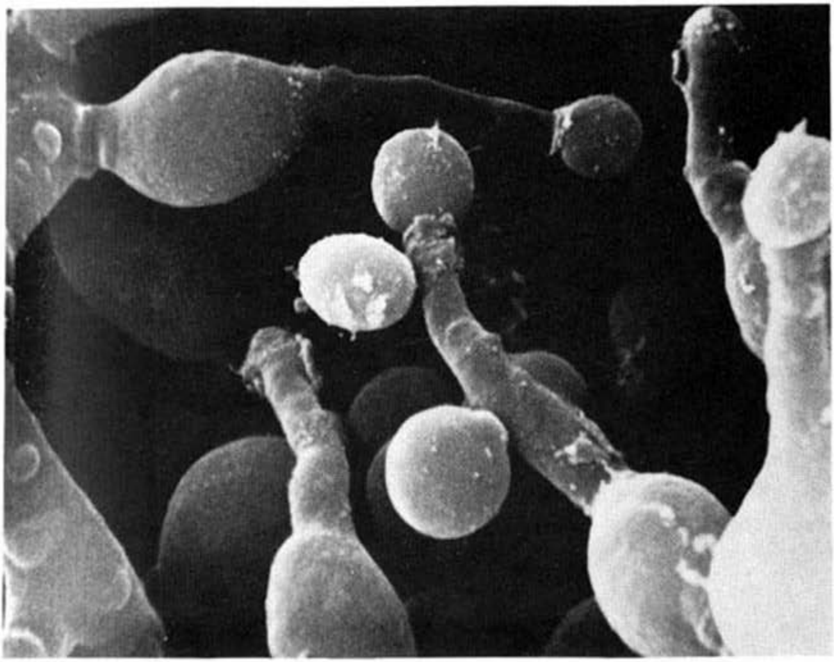
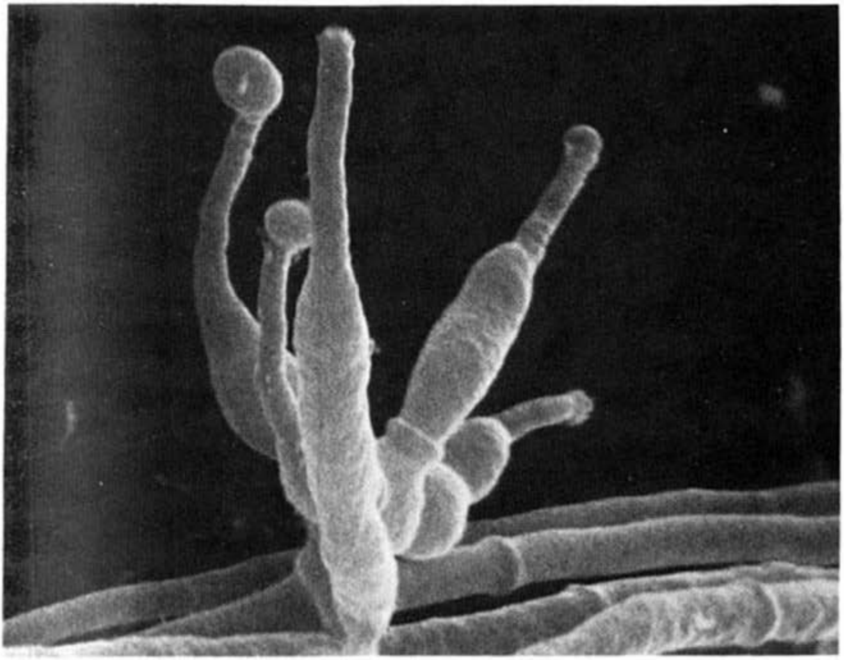
Fig. 1. *Beauveria nivea*, conidiogenous cells and conidia. Note the long rhachis with annellations and/or lateral scars (from S 79391F) (c. 9000 ×).





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MYCENA TRISTIS, A NEW EUROPEAN SPECIES OF SECTION FRAGILIPEDES

R. A. MAAS GEESTERANUS

c/o Rijksherbarium, Leiden

Mycena tristis, collected in Finland and belonging to section *Fragilipedes*, is described as a new species.

The purpose of this note is to draw the attention to a species of the genus *Mycena* kindly sent to me for identification by Mr. U. Söderholm, Tampere, Finland.

The parcel contained, apart from a few brief macroscopic notes and an excellent colour slide, some well-dried specimens which, however, were badly broken in transport. Fortunately this proved in no way an impediment for microscopic investigation, in the course of which the conviction grew that Mr. Söderholm's find represents an as yet undescribed species. Its features identify this species as a member of section *Fragilipedes* (Fr.) Quél.

Mycena tristis Maas. G., *spec. nov.*[1] — Figs. 1–8

Basidiomata sparsa. Pileus usque ad 45 mm latus, conicus, hygrophanus, e atro griseobrunnescens. Caro tenuis, odore indistincta. Lamellae c. 30 stipitem attingentes, obscure griseae, margine albidae. Stipes –80 × 3–4 mm, fragilis, e atro griseobrunnescens vel brunneus, basi fibrillis albis munitus.

Basidia 35–45 × 9 µm, clavata, 4-spora, fibulata. Sporae 9.1–10.3 × 6.5–7.2 µm, amyloideae. Cheilocystidia 35–70 × 11–22.5 µm, clavata, fibulata, levia (lamellarum media parte) vel surculis versiformibus instructa (pilei marginem versus). Pleurocystidia non visa. Trama lamellarum iodi ope vinescens.

Holotypus: 'Fungi fennici / *Mycena tristis* Maas G. / *U. Söderholm 1466* / 4 Oct. 1987 / (province) Etelä-Häme, Kangasala, Vihtinen' (L, no 987.340-241).

Basidiomata scattered. Pileus up to 45 mm across, conical, flattening with age and becoming very shallowly conical with broad, low umbo, shallowly sulcate, translucent-striate, moist, hygrophanous, very dark grey to almost blackish, drying with a more brownish tint. Flesh thin, dark greyish. Odour indistinct, taste not recorded. Lamellae c. 30 reaching the stipe, tender, ascending, up to c. 3.5 mm broad, ventricose, narrowly adnate, smooth, dark grey, more particularly towards the base, the edge convex, whitish. Stipe –80 × 3–4 mm, hollow, fragile, splitting lengthwise, gradually widening towards the base, terete or somewhat compressed, straight to slightly curved, smooth, delicately pruinose above, glabrous farther down, blackish grey when young, then more date brown to grey-brown, paler than the drying pileus, the base densely covered with long, coarse, somewhat woolly, white fibrils.

Basidia 35–45 × 9 µm, slender-clavate, 4-spored, clamped, with sterigmata 7–8 µm long. Spores 9.1–10.3 × 6.5–7.2 µm, fairly broadly pip-shaped, smooth, amyloid. Cheilo-

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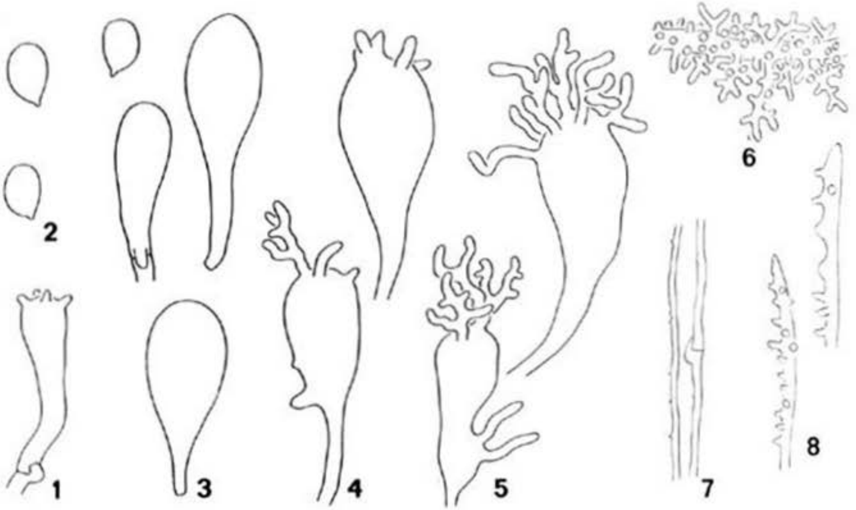
[1] Etymology: *tristis*, sad; also used to denote a very dark colour.



Figs. 1–8. *Mycena tristis* (holotype). — 1. Immature basidium. — 2. Spores. — 3. Cheilocystidia, taken from about the middle of a lamella. — 4. Cheilocystidia nearer the pileus margin. — 5. Cheilocystidia close to the pileus margin. — 6. Part of a hypha of the pileipellis. — 7. Hyphae of the cortical layer of the stipe. — 8. Terminal cells. (All figs., × 700.)

cystidia 35–70 × 11–22.5 µm, occurring mixed with basidia, sometimes more crowded but not really forming a sterile band, clavate, clamped, smooth (in the middle part of the lamella) or covered with few (farther towards the pileus margin) to several (close to the pileus margin) unevenly spaced, coarse, simple to furcate or branched, cylindrical, variously curved excrescences –20 × 2–3.5 µm with obtuse tips. Pleurocystidia not observed. Lamellar trama vinescent in Melzer's reagent. Hyphae of the pileipellis 1.5–3.5 µm wide, clamped, covered with scattered to more crowded, simple to branched excrescences 2.5–15 × 1–2 µm which may form very dense masses. Hyphae of the cortical layer of the stipe 1–2 µm wide, clamped, smooth or sparsely covered with small warts or more cylindrical excrescences less than 1 µm high, the terminal cells (causing the pruinosity at the top of the stipe) 2–6.5 µm, covered with simple, cylindrical excrescences 2–5 × 2 µm.

Growing on vegetable debris (containing decayed *Picea* needles) among grass and herbs under *Betula*.

Collection examined. — FINLAND, prov. Etelä-Hame: Kangasala, Vihtinen, 4 Oct. 1987, *U. Söderholm 1466* (holotype: L, no 987.340-241).

The macroscopic description of the species is adapted from the collector's notes, complemented by my own observations on the colour slide and the dried material. The microscopic details are based on examination of the type.

The dark colours of the pileus and the lamellae remind one of those in fresh, young specimens of *Mycena leptocephala* (Pers.: Fr.) Gillet, but the latter differs among other features in the slightly lubricous surface of the wet pileus, the fewer lamellae, and the smooth hyphae of the cortical layer of the stipe with their strikingly inflated terminal cells.

Another dark species with which *M. tristis* conceivably could be confused is *Mycena aetites* (Fr.) Quél., but the salient characters of this species are the lubricous pileus surface when moist, much fewer lamellae reaching the stipe, and the more pronounced ornamentation of the hyphae of the cortical layer of the stipe.

At the time Mr. Söderholm's material was received, I had finished the revision of section *Fragilipedes* of the Northern Hemisphere (to be published elsewhere) and awaited the galley-proofs. Changes in the manuscript, however desirable, were no longer possible, but the discovery of yet another member of the *Fragilipedes* once again demonstrates that this section (by far the largest and most difficult of the genus) still has surprises in store.

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NOTES ON THE GENUS PSATHYRELLA – IX
Psathyrella umbrina Kits van Wav. and P. galeroides Romagn.

E. KITS VAN WAVEREN

Rijksherbarium, Leiden

It is pointed out that *Psathyrella umbrina* Kits van Wav. (1982) and *P. galeroides* Romagn. (1986) are conspecific and that intermediate variants exist between *P. umbrina* var. *umbrina* and *P. umbrina* var. *utriformis* Kits van Wav.

Psathyrella umbrina Kits van Wav. (see full description and figures, 1982: 506 and 1985: 187) was described as a *Conocybe*-like small species, its characteristic features being: rather conical brown cap, brown gills, small and pale brown spores (6.5–)7–8 × 4.5–5 μm (mean values 6.9–7.3 × 4.6–4.8 μm) without germ pore, fusoid and often mucronate pleurocystidia, numerous pleurocystidioid cheilocystidia, distinctly pigmented hymenophoral trama, terrestrial growth in moss. Our original description was based on only one specimen (Scotland, 1968). Later we discovered having already found this species in 1965 in the Netherlands near Eindhoven; in 1980 Bendiksen found it in Norway (exsiccatum examined).

The Eindhoven collection consisted of four specimens (a, b, c and d) all growing at a distance of some two meters from each other. In 1983 we studied each of these separately and restudied the Scottish type specimen, making as always pleurocystidio- and cheilocystidiograms (= white cards, measuring 15 × 15 cm, on which of both kinds of cystidia, usually some 15–25 of these cells, taken at random from a squashed gill, are drawn at magnification of 1150 ×).

Both macro- and microscopically (size, shape, and colour of spores, absence of germ pore, pigmentation of hymenophoral trama) the four specimens were fully identical except for the shape of the cystidia. In specimen a the pleurocystidia (35–52.5 × 9–12 μm) were fusoid(-sublageniform) about half of them mucronate, the numerous pleurocystidioid cheilocystidia following suit (Fig. 1). In specimens b and c to our great surprise all pleurocystidia (35–60 × 9–17 μm) and all pleurocystidioid cheilocystidia were distinctly utriform (Figs. 8–11), almost all of the former cells even with a subapical constriction and none of them mucronate. Altogether 35 cells, obtained from two gills from specimen b and 43 cells from two gills from specimen c were drawn. The specimens b and c were described as *Psathyrella umbrina* var. *utriformis* (Kits van Waveren, 1985: 189).

Out of the 71 pleurocystidia, obtained from two gills from specimen d, 43 were rather broadly (up to 15 μm) fusoid with subobtuse to subacute apex, while 28 were utriform; none of these cells were subapically constricted and none were mucronate. But among the many pleurocystidioid cheilocystidia (also broadly fusoid or utriform) we came across one mucronate cell. It was therefore concluded that specimen d was to be regarded as an intermediate variant between *P. umbrina* var. *umbrina* and *P. umbrina* var. *utriformis*, represented respectively by the type + specimen a and the specimens b + c.

A specimen found in 1985 by Örstadius in Sweden (exsiccatum examined) with on its gills numerous utriform pleurocystidia, none of them subapically constricted but many with a very obtuse forked apex (as so often seen among the utriform cystidia in *P. spadiceogrisea*) could also be ranked with *P. umbrina* var. *utriformis* because far and away most pleurocystidia were utriform. But because of the presence of, be it only very few, broadly fusoid mucronate cells (Fig. 12) it could also be regarded as an intermediate form.

Going by Romagnesi's description of his *P. galeroides* (1986: 189) in which he called the pleurocystidia lageniform and stated his species to differ from *P. umbrina* in only two respects i.e. smaller size of the carpophores and different shape of the cystidia, we regard these two taxa to be conspecific. The smaller size of the carpophores lies within the range of the variability of this obviously very rare species and on examination of the holotype Mr. Romagnesi very kindly sent us, we found the pleurocystidia (Fig. 6) to be fully identical with those of the type of *P. umbrina* fusoid(-sublageniform), many of them mucronate (even depicted by Romagnesi with 2 cells but not described!). Sizes (mean values 7.1 × 4.5 μm), shape, and colour of the spores and pigmentation of the hymenophoral trama also turned out to be the same as in *P. umbrina*. In his description of his *P. galeroides* Romagnesi did not mention the presence of utriform pleurocystidia, but he obviously must have found them as in his fig. 1 he depicted one large utriform pleurocystidium and one utriform cell with an obtuse and forked apex (cf. our Fig. 12 from the Swedish specimen) and in his fig. 2 four pleurocystidia, two of which slightly subapically constricted. Having found three collections of his *P. galeroides*, his observations are explained away by the presumption that his description is based on the holotype which he sent us for examination and that his figs. 1 and 2 were taken from the other two collections (no date or locality mentioned under the figures), which have to be interpreted as intermediate variants between *P. umbrina* var. *umbrina* and *P. umbrina* var. *utriformis* by analogy with the intermediate variants Romagnesi (1975: 220) and we (1971: 270) described for *P. gracilis* and *P. microrrhiza*.

Figs. 1–5. *Psathyrella umbrina* var. *umbrina* (type). — 1. Carpophore (× 0.5). — 2. Spores (× 1210). — 3. Basidia (× 575). — 4. Pleurocystidia (× 575). — 5. Pleurocystidioid cheilocystidia (× 575).

Figs. 6–7. *Psathyrella galeroides* (type). — 6. Pleurocystidia (× 575). — 7. Pleurocystidioid cheilocystidia (× 575).

Figs. 8–9. *Psathyrella umbrina* var. *utriformis* (type, Eindhoven specim. b). — 8. Pleurocystidia (× 575). — 9. Pleurocystidioid cheilocystidia (× 575).

Figs. 10–11. *Psathyrella umbrina* var. *utriformis* (type, Eindhoven specim. c). — 10. Pleurocystidia (× 575). — 11. Pleurocystidioid cheilocystidia (× 575).

Figs. 12–13. Pleurocystidia of variants intermediate between *P. umbrina* var. *umbrina* and *P. umbrina* var. *utriformis*. — 12. In Swedish specimen (× 575). — 13. In specimen d from Eindhoven (× 575).


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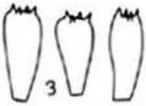
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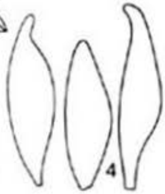
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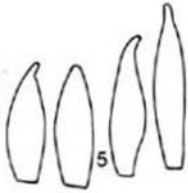
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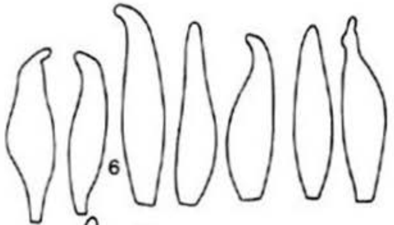
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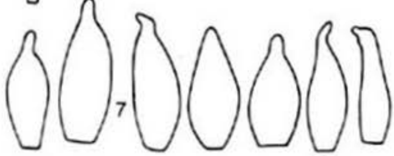
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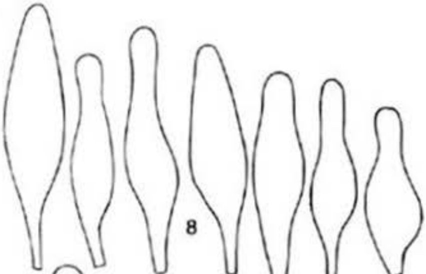
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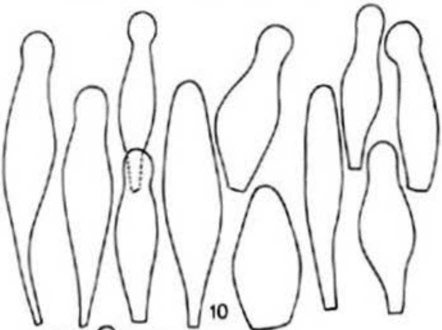
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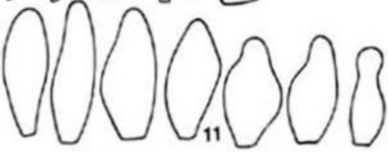
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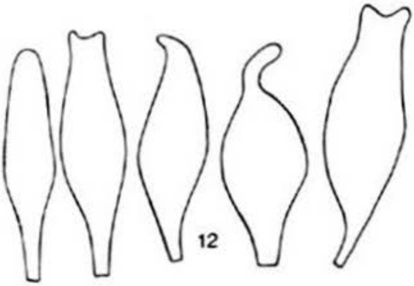
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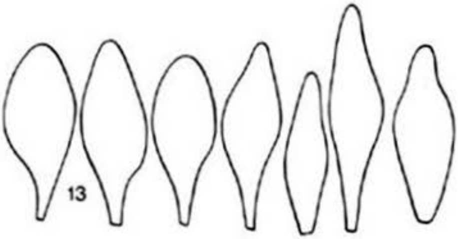
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FOUR NEW SPECIES OF COPRINUS FROM THE NETHERLANDS

C.B. ULJÉ*

Three species of *Coprinus* belonging to the *C. niveus-C. cortinatus* group are newly described, viz. *C. bellulus, C. candidatus*, and *C. iocularis*. For purposes of comparison a description of *C. cortinatus* is given also. In addition *C. singularis*, belonging to subsection *Setulosi*, is introduced as a new species.

As three of the four new species described in this paper are rather closely related to *C. cortinatus* J. Lange it seemed important first to establish a clear concept of that species. Type material does not seem to exist, but authentic material was kindly sent on loan from Copenhagen. The following description is based on that material.

Coprinus cortinatus J. Lange — Figs. 1E–H

Coprinus cortinatus J. Lange in Dansk bot. Ark. 2(3): 45. 1915.

Pileus up to 15 mm wide when expanded, white but in young stages and with age at centre somewhat cream coloured, powdery. Stipe up to about 40 × 0.5–1 mm, with subbulbous base.

Spores 7.0–9.7 × 4.4–5.9 μm, ellipsoid to ovoid, with central germ pore, Q = 1.35–1.85, $\overline{L}$ = 8.4 μm, $\overline{B}$ = 5.2 μm. Basidia 13–32 × 7–8 μm, 4-spored. Pleuro- and cheilocystidia absent. Clamp-connections present.

Collection examined. — DENMARK: (exact locality unknown), 20 Jan. 1939, *J. E. Lange*, on mull in *Fagus-Ulmus* forest (C).

In Lange's description too no cystidia are mentioned. This is in agreement with my collections of *C. cortinatus*. In a few other collections, however, which are macroscopically and microscopically indistinguishable from typical *C. cortinatus*, very distinct subglobose to sack-shaped cheilocystidia are present and cover the lamella edge completely.

For the moment it seems to me that the presence of distinct cheilocystidia is such an important character that it prevents the subordination of these collections under *C. cortinatus*. The more so, as I have another collection with the typical ellipsoid *C. cortinatus*-spores, be it somewhat smaller than usual ($l \leqslant 7$ μm), which has utriform cheilocystidia. It should be mentioned, however, that also in my *C. cortinatus* collections without cheilocystidia the length of the spores varies considerable from collection to collection, viz. from 6–8 μm to 8–10.5 μm.

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* Address: Van Dijkstraat 21, 2405 XE Alphen a/d Rijn.

Examination of many more collections is necessary to find out whether we are dealing here with several taxa or with just one highly variable species.

For the moment only the collections without cheilocystidia are accepted here as representing true *C. cortinatus*. The spore-sizes found in these collections are:

Spores [100/5/5] 6.0–10.2 × 4.2–6.0 µm, Q = 1.30–1.95, $\overline{Q}$ = 1.53–1.81; $\overline{L}$ = 7.9–9.1 µm, $\overline{B}$ = 5.1–5.7 µm.

Collections examined. — NETHERLANDS: prov. Utrecht: Breukelen, estate 'Sterreschans', 9 Sept. 1986, *Uljé 811*; prov. Noord-Holland: Amsterdam, Amsterdamse Bos, 7 Sept. 1985, *Uljé 608* & 27 Sept. 1986, *Uljé 828*; prov. Zuid-Holland: Leiden, Leidse Hout, 9 Oct. 1985, *Uljé 652* & 10 Sept. 1986, *Uljé 810*. (All collections in herb. Uljé.)

On the following pages three new species undoubtedly belonging to the *Coprinus cortinatus/niveus* group, are described, all three with terrestrial basidiocarps and small spores (≤ 11 µm).

In current literature (Kühner & Romagnesi, 1953; Moser, 1983; Orton & Watling, 1979) besides *C. cortinatus* three of such species are to be found, viz. *C. filiformis* Berk. & Br. (1861: 379), *C. patouillardii* Quél. in Pat. (1883: 107), and *C. coniophorus* Romagn. (1941: 115).

Coprinus filiformis as described by Orton & Watling (1979: 115), apparently the only recent authors knowing this species, is strongly characterized by the presence of thick-walled hyphae among the globose velar cells.

The original description of *C. filiformis* by Berkeley & Broome deviates somewhat from the one given by Orton & Watling. Berkeley & Broome describe and depict a very small species: basidiocarps less than 10 mm high; pileus about 1 mm in diam. (Orton & Watling: pileus 4–7 × 2–6 mm before expanding and stipe 15–40 mm long); moreover in the enlarged drawing of a basidiocarp distinct erect hairs are to be seen on the stipe which remind of species in subsection *Setulosi*. In addition the strongly cylindrical young pileus is somewhat aberrant in the *C. cortinatus*-group where the closed pileus usually is more roundish. It should be mentioned, however, that Berkeley & Broome indicate the presence of white velar flocculi on the pileus.

Altogether it seems possible that the interpretation of *C. filiformis* by Orton & Watling is incorrect. Unfortunately type material seems to be lacking (Orton, 1957: 275).

However that may be, none of the interpretations of *C. filiformis* mentioned agree with one of the three following new species.

Coprinus patouillardii Quél. is fully characterized by rounded-angular spores and occurs besides on earth also on dung. I am not convinced that *C. cordisporus* Gibbs (1908: 100) with the same microscopical characters but with smaller basidiocarps on dung (cf. Orton & Watling, 1979: 66) is a different species.

Coprinus coniophorus Romagnesi is easily distinguished by the dark grey to olivaceous grey velar squamules on its pileus and its narrowly amygdaliform spores with somewhat attenuate apex.

Fimicolous species with small spores in the *Coprinus cortinatus/niveus*-group are *C. ephemeroides* (Bull.: Fr.) Fr. (1838: 250), *C. cordisporus* Gibbs, *C. poliomallus* Romagn. (1945: 81), and *C. luteocephalus* Watling (1972: 359).

Coprinus ephemeroides and *C. cordisporus* (see above) have rounded-angular spores like *C. patouillardii*.

Coprinus poliomallus is a very small species with cylindrico-ellipsoid spores combined with roundish cheilocystidia.

Coprinus luteocephalus shows yellowish tinges, has 10–12.5 µm long spores, and velar cells on the pileus that are not globose. Its position in the *C. cortinatus/niveus* complex is uncertain.

Two more taxa belonging to the species-complex concerned but not treated in the works mentioned above are *C. pseudocortinatus* Locq. (1947: 81) and the recently described *C. cardiasporus* Bender (in Enderle, Krieglsteiner & Bender, 1986: 102). The former is a fimicolous species with very tiny basidiocarps (only a few millimeters high) and very small spores (up to 7 µm long) and the latter is the only species in this group with truly heart-shaped spores.

None of the species discussed above agrees with one of the following three, which are therefore described as new.

Coprinus bellulus Uljé, *spec. nov.* — Figs. 1A–D

Pileus ad 27 mm latus, sulcatus, initio albo- vel cremeo-pulverulentus, postea sordide albidus. Lamellae 22–36, liberae, primo albae, dein cinereae vel atro-maculateae. Stipes ad 65 × 2.5 mm, albo-flocculosus, basi subbulbosus saepe brunneolus. Sporae 7.3–10.6 × 5.8–8.0 × 5.0–7.1 µm, late ellipsoideae, interdum latere leviter applanatae, obscure rubro-brunneae, poro germinale centrico praeditae. Basidia bispora. Cystidia nulla. Velum pilei constans ex cellulis globosis, ad 50 µm latis, hyalinis vel flavidulis tenuitunicatis, granulosis (granula in HCl dissoluta). Fibulae adsunt. — Typus: 'Netherlands, prov. Zuid-Holland: Langeraar, 16 X 1986, *C. B. Uljé* 777 (L).'

Etymology: bellulus, pretty.

Closed pileus subglobose to ellipsoid, up to 11 mm high and 9 mm wide, completely covered with powdery white veil, but very young buds and centre of pileus of more advanced stages often cream to pale ochraceous; veil at margin, particularly in early stages somewhat more hairy-floccose; expanded pileus up to 27 mm wide, convex to flat with slightly deflexed margin, rarely totally flat; with age veil on pileus greying. Lamellae (L = 22–36, l = 1–3) free, up to 2 mm wide, at first white, later greyish to grey with blackish spots. Stipe up to 65 × 2.5 mm, attenuate upwards, at apex up to 1.5 mm wide, white but at apex often somewhat hyaline and at subbulbous, up to 3.5 mm wide base often brownish, with white velar flocks. Smell absent. Spore print dark chocolate brown (Munsell 5 YR 2/1).

Spores [160/8/8] 7.3–10.6 × 5.8–8.0 × 5.0–7.1 µm, Q = 1.20–1.65, $\bar{Q}$ = 1.38–1.50, L = 9.6–9.9, $\bar{B}$ = 6.6–7.1 µm, in face view broadly ellipsoid, sometimes with slightly flattened side, but often somewhat irregularly shaped, with central germ pore and apex somewhat attenuate, dark red-brown. Basidia 15–32 × 7–9 µm, 2-spored, surrounded by 3–5 pseudoparaphyses. Cheilo- and pleurocystidia absent but here and there sterile cells (probably somewhat enlarged basidioles) projecting from lamellae

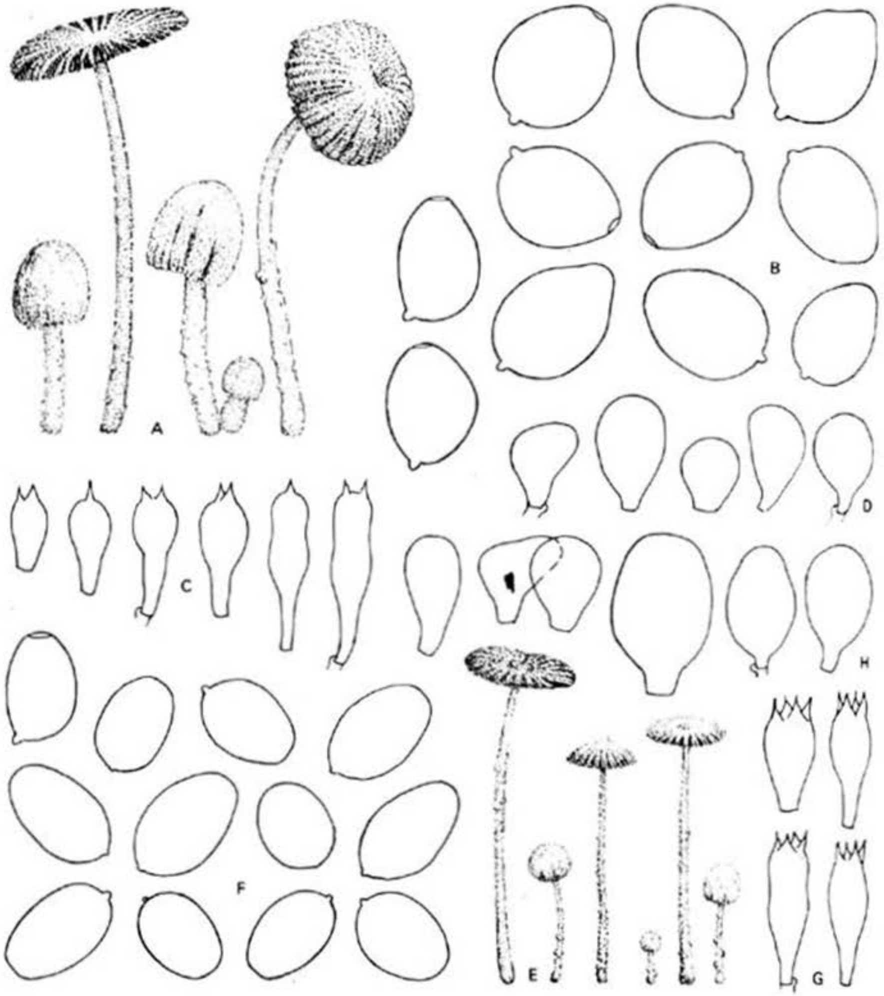

Fig. 1A–D. *Coprinus bellulus*. — A. Basidiocarps × 1. — B. Spores × 2000. — C. Basidia × 800. — D. Strongly developed pseudoparaphyses at lamella edge × 800.

Fig. 1E–H. *Coprinus cortinatus*. — E. Basidiocarps × 1. — F. Spores × 2000. — G. Basidia × 800. — H. Strongly developed pseudoparaphyses at lamella edge × 800.

(Figs. 1D and 1H) and sometimes velar remnants sticking to lamella edge. Pileipellis made up of ventricose, ellipsoid and subglobose cells covered by about 7 μm wide hyphae consisting of oblong-ventricose cells and these upwards passing into thin-walled, colourless to slightly yellowish, smooth to granular, up to 50 μm wide, globose velar cells; granules on surface of velar cells disappearing in HCl. Clamp-connections present.

Habitat & distribution. — Mostly in small groups, more rarely in bundles of up to 40 specimens, but sometimes also solitary. Usually on bare soil, but sometimes also at grassy-mossy places, always under shrub or trees. Not rare in the Netherlands.

Collections examined. — NETHERLANDS: prov. Flevoland: Oostelijk Flevoland, Bremerbergbos, 4 Oct. 1986, *G. Tjallingii* (herb. Tajllingii); prov. Zuid-Holland: Alphen a/d Rijn, 26 June 1984, *Uljé 320*, 1 Aug. 1985, *Uljé 530* & 11 Sept. 1987, *Uljé 827* (L); Leiden 28 Aug. 1986, *Uljé 648* & 31 May 1987, *Uljé 849* (L); Ter Aar, Langeraar, 10 Nov. 1983, *Uljé 308* & 16 Oct. 1986, *Uljé 777* (type; L). (All collections in herb. Uljé unless otherwise mentioned.)

Coprinus bellulus is easily distinguished from the other members of the *C. cortinatus*-group by the 2-spored basidia, lacking pleuro- and cheilocystidia, and the often somewhat irregular, broadly ellipsoid spores.

Coprinus candidatus Uljé, *spec. nov.* — Figs. 2A–F

Pileus ad 16(–20) mm latus, sulcatus, initio albo- vel cremeo-pulverulentus, postea sordide albidus. Lamellae 21–28, liberae, primo albae, dein cinereae vel atro-maculatae, albo-marginatae. Stipes c. 50 × 1.5 mm, albo-flocculosus, basi subbulbosus. Sporae 7.5–11.5 × 4.5–6.0 µm, cylindrico-ellipsoideae, rubro-brunneae, poro germinali centrico, ad 2 µm lato praeditae. Basidia tetraspora. Pleurocystidia nulla. Cheilocystidia 20–40(–50) × 7–15(–25) µm, utriformia, interdum lageniformia vel vesiculosa. Velum in pileo constans ex cellulis globosis, ad 50 µm latis, hyalinis vel flavidulis, tenuitunicatis, granulosis (granula in HCl dissoluta). Fibulae adsunt. Terrestris, interdum ad ramulos dejectos. — Typus: 'Netherlands, prov. Noord-Holland: Amsterdam, Amsterdamse Bos, 2 IX 1986, *C. B. Uljé 812*' (L).

Etymology: candidatus, dressed in white.

Pileus ovoid to subglobose and up to 8 × 6 mm when still closed, expanding up to 16(–20) mm, white to cream, becoming sordid with age, entirely powdery but at margin somewhat hairy-floccose. Lamellae L = 21–28, l = 0–3, free, first white but soon grey to spotted blackish, with white edge. Stipe c. 50 × 1.5 mm, attenuate upwards, subbulbous at base, white-flocculose. Smell absent.

Spores [140/7/4] 7.3–11.5 × 4.6–6.0 µm, Q = 1.60–2.05, $\bar{Q}$ = 1.72–1.88, $\bar{L}$ = 8.6–10.9, $\bar{B}$ = 5.0–5.8, cylindrico-ellipsoid, but somewhat conical towards apiculus, W about equal to B, red-brown under microscope, with central, up to 2 µm wide germ-pore. Basidia 15–35 × 7–10 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia up to 40(–50) µm long, with 7–15(–25) µm wide ventricose part and 4–10(–15) µm wide neck, utriform to more rarely lageniform or vesiculose, with more or less cylindrical neck and rounded apex. Pleurocystidia absent. Pileipellis consisting of roundish cells covered by narrow hyphae upwards passing into velar tissue. Velar cells (Fig. 2D) (sub)globose, up to 50 µm wide, colourless to yellowish, thin-walled, granular; granulae dissolving in HCl. Velum at margin of pileus and on stipe made up of cylindrical to fusiform or clavate elements. Clamp-connections present.

Habitat. — Terrestrial on bare soil, sometimes against fallen branchlets.

Collections examined. — NETHERLANDS: prov. Utrecht: Breukelen, estate 'Over-Holland', 19 Sept. 1986, *Uljé 807*; prov. Noord-Holland: Amsterdam, Amsterdamse Bos, 2 Sept. 1986, *Uljé 812* (type, L); ditto, 20 Sept. 1987, *Uljé 852*; prov. Zuid-Holland: Leiden, 26 March 1985, *Uljé 486*. (All in herb. Uljé unless mentioned otherwise.)

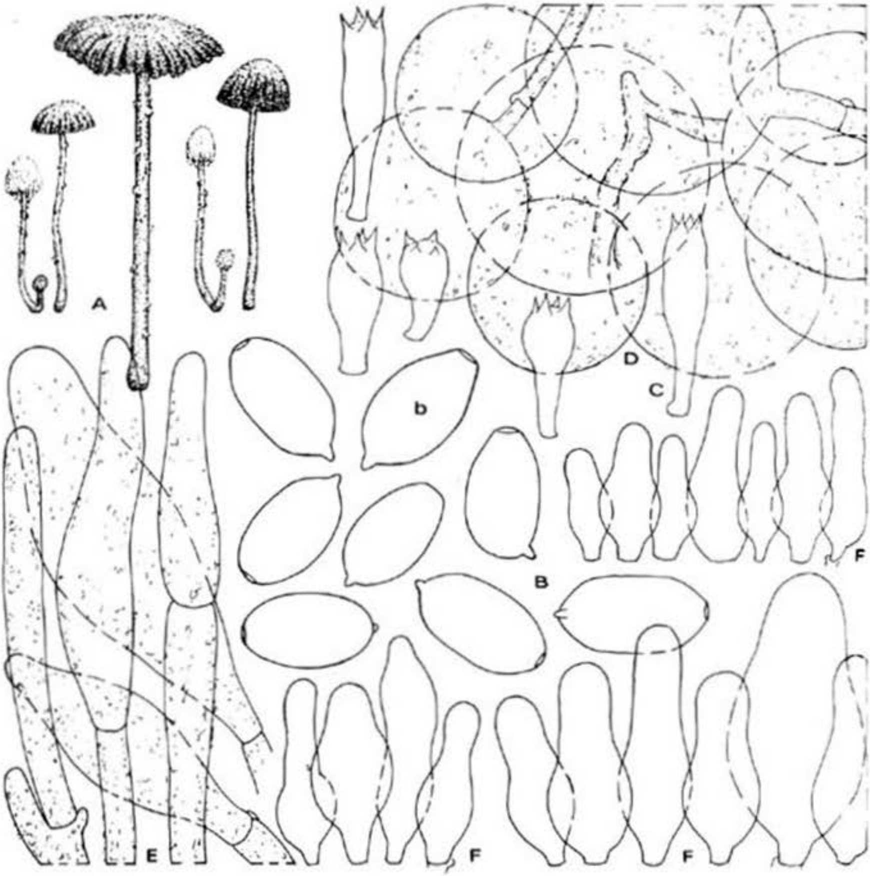

Fig. 2A–F. *Coprinus candidatus*. — A. Basidiocarps × 1. — B. Spores × 2000. — C. Basidia × 800. — D. Elements of veil on pileus × 800. — E. Elements of veil on stipe × 800. — F. Cheilocystidia × 800 (from 3 collections).

Among the species of the *C. cortinatus*-group, *C. candidatus* is easily recognized by its utriform cheilocystidia and by its usually cylindrico-ellipsoid spores. The subcylindrical shape of the spores, however, is not always very distinct, e.g. in the collection cited from Breukelen and in a collection described by Gröger (1986: 37) from East Germany (as *C.* cf. *cortinatus* Lange). In these two collections the spores are also somewhat longer and somewhat stronger attenuate towards the germ-pore than usually (Fig. 2Bb). But also in these cases the subcylindrical shape is perceptible in at least some of the spores. Shape and size of the cheilocystidia, however, are the most important indications that these collections with slightly aberrant spores belong to *C. candidatus*.

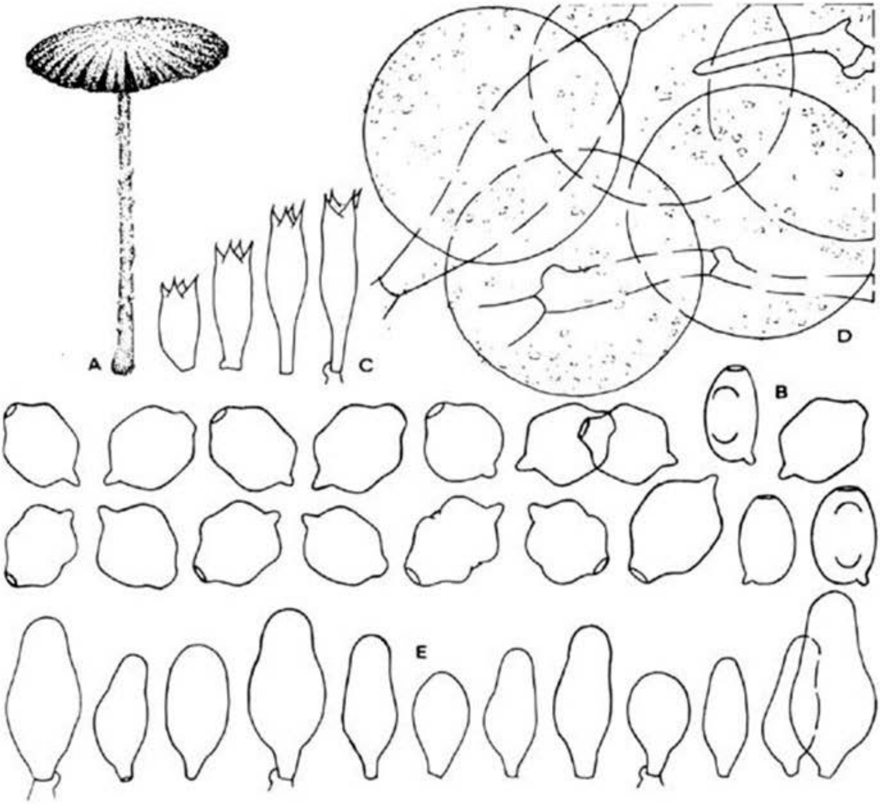

Fig. 3A–E. *Coprinus iocularis*. — A. Basidiocarps × 1. — B. Spores × 2000. — C. Basidia × 800. — D. Elements of veil on pileus × 800. — E. Cheilocystidia × 800. (All Figs. from type.)

Coprinus iocularis Uljé, *spec. nov.* — Figs. 3A–E

Pileus expansus 27 mm latus, sulcatus, albo-pulverulentus. Lamellae 26, liberae, primo albae, dein cinereae vel atro-maculatae. Stipes 45 × 1–1.5 mm, subbulbosus, albido-hyalinus, albo-flocculosus. Sporae 5.9–7.1 (–7.9) × 4.9–5.8 × 4.0–4.3 µm, hexagonae, saepe lateraliter depressae quare plus minusve nodulosae, rubro-brunneae, poro germinali centrico praeditae Basidia tetraspora. Cheilocystidia 20–35 × 8.5–15.5 µm, pro maxima parte utriformia, collo 6–9.5 µm lato. Pleurocystidia nulla. Velum in pileo constans ex cellulis globosis, ad 50 µm latis, laevibus vel subgranulosis et hyphis ramosis surculisque praeditis. Fibulae adsunt. Terrestris, in locis graminosis. — Typus: Netherlands, prov. Zuid-Holland, Alphen a/d Rijn, 23 VIII 1987, *C. B. Uljé 851* (L).

Etymology: iocularis, funny; because of the shape of the spores.

Pileus 27 mm wide, plano-convex, completely white-powdery. Lamellae L = 26, l = 1–3, free, first white, then grey to blackish spotted. Stipe 45 × 1.5 mm, with subbulbous base, whitish-hyaline, covered with white velar flocculi. Smell absent.

Spores [40/1/1] 5.9–7.1(–7.9) × 4.9–5.8 × 4.0–4.3 µm, Q = 1.05–1.40, $\bar{Q}$ = 1.26, $\bar{L}$ = 6.7 µm, $\bar{B}$ = 5.3 µm, in face view more or less hexagonal but frequently with two rounded lateral nodules at each side because of slightly depressed lateral faces, red-brown, with central germ pore. Basidia 13–32 × 6–8 µm, 4-spored, surrounded by 3–5 pseudoparaphyses. Cheilocystidia 20–35 × 8.5–15.5 µm, mostly utriform; neck 6–9.5 µm wide. Pleurocystidia absent. Veil on pileus consisting of up to 50 µm wide, smooth or somewhat granular globose cells (granules dissolving in HCl) mixed with frequently branching, colourless, thin-walled hyphae with processes. Clamp-connections present.
Habitat. — Terrestrial on lawn.

Collection examined. — NETHERLANDS: prov. Zuid-Holland: Alphen a/d Rijn, near Zegerplas, 23 Aug. 1987, *Uljé 851* (type; L).

Coprinus iocularis can be recognized immediately by the characteristic shape of its spores. Therefore it was decided to describe it as a new species, in spite of the fact that only one specimen was found.

Coprinus singularis Uljé, *spec. nov.* — Figs. 4A–F

Pileus fortiter plicatus, initio subglobosus vel ovoideus, ad 3 × 2 mm, pallide brunneus, striis parum obscurioribus; postea expansus, ad 8(–11) mm latus, cinerascens sed centro color brunneus persistens, sub lente subpubescens. Lamellae 8–16, anguste adnatae, primo albae, dein cinereae vel atro-maculatae. Stipes ad 35 × 0.7 mm, basi subbulbosus, hyalinus, sparsim pubescens. Sporae 9.5–17 × 6.5–11 µm, ellipsoideae vel cylindrico-ellipsoideae, obscure rubro-brunneae, poro germinali centrico indistincto praeditae. Basidia 15–34 × 8–10 µm, bispora, pro parte unispora. Cheilocystidia 30–50 × 12–17 µm, lageniformia, collo 3–5 µm lato. Pleurocystidia nulla. Pileipellis constans ex cellulis ovoideis vel globosis et pileocystidiis 50–85 × 11–18 µm, collo 3.5–8 µm lato, lageniformibus. Caulocystidia 30–90 × 11–20 µm lageniformia, collo 3.5–9.5 µm lato. Fibulae adsunt. — Typus: 'Netherlands, prov. Zuid-Holland: Alphen a/d Rijn, Zegerplas, 21 VIII 1987, *C. B. Uljé 850*' (L).
Etymology: singularis, solitary.

Closed pileus up to 3 × 2 mm, subglobose to ovoid, pale brown (Mu. 10 YR 7/3; K. & W. 4A3) with somewhat darker striation; expanded pileus up to 8(–11) mm wide, soon becoming very thin and greyish to almost hyaline but remaining brownish at centre particularly when dehydrated (Mu. 7.5 YR 5/6); rather strongly sulcate already in early stages, seemingly glabrous but under lens subpruinose. Lamellae L = 8–16, l = 0–3, narrowly adnate, white at first then grey to blackish spotted. Stipe up to 35 × 0.7 mm, subbulbous at base, hyaline, sparsely pubescent. Smell absent.
Spores [120/6/4] 9.7–17 × 6.8–10.9 µm, Q = 1.20–1.70, $\bar{Q}$ = 1.35–1.47, $\bar{L}$ = 11.4–14.4, $\bar{B}$ = 8.5–9.1, ellipsoid to cylindrico-ellipsoid, in frontal view often slightly flattened at both sides of apiculus, dark red-brown, with central, rather indistinct germ pore. Basidia 15–34 × 8–10 µm, 2-spored but also rather frequently 1-spored, surrounded by 4–6 pseudoparaphyses. Pleurocystidia absent. Cheilocystidia 30–50 × 12–17 µm, with tapering 3–5 µm wide neck and rounded apex, lageniform, colourless, thin-walled. Pileipellis consisting of globose to ovoid cells up to 30 × 25 µm (in grooves slightly larger) and lageniform pileocystidia 50–85 × 11–18 µm, with tapering to cylindrical 3.5–8 µm wide neck and thin, colourless walls. Caulocystidia 30–90 × 11–20 µm with rather cylindrical, 3.5–9.5 µm wide neck, colourless, thin-walled. Clamp-connections present.
Habitat. — Solitary on lawns, particularly at bare spots.

Collections examined. — NETHERLANDS: prov. Zuid-Holland: Alphen a/d Rijn, Edelsteensingel, 28 July 1985, *Uljé 671*; ditto, near Zegerplas, 3 Sept. 1985, *Uljé 503*, 21 Aug. 1987, *Uljé 850* (type; L) & 22 Sept. 1987, *Uljé 853*, and several other collections from same area. (All collections in herb. Uljé unless otherwise mentioned.)

Within subsection *Setulosi*, *Coprinus singularis* is highly characterized by its large cylindrico-ellipsoid spores with central germ pore on 2-spored basidia. In all collections,

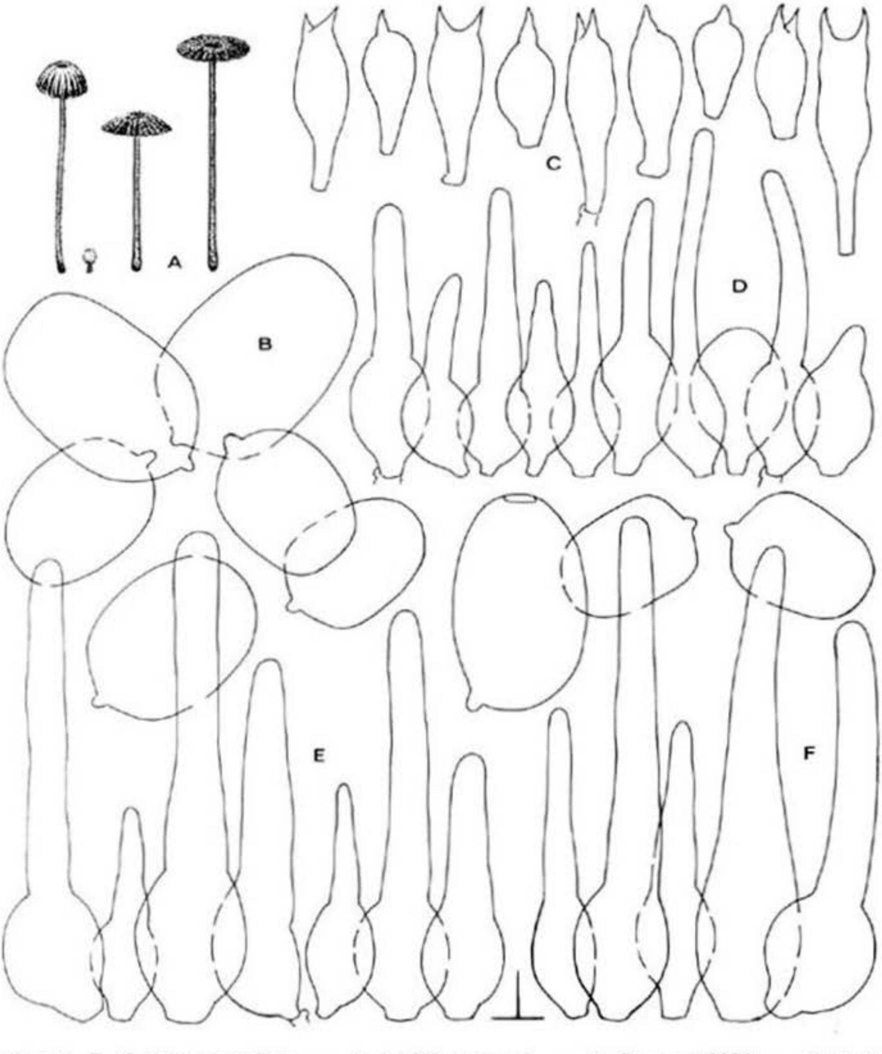

Fig. 4A–F. *Coprinus singularis*. — A. Basidiocarps × 1. — B. Spores × 2000. — C. Basidia × 800. — D. Cheilocystidia × 800. — E. Caulocystidia × 800. — F. Pileocystidia × 800.

of which some were found more than one kilometer apart, there is a limited number of 1-spored basidia intermixed with the 2-spored ones, which explains the great range of spore-sizes given above.

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Dr. C. Bas has to be thanked for critically reading and improving the text of this paper. Thanks are also due to Mr. H. Knudsen, Copenhagen for the loan of J. Lange's collection of *C. cortinatus* and to Mr. H. Bender for the exchange of material, documents and information. Dr. R. A. Maas Geesteranus kindly corrected the Latin diagnoses.

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PERSOONIA
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ON A FALSE HYDROPUS, FLAMMULINA MEDITERRANEA, COMB. NOV.

C. BAS

Rijksherbarium, Leiden

G. ROBICH

*Museo civico di Storia Naturale, Venezia**

Re-examination of two collections of *Hydropus mediterraneus* Pacioni & Lalli revealed a number of characters that necessitate the transfer of this species to the genus *Flammulina*.

After the publication of a detailed, illustrated description by one of us (Robich, 1986) of *Hydropus mediterraneus* Pacioni & Lalli, the other (C. B.) suggested a re-examination of material of this species because of its for a species of *Hydropus* rather unusual habit and a certain resemblance to species of the genus *Flammulina*, particularly to the frequently terrestrial *F. ononidis* Arnolds (Arnolds, 1977: 33).

Our re-evaluation of its characters, in particular those of the trama of the stipe and the pileipellis, indeed led us to the conclusion that *H. mediterraneus* has to be transferred to *Flammulina*.

Flammulina mediterranea (Pacioni & Lalli) Bas & Robich, *comb. nov.* — Figs. 1–6

Hydropus mediterraneus Pacioni & Lalli in Micol. ital. 14: 5. 1985 (basionym).

Descriptions & illustrations. — Pacioni & Lalli in Atti Centro Studi Fl. mediterr. (Borgo di Taro) 6: 209–212 ('1984'), 1986; Robich in Boll. Gruppo micol. Bresadola 29: 199, col. photogr. 1986.

Pileus 15–32 mm in diam., first convex, then plano-convex with depressed to weakly infundibuliform centre, sometimes with small pointed umbo, pale to dark brown (orange-brown, about Munsell 5 YR 6/8 and darker, in published photograph), usually somewhat darker at centre and slightly paler at margin, glabrous and viscid, nearly always covered with strongly adhering grains of sand. Lamellae distant (L = 24–28, l = 0–1), fairly broad, subdecurrent to decurrent, thickish, from white to ivory white or greyish-whitish, with entire, concolorous edge. Stipe 40–80(–100) × 2–4 mm, cylindrical, fistulose, elastic; epigeal part only c. 30 mm high, pale brown and somewhat pruinose at apex to distinctly darker brown and subviscid just above the soil; hypogeal part slightly thickened, covered with a fine ochraceous brown down. Context whitish to greyish-brownish. Smell and taste indistinct.

Spores [20/2/2] 11.5–14.8 × 8.4–9.8 μm, Q = 1.35–1.7, $\bar{Q}$ = 1.42–1.47, ellipsoid to subamygdaliform, with small abrupt apiculus, with slightly to distinctly thickened

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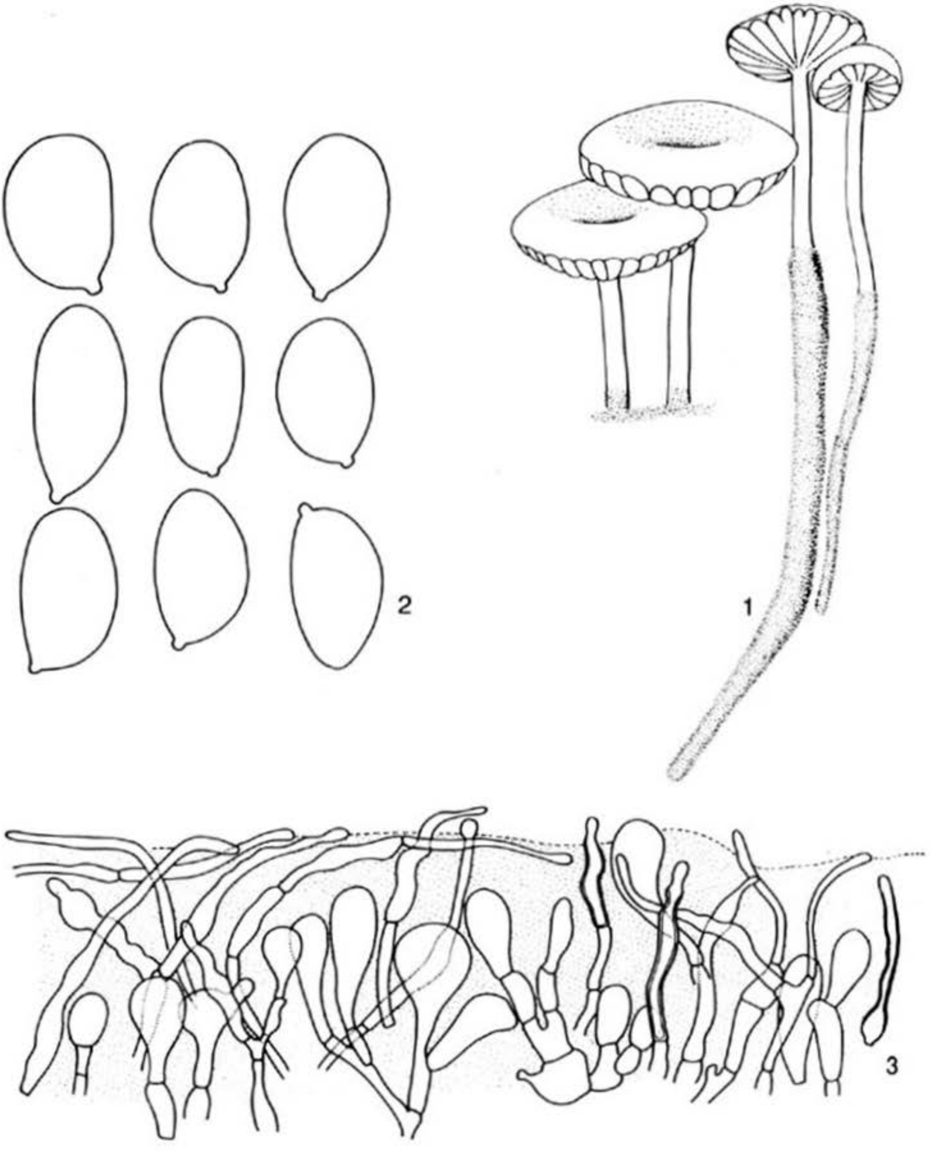
* Address: Società Veneziana di Micologia, S. Croce 1730-30100 Venezia, Italy.



Figs. 1–3. *Flammulina mediterranea*. — 1. Basidiocarps × 1. — 2. Spores × 1500. — 3. Pileipellis × 500.

wall (up to c. 1.0 μm), colourless to very pale yellowish in NH_4OH 10% and KOH 5%, smooth, inamyloid, not to very weakly cyanophilous, slightly metachromatic in Chresyl blue (walls pale purplish lilacinous), congophilous; mature spores binucleate[1]. Basidia 52–80 × 9.8–14.5 μm, 4-spored, slenderly clavate, when young with distinct clamp but later only with kinked basal septum; sterigmata rather broadly conical. Pleurocystidia abundant, (55–)70–145 × 17–27(–32) μm, with 5–10 μm wide neck and usually obtuse, more rarely subcapitate apex, mostly subcylindrical-subfusiform or slenderly to ventricose lageniform, but sometimes utriform or merely ventricose, often with neck tapering upwards, with slightly to strongly thickened wall (up to 3.5 μm) but usually thin-walled at apex, colourless to slightly yellowish in NH_4OH or KOH, sometimes with granular debris on apex, inamyloid, congophilous, metachromatic in Chresyl blue. Cheilocystidia abundant, rendering lamella edge sterile, 40–105 × 13–30 μm, rather variably shaped, ventricose-fusiform or -lageniform, lageniform, clavate or even spheropedunculate, colourless, thin- to slightly thick-walled. Hymenophoral trama regular to subregular, made up of 3–6 μm wide, thin-walled, colourless hyphae; subhymenium ramose, c. 15 μm thick; elements of trama and subhymenium somewhat distant and embedded in gelatinous substance (not very conspicuous). Pileipellis strongly gelatinized, consisting of erect, clavate to almost spheropedunculate cells (14–31 × 5.5–15.5 μm) and more or less erect, hair-like, sometimes septate, very slenderly lageniform to narrowly cylindrical pileocystidia (30–65 × 2.5–7 μm) with their upper parts (but sometimes also complete pileocystidia) bent and repent along surface; pileipellis about 80 μm thick with membranal (also epimembranal?) pigment concentrated in lower half. Stipitipellis with scattered, solitary or clustered, thin-walled, colourless, slenderly lageniform caulocystidia 45–105 × 4–15 μm. Stipititrama regular, monomitic (certainly not sarcodimitic, as broad hyphae are cylindrical and regularly septate), made up of longitudinal hyphae from c. 3 μm wide near surface to c. 12 μm wide at centre, with slightly thickened wall; in longitudinal sections with several longitudinal bands of very abundant small quadrangular crystals. Clamp-connections seen in trama of stipe and at base of young basidia.

Habitat & distribution. — Terrestrial among grasses (*Ammophila litoralis*) on coastal dunes. Recorded from the east and the west coast of the southern half of Italy, Sardinia, and Tunesia.

Collections examined. — ITALY, prov. Rovigo, Porto Caleri, Dec. 1985, *G. Robich* (L; herb. Robich). — TUNESIA, Tabarka, 12 Dec. 1982, *G. Pacioni* (L; herb. Pacioni).

Note. — The macroscopic description above is a translation of the Italian one published by the second author (Robich, 1986: 199) with some additions; the microscopic description is based largely on the observations by the first author on the collections cited.

The transfer of *Hydropus mediterraneus* to *Flammulina* is necessary because we found that (i) the stipititrama consists merely of longitudinal, septate hyphae ranging in width from 3 to 12 μm and is certainly not sarcodomitic as in *Hydropus* (Singer, 1982: 8; Redhead, 1987: 1557), and that (ii) the pileipellis is an ixohymeniderm with dermatocystidia, a type of pileipellis fitting in well with *Flammulina* but not occurring in *Hydropus* (Singer, 1982: 13).

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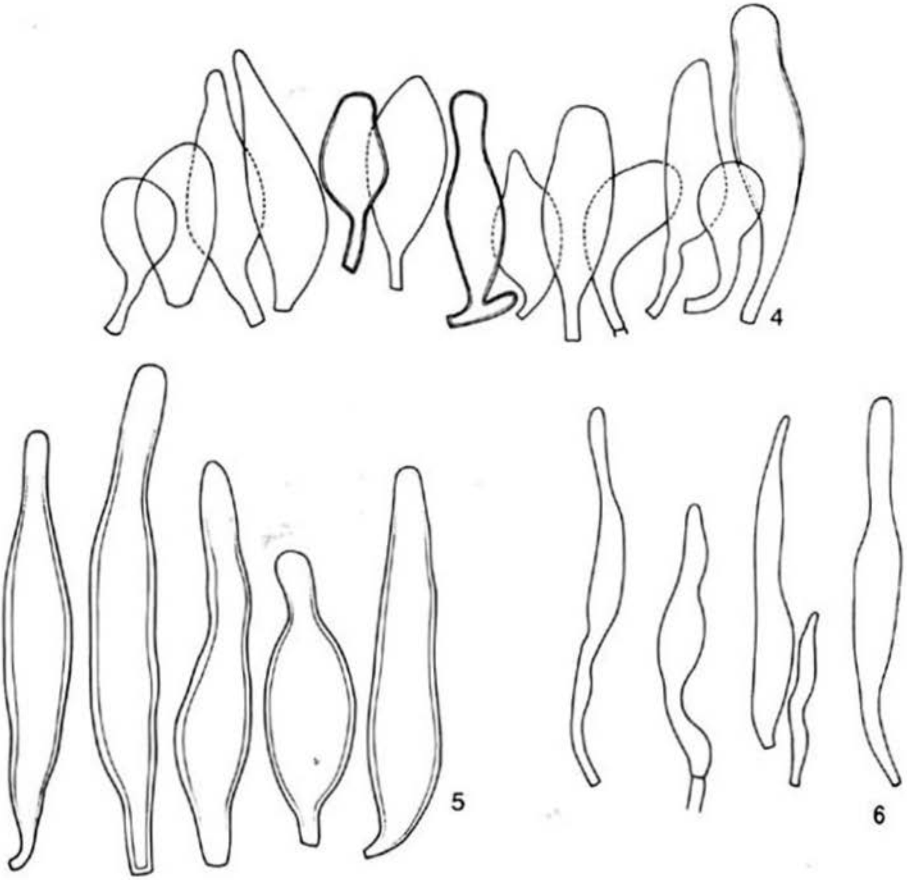
[1] Spores taken from the lamellae of dried material and coloured in aceto-carmine after treatment in Clémençon's mordant often showed irregular dark bodies, but in about 25% two distinct nuclei were present. Apparently in many spores nuclear division was in progress.



Figs. 4–6. *Flammulina mediterranea*. — 4. Cheilocystidia. — 5. Pleurocystidia. — 6. Caulocystidia. (All Figs. × 500.)

In fact, keying out the present species with Singer's key to the tribus of the Tricholomataceae (Singer, 1986: 209) one arrives immediately at tribus Pseudohiatuleae and in the key to the genera of that tribus (because of the viscid pileipellis) at *Flammulina*.

It should be noted, however, that Singer (l.c.: 434) describes the hypoderm of *Flammulina* as gelatinized but does not mention the fact that the pileipellis itself is strongly gelatinized and should be called an ixotrichoderm or an ixohymeniderm according to the shape of its main elements. Moreover it should be mentioned that in his key to the genera of tribus Pseudohiatuleae the hymenophoral trama of *Flammulina* is called weakly 'bilateral'[2] and in his description of that genus weakly and inconsistently 'bilateral'. In the experience of the first author the hymenophoral trama of *Flammulina* is regular to subregular in sporulating basidiocarps and diverging only in very young basidiocarps where this is probably a remnant of the primordial divergency occurring in many agarics.

Among the European species of *Flammulina*, *F. mediterranea* is somewhat aberrant on account of the following characters:

(i) Its pileipellis is not an ixotrichoderm as in *F. velutipes*, *F. ononidis*, and *F. fennae*, but an ixohymeniderm because its main elements are not elongate or dendroid cells as in these three species (Bas, 1983: figs. 4 and 12; Arnolds, 1977: fig. 14), but clavate to spheropedunculate cells. However, *F. callistosporioides* (Sing.) Sing. from South America also has an ixohymeniderm (Singer, 1964: fig. 6).

(ii) The stipe of *F. mediterranea* is not densely pubescent or velutinous as in the other European species, but pruinose only at the apex and glabrescent. But again, the same situation is found in *F. callistosporioides* (Singer, 1964: 183).

(iii) The basidiocarp of *F. mediterranea* tends to become omphalioid, but that does not seem to be of great importance as in *F. velutipes* as well as in *F. fennae* flattened to depressed mature pilei are not uncommon.

(iv) *Flammulina mediterranea* seems to grow on subterranean parts of the grass *Ammophila*, whereas other species of the genus grow always on wood or woody plants. A long root-like base of the stipe can be found also in basidiocarps of the other three European species when they grow on a subterranean substrate.

(v) The spores of *F. mediterranea* are larger (especially wider) than in any other species of *Flammulina*.

On account of the large spores and basidia and the presence of a pseudorhiza one might be tempted to transfer *Hydropus mediterraneus* to the genus *Xerula* (sensu Dörfelt = including *Xerula radicata*) instead of to *Flammulina*. In *Xerula*, however, the context of the stipe is sarcodimitic (except in the very tiny *X. kuehneri*, see Boekhout & Bas, 1986: 51), there is intracellular pigment in the cells of the pileipellis, and the pileipellis is a denser, more regular hymeniderm.

ACKNOWLEDGEMENT

We thank Mr. G. Pacioni (L'Aquila, Italy) for putting valuable material of *F. mediterranea* at our disposal.

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[2] In accordance with Reijnders (1963: 263) we prefer here the term 'divergent' and wish to preserve the term 'bilateral' for the secondary divergency of the hymenophoral trama in *Amanita*.

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AURICULARIOPSIS AND THE SCHIZOPHYLLALES

J. A. STALPERS

*Centraalbureau voor Schimmelcultures, Baarn**

The cultural characters and the development of the basidiomes of *Auriculariopsis ampla* (Lév.) Maire are described and compared with those of *Schizophyllum commune* Fr.: Fr. It is concluded that *Auriculariopsis* is very close to *Schizophyllum* and that the existence of the order Schizophyllales is not justified.

Auriculariopsis ampla (Lév.) R. Maire is a rather rare species in Europe, but locally it can be quite common, for example in the more southern coastal sand dunes of the Netherlands. Its substrate is generally twigs of *Populus*, but occasionally *Salix*; there is one report from *Rubus* (Donk, 1959).

In the older literature this species occurs almost uniformly under the name *Cytidia flocculenta* (Fr.) Höhn. & Litsch. Donk (1959) doubted that *Thelephora flocculenta* Fr. really was this species and Eriksson & Ryvarden (1975) found that authentic material contained *Cylindrobasidium evolvens* (Fr.: Fr.) Jülich.

METHODS

Isolates were grown in plastic Petri dishes on neutralized 2% malt agar (MEA) and cherry decoction agar (ChA) at room temperature (18–20° C) in diffuse daylight. Drop tests on laccase and tyrosinase were performed as described by Käärik (1965) and Stalpers (1978). Preparations for scanning electron microscopy were made according to Samson et al. (1979).

CULTURAL CHARACTERS OF AURICULARIOPSIS AMPLA

Growth on MEA rather fast, reaching 25–35 mm radius in 2 weeks, on ChA up to 40 mm. Odour insignificant. Advancing zone appressed to submerged, with irregularly undulating outline; hyphae dense. Mycelial mat 1–2 mm from the margin, cottony-woolly to floccose, white. Around the inoculum the mycelium is thinner, cottony. After four weeks the colony is locally woolly to felty, or floccose-cottony, up to 2 mm high, in other spots appressed, occasionally zonate. After four weeks the colour is generally white, but the felty spots may show some light orange-brown tints. On these spots basidiomata may develop. Reverse unchanged. Reaction with α-naphthol negative, with p-cresol positive. Cardinal temperatures for growth: minimum 4° C, optimum 26–27° C, maximum 34° C.

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* Address: P. O. Box 273, 3740 AG Baarn, Netherlands.

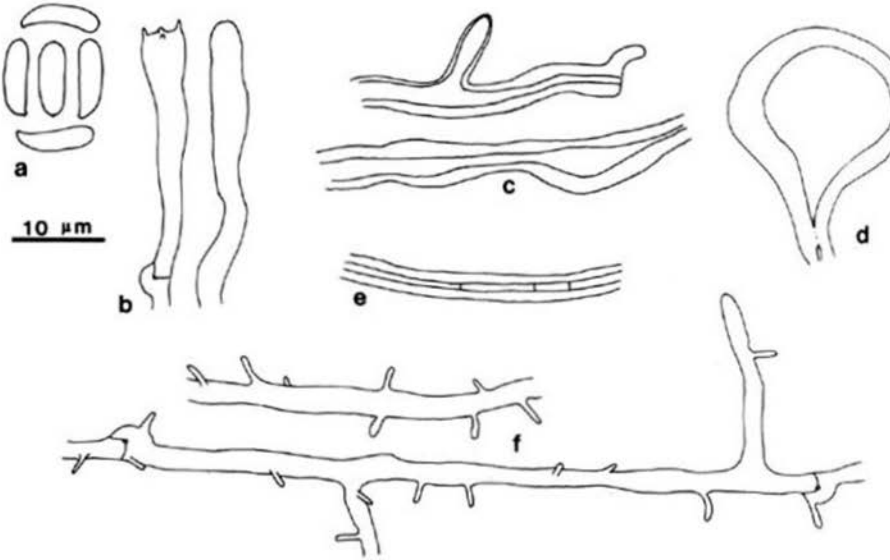

Fig. 1. *Auriculariopsis ampla*. — a. Basidiospores. — b. Basidia. — c. Thick-walled hyphae. — d. Hyphal swelling. — e. Thick-walled hypha with secondary septa. — f. Generative hyphae with spines.

Marginal hyphae hyaline, thin-walled, often slightly wavy, 2–4.5 µm wide. Clamps present at all primary septa, often sprouting. Diameter of clamp smaller than or equal to the hyphal width. Branching frequent, somewhat irregular; branches often rather short. Cells short, generally less than 70 µm long, but occasionally in straight hyphae reaching up to 200 µm. Crystals absent.

Aerial hyphae in floccose mycelium hyaline, thin- to slightly thick-walled, 2–3.5 µm wide, with clamps at every septum, often covered with granular material. Later also wider hyphae occur, 3–6.5 µm wide, with prominent clamps. Spinulose projections (Fig. 1f) are often present. Crystals present, long.

Submerged mycelium tough. Hyphae hyaline, thin- to thick-walled (wall up to 0.5 µm thick, swelling in KOH), 2–6.5 µm wide.

Young basidiomes produced in vitro are stalked, about 1 mm high, terminating with a cup-shaped structure, 0.3–0.6 mm diam. (Fig. 2a, b). Both stipe and cup are covered on the outer surface with slightly reflexed white to greyish hairs. The stipe stops growing, but the cup expands. Further development is dependent on the orientation. If the agar surface is not facing a light source, the cup will grow out to form a flattened disc, partly attached to the substratum, which may become up to 8 mm in diam. (Fig. 2c). The hymenial surface remains even, the margin of the disc is appressed or slightly recurved.

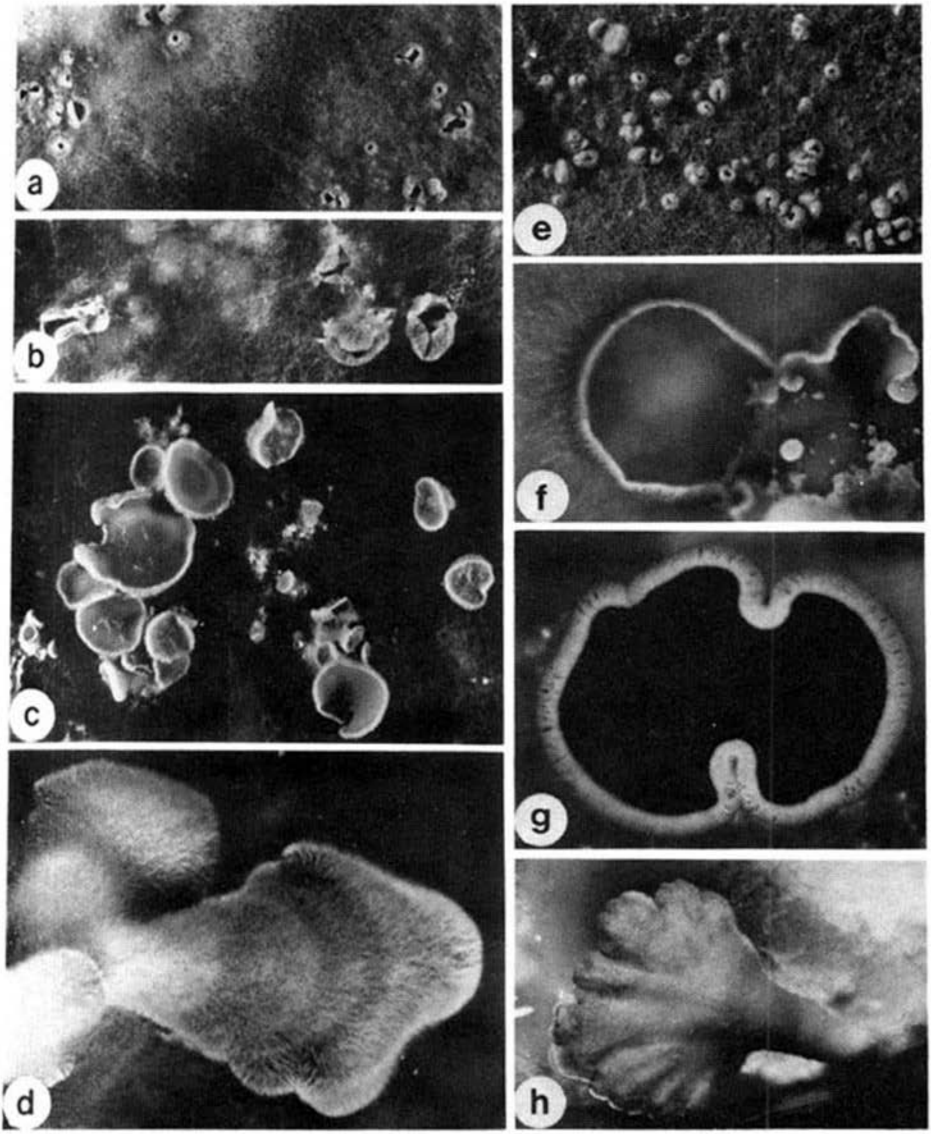

Fig. 2. Development of basidiomes of *Auriculariopsis ampla* (a–d) and *Schizophyllum commune* (e–h). — a, b, e. Young cup-shaped to cyphelloid basidiomes. — c, f, g. Young discoid basidiomes with already mature basidia. — d, h. Well-developed basidiomes.

If the agar surface is facing a light source (for example when the fungus grows on a vertical substrate), then the basidiome will become cupulate to semiglobose (Fig. 2d). The final result will always be a structure with a downward facing hymenium. In this type of basidiome the hymenium may become ridged. The tomentum of the abhymenial surface is white at first, but becomes greyish white or more rarely pale greyish brown. The hymenium is originally cream-coloured to light orange-yellow, but later it becomes pale ochraceous to cinnamon and even reddish brown, especially in dry conditions. In fresh condition the hymenium is ceraceous; when dry the basidiome shrinks strongly, curls inward (protecting the hymenium) and becomes paper-thin.

The abhymenial tomentum consists of hyaline to slightly yellowish thick-walled hyphae, 2–3.5 µm wide, (wall up to 1 µm thick), only occasionally branched, not gelatinized, septate. Clamps do occur, albeit rarely. Sometimes empty and collapsed clamps were observed on perfectly healthy hyphae. The tramal hyphae are thin- to slightly thick-walled, 2–4.5 µm wide, gelatinized or embedded in mucus, in more or less parallel arrangement, septate, with clamps at nearly all septa. Branching is frequent, but the side-branches are usually rather short. Some hyphae display swellings, 5–8(–20) µm wide. The wall of the tramal hyphae swells strongly in KOH and then becomes up to 2.5 µm thick.

The hymenium consists of cylindrical basidia, 22–40 × 3.5–4.5 µm, with four rather short sterigmata (0.8–2 µm long) and with a clamp at the base. Brown resinous material often present between the basidia. The spores are hyaline, thin-walled, cylindrical and often slightly curved, somewhat attenuating towards the small apiculus, (6–)7.5–9(–10) × (2–)2.5–3 µm. The spore print is white at first, becoming cream coloured with age.

Hyphal cells and spores are binucleate. The species is tetrapolar (bifactorial).

Species code of Stalpers (1978): 2, (8), (11), 13, 15, (19), 21, 22, 25, (29), 30, (32), (34), 39, 42, (44), (45), 48, 52, 53, 54, 59, (80), 82, 88, 89, 94, 95, 98.

Species code of Nobles (1965): 1, 3, 20, 32, 36, 38, 43, 48, 54, 60.

Material examined. — Living strains: *CBS 182.83*, from branch of *Populus* lying in pear orchard, Netherlands, prov. Zeeland, Zeeuws Vlaanderen, leg. & det. J. A. Stalpers; *CBS 285.88*, from *Populus*, Netherlands, prov. Utrecht, Bunnik. — Herbarium material: NETHERLANDS: prov. Zuid-Holland: Wassenaar, 'Meijendel', 30 Oct. 1955, *M. A. Donk 11055*, on fallen rotten branches of *Populus* (L); Wassenaar, 'Bierlap', 23 Oct. 1952, *R. A. Maas Geesteranus* (Donk 11206), on fallen branches of *Populus tremula* (L); prov. Zeeland, 's Gravenpolder, Koedijk, date unknown, *W. D. J. Kuijs* (herb. Kuijs).

The data in the literature (Bourdot & Galzin, 1928; Donk, 1930; Møller, 1942; Eriksson & Ryvarden, 1975) agree with the present description of the basidiomes, but two remarks have to be made. In the Dutch material the spore length is in average shorter: the maximum size rarely exceeds 9.5 µm, while in the literature a maximum of 10.5 µm is normal and extremes up to 12 µm are known. The descriptions in the literature always mention ridges on the hymenial surface, but some specimens had a perfectly even hymenium, while others displayed ridges.

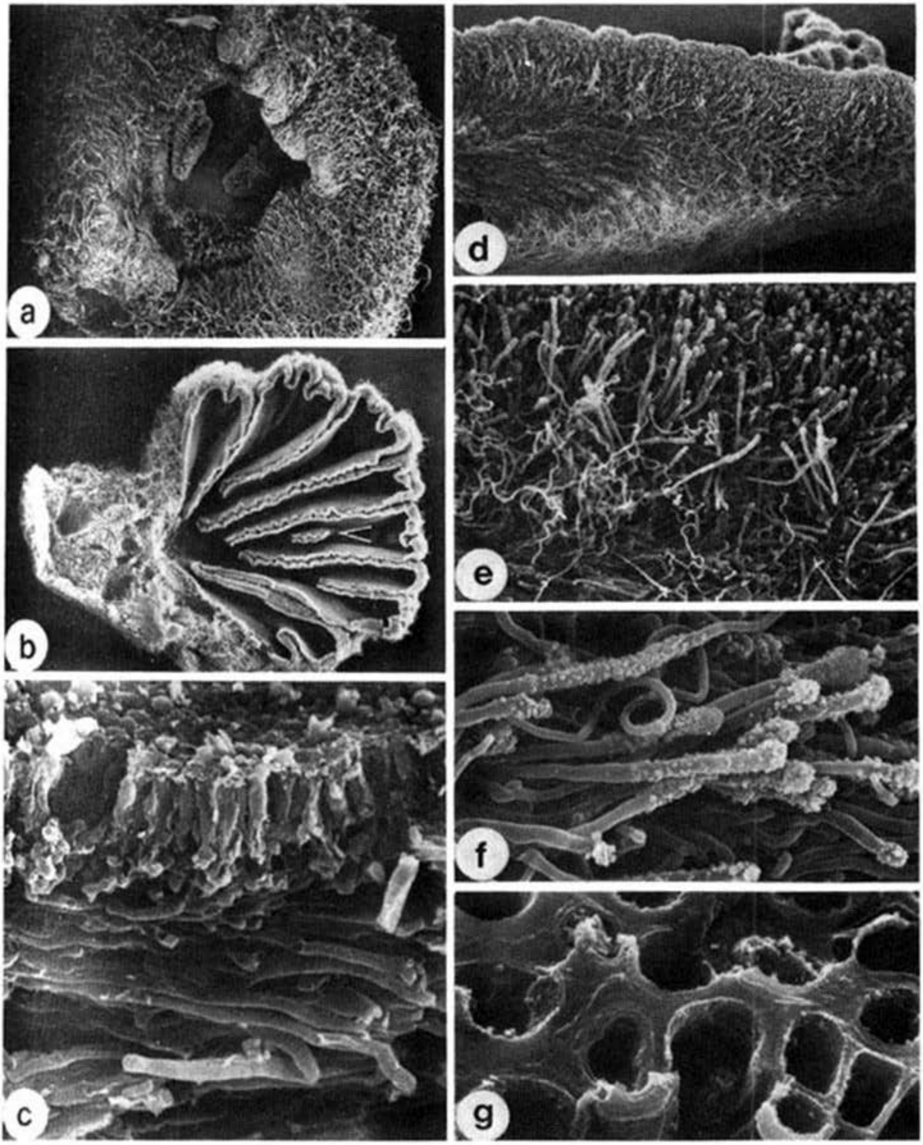

Fig. 3. *Schizophyllum commune*. — a. Basidiome with young, centrally developing gills. — b. Mature basidiome with invaginated and centrally developing (arrow) gills. — c. Section through hymenium, subhymenium and upper trama. — d–f. Basidiome sectioned through split lamella. — d. Overview, showing from top to bottom inner side of split, gelatinized hyphae and abhymenial hairs. — e. Detail of inner side of split with encrusted hyphae. — f. Detail of encrusted hyphae. — g. Gelatinized hyphae of basal layer.

Traditionally (Léveillé, 1848; Bourdot & Galzin, 1928; Donk, 1930) the relatives of *Auriculariopsis* are sought in the cyphelloid basidiomycetes. More recently this has been doubted: *Phlebia*-like genera, like *Merulius* s. str., are now considered as most closely related (Donk, 1959; Eriksson & Ryvarden, 1975).

Very closely related is certainly *Cytidiella* Pouzar, like *Auriculariopsis* a monotypic genus. Pouzar (1954) mentioned the absence of gelatinized hyphae in *Cytidiella melzeri* Pouzar as the only important difference between the genera, but Eriksson & Ryvarden (1975) demonstrated gelatinized hyphae in *C. melzeri*. They retain *Cytidiella* on the basis of another character, the presence of a basal layer parallel to the substratum consisting of non-gelatinized, thick-walled hyphae in *Auriculariopsis* and the absence of such a layer in *Cytidiella*. However, there are several natural genera within which both situations exist, for example *Amylostereum* Boidin or *Peniophora* Cooke. *A. chailletii* (Pers.) Boid. and *P. limitata* (Fr.) Cooke have a distinct parallel layer of often thick-walled hyphae, while *A. laevigatum* (Fr.) Boidin and *P. cinerea* (Fr.) Cooke lack such a layer completely. Moreover, *C. melzeri* displays a kind of rudimentary parallel layer in which the hyphae are less thick-walled than in *Auriculariopsis ampla*, have several clamps and are not gelatinized.

The presence of a basal layer parallel to the substratum is connected with the potential of the basidiome to become partly free from the substratum. The above-mentioned species of *Amylostereum* and *Peniophora* with such a layer generally have a rolled-up or even reflexed margin, while the species without such a layer remain strictly effused and even have no loosening margins. The basidiomes of *Auriculariopsis* are distinctly cup-shaped, while those of *Cytidiella* are more disc-shaped with a revolute margin. These features do not seem sufficient to maintain *Cytidiella* as generically distinct from *Auriculariopsis*. (See note added to the Proof on p. 504.)

The observations made from pure cultures certainly do not exclude a relationship with *Merulius* s. str. and relatives, although these species show an astatocoenocytic behaviour and are unifactorial (bipolar), while *Auriculariopsis* has a normal behaviour and is bifactorial (tetrapolar).

The relationship of *Auriculariopsis* with *Schizophyllum commune* Fr.: Fr. is, however, much closer. Traditionally from Fries until Singer (1962), the genus *Schizophyllum* has been considered to belong to the Agaricales, simply because it has gills. In recent years its affinities were thought to be in the Aphyllophorales, because the ontogeny of the gills proved not to be homologous with the lamellae of the Agaricales, and the texture of the basidiome also was aberrant. So Donk in his conspectus of the families of the Aphyllophorales (1964), restored the family Schizophyllaceae Roze, and considered *Stromatoscypha* as possibly the closest relative, a view shared by Wessels (1965). The reason for this was, that a basidiome of *Schizophyllum* was thought to be composed of several cups, developing on a common stroma, an idea that may have originated from a cross section through a basidiome (cf. illustration of Watling, 1973).

Nuss (1980) correctly considered *Scytinostroma* as unrelated with *Schizophyllum* and erected the order Schizophyllales, with a single family and a single genus.

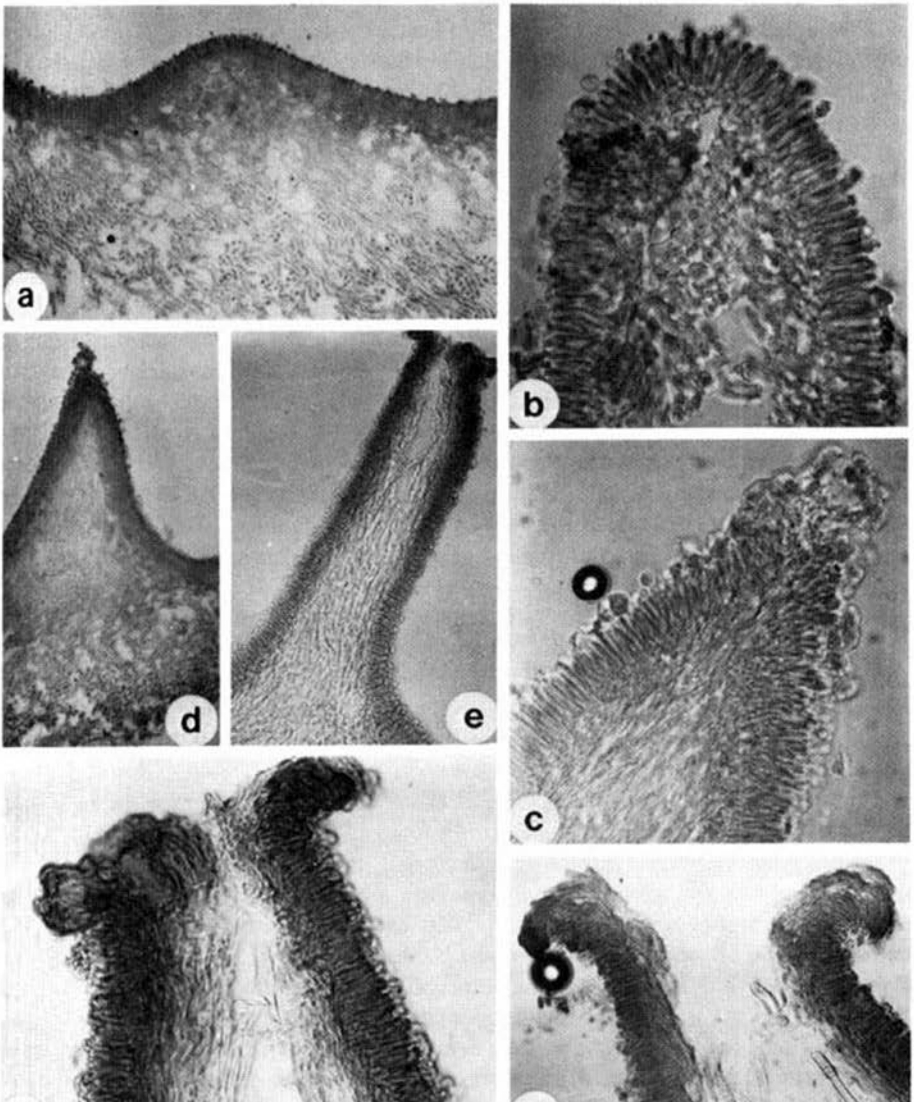

Fig. 4. *Schizophyllum commune*, development from ridge to gill. — a. Young ridge. — b. Older ridge. — c–d. Beginning of splitting, crystalline material present at apex. — e–f. Actual splitting. — g. Split gill with incrusted hyphae.

Jülich (1981) more or less adopted Donk's concept, but accepted the order Schizophyllales. On several places he mentioned a relationship with the Lentinaceae, but did not give any reasons. I am not aware of any argument in favour of this theory.

The development of a basidiome of *Schizophyllum*, however, does not support the theory of a common stroma, but points towards a close relationship with *Auriculariopsis*. In fact it is identical with it, up to the formation of ridges (Fig. 2e–h). Figs. 3a, b clearly show, that there are two ways in which a split lamella can be formed. As already indicated by Donk (1964) the first consists of a marginal invagination (Fig. 2h), or the development of lobes, which elongate with further growth, resulting in a lamella. The other mode in which a gill can be formed starts with a central development of a ridge somewhere on the existing hymenium. This ridge grows – at first mainly by expansion of the subhymenium, later there is also tramal growth – until it reaches a certain height and then splits. The series of sections illustrated in Fig. 4 shows what happens during the splitting process. A peculiar type of hyphae with terminal encrustations occurs on the surface of the exposed split (Fig. 3e, f; Fig. 4g), which was earlier reported by van der Valk & Marchant (1978) from the edge of the basidiome initial. This observation may serve as an argument, that the hyphae of the split lamellae are homologous with the abhymenial hairs.

It is considered unlikely that both ways of the gill development are fundamentally different (they cannot be distinguished morphologically). The early development of the latter type agrees completely with ridge formation as seen in for example *Phlebia*, *Merulius* and *Auriculariopsis*, up to the actual splitting of the ridge. The idea of non-homology of *Schizophyllum* gills with ridges as defended by Watling (1973), has to be abandoned.

Colony morphology and microscopical characters are similar in *Schizophyllum* and *Auriculariopsis*. Like *Schizophyllum*, *Auriculariopsis* has cylindrical binucleate basidiospores; as both species are tetrapolar (bifactorial), the two nuclei are genetically identical. Colonies of the various mating types are morphologically distinguishable as was already known from *Schizophyllum* (Wessels, 1965) and they display a similar unpleasant odour. The occurrence of the peculiar hyphae with spines was so far only known in *Schizophyllum* and a sterile culture displaying them was automatically identified as *Schizophyllum commune*. This view is no longer true as the same kind of spinose hyphae may also occur in *Auriculariopsis*. Like *Schizophyllum*, *Auriculariopsis* is very resistant against drought. The capacity of reviviscence lays in the tramal hyphae which are slightly gelatinized or embedded in gelatinous material, which prevents drought damage. Normally, however, basidiomes of both species live long, but not more than a year.

In fact the only difference between the genera is the more pronounced development and splitting of the gills in *Schizophyllum*.

In the literature there is one further fact, that may point towards a possible relative of *Schizophyllum*. Breitenbach & Kränzlin (1986, Fig. 230) illustrate a specimen of *Lachnella alboviolascens* (Alb. & Schw.: Fr.) Fr., showing 'insel-artige Wucherungen' that are strikingly similar to developing lamellae of *Schizophyllum* as illustrated in Fig. 3a). The microscopical details given by the authors exclude a misidentification with this species. However, a specimen of the closely related *L. villosa* (Pers.: Fr.) Gillet, collected and isolated from the Netherlands, showed neither the spines nor other *Schizophyllum*-like characters.

The evidence presented here indicates that *Schizophyllum commune* can no longer be seen as an outsider in the basidiomycete system. The evidence for a developmental line from *Cytidiella* to *Auriculariopsis* and finally *Schizophyllum* is too convincing. A separate order Schizophyllales is not considered justified, and the family Schizophyllaceae should also include *Auriculariopsis* (and, if retained, *Cytidiella*). The family Auriculariopsidaceae proposed by Jülich (1981) is certainly superfluous. If *Merulius* is ever considered to belong to the same family as *Auriculariopsis*, Schizophyllaceae Roze (1876) has priority above Meruliaceae Rea (1922).

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NOTE ADDED TO THE PROOF

After the submission of the manuscript additional material of *Cytidiella melzeri* from Sweden could be examined. This fully supported the close relationship with *Auriculariopsis ampla* and thus a new combination is proposed: **Auriculariopsis melzeri** (Pouzar) *comb. nov*. (basionym: *Cytidiella melzeri* Pouzar, Česká Mykol. 8: 129. 1954).

Material examined. — SWEDEN: Upland, Svartsjölandet, Hillersjö, 30 Apr. 1905, L. Romell 2872½, on *Pinus silvestris*; Södermanland, Södertälje, 1 June 1949, Ph. Johansson (Fungi suecici 8720), on dry branch of *Quercus robur*.

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BOOKS RECEIVED BY THE RIJKSHERBARIUM LIBRARY

R. Agerer. *Colour atlas of ectomycorrhizae* [Fasc. 1]. (Einhorn-Verlag Edward Dietenberger GmbH. Schwäbisch Gmünd. 1987.) Pp. 58, including 20 Half-tone and 10 Col. Pls., loose-leaf system in binder. Price: DM 40.-.

The increasing interest in and importance of ectomycorrhizae make it more and more desirable that ectomycorrhizae taken from the soil can be identified. In this loose-leaf colour atlas, expected to contain 200–300 plates in the future, each mycorrhiza treated is illustrated on one plate with four good colour photographs and in addition on two plates with black-and-white microphotographs of the structures seen at the surface and in sections of the mycorrhizae. In this first fascicle 10 species are being analyzed, viz.: 2 Russulas, 4 Lactarius, 2 Dermocybes, and 2 Tricholomas. In the introductory part an identification key and a glossary are given.

L. Hagara. *Atlas hùb*. (Vydavatel'stvo Osveta, Martin (Czechosl.) 1987.) Pp. 467 including 187 Col. Pls. Price: Kčs 80.-.

A well-edited Czechoslovakian mushroom guide presenting 270 rather good to good coloured photographs of mainly common, but also quite a few uncommon Central European macrofungi, mostly boleti and agarics but also some Ascomycetes, Gastromycetes and Aphyllophorales.

Among the less frequently depicted species are: *Verpa bohemica, Clavariadelphus flavo-immaturatus, Boletus edulis* subsp. *discolor, Boletus fragilipes, Hygrophorus fagi, H. atramentosus, Flammulina fennae, Lyophyllum paelochroum, L. crassifolium, Agaricus altipes, Lactarius pinicola, Russula galochroa, R. cremeoavellanea, R. mollis.*

P. Konrad & A. Maublanc. *Icones selectae Fungorum.* Vol. VI. Texte général. (Reprint edition. Libreria editrice Giovanna Biella, Saronno (It.). 1987.) Pp. 558. Price: Lire 110.000.

With the appearing of the sixth volume, the endeavour to publish a reprint edition of the famous fungus atlas of Konrad & Maublanc has come to a successful end exactly on schedule.

The whole work has been reproduced with much care, is printed on heavy glossy paper and is handsomely bound in red artificial leather.

The price is relatively low and brings this 'classical' mycological work again within the financial reach of institutes, mycological societies and amateurs building up a private mycological library.

M.M. Nauta. *Revisie van de in Nederland voorkomende soorten van het geslacht Agrocybe* (Rijksherbarium, Leiden. 1987.) Pp. 168, including 52 Text-figs. and 13 Distrib. Maps. Price: Dfl. 10.-.

In this revision, written in the Dutch language, 12 species and 1 unidentified taxon of *Agrocybe* found in the Netherlands are extensively described and copiously illustrated with line drawings of habit and microscopic characters including those of hymenophoral trama and pileipellis. Much attention is paid to the variability of the taxa. Distribution maps of the concerning taxa in the Netherlands are provided.

M.E. Noordeloos. *Entoloma (Agaricales) in Europe*. (J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung, Berlin-Stuttgart. 1987.) Pp. 419, 128 Text-figs. Price: DM 280.-.

The main part of this impressive work on the genus *Entoloma* consists of European monographs of the *Leptonia*-like species, viz. the subgenera *Trichopilus, Inocephalus, Alboleptonia, Leptonia, Paraleptonia*, and *Omphaliopsis*, altogether 95 species.

These monographs are preceded by keys in English and German to all the c. 225 European species of *Entoloma* known to the author and a synopsis in which for all these species the correct name, synonymy, and references to selected descriptions, illustrations and icones are given (except for the taxa treated in the monographs). In an appendix to the synopsis descriptions and notes are presented on 18 taxa (10 of which are new) that belong to other subgenera than those monographed. All species fully described are illustrated by line drawings. A long list (50 pages) of insufficiently known and excluded taxa is added.

R.H. Petersen. *The clavarioid fungi of New Zealand*. (DSIR Science Information Publishing Centre, Wellington. 1988.) Pp. VII + 170, 143 Text-figs., 4 Col. Pls., 2 Microfiches representing 113 Col. Slides. Price: $ 48.95.

Three visits of the author to New Zealand resulted in this monograph of the ascending clavarioid fungi of that country. The material has been collected mainly in *Agathis, Nothofagus* and *Podocarpus* forests. Descriptions and illustrations are given of 121 taxa, including 53 new species and 6 new varieties, in 11 genera, one of which is newly described (*Setigeroclavula*). For practical reasons some genera, e.g. *Typhula* and *Pistillaria* have been omitted. The four colour plates are watercolours by Mary Taylor representing 15 species.

At first sight it looks as if none of the new species and varieties are validly published, as no types are mentioned in the protologues, as is usually done. The types are indicated, however, at the end of the book in an enumeration of the specimens examined.

A.Y. Rossman, M.E. Palm & L.J. Spielman. *A literature guide for the identification of plant pathogenic Fungi*. (American Phytopathological Society Press, St. Paul, Minnesota. 1987.) Pp. 252. Price: $ 30.00 ($ 24.00 inside U.S.A.).

The purpose of this guide is to bridge the gap between the worldwide mycological literature on plant pathogenic Fungi and those who wish to use it. This is stated in the introduction of this very practical book and this purpose seems well served.

The first five pages are filled with a list of general identification literature of the larger groups, particularly of orders. The bulk of the book consists of a list of references to such literature alphabetical by genus, followed by indexes to authors and generic names.

Each generic entry consists of the correct name with up-dated author citation, the name of the order to which the genus belongs, the number of species described, a list of taxonomic references alphabetical by the author names, and concise general information on the plant pathogenic activities of the genus.

R. Singer & B. Harris. *Mushrooms and truffles*. Botany, cultivation, and utilization, 2nd Ed. (Koeltz Scientific Books, Koenigstein. 1987.) Pp. 389, 4 Text-figs., 29 Half-tone Pls., 4 Col. Pls. and 6 Tables. Price: DM 120.-.

A second and enlarged edition of Singer's well-known book on the cultivation of edible fungi. The original text has been altered only very slightly. The book is rendered up to date by an appendix written by the second author in which the latest results of mushroomgrowing research on *Agaricus bisporus, Volvariella volvacea, Lentinus edodes*, truffles, and various other fungi are compiled. The bibliography has grown considerably.

K. Vánky. *Illustrated genera of smut fungi*. (Cryptogamic Studies 1. Gustaf Fischer Verlag. Stuttgart & New York. 1987.) Pp. VII + 159, 62 Pls. Price: DM 68.-. (DM 61.20 for subscribers to Cryptogamic Studies.)

A concise introduction to morphology, life cycles, systematics, and phylogeny of the Ustilaginales is followed by a key to the accepted genera. The main part of the book consists of descriptions and synonymy of the accepted and a few not definitely accepted genera, 55 altogether, and of one species of each of these genera. Each of these species is also represented on a usual full page plate mostly including drawings of the infection symptoms on the host, SEM and/or LM photographs of the spores, illustrations of spore germination, etc.

This book will prove to be a great help to all mycologists who have to or like to identify plant pathogenic fungi.

R. Watling & N. M. Gregory. *Strophariaceae & Coprinaceae p.p.* (British Fungus Flora 5. Royal Botanic Garden, Edinburgh. 1987.) Pp. 121, 104 Text-figs. Price: £ 9.- (including postage; £ 8.50 in U.K.).

In this fifth part of the well-known British Fungus Flora keys to and description of the c. 75 British representatives of the genera *Hypholoma, Melanotus, Psilocybe, Stropharia, Lacrymaria*, and *Panaeolus* are given. The genera *Pholiota* and *Kuehneromyces* are excluded from the Strophariaceae. A selection of drawings of habit, spores, cystidia, and other structures relating to more than half of the species treated are gathered on 8 full-page plates at the back of the book. An ecological list of species, an index to the most important synonyms and misidentifications, and an enumeration of rejected names are added. A key to hallucinogenic species of the Strophariaceae and descriptions of the extralimital *Psilocybe cubensis* and *Copelandia cyanescens* are supplied for forensic purposes.

V. Wirth. *Die Flechten Baden-Württembergs*. (Verlag Eugen Ulmer GmbH & Co., Stuttgart. 1987.) Pp. 528, 408 Col. Pls., 860 Distrib. Maps. Price: DM 78.-.

A very well edited and richly illustrated survey of the lichens of Baden-Württemberg, the most south-western state of West Germany. The genera are treated in alphabetical order. For each genus an enumeration of the indigenous species is followed by a concise description of the genus, an account of the ecology and distribution of its species and observations on decrease or increase of their populations. The maps represent the distribution data on c. 1000 species. The coloured photographs are of excellent quality.

The introductory chapters (c. 30 pp.) contain a description of the mapping method used, elaborate data on geology and climate with maps, discussion on changes in distribution patterns with emphasis on the decrease of populations of many species and the nature conservation aspects of these phenomena.

It is to be expected that this book, that many will buy just for the sheer beauty of its illustrations, will have a great positive effect on the general interest in lichens in Europe.

J.E. Wright. *The genus Tulostoma (Gastromycetes) — A world monograph*. (Bibliotheca mycologica 113. J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung. Berlin & Stuttgart. 1987.) Pp. 338, 156 Text-figs., 50 Pls. Price: DM 160.-.

The rather surprisingly high number of 139 species of *Tulostoma* are extensively described in this respectable world monograph, which is the result of research that stretched over a period of 30 years and included the analyses of thousands of specimens from the most important herbaria of the world.

The genus is subdivided into two subgenera, viz. subgenus *Tulostoma* with 10 sections and subgenus *Lacerostoma* nob. with 1 section. Unfortunately the term series is incorrectly used for a rank between subgenus and section where the term supersection would have been better.

The systematical arrangement of the species is given in a synopsis but in the descriptive part of the book the species and lower taxa are treated in alphabetical order, which makes it necessary to consult the index of the book or to scan the synopsis in order to find out where in the genus the concerning species is classified.

Collections examined are cited. Of most species a drawing of spores and capillitium is presented, whereas a great number of SEM photographs demonstrate the taxonomic value of spore ornamentation in *Tulostoma*. Photographs of types and other specimens of many species are added.

INDEX

New names are in **bold-face** type. Subdivisions of genera are indicated by the sign §, illustrations by an asterisk (*) added to the page number.