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ON THE IDENTITY OF THE NEW TAXA OF GALERINA (AGARICALES), PROVISIONALLY DESCRIBED BY J.J. BARKMAN[1]

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Descriptions are presented of thirteen species and five varieties of *Galerina*, provisionally described as new by the Dutch mycologist J.J. Barkman in 1969 and 1970. The descriptions and illustrations are based on the original descriptive notes and our own study of microscopic characters. The study was hampered by the poor condition of most exsiccata. Nevertheless, the majority of the provisional taxa could be identified as belonging to species described before.

Four provisional species could not be identified with certainty, but they show so much resemblance to existing species that there is no reason to consider them as new taxa. One provisional species, *G. anomala*, is strongly deviating from other *Galerina* species and does probably not belong to that genus. Its identity remains unknown. In addition, our study revealed useful information on the taxonomic significance and variability of some diagnostic characters in *Galerina*.

Jan Barkman was a Dutch ecologist and phytosociologist with special interest for cryptogams in vegetation science. He introduced the discipline of mycosociology in the Netherlands and made it flourish (Barkman, 1976a, 1987). Together with his assistant B. de Vries he carried out extensive mycosociological studies in juniper scrubs in north-western and central Europe, of which only parts of the results have been published (Barkman, 1976b; de Vries, 1973, 1976; de Vries & Arnolds, 1994).

During this research he developed a special interest in the small brown-spored agarics of the genus *Galerina* Earle, at that time a strongly neglected group in Europe. Juniper scrubs appeared to be a particularly rich habitat for these fungi. In 1969 Barkman published a survey of the genus *Galerina* in the Netherlands in the form of a key with short descriptions and drawings of microscopical characters. Although this publication was written in Dutch, the paper has also been used and quoted by foreign European agaricologists (e.g. Bon, 1992; Watling & Gregory, 1993). In his 1969 paper Barkman described also 17 taxa as provisionally new, deliberately without a Latin diagnosis or reference to (type) collections. In 1970 he added some comments to his earlier survey and he again introduced one new provisional species without formal description. In the herbarium of the Biological Station at Wijster (WBS) several other collections are present with a provisional name on the label, which have never been published in any paper.

Barkman died unexpectedly in 1990, without having validly published any of his *Galerina* taxa. In this paper we attempt to clarify the identity of the taxa, provisionally described as new in Barkman's 1969 and 1970 papers, based on our re-examination of the collections at Wijster and the extensive notes by Barkman on the fresh sporocarps. We have not yet studied the taxa which were not described in his papers, but indicated as new on herbarium

1) Communication no. 598 of the Biological Station Wijster.

labels only. In some cases collections are also available, which were identified by other persons as belonging to one of Barkman's provisional species. In general we did not examine these collections either. All collections cited are preserved in WBS.

The investigation of the exsiccata of *Galerina* was hampered by two main problems. First, many collections remained after collecting in the refrigerator for some days, sometimes over one week, before they were examined (communication by B. de Vries). Therefore many sporocarps have been studied and preserved in bad condition and in some cases we observed evidently abnormal mis-shaped spores, apparently due to a long stay in the refrigerator. Secondly, the collections were dried in a closed stove without sufficient air circulation at 40°C. By this practice the sporocarps were more cooked than dried and in many exsiccata (almost) all cystidia and cells of other tissues were collapsed. It was often very difficult to find undamaged cystidia and pileipellis structures, even after boiling fragments of the tissues in KOH 5%.

The results of our studies are presented according to the names used by Barkman (1969, 1970) in alphabetical order. Each taxon is described and drawings of diagnostic features are given. The description of macroscopic characters is mainly based on Barkman's annotations on the fresh sporocarps. Four different colour codes were used by him, viz. Séguy (1936), Cailleux & Taylor (without year, in the text indicated as Expo), Kornerup & Wanscher (1978, in the text indicated as K & W) and Munsell (1954). The microscopic characters are derived from our own study of the exsiccata and, when useful, supplemented by observations made by Barkman on the fresh sporocarps. In our comments we compare the characteristics, as noted by Barkman and observed by us, and we try to find an appropriate valid name for the provisionally described taxa.

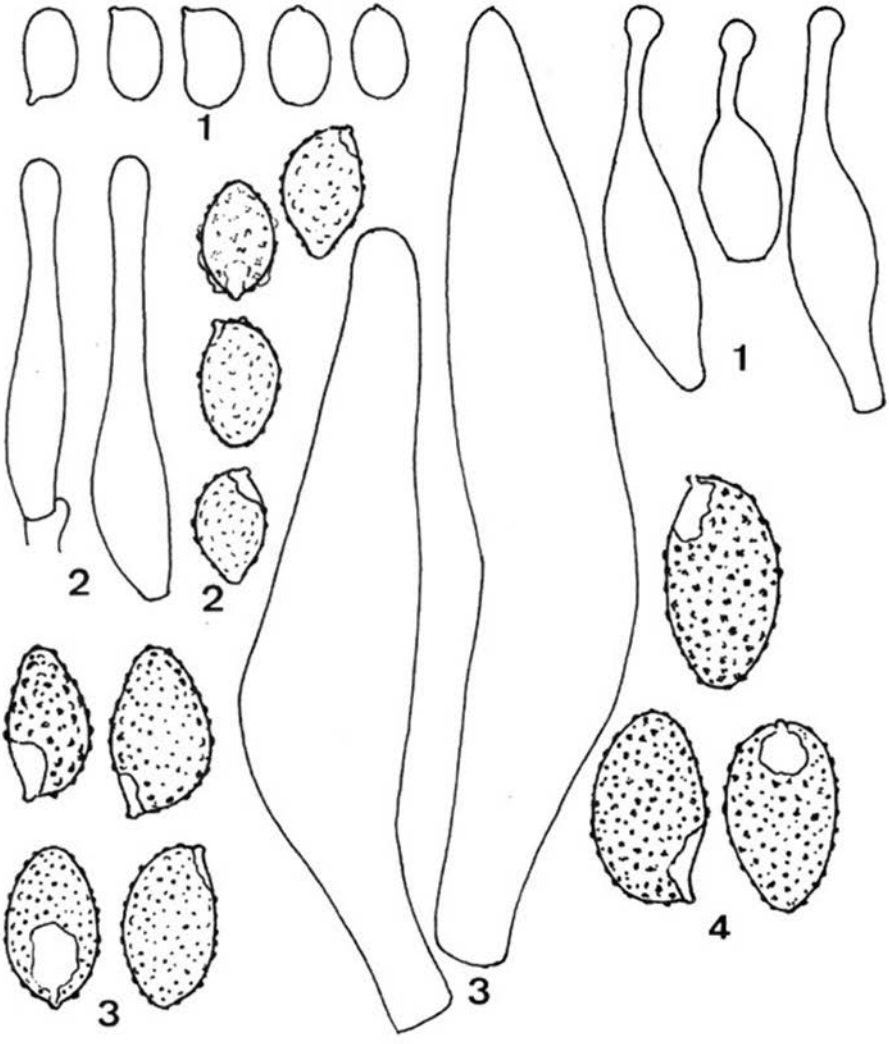
From our study it becomes evident that Barkman's species concept around 1969 was still immature. Collections, labelled with the same provisional name, appear often to belong to several species and sometimes also within a single collection more than one species was found to be present. Most newly introduced names were in our opinion given to atypical or aberrant specimens of widespread, variable species. Only two provisional names in Barkman's publications, viz. *G. dunensis* and *G. fellea*, are considered to represent new species, not described at that time. In the meantime the two species have been formally described already as *G. caulocystidiata* Arnolds and *G. beatricis* Bas, respectively. One other provisional species, *G. anomala*, is strongly deviating in many respects and does probably not belong to the genus *Galerina*. Its identity remains unsolved.

Our study of these collections has learnt us that some characters in *Galerina* are more variable or less prominent than often assumed. No less than six provisional taxa contained collections or specimens assigned by us to *G. allospora* Smith & Sing., whereas *G. hypnorum* was represented in the material of five provisional taxa.

Galerina acuta Barkman *nom. prov.*, Coolia 14 (1969) 62 — Fig. 1

Identified as: *G. sideroides* (Bull.) Kühner (the collection contains also *G. calyptrata* P.D. Orton).

Pileus 6 mm broad, rather acutely conical, ochraceous yellow-brown, rather long translucently striate, without veil. Lamellae [L = 12–16, l = 1–3] adnexed, subdistant, concolorous with pileus, with white floccose edge. Stipe 45 × 1 mm, cylindrical, apex pale honey yellow, pruinose, downwards honey brown to ochraceous yellow-brown, glabrous except tomentose base (from Barkman's notes).



Figs. 1–4. — 1. '*Galerina acuta*' (= *G. sideroides*), spores and cheilocystidia. — 2. '*Galerina aimaroides*' (= *G.* cf. *hypnorum*), spores and cheilocystidia. — 3. '*Galerina annulata*' (= *G. atkinsoniana*), spores and cheilocystidia. — 4. '*Galerina atkinsoniana* var. *rugosocystis*' (= *G. atkinsoniana*), spores. All × 2000.

Spores 6.5–7.5 × 4.0–4.5(–5.0) µm, Q = 1.55–1.65(–1.75), ellipsoid to ellipsoid-oblong, sometimes laterally flattened, entirely smooth, pale yellow-brown. Basidia 15–23 × 5–8 µm, almost all collapsed, presumably 4-spored (not noted by Barkman). Cheilocystidia abundant, almost all collapsed, 17.5–28 × 5.5–6.5 µm, tibiiform with slender cylindrical

neck, c. 1.5–2.0 µm broad and globose capitulum, 2.8–3.7 µm broad (Barkman: 23–38 × 4.5–6.5 µm, neck 1.0–2.5 µm, capitulum 2.5–3.8 µm). Pleurocystidia absent. Pileipellis according to Barkman made up of thin and smooth, gelatinized hyphae, c. 2.5 µm wide. Clamp-connections present.

Collection examined. NETHERLANDS: prov. Drenthe, Dwingeloo, 'Lheebroekerzand, Reigerplas', in dense scrub of *Juniperus communis*, 4 Nov. 1964, *J. J. Barkman 8009* (WBS).

The collection comprises two sporocarps in rather bad condition. Besides the specimen described above it contains a smaller sporocarp (pileus 5 mm, stipe 20 × 0.6 mm) with amygdaliform spores, 8.5–11.0 × 5.5–6.5 µm, smooth with exosporal blisters near the plage area. It is strongly deviating from the microscopical characters as described by Barkman and evidently belongs to the section *Calyptrospora*, probably to *G. calyptrata* P. D. Orton. The characters of the larger specimen agreed well with the annotations by Barkman. Apparently the two species were confused in the field.

The described fungus clearly belongs to stirps *Sideroides* of subsection *Tibiicystidiae*, characterized by tibiiform cystidia and smooth spores. It comes very close to *G. sideroides* and in Barkman's paper it keys out next to that species. The common diagnostic characters are the absence of a well-developed veil (present in *G. stylifera* (Atk.) Smith & Sing.) and the presence of a viscid, gelatinized pileipellis (absent in *G. camerina* (Fr.) Kühner). Bas (1996) studied the pileipellis in this collection as well and confirmed the existence of a clearly gelatinized layer (unpublished notes on collection). The present collection is slightly deviating from typical *G. sideroides* as described by Smith & Singer (1964) in (1) small dimensions of the sporocarp, (2) more acutely umbonate pileus, and (3) slightly smaller basidia and spores than usual (according to Smith & Singer (1964) 20–40 × 7–8 µm and 7–8.5(–9) × 4–4.5 µm, respectively; according to Derbsch & Schmitt (1987) 25–30 × 6.5–7.5 µm and 6.7–8.2 × 4–4.5 µm). However, these differences are only gradual and we believe that the studied collection still falls within the variation of *G. sideroides*.

Galerina sideroides is a rare species in the Netherlands, much less common than its relatives *G. camerina* and *G. stylifera*.

Galerina aimaroides Barkman *nom. prov.*, Coolia 14 (1970) 62 — Fig. 2

Identified as: *G.* cf. *hypnorum* (Schrank: Fr.) Kühner.

Pileus 3 mm wide, obtusely conical, dirty dark yellow-brown (Expo E66), long translucently striate. Lamellae [L = 9, l = 1] broadly adnate with decurrent tooth, distant, pale yellow-brown. Stipe 13 × 0.6 mm, cylindrical, honey brown, slightly dark brown fibrillose, apex white pruinose (from Barkman's notes).

Spores 8.5–10.5 × (5.0–)5.5–6.5(–7.0) µm, Q = 1.45–1.65, ovoid to slightly amygdaliform, minutely but distinctly warty-rugulose, a few spores with small, wrinkled exosporal blisters, plage mostly not visible, but observed in a few spores. Basidia 24.5–26 × 7–7.5 µm, 4-spored. Cheilocystidia present, but not well reinflating, with rather slender neck, 2–3.5 µm wide, usually weakly subcapitate, apex 3–4.5 µm wide; according to Barkman 32–40 × 3–6.5 µm, neck 1.3–2.5 µm, apex 1.3–4 µm. Hyphae in trama strongly encrusted, with clamp-connections.

Collection examined. GERMANY: Westfalen, Haltern, 'Tannenberg', on rhizome of *Dryopteris carthusiana* in dense scrub of *Juniperus communis*, 16 Nov. 1967, *J. J. Barkman 8621* (WBS).

The description by Barkman was based on a single minute sporocarp. At present half of a fragmented sporocarp in bad condition remains.

In Barkman's key *G. aimaroides* keys out in a group of species without pleurocystidia and with cheilocystidia with a long, thin, often acute neck, side by side with *G. uncialis*. It would be different from the latter species in lack of an annulate veil, entirely rugulose spores (without plage), numerous hyphae without clamp-connections and special substrate. However, we were able to demonstrate the presence of a smooth plage area in some spores and found the clamps to be numerous. We also observed that the cystidia were less slender than described and depicted by Barkman, and usually subcapitate. We do not think that this fungus is closely related to *G. uncialis*, but to *G. hypnorum*. Both of us observed irregular, wrinkled exosporal blisters in a small proportion (< 10%) of the spores, a feature characteristic of this species. However, the spores are relatively broad for *G. hypnorum* and the cheilocystidia are relatively slender. Nevertheless we believe that this collection represents an extreme variant of this quite variable species. The habitat on fern rhizomes is peculiar, but *G. hypnorum* is known from wood, debris of various herbaceous plants and bryophytes (Arnolds, 1983). The identity of this collection cannot be established with certainty due to the bad condition of the extremely scanty material.

Galerina annulata Barkman *nom. prov.*, Coolia 14 (1970) 144 — Fig. 3

Identified as: *Galerina atkinsoniana* A.H. Smith, possibly an undescribed variety (= *G. annulata* sensu Sing.); also comprising a collection of *Galerina rubiginosa* var. *annulata* Favre (= *G. terrestris* Wells & Kempton).

Pileus 4–8 mm broad, campanulate to conico-convex, hygrophanous, when moist yellowish brown, orange-brown, warm brown (Expo D56, E46, E58, E68) with paler margin, translucently striate up to 3/4 of the radius, drying pale ochre yellow, margin straight, under hand lense pruinose-pubescent, in one collection (*de Vries 793*) in addition marginal zone with arachnoid white remains of veil. Lamellae [L = c. 15, l = 1] adnexed to adnate with decurrent tooth, subdistant, honey-yellow to orange-brown. Stipe 15–25 × 1.5–2.3 mm, cylindrical, orange-brown to reddish brown (Expo F44, E46, E56, E58), entirely pruinose-pubescent, in addition with small white flocks of fibrillose-arachnoid veil and/or thin annulate zone of veil on a variable position, varying from 2 mm below the apex to the lower part of the stipe. Smell and taste not recorded (from Barkman's notes).

Spores 9.5–15(–15.5) × 5.5–8.5 µm, Q = 1.55–1.85(–1.95), ovoid(-oblong) to amygdaliform, entirely verrucose except for the distinct, smooth or minutely punctate plage, yellow-brown in KOH 5%. Basidia 23–26 × 7–9 µm, 2-spored, almost all collapsed in exsiccata. Cheilocystidia numerous, most of them collapsed, 46–66 × 10.5–16 µm, lageniform, gradually tapering towards obtuse or subacute apex, 4.5–8 µm wide, occasionally with brown content or wall near apex slightly thickened. Pleurocystidia difficult to find in exsiccata, collapsed, scattered, according to Barkman and de Vries 41–64(–100) × 11–16.5(–22) µm, similar to cheilocystidia. Pileipellis made up of encrusted, more or less radial hyphae, 5–12 µm wide, in addition with numerous lageniform pileocystidia, according to Barkman measuring 40–78 × 10–16 µm, apex 5–8 µm, similar to hymenial cystidia, sometimes with brown content. Stipitipellis with numerous caulocystidia, similar to pileocystidia. Clamp-connections frequent in trama.

Collections examined. NETHERLANDS: prov. Overijssel, Ommen, 'Stegerveld', on dead grass remains and amongst the moss *Pohlia nutans* in scrub of *Juniperus communis*, 14 Nov. 1969, *B. de Vries 295* (on label indicated as type); prov. Drenthe: Sleen, State Forest Emmen, 'Sleenerzand', in scrub of *Juniperus communis*, 21 Dec. 1970, *B. de Vries* 793; Grolloo, 'De Berenkuil', amongst the mosses *Pseudoscleropodium purum* and *Polytrichum piliferum* on northern side of *Juniperus* scrub, 10 Nov. 1977, *J. J. Barkman 10.091* (all in WBS).

The three collections, described above, are identical in all important diagnostic characters, in particular the presence of pileo- and caulocystidia in combination with a fibrillose veil on the stipe (and in one case also at the margin of the pileus). All of them were labelled as '*G. annulata* n.p.' by Barkman. Collection *B. de Vries 295* has provisionally been indicated as type and comprises three sporocarps in reasonable condition.

A fourth collection in WBS, identified as *G. annulata* by Barkman, is deviating in the lack of pileocystidia. A concise description of this collection reads as follows:

Pileus c. 4.5 mm broad, ochraceous yellow-brown, smooth. Stipe 28–32 × 1.0–1.3 mm, first ochraceous yellow-brown, darkening to reddish brown from the base upwards, entirely pubescent-pruinose, below apex with fugacious white annulus of white fibrils, downwards also with scattered flocks of veil. Spores 10.5–13.5 × 5.5–7.0 µm, verrucose with smooth plage. Basidia 28–30 × 6.5–7 µm, 2-spored. Cheilo- and pleurocystidia lageniform, 44–67 × 5.5–14 µm with neck 4–5.5 µm wide. Pileocystidia absent.

Collection examined. GERMANY: Westfalen, Eiffel, N. slope of Wiwwelsberg, on wood of *Juniperus*, 21 Sept. 1972, *J. J. Barkman 9552* (WBS).

The three collections, described first, are in all respects similar to the widespread 2-spored form of *G. atkinsoniana* A.H. Smith, in particular in the presence of pileo- and caulocystidia and size and ornamentation of spores. The only difference is the presence of veil remains at the stipe and occasionally along the margin of the pileus. Likewise, the fourth collection from Germany seems to be identical with *G. vittaeformis* (Fr.) Sing. except for the presence of veil remnants. *G. atkinsoniana* and *G. vittaeformis* differ only in the abundance, viz. absence or scarcity of pileocystidia. This character is, at least in some regions, intergrading (Arnolds, 1983) and therefore *G. atkinsoniana* is regarded by some authors as a subspecies (Arnolds, 1983) or variety (Krieglsteiner, 1991; Arnolds et al., 1995) of *G. vittaeformis*.

The significance of a veil in section *Galerina* is much disputed and the nomenclature of veiled taxa is extremely confused. Smith & Singer (1964) regarded this character as quite important since they divided section *Galerina* into two stirpes on this basis: stirps *Minima* with remains of veil and stirps *Vittaeformis* without veil. We do not share this point of view since the presence of a subtle veil is the only difference between several pairs of otherwise identical taxa, placed in the two stirpes.

Favre (1955) introduced the name *G. rubiginosa* var. *annulata* Favre for alpine collections with an annulate zone on the stipe, 2- or 4-spored basidia and without pileocystidia. He noticed that in typical *G. rubiginosa*, by us regarded as a synonym of *G. vittaeformis*, in very young sporocarps rarely a weakly developed veil was observed ("un vague voile cortiniforme très fugace"). Kühner (1972) described 4-spored populations with distinct veil as belonging to *G. vittaeformis* f. *vittaeformis* and discussed in extenso the significance of that character, which was thought by him to be of no importance at all. On the other hand, Gulden (1980) and Watling & Gregory (1993) treated such forms as species in their own

right and adopted the name *G. terrestris* Wells & Kempton, a species originally described from Canada with 4-spored basidia (Wells & Kempton, 1969). Collection *Barkman 9552* can be considered to belong to this taxon. A possible earlier synonym is *G. subannulata* (Sing.) Smith & Sing. (= *G. vittaeformis* var. *subannulata* Sing., 1953), which may be different, however, in the predominantly vesiculose cheilocystidia (Smith & Singer, 1964; Singer, 1974). In addition the basidia in this taxon are 2- (some 1- or 3-)spored, but we think that the numbers of sterigmata on the basidia are of little or no importance in this group. A related, but apparently distinct species is *G. caulocystidia* Arnolds, also with 2-spored basidia, a pruinose-pubescent stipe and a fibrillose veil, but characterized by the absence of pleurocystidia (Arnolds, 1983; see also discussion on *G. dunensis* in this paper).

Collections of the *G. vittaeformis* complex with both pileocystidia, caulocystidia and veil remnants on the stipe are apparently less widespread. They were unknown to Gulden (1980), and Kühner (1972: 82) included only one collection from the Swiss alps with very fine flocks at the stipe in his description of *G. atkinsoniana* f. *atkinsoniana* with 2-spored basidia. On the other hand, Singer (1974) described a similar fungus from the Swiss alps with predominantly 4-spored (some 2- and 3-spored) basidia as a separate species. He used the name *G. annulata* (Favre) Sing., based on *G. rubiginosa* var. *annulata* Favre (1955), although Favre described the pileipellis without mentioning the presence of pileocystidia, as noticed also by Kühner (1972). Singer (1974) did not indicate whether he has examined Favre's type collection with different results.

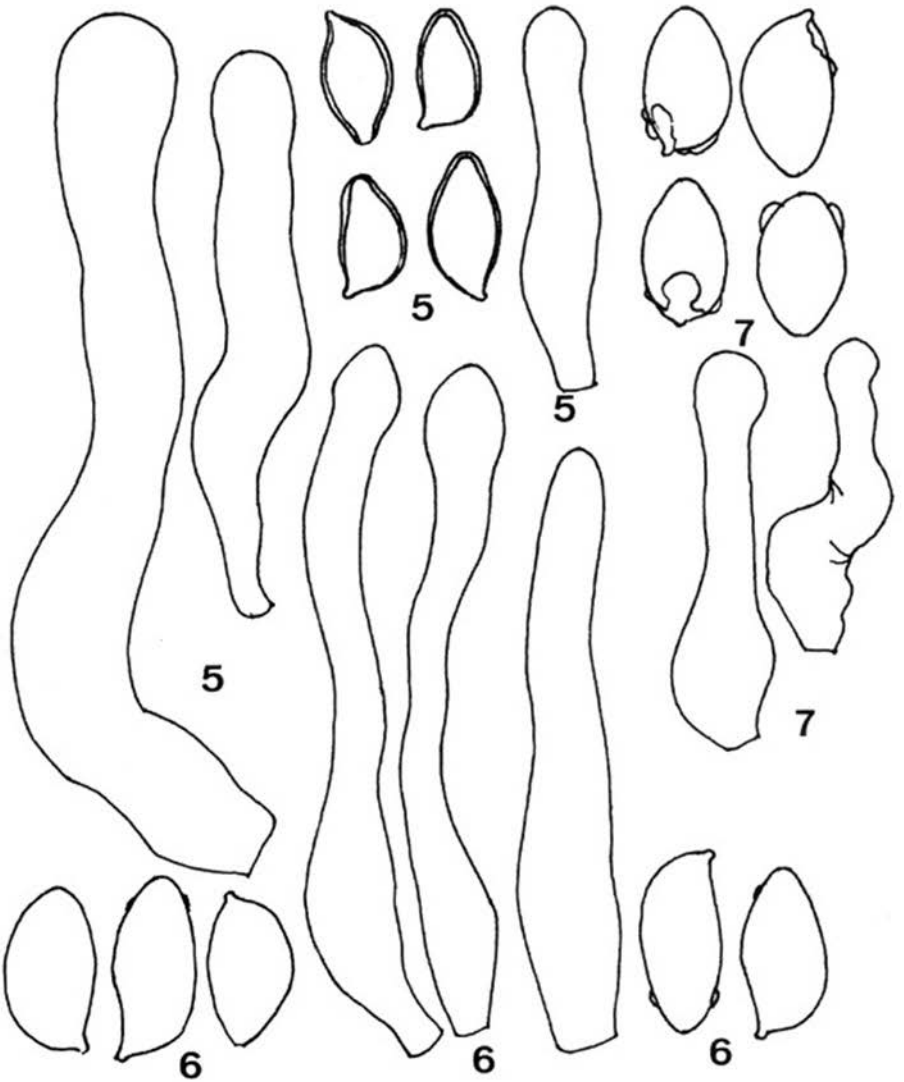
In our opinion, the taxonomic significance of the presence of a fibrillose velum in this group of fungi is very doubtful since the degree of development varies considerably. De Vries noted on the label of his collection 793 of '*G. annulata*', made in December 1970, that he found typical *G. atkinsoniana* without veil remains on exactly the same spot in December 1971. We are inclined to regard collections with veil at the most as taxa in the rank of variety. We do not consider it useful to give the described collections a formal name as long as the constancy and reliability of veil characters in this group are not elucidated and the nomenclature of the various recognized taxa is not cleared up by renewed type studies. In any case *G. annulata* Barkman nom. prov. cannot be validated since it would be a later homonym of *G. annulata* (Favre) Sing., which, completely accidentally, might refer to the same fungus.

Galerina anomala Barkman *nom. prov.*, Coolia 14 (1969) 58 — Fig. 5

Identity unknown.

Pileus 4.5 mm broad, hemispherical, very pale cream-coloured, almost white, margin weakly striate, smooth. Lamellae [L = 14, l = 1] emarginate-adnate, ascending, broad, pale yellow-brown with pubescent, white edge. Stipe 17 × 0.7 mm, cylindrical, apex cream-coloured, downwards red-brown, base blackish brown, minutely white pubescent over most of the length (from Barkman's notes).

Spores 8.5–10.5(–10.8) × 5.0–6.0 µm [according to Barkman 7.5–9.0 × 4.5–5.5 µm], Q = 1.55–1.85, ovoid, amygdaliform to limoniform, slightly thick-walled, many collapsed, apex with callus, sometimes almost a germ pore, pale yellowish sub micr. Basidia 18–23(–31) × 5–7 µm [Barkman], 4-spored. Lamella edge sterile, made up of thick-set, lageni-



Figs. 5–7. — 5. '*Galerina anomala*' (unidentified), spores, caulocystidia (left) and cheilocystidium (right). — 6. '*Galerina atrofusca*' (= *G. allospora*), spores and cheilocystidia. — 7. '*Galerina calyptrata* var. *clavipila*' (= *G. calyptrata*), spores and cheilocystidia. All × 2000.

form cheilocystidia c. 31 × 5 µm with thick neck c. 3.7 µm wide and subcapitate apex c. 4.7 µm wide, almost all collapsed [according to Barkman measuring 23–41 × 5–8, neck 3–4.5 µm, and apex 4–6.5 µm]. Pleurocystidia absent. Pileipellis difficult to reinflate, apparently made up of radial hyphae with elongated elements, 5–10 µm wide, not encrusted. Stipitipellis a cutis made up of parallel hyphae, 2–8 µm wide, with pale yellowish parietal pigment, near apex with small tufts of subcylindrical caulocystidia, slightly thickened to the apex, 44–65 × 4.5–5.5 µm, apex 7–8.5 µm wide. Clamp-connections frequent.

Collection examined. NETHERLANDS: prov. Drenthe, Dwingeloo, 'Lheebroekerzand', open spot in scrub of *Juniperus communis*, 11 May 1965, *A.K. Masselink 8030* (WBS).

The collection consists of a single, dried sporocarp in bad condition. Barkman (1969) placed this taxon in the group of *Galerina* with an entirely pubescent stipe. However we found caulocystidia only at the upper third part of the stipe. The very pale, smooth and almost papillate spores do not fit in with the spore characters of *Galerina*. Also the cream-coloured pileus would be very unusual for this genus. These characteristics remind of the genus *Flammulaster* Earle, in particular of the group around *F. carpophilus* (Fr.) Earle (Vellinga, 1986). However, in this group the pileus is not smooth but rugulose and the pileipellis contains chains of globose to ellipsoid cells. Neither Barkman, nor we could find such elements in the studied collection. Furthermore the stipe of this fungus is pubescent and dark at the base, instead of flocculose and pale in *Flammulaster*. On our request E. Vellinga (Leiden) was so kind to study this collection as well and confirmed that it was not a *Flammulaster*.

The structure of the pileipellis and shape and colour of the spores are more similar to the genus *Tubaria* (W.G. Smith) Gillet. *Tubaria pallidospora* J. Lange was described as a small species (pileus 5–10 mm) with pale colours and spores 9.5–10 × 5.5 µm. However this fungus has subdecurrent lamellae and clavate cheilocystidia (Lange, 1939; Bon, 1992). Consequently, the identity of '*Galerina anomala*' remains obscure for the time being.

Galerina atkinsoniana A.H. Smith var. **rugosocystis** Barkman *nom. prov.*, Coolia 14 (1969) 58 — Fig. 4

Identified as: *Galerina* cf. *atkinsoniana* var. *atkinsoniana*.

Pileus 11 mm broad, conico-convex, pale greyish yellow-brown, translucently striate up to 3/4 of the radius, drying beige-white. Lamellae [L = 11, l = 1] broadly adnate, distant, honey-brown. Stipe 35 × 0.75 mm, cylindrical, rather dark honey-brown with slightly paler apex, entirely pubescent, without veil remains (from Barkman's notes).

Spores 13–16(–17) × 7.5–8.5(–9.5) µm, Q = 1.65–1.95, amygdaliform-oblong, strongly warty-rugulose, with smooth plage, orange-brown sub micr. Basidia collapsed, probably 2-spored (not mentioned by Barkman). Cheilocystidia numerous, mostly collapsed, 37–47 × 12–17 µm, lageniform with subcylindrical neck. Pleurocystidia not seen, but according to Barkman present, lageniform, 49–54 × 13–17 µm, with subcylindrical neck. Pileipellis a cutis of repent hyphae, 5–15 µm wide, in part with brown encrusting pigment, without pileocystidia; according to Barkman with scattered, lageniform cystidia, 48–69 × 8–13 µm, with encrusted walls. Clamp-connections present on hyphae of the pileipellis (absent according to Barkman).

Collection examined. NETHERLANDS: prov. Drenthe, Sleen, 'Sleenerzand', in scrub of *Juniperus communis*, 17 Oct. 1963, *J. J. Barkman 7637* (WBS).

This collection contains only one specimen in bad condition. The pileus has been infected by a mould, which may be the reason for our unability to find pileocystidia. Otherwise the fungus is in all respects similar to *G. vittaeformis* or, if the presence of pileocystidia is accepted, to *G. atkinsoniana*. The unique feature of this collection would be, according to Barkman, the presence of encrusted pileocystidia. These structures are apparently lost in the exsiccatum. Otherwise we wonder whether the presence of encrusted pigment would be of sufficient taxonomic relevance to distinguish a variety, in particular since part of the pileocystidia in *G. atkinsoniana* often have slightly thickened, brown walls.

Galerina atrofusca Barkman *nom. prov.*, Coolia 14 (1969) 63 — Fig. 6

Identified as: *G. allospora* Smith & Sing.; also comprising a collection of *G. pumila* (Pers.: Fr.) Sing.

Pileus 5 mm broad, hemispherical, with inflexed margin, very dark brown-grey (Séguy 111–116), surface rugulose, tomentose, not translucently striate, drying beige-grey with weak olivaceous tone. Lamellae [L = 10] adnexed, ventricose, distant, thickish, pale greyish olive with pale fimbriate edge. Stipe 9 × 1.2 mm, cylindrical, dirty ochraceous brown with some white fibrils, apex white flocculose (from Barkman's notes).

Spores (11.0–)11.5–13.5(–14.0) × (5.5–)6.0–7.5 µm, Q = (1.6–)1.8–2.0(–2.2), predominantly ovoid-oblong to amygdaliform, some ellipsoid-oblong, brownish orange sub micr., smooth without germ pore, in some spores with distinct plage, in a few spores with very small exosporal blisters near the apex. Basidia 4-spored. Cheilocystidia numerous, (39–)41–52 × 4–8 µm, subcylindrical, usually slightly swollen near base, with long neck (2.8–4.7 µm wide) and slightly enlarged, subglobose to ovoid apex. Pleurocystidia absent. Pileipellis difficult to examine in exsiccatum, predominantly made up of elongated hyphae, 2–6 µm wide, in addition with some shorter, elliptic elements, up to 8 µm wide, with encrusting, orange-brown pigment. Clamp-connections present.

Collection examined. NETHERLANDS: prov. Drenthe, Ruinen, 'Dwingelder Veld' near Kraloo, in scrub of *Juniperus communis*, 20 Oct. 1964, *J. J. Barkman 7956* (WBS).

In the herbarium WBS are two collections, labelled *Galerina atrofusca* by Barkman. The collection described above was designated as type on the label. It consists of only one, very small sporocarp in rather bad condition. *Galerina atrofusca* was keyed out by Barkman (1969) mainly on the basis of the striking grey-brown colours of the sporocarps and the velvety pileus. However, the colour in the exsiccatum is, surprisingly, rather pale yellow-brown and the pileus has a smooth appearance. Also in microscopical studies no trace of scales or hairs on the pileus could be demonstrated. Barkman himself did describe the pileipellis as made up of normal hyphae.

In our opinion this collection represents a variant of *G. allospora* Smith & Sing. with abnormally dark pigments. It is interesting to note that Barkman described one of his collections of *G. juniperina* nom. prov. (= *G. allospora*) also as having a "dark grey-brown pileus" (see *G. juniperina*). Most spores are completely smooth, but in very few spores a minute exosporal blister near the apex could be observed. In addition, the size and shape of the cheilocystidia fit in well with this species. In particular the somewhat pointed, triangular

apex of some cheilocystidia is characteristic of this species and *G. pumila* (Pers.: Fr.) M. Lange. The latter species differs, among other things, in ellipsoid spores.

Galerina allospora is a name of a species described from North-America, scarcely used in Europe. This species is better known under the name *G. luteofulva* P.D. Orton. See the notes on *G. juniperina* nom. prov.

The second collection, labelled *Galerina atrofusca*, in WBS consists of two sporocarps and has the following characteristics: Pileus 8 mm broad, dark grey-brown (Expo H64), drying pale greyish yellow-brown. Lamellae adnate, subdistant, yellow-brown with white crenulate edge. Stipe 25 × 1.5 mm, base yellow-brown, upwards with numerous white fibrils, apex pruinose. Spores (10.5–)11.0–12.5(–13.5) × 5.5–6.5 µm, Q = 1.9–2.15, ellipsoid-oblong to slightly ovoid, smooth, brownish orange. Cheilocystidia not reinflating; according to Barkman 54–59 × 5.5–7.3 µm with long, slender neck (c. 4 µm) and often slightly triangular capitulum, 4–6.5 µm wide.

Collection examined. NETHERLANDS: prov. Gelderland, Otterloo, 'Hoge Veluwe', in scrub of *Juniperus communis*, 9 Nov. 1967, *J.J. Barkman 8606* (WBS).

This collection is deviating in several respects from the one described above (*Barkman 7956*). The pileus is not described as velvety or roughened, the lamellae have a normal *Galerina* colour and the spores are predominantly ellipsoid, without any exosporal blister. Barkman himself wrote in his descriptive notes on this collection that the microscopical characters are completely identical with *G. pumila*, and that only the colours of pileus and stipe are deviating. We fully agree with this opinion, but are not inclined to attach much taxonomic significance to the differences in colour. In our opinion they may be caused by frost damage. The sporocarps were collected late in the year and the exsiccatum is in a bad condition.

Galerina calyptrata P.D. Orton var. **clavipila** Barkman *nom. prov.*, Coolia 14 (1969) 59 — Fig. 7

Identified as: *G. calyptrata* P.D. Orton.

Pileus 6 mm, rather acutely conical, vividly orange-brown, translucently striate up to halfway the radius, densely pubescent. Lamellae [L = 14, l = 1–3] emarginate-adnate, subdistant, dark ochraceous yellow-brown. Stipe 40 × 0.8 mm, cylindrical with swollen basis (up to 1.5 mm), shiny yellow-brown, with scattered white fibrils of veil, apex and base white pruinose. Smell and taste not noted (from Barkman's notes).

Spores 10.5–12.0(–13.0) × (5.5–)6.0–7.0(–7.5) µm, Q = (1.55–)1.65–1.75(–1.95), ovoid to subamygdaliform, in majority smooth, but some spores calyptrate with small to large, smooth or wrinkled exosporal blisters near the plage area. Basidia 4-spored. Cheilocystidia collapsed, short (c. 25 µm) with thick neck (3.0–3.5 µm wide), not to strongly capitate; apex 3.5–6 µm wide (according to Barkman cheilocystidia variable, lageniform to bar-bell shaped, 25–45 × 6.5–10 µm; neck 3–4 µm; apex 4–8 µm). Pileipellis a cutis of repent hyphae, 4–9 µm wide, strongly yellow-brown encrusted, some hyphae with subclavate terminal cells but without differentiated pileocystidia (according to Barkman with clavate pileocystidia, 40–130 × 10–15 µm). Clamp-connections present.

Collection examined. NETHERLANDS: prov. Drenthe, Sleen, 'Sleenerzand', in scrub of *Juniperus communis*, 17 Oct. 1963, *J. J. Barkman 7636* (WBS).

The studied exsiccatum contains a single, strongly damaged sporocarp. It has all characters of *G. calyptrata*. In particular the vividly orange tinge of the pileus is diagnostic for this species. Barkman (1987) distinguished var. *clavipila* in view of the numerous clavate cystidia on the pileus surface. We could not find these structures in the exsiccatum, although the structure of the pileipellis was quite distinct in our preparations. In our opinion terminal cells of the superficial hyphae may be considered by Barkman as pileocystidia. According to B. de Vries (oral communication) Barkman himself doubted the taxonomic value of these structures in a later period of his research. We agree with this view.

In herbarium WBS three other collections are labelled as *G. calyptrata* var. *clavipila*, but they were not reinvestigated by us. The collection, described here, was indicated on the label as type by Barkman.

See also our observations on *G. sahleri* var. *clavipila*.

Galerina cyclocystis Barkman *nom. prov.*, Coolia 14 (1969) 60 — Fig. 8

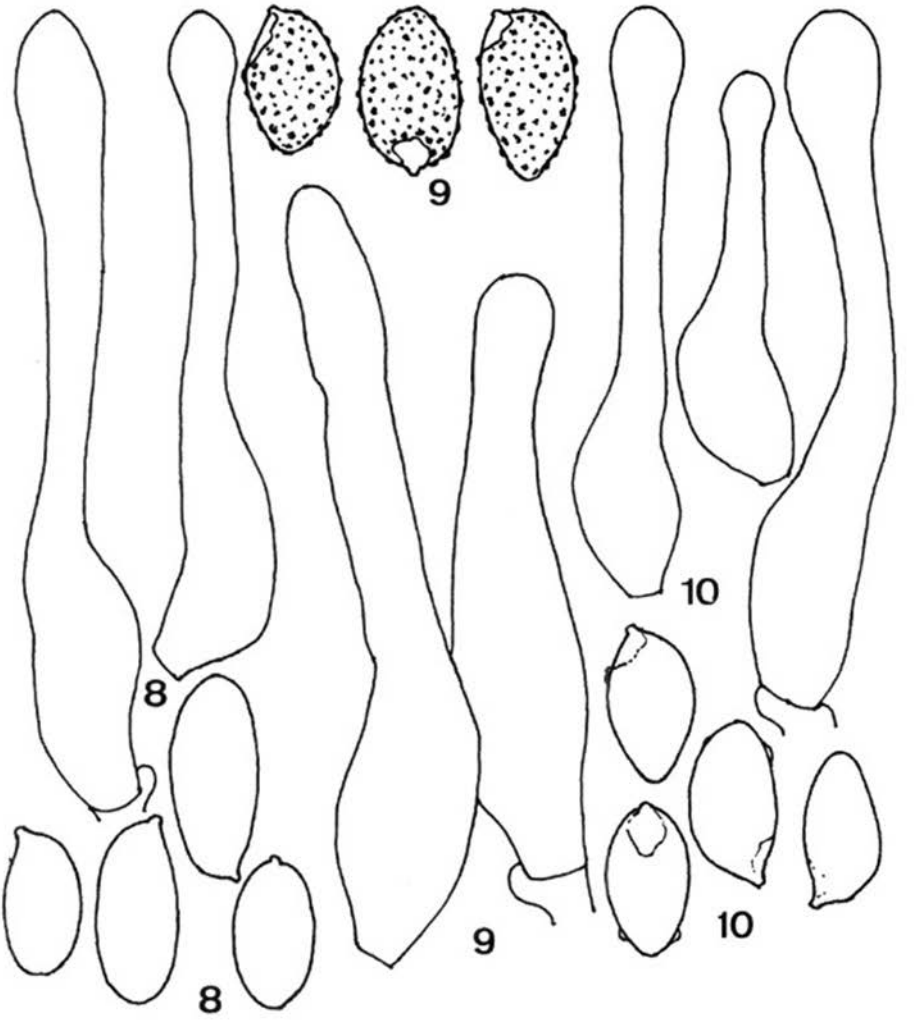
Identified as: *Galerina pumila* (Pers.: Fr.) Sing.; the collection contains also *G. allospora* Smith & Sing. and *G. hypnorum* (Schrank: Fr.) Kühner.

Macroscopical details unknown (see observations). Spores (10.0–)11.0–15.0 × 5.5–6.5 µm, Q = 1.7–2.4, ellipsoid-oblong to subcylindrical or slightly ovoid, smooth without pore or plage, brownish orange sub micr. Basidia 4-spored. Cheilocystidia in exsiccatum not reinflating, according to Barkman (descr. notes) 50–65 × 5–6 µm, subcylindrical with slightly narrower neck (4–5 µm) and swollen apex (5–9 µm), often with ovoid to triangular capitulum, often with refractive thickening of the wall in the lower half. Pleurocystidia absent.

Collection examined. NETHERLANDS: prov. Drenthe, Dwingeloo, 'Lheebroekerzand, Reigerplas', in centre of large scrub of *Juniperus communis*, 27 Oct. 1964, *J. J. Barkman 7958*.

Bernhard de Vries reinvestigated this collection in 1975 and concluded that it was heterogeneous. Among the ten dried sporocarps eight were identified as *G. allospora* (= *G. luteofulva*, see observations on *G. juniperina*); one sporocarp belonged to *G. hypnorum* (= *G. decipiens*), see observations on *G. inversa*) and only one sporocarp had the microscopical characters of *G. cyclocystis*. The notes on macroscopical characters refer to the mixture of sporocarps.

This taxon was keyed out by Barkman on the basis of a unique feature, viz. a thickening of the wall halfway the cheilocystidia, which might indicate affinity with section *Inocybeoides* (*Galerina nana* (Petri) Kühner and allies). However, in the exsiccatum no trace of a thickened wall could be found. According to Barkman it was present in part of the cystidia only and in our opinion it is very likely that the observed thickening consisted of a refractive, mucoid substance, occasionally seen in cystidia of several species of *Galerina* and in our opinion not of taxonomic importance. The large, black humps on the cystidial walls, depicted in Coolia (Barkman, 1969: 83, fig. 37) can be safely regarded as a 'poetic license'. For the rest the sporocarp could be easily identified as *G. pumila* (Pers.: Fr.) Sing. on the basis of its large, smooth, ellipsoid spores and slender cheilocystidia, often with triangular apex.



Figs. 8–10. — 8. '*Galerina cyclocystis*' (= *G. pumila*), spores and cheilocystidia. — 9. '*Galerina dunensis*' (= *G. caulocystidiata*), spores and cheilocystidia. — 10. '*Galerina glutinosa*' (= *G. allospora*), spores and cheilocystidia. All × 2000.

Galerina dunensis Barkman *nom. prov.*, Coolia 14 (1969) 64 — Fig. 9

Identified as: *G. caulocystidiata* Arnolds.

Pileus 5–18 mm, campanulate with flattened apex, orange-brown with yellow margin, smooth, dry, shiny, translucently striate up to halfway the radius. Lamellae [L = 10–19,

l = 3] broadly adnate with decurrent tooth, subdistant, yellow-brown with paler edge. Stipe 15–28 × 1–3 mm, orange-brown, gradually discolouring blackish brown in age, entirely densely pubescent, with narrow arachnoid-fibrillose, whitish annulus, downwards with a few additional fibrils of veil (from Barkman's notes).

Spores 10.5–13.0(–14.0) × 6.5–7.5 µm, Q = 1.5–1.8, ovoid(-oblong) to amygdaliform, entirely warty-rugulose with smooth to punctate plage, occasionally with apical callus. Basidia 2-spored, collapsed, according to Barkman 24–31 × 6.8–7.5 µm. Cheilocystidia abundant, mostly collapsed, 44–60 × 9.5–15 µm, lageniform, gradually tapering into a subcylindrical neck, 4.5–7.5 µm wide. Pleurocystidia absent. Caulocystidia numerous, similar to the cheilocystidia. Pileocystidia absent. Clamp-connections present.

Collection examined. NETHERLANDS: prov. Noord-Holland, Petten, in moist dune slack amongst grasses and moss, Nov. 1967 & Oct. 1968, *F.A. van den Bergh s.n.* (WBS).

This collection comprises twelve sporocarps of different ages in fairly good condition. The combination of a pubescent stipe, lageniform cheilocystidia and rugulose spores is characteristic of the group of *G. vittaeformis* (Fr.) Sing. It comes close to the latter species, but differs macroscopically in the presence of a fibrillose annulus. This character is probably of minor taxonomic importance; see the discussion on *G. annulata*. More fundamental is the absence of pleurocystidia, which are supposed to be present in all members of section *Galerina* (Smith & Singer, 1964; Watling & Gregory, 1993). The collection of *G. dunensis* appears to be fully identical with *G. caulocystidiata* Arnolds, described after the publication of Barkman's key (Arnolds, 1983).

Galerina fellea Barkman *nom. prov.*, Coolia 14 (1969) 59

Identified as: *G. beatricis* Bas.

Description: see Bas, Blumea 41 (1996) 3–6.

Collection examined. NETHERLANDS: prov. Noord-Holland, 's-Graveland, on compost in orchard, 30 Oct. 1968, *J. Daams s.n.*

This species was included as '*G. fellea* n.p.' in Barkman's key. It was collected by the amateur mycologist J. Daams and recognized as an undescribed species of *Galerina* by C. Bas, but not formally described before 1996 as *G. beatricis*. We refrain from giving a description of this characteristic species, belonging to section *Naucoriopsis*, stirps *Marginata*, and refer to Bas (1996).

Galerina glutinosa Barkman *nom. prov.*, Coolia 14 (1969) 60 — Fig. 10

Identified as: *G. allospora* Smith & Sing.

Pileus 5–8 mm broad, convex, pale orange-brown with dark orange-brown centre (Séguy, 1936: 191), translucently striate, radially fibrillose-tomentose, viscid, pileipellis separable. Lamellae [L = 13–15, l = 1(–3)], broadly adnate, horizontal, sometimes loosening from the stipe and forming a pseudocollarium. Stipe 7–20 × 1–1.5 mm, pale honey yellow to honey brown, subviscid, with fibrils lengthwise, apex white pruinose (after Barkman's notes).

Spores (9.5–)10.0–11.5(–12.5) × 5.5–6.0(–7.0) µm, Q = 1.7–2.0, ovoid-oblong to amygdaliform, smooth with weakly delimited plage and a minority (c. 20%) with small exosporal blisters below apex, rarely in addition small blisters at the edge of the plage. Basidia collapsed, 4-spored. Cheilocystidia abundant, mostly collapsed, 32–54 × 6–8 µm, slenderly lageniform with cylindrical neck, 2.8–4.7 µm wide, and weakly to strongly swollen apex, 4–8.5 µm wide; capitulum often ellipsoid, sometimes rhomboid. Pleurocystidia absent. Pileipellis a cutis of radial, cylindrical hyphae, 2.5–8 µm wide with encrusted pigment. Clamp-connections present.

Collection examined. NETHERLANDS: prov. Drenthe, Dwingeloo, Lheebroek, 'Kliploo, near Reigerplas', on open spots in scrub of *Juniperus communis*, 11 Nov. 1964, *J.J. Barkman 7795* (WBS).

The collection comprises two young and two mature sporocarps in bad condition. The spore ornamentation is characteristic of *G. allospora* (see also *G. atrofusca*) and in Barkman's key *G. glutinosa* is placed in the same couplet as *G. allospora*. *G. glutinosa* is said to be different by (1) viscid pileus and stipe, (2) lamellae forming a pseudo-collarium and (3) shorter cheilocystidia with broader, obtuse capitulum. We could not find a trace of gelatinized hyphae in the pileipellis of the exsiccatum. Barkman described the pileipellis in his notes also as a normal cutis. Moreover the combined occurrence of 'a radially fibrillose-tomentose' surface of the pileus and viscidity is difficult to imagine. We are inclined to think that the viscidity of pileus (and stipe, not studied by us) has been an artefact, caused by accidental weather conditions, for instance frost damage. The collection was made very late in the season.

Also the occurrence of a 'pseudocollarium' is, in our opinion, accidental. This supposition is supported by the fact that in his descriptive notes Barkman wrote that the lamellae 'sometimes' form a pseudocollarium. It is evident that such a character is an accidental phenomenon of no taxonomic importance.

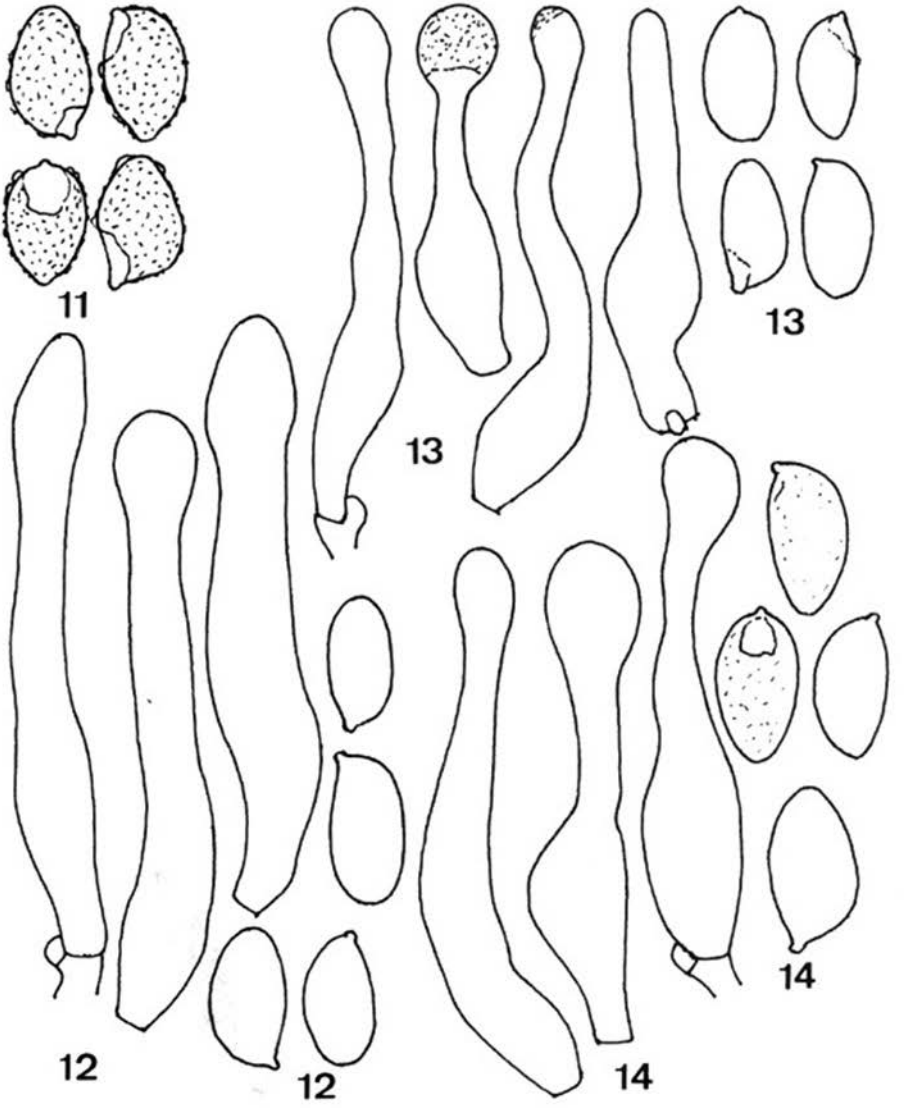
It is true that the cheilocystidia are shorter and more capitate than usual for *G. allospora*. However, this species is rather variable in this respect and the observed cystidia still fall within the variation, for instance within the dimensions given by Watling & Gregory (1993) for *G. luteofulva* (= *G. allospora*).

Galerina hypnorum (Schrank: Fr.) Kühner var. **clavipila** Barkman *nom. prov.*, Coolia 14 (1969) 64 — Fig. 11

Identified as: *Galerina hypnorum* (Schrank: Fr.) Kühner; also containing *Galerina allospora* Smith & Sing.

Pileus 8–9 mm, conico-convex, pale honey brown, long translucently striate. Lamellae [L = 12, l = 1] adnate with decurrent tooth, ascending, distant, orange-brown with pale edge. Stipe 20–25 × 1–1.5 mm, cylindrical, pale honey yellow to ochraceous yellow-brown (from Barkman's notes).

Spores 8.5–9.5(–10) × (5.5–)6.0(–6.5) µm, Q = 1.5–1.6(–1.7), ovoid, often subpapillate, weakly rugulose, in a small minority with distinct exosporal blisters near the apex or plage area. Basidia 4-spored. Cheilocystidia collapsed, short and more or less lageniform with thick neck (c. 4 µm), often subcapitate (apex up to 6.5 µm); according to Barkman 30–46 × 6.5–9 µm; neck 3.8–5.2 µm; apex 5.2–7.5 µm. Pleurocystidia absent. Pileipellis a cutis of brown encrusted hyphae, 3–9 µm wide, without cystidoid elements; according to Barkman covered with repent, clavate cells, 20–92 × 7–18 µm. Clamp-connections present.



Figs. 11–14. —11. '*Galerina hypnorum* var. *clavipila*' (= *G. hypnorum*), spores. — 12. '*Galerina incurvata*' pro parte (= *G. pumila*), spores and cheilocystidia. — 13. '*Galerina incurvata*' pro parte (= *G. permixta*), spores and cheilocystidia. — 14. '*Galerina incurvata*' pro parte (= *G. mniophila* sensu lato), spores and cheilocystidia. All × 2000.

Collection examined. NETHERLANDS: prov. Drenthe, Ruinen, 'Kraloo', in open spots in scrub of *Juniperus communis*, 17 Nov. 1964, *J.J. Barkman 7999* (WBS).

The collection consists of two mature and one young, badly preserved sporocarps. The spore characters of one sporocarp fit in with the descriptive notes by Barkman and are typical of *G. hypnorum* as defined in this paper (see also our remarks on *G. ramicola*). Barkman distinguished variety *clavipila* on the basis of the presence of clavate structures on the pileus surface. We were unable to confirm this observation, possibly because of the old age and bad condition of the material. However, we are inclined to consider these clavate 'pseudocystidia' as apical cells of normal hyphae of the pileipellis and to attach no taxonomic significance to this phenomenon, the more so since similar structures were observed by Barkman in *G. calyptrata* var. *clavipila* and *G. sahleri* var. *clavipila* (see there).

The second mature sporocarp of collection *Barkman 7999* has different microscopic characteristics: spores measured 10.5–12 × 6–7 µm and were practically smooth, with the exception of a very subtle subapical wall-thickening in some spores. The cheilocystidia were more slender. This sporocarp undoubtedly belongs to *G. allospora* Smith & Sing.

The third sporocarp was quite young and not studied by us.

Galerina incurvata Barkman *nom. prov.*, Coolia 14 (1969) 63 — Figs. 12–14

Identified as: *G. pumila* (Pers.: Fr.) Sing.; also comprising collections of *G. permixta* (P.D. Orton) Pegler & Young and *G. mniophila* (Lasch) Kühner sensu lato.

Pileus 14–16 mm, conico-convex, margin slightly inflexed, orange-brown (Expo E66–68), translucently striate up to 1/4 of the radius, viscid. Lamellae adnate, ascending, moderately distant, orange-brown. Stipe 60–70 × 3–3.5 mm, tapering to the base, orange-brown, base white tomentose (from notes R. Kramer).

Spores 9.5–11.0 × 5.5–6.0 µm, Q = 1.7–1.9(–2.0), predominantly ellipsoid-oblong, some ovoid, smooth, plage not visible, rather pale orange-yellow (according to Kramer spores 8.0–10.5 × 5.0–6.0 µm, often amygdaliform). Basidia 4-spored. Lamella edge sterile, cheilocystidia 31–52 × 5.5–8.5 µm, subcylindrical to slenderly lageniform with thick neck (4.5–5.5 µm), usually subcapitate, capitulum often ellipsoid to rhomboid, 5.5–8 µm wide. Pleurocystidia absent. Pileipellis an ixocutis, made up of smooth hyphae, 1.5–4(–5) µm wide, hyaline or with orange-brown intracellular pigment. Clamp-connections present in trama.

Collection examined. NETHERLANDS: prov. Friesland, Bakkeveen, 'Duurswoude', in *Empetrum* heathland, 17 Oct. 1968, *R. Kramer s.n.* (det. J.J. Barkman) (WBS).

In WBS five collections are present, labelled as *G. incurvata*. The collection described above is the only one collected before Barkman's introduction of the name *G. incurvcta* in 1969, and consequently it has to be regarded as the (provisional) type. The remaining collections belong to different taxa and are treated below.

In our opinion the type collection fits in very well with *G. pumila* as described by Kühner (1935; sub nom. *G. mycenopsis*). Diagnostic features are the relatively large sporocarps with obtuse pileus, the smooth, predominantly ellipsoid spores (according to Kühner 8.5–13(–14) × 5–6.5 µm) and the slender cystidia, often with slightly elongated capitulum, measuring according to Kühner (1935) 37–52 × 6.2–7.2 µm with 2.5–5.5 µm wide neck.

Barkman (1969) distinguished in his key *G. incurvata* from *G. pumila* mainly on behalf of (1) dark yellow-brown pileus (instead of orange-brown); (2) encrusted hyphae of the pileipellis and (3) slightly amygdaliform, smaller spores. It is remarkable that in the original descriptive notes the pileus was indicated as 'orange-brown', whereas we found the hyphae of the pileipellis to be practically smooth and the spores predominantly ellipsoid, exactly as in *G. pumila*.

A closely related species, *Galerina viscidula*, was described by Orton (1988) from Scotland. It is said to differ from *G. pumila* mainly in a viscid pileus, smaller spores (9–11.5 × 5–6 µm) and shorter cheilocystidia (30–50 µm). According to Watling & Gregory (1993) true *G. pumila* should have spores of (9–)12(–14) × 6–8 µm and cystidia measuring 60–100 µm. Spore and cystidial characters of the collection described above are in better agreement with *G. viscidula*, but also the description of *G. mycenopsis* by Kühner (1935) is in these respects more similar to *G. viscidula* than to *G. pumila* sensu Watling & Gregory. This question deserves further study. For the time being we identify our collection as *G. pumila*, a common fungus in the Netherlands.

Two other collections, identified by Barkman as *G. incurvata*, were collected in one locality and represent a different taxon with the following characteristics.

Pileus 3.5–12 mm, obtusely conical with inflexed margin to conico-convex with obtuse umbo, centre dark chestnut brown to reddish brown (Expo J23; K&W 7D6) to the margin paler yellow-brown (K&W 5B5; Expo F28), strongly translucently striate up to halfway the radius, hygrophanous, dull, slightly rugulose-tomentose, in particular when dry. Lamellae [L = 14–18, l = 1(–3)] adnexed to emarginate, subdistant, orange- to yellow-brown (Expo C48; K&W 5A4/5B5) with whitish edge. Stipe 10–30 × 0.8–1.2 mm, slightly thickened to the base or subbulbillose (up to 2 mm), yellow-brown (Expo C48-D46; K&W 4A4) with darker base, with scattered white fibrillose remains of veil. Taste weakly farinaceous (from descriptive notes by Barkman, Jalink and Nauta).

Spores 8.5–11.0(–12.0) × 5.0–6.0 µm, Q = 1.65–2.00, ellipsoid- to ovoid-oblong, smooth, in some spores plage area slightly demarcated, by exception with very small exosporal blister near plage, brownish orange sub micr. Basidia collapsed, 4-spored (according to Barkman 27–31 × 6–8 µm). Lamella edge sterile; cheilocystidia 22–39 × 4–7 µm, variable, mainly subcylindrical to slenderly lageniform with long, often more or less tortuose neck, 2.5–4.5 µm wide, apex often enlarged, up to 6 µm wide, occasionally with greyish refractive mucoid substance near the apex. Pleurocystidia absent. Pileipellis a cutis, made up of 2.5–8 µm wide, repent hyphae with strongly encrusting hyphae, not gelatinized. Clamps present in trama and pileipellis.

Collections examined. NETHERLANDS: prov. Drenthe, Dwingeloo, 'Lheebroekerzand, Kliploo', amongst *Sphagnum* and on muddy soil in wet forest of *Betula pubescens* on peaty soil, 25 Oct. 1982, *L. Jalink & M. Nauta 146* (det. J.J. Barkman; WBS); same loc., 31 Oct. 1982, *L. Jalink & M. Nauta 147* (det. J.J. Barkman; WBS).

The collections, described above, differ from the first collection of *G. incurvata* nom. prov. in much smaller sporocarps, shorter cystidia with thinner neck and different apex, a pileipellis with encrusted hyphae and a different habitat. They key out as *G. permixta* (P.D. Orton) Pegler & Young, a species usually associated with *Salix*. Interestingly, Jalink & Nauta

(1984: 22) published a complete vegetation relevé of the site where this collection was made. In this relevé *Salix aurita* was present in the shrub layer, a welcome argument for our identification.

It is understandable that this fungus could not be readily identified by Barkman with the relevant keys on *Galerina* since *G. permixta* has originally been described as a *Naucoria* (Orton, 1960) and was only in 1975 transferred to *Galerina* by Pegler & Young.

A collection of *G. incurvata*, collected at the same locality, and identified by Jalink & Nauta (nr. 310, 2 Nov. 1983) belongs also to *G. permixta*.

A fifth collection, present in herbarium WBS, again represents a different taxon.

Pileus 11–17(–30) mm broad, obtusely conical, remarkably dull and dark yellow-brown (Expo E58-F52). Lamellae adnate, ascending, cinnamon brown. Stipe 28–33(–35) × 2–2.5 (–5) mm, cylindrical, base subbulbose, 3–4(–6) mm wide, ochraceous yellow-brown (Expo E64), apex pruinose, downwards with scattered white fibrils (from Barkman's notes).

Spores 9.5–11.0(–12.0) × (5.0–)5.5–6.5 µm, Q = 1.6–1.95, mostly amygdaliform, some ovoid-oblong, none ellipsoid, rather pale yellow-brown sub micr., smooth in optical section, surface in most spores appearing smooth, but in some minutely marbled-punctate, some with well-delimitated plage. Basidia 22.5–25 × 6.5–7.5 µm, 4-spored. Lamella edge sterile with densely packed cheilocystidia (mostly collapsed), 30–39 × 5.5–8.5 µm, lageniform to subcylindrical with cylindrical neck, 2.8–4.7 µm wide and slightly swollen to distinctly capitate apex, 4.2–7.5 µm wide. Pleurocystidia absent.

Collection examined. GERMANY: Mecklenburg, Rügen, 'Fährinsel', in centre of scrub of *Juniperus communis*, 9 Nov. 1973, *J.J. Barkman 9696* (WBS).

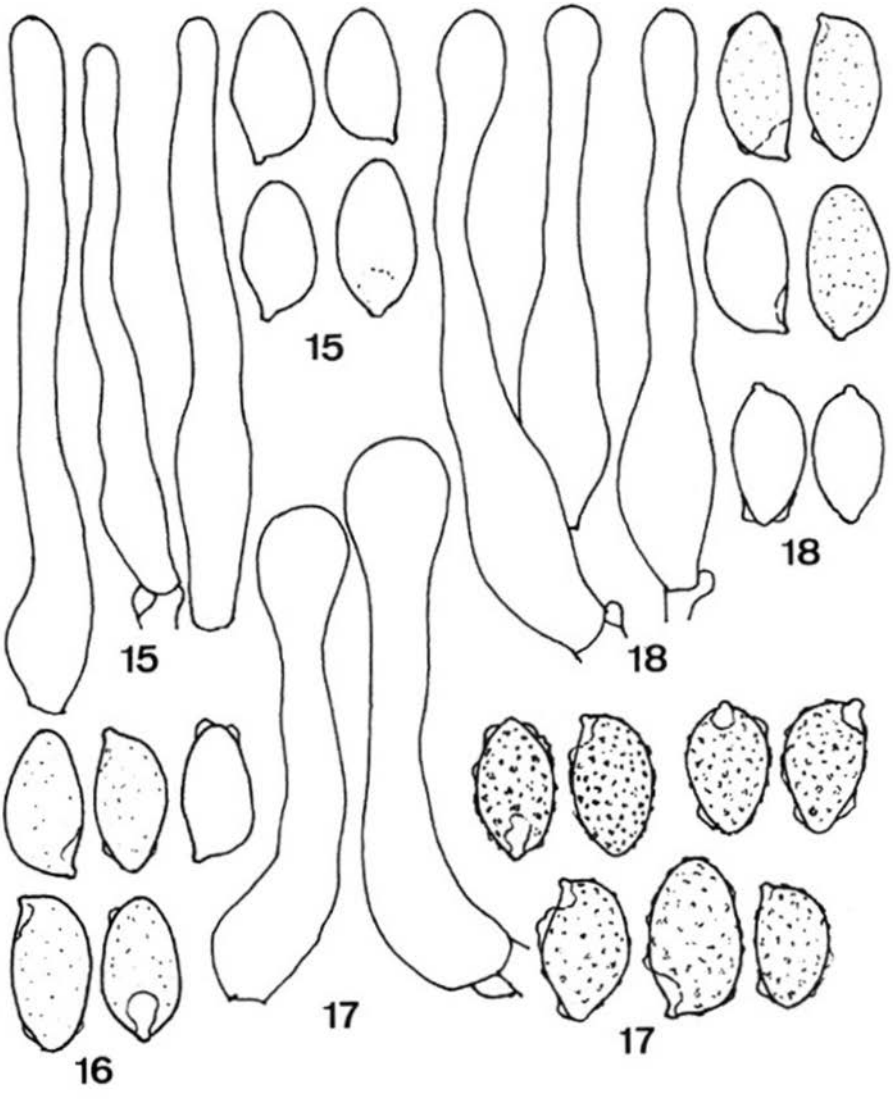
This collection comprises seven sporocarps in reasonable condition. It differs from the other collections, described in this paper under the name *G. incurvata*, among other things, in sporocarps with conical, dull coloured pileus and in amygdaliform spores. Barkman noted under his description that the colour of the pileus and spore shape were like *G. mniophila* (Lasch) Kühner, but that the colour of lamellae and spores were warmer, the pileus margin inflexed and the cheilocystidia often acute. It was apparently named *G. incurvata* mainly because of the inflexed pileus margin, which is, however, not at all unusual in *G. mniophila* and allies.

We could not observe important discrepancies between this collection and *G. mniophila* sensu lato. That species was split by Kühner (1972) into three species. When these concepts are accepted, the described collection shows most resemblance to *G. pseudomniophila* Kühner in view of the practically smooth spores and shape of cystidia. However, we are not convinced that these taxa are distinct species since the characters seem to be intergrading (Arnolds, 1983). This question deserves further study.

Galerina incurvata Barkman *nom. prov.* var. **longicystis** Barkman *nom. prov.*, Coolia 14 (1969) 63 — Fig. 15

Identified as: *G.* cf. *permixta* (P.D. Orton) Pegler & Young.

Pileus 12 mm, conico-convex, dark honey brown, smooth, slightly viscid, margin weakly translucently striate, inflexed. Lamellae pale yellow-brown. Stipe 30 × 2 mm, cylindrical, pale beige-brown, slightly striate, without veil remains. Smell and taste not recorded.



Figs. 15–18. — 15. '*Galerina incurvata* var. *longicystis*' (= *G.* cf. *permixta*), spores and cheilocystidia. — 16. '*Galerina inversa*' pro parte (= *G. allospora*), spores. — 17. '*Galerina inversa*' pro parte (= *G. hypnorum*), spores and cheilocystidia. — 18. '*Galerina juniperina*' (= *G. allospora*), spores and cheilocystidia. All × 2000.

Spores (8.0–)8.5–11.0(–11.5) × 5.5–6.0 µm, Q = (1.5–)1.6–2.0, rather variable in shape, ellipsoid-oblong, ovoid-oblong to amygdaliform, smooth, without pore or exosporal blisters, plage sometimes delimited by weak line, brownish orange. Basidia 4-spored, according to Barkman 25–30 × 7.5–10.5 µm. Lamella edge sterile; cheilocystidia mostly 40–62 × 4.5–6.5 µm, subcylindrical to slenderly lageniform with long, flexuose neck, 2.5–3.5 µm wide, capitate to subcapitate, apex up to 4.5 µm wide (according to Barkman measuring 72–100 (–123) × 5.0–7.5 µm, neck 3–4 µm, apex 4–5 µm wide). Pleurocystidia absent. Pileipellis made up of slightly encrusted, slender hyphae, 2.5–4 µm wide.

Collection examined. NETHERLANDS: prov. Overijssel, Mariënberg, 'Beerzer Belten', among the moss *Dicranum scoparium* in scrub of *Juniperus communis*, 4 Nov. 1968, *J. J. Barkman 8836* (WBS).

The preserved material consists of one old, damaged sporocarp in otherwise reasonable condition (cystidia well reinflating). The cheilocystidia were described as very long and slender by Barkman, a reason to distinguish this variety. We observed only much shorter cystidia and cannot find an explanation for the discrepancies between these values.

The collection evidently belongs to stirps *Mycenopsis*, but we were not able to identify it to species with certainty. It shows much resemblance to *G. pumila*, where also the type collection of *G. incurvata* var. *incurvata* belongs (see our description above). However, it differs in the often ovoid to amygdaliform, instead of ellipsoid spores; in the shape of the cheilocystidia which lack the prolonged capitula characteristic of *G. pumila* and in the encrusted hyphae of the pileipellis. It is more similar to *G. permixta*, also part of the species complex described by Barkman under the name *G. incurvata*. The characters are almost identical to those of the collections made by Jalink and Nauta (nrs. *146* and *147*), described above. In view of the morphological characters this collection might be assigned to *G. permixta*, but the habitat is very different: *G. permixta* is known from *Salix* thickets on wet soils, whereas collection *Barkman 8836* was made on dry, sandy soils where *Salix* is absent.

Galerina inversa Barkman *nom. prov.*, Coolia 14 (1969) 58 — Figs. 16, 17

Identified as: *G. allospora* Smith & Sing.; also comprising a collection of *G. hypnorum* (Schrank: Fr.) Kühner.

Pileus 6–8 mm, plano-convex, dirty yellow-brown (Expo C74), translucently striate up to centre, glabrous, with straight margin. Lamellae [L = 9–13, l = 1–2(–3)] adnate, horizontal, distant, concolorous with pileus. Stipe 10 × 0.8 mm, cylindrical, pale honey-yellow, apex pruinose, without veil remnants.

Spores 9.5–11.5(–12.5) × 5.0–6.0(–6.5) µm, Q = 1.8–2.0, (according to Barkman 12.1–13.4 × 5.9–7.2 µm), ovoid-oblong to amygdaliform, smooth or sometimes minutely punctate, in a small minority with one or two small blisters near apex, exceptionally with large blisters, with weakly demarcated plage. Basidia collapsed, according to Barkman 4-spored, a few 2-spored. Cheilocystidia not reinflating in boiling KOH, according to Barkman 21–40 × 5.3–8 µm, slenderly lageniform with neck 3.5–4.3 µm wide and weakly swollen to subcapitate apex, 4.3–5.9 µm wide. Pileipellis according to Barkman a cutis, made up of encrusted hyphae, 5.4–18.8 µm wide, some with clavate terminal cells. Clamp-connections present in trama.

Collection examined. NETHERLANDS: prov. Drenthe, Ruinen, 'Echtenerzand', in moist *Calluna* heathland amongst mosses, 16 Oct. 1967, *R.N.A. Kramer s.n.* (WBS).

The collection, described above, was indicated by Barkman on the label as type of *G. inversa*. It contains two sporocarps in very poor condition. According to Barkman (1969) this taxon is mainly characterized by the large apical exosporal blisters near the apex of the spores, reminding of the blisters of *G. calyptrata* P.D. Orton and allies, but on the opposite end of the spores. We found that such spores were present indeed, although very rarely. Most spores were smooth or had small apical blisters, exactly as in typical *G. allospora* (for comments on this name, see also *G. juniperina*). The shape of the cheilocystidia, as described and depicted by Barkman, fits also well with that species, although the length, measured by Barkman, is shorter than usual. We cannot explain the considerable difference in spore size, measured by Barkman and us. We regard this collection as belonging to *G. allospora* with sometimes abnormally well-developed exosporal blisters.

In WBS one additional collection was identified by Barkman as *G. inversa*. It contains only one sporocarp in reasonable condition. Barkman did not provide a description, but confined himself to remarking that habitat, colours and cystidia were of the *G. hypnorum*-type. He described the spores as roughened with two blisters near the apex. We found the following microscopical characters in the exsiccatum: spores 8.5–10.5(–11.0) × 5.0–6.5 (–7.0) µm, Q = 1.6–1.8, ovoid-oblong to amygdaliform, sometimes apex papillate, almost smooth to strongly and irregularly rugulose, sometimes with distinct exosporal blisters, in particular near plage and apex. Cheilocystidia dumb-bell shaped, mostly 33.5–37.5 × 6.0–6.5 µm, with short, thick neck, 3.7–4.2 µm wide and capitulum often broader than the base, 6.5–7.5 µm wide.

Collection examined. NETHERLANDS: Drenthe, Beilen, 'Terhorsterzand', in scrub of *Juniperus communis*, 6 Dec. 1967, *J. J. Barkman 8638* (WBS).

This collection completely agrees with *G. hypnorum*, a species with considerable variation in the degree and place of exosporal ornamentation on the spores, as described by Arnolds (1983). For remarks on the interpretation of the name *G. hypnorum*, see also *G. ramicola*.

In our herbarium thirteen other collections are preserved, identified by various collectors as *G. inversa*. We have not studied these exsiccata in detail but, judging from their descriptive notes and remarks, the majority belong to *G. hypnorum*.

Galerina juniperina Barkman *nom. prov.*, Coolia 14 (1969) 62 — Fig. 18

Identified as: *G. allospora* Smith & Sing.

Pileus 5–16 mm broad, obtusely conical to conico-convex, occasionally umbonate, when moist yellow-brown to rather dark brown, in one collection grey-brown (e.g. Expo F54, H44, Munsell 5YR 3/4, 4/6), to the margin paler, more yellowish, short to long translucently striate, sometimes with white fibrils of veil along margin when young, otherwise glabrous. Lamellae [L = 15–23, l = 1–3] emarginate to adnate or with decurrent tooth, moderately distant to crowded, honey yellow to yellow-brown or dirty brown. Stipe 10–45 × 1–3 mm, cylindrical, pale beige, honey yellow, yellow-brown, base sometimes becoming reddish brown, occasionally pale grey-brown, when young with adpressed white fibrils of veil, apex pruinose. Taste in at least two collections farinaceous (from Barkman's notes).

Spores (8.0–)9.5–12.5(–13.5) × (5.0–)5.5–6.5(–7.0) µm, Q = 1.6–2.0, ovoid-oblong to amygdaliform, sometimes apex slightly papillate, yellow-brown to brownish orange, in majority or sometimes exclusively smooth to minutely marbled, with delimitated plage, in almost all collections a minor proportion (< 5–25%) with subtle wall-thickening to distinct exosporal blisters near the apex, occasionally a few spores with very small blisters on other parts of the spores. Basidia 4-spored, almost all collapsed. Lamella edge sterile, cheilocystidia densely packed, 32–60(–82) × (3–)4–10 µm, narrowly lageniform to subcylindrical, with long, cylindrical neck, 2–4(–5) µm wide, often gradually slightly broader to the apex or subcapitate, capitulum often ovate. Pleurocystidia absent. Pileipellis a cutis, made up of cylindrical hyphae, 5–15 µm wide, with encrusted pigment. Clamp-connections present.

Collections examined (all in WBS). NETHERLANDS: prov. Drenthe, Meppen, 'Mepperzand', on the basis of trunk of *Juniperus communis* in scrub on poor, acid sand, 27 Nov. 1963, *J.J. Barkman 7806*; Lheebroek, 'Kliploo, Reigerplas', in dense scrub of *Juniperus communis*, 4 Nov. 1964, *J.J. Barkman 7985*; same loc., on bark of the base of living *Juniperus*, 14 Sept. 1965, *A. Masselink 65-24* (det. J.J. Barkman); Sleen, 'Slenerzand', on N. side of *Juniperus* scrub, 27 Oct. 1965, *J.J. Barkman 8095*; prov. Overijssel, Buurse, 'Buurserzand', on dead wood of *Juniperus communis* on the soil, 2 Nov. 1963, *J.J. Barkman 7703*; Denekamp, 'Lutterzand', in scrub of *Juniperus communis* on poor, acid sand, 18 Sept. 1968, *J.J. Barkman* 8718. — GERMANY: Westfalen, Haltern, 'Tannenberg', on the base of *Juniperus* trunk, 15 Nov. 1967, *J.J. Barkman 8620*, Mecklenburg, Hiddensee, 'Fährinsel', in scrub of *Juniperus communis*, 18 Oct. 1975, *J.J. Barkman 9865*.

These collections, labelled as *G. juniperina*, apparently belong to the same taxon in spite of some variability in some characters. In Barkman's paper *G. juniperina* keys out in a small group of species with long cheilocystidia with thin, often acute neck. The spores were described as smooth or very weakly rugulose. *G. uncialis* is said to have the same type of cystidia, but at the same time strongly rugose spores.

The cheilocystidia in *G. juniperina* are remarkably slender indeed, but the neck is rarely acute, more often slightly enlarged to subcapitate. The capitulum is often not globose, but elliptical. Barkman himself noted at collection *Barkman 9865*: "cheilocystidia of the allospora-juniperina type", and we agree that they are similar to those of *G. allospora*.

The spores are completely smooth or slightly rugulose in two collections only. In the remaining collections after careful examination always some spores could be found with subtle apical thickening of the wall or small exosporal blisters in that region, again a characteristic feature of *G. allospora*. Barkman himself noticed at collection *Barkman 7984* that the spores were "smooth, without germ pore, sometimes at the apex with annuliform wall-thickening". In six collections in addition very few spores were present with small exosporal blisters in other areas of the spore, in particular near the plage.

In our opinion the collections with spores without exosporal ornamentation fit in perfectly well with *G. luteofulva* P.D. Orton, the collections with spores with apical wall-thickening or blisters with *G. allospora* Smith & Sing. We are convinced that these are two variants of one and the same taxon, apparently with a weak tendency to form small blisters near the apex and occasionally elsewhere on the spores. This opinion is confirmed by an observation by C. Bas, who studied the type of *G. luteofulva* and observed spores with small apical blisters, so characteristic of *G. allospora* (communicated by Barkman, 1970: 141).

One of the studied collections (*Barkman 7806*) is slightly deviating by the relatively small, smooth spores (8–10 × 5–5.5 µm) and often subcylindrical cheilocystidia. We do not feel certain whether this collection belongs to *G. allospora* as well.

Galerina lyophylloides Barkman *nom. prov.*, Coolia 14 (1969) 60 — Fig. 19

Identified as: *G. allospora* Smith & Sing.

Pileus 6–10 mm broad, convex to conico-convex, hygrophanous, when moist almost black, obscurely striate, drying beige-grey, surface rugulose-tomentose, without veil remnants. Lamellae adnate with decurrent tooth, ascending, thickish, dark olive grey with white pruinose edge. Stipe 15–25 × 1.5 mm, cylindrical, fibrillose, apex pruinose. Smell and taste not recorded (from Barkman's notes).

Spores 10.5–13.5(–14.0) × 5.5–7.0 µm, Q = (1.75–)1.85–2.0(–2.1), ovoid-oblong to amygdaliform, orange-brown, smooth with plage, sometimes with small exosporal blisters near apex. Basidia 23.5–31.5 × 7.5–8.0 µm, in majority 4-spored, a few 2-spored. Lamella edge sterile; cheilocystidia 27–44 × 5.5–8.5 µm, lageniform with a slender cylindrical neck, 2–4 µm wide, mostly subcapitate, apex 3.3–6.0 µm wide, near apex sometimes with clots of greyish, refractive material. Pleurocystidia absent. Pileipellis a cutis, made up of radial hyphae, 3–8 µm wide, with yellow-brown parietal and encrusting pigments. Clamp-connections present in hymenium and trama.

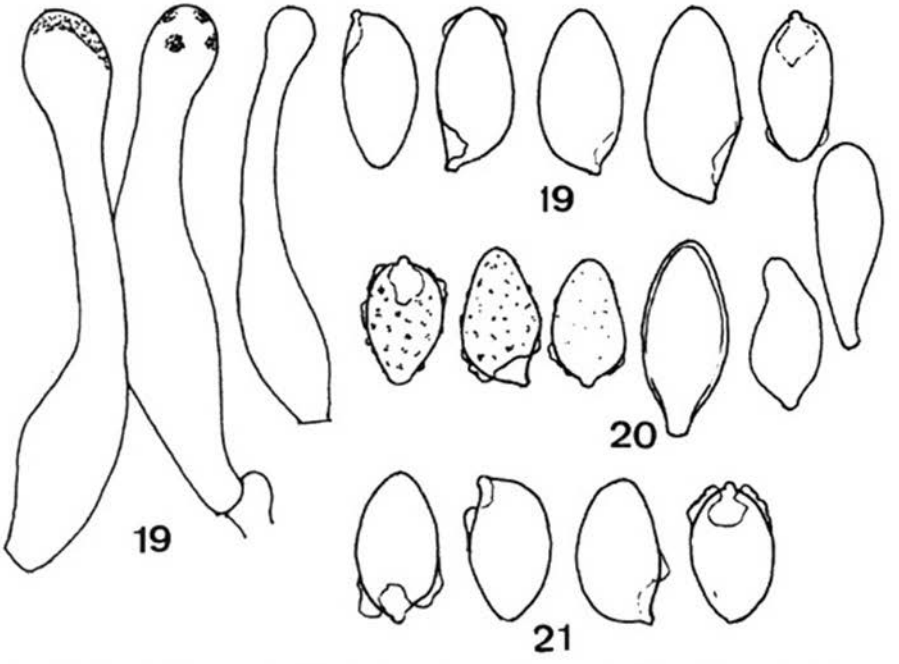
Collection examined. NETHERLANDS: Drenthe, Dwingeloo, 'Lheebroekerzand, Reigerplas', in scrub of *Juniperus communis*, 27 Oct. 1964, *J. J. Barkman 7957* (WBS).

The collection, described above, was labelled as type and consists of four sporocarps in rather good condition.

Galerina lyophylloides was distinguished by Barkman (1969) mainly on the basis of (1) "spores with cap-shaped thickened apex, (2) cheilocystidia with small slime cap at apex, (3) pileus almost black, rugulose tomentose". In his own annotations, however, Barkman described the spores as "smooth ..., sometimes with slightly loosening perispore (sometimes as small cap on apex of spores)". Thus, spores with thickened apex were rather an exception than a rule, in agreement with our observations. In fact the small apical blisters on some spores are identical to those in *G. allospora* (see also remarks on *G. junipera*) and Barkman's original drawing of a spore is quite similar. The drawing, produced in Coolia (Barkman, 1969: 72, fig. 38) with a black cap on the spore apex, is overdone.

Instead of a slime cap on the cheilocystidia (as figured by Barkman, 1969: 83, fig. 38), we found only some small clots of greyish, refractive material, probably inside the apex of the cystidia. We do not pay much taxonomic weight to this character.

The very dark colours of pileus and lamellae, described for the fresh sporocarps, are quite unusual within *Galerina*. However, the exsiccata are dark yellow-brown, not deviating from typical collections of *G. allospora* (and many other species), which make us wonder whether the dark colours may be caused by frost damage or another external factor. It is striking that this collection shows much resemblance to the provisional type collection of *G. atrofusca* (*Barkman 7956*), also described in this paper and collected a week earlier in the same year 1964. We are convinced that they belong to the same taxon, close to or very probably identical with *G. allospora* Smith & Sing. In this respect it is remarkable that in his descriptive notes on a collection of *G. juniperina* (*Barkman 8718*), Barkman described the pileus as 'dark grey-brown' and the stipe as 'pale grey-brown'. This collection was, together with the other exsiccata of *G. juniperina*, identified by us as *G. allospora* (see notes on *G. juniperina* in this paper).



Figs. 19–21. — 19. '*Galerina lyophylloides*' (= *G. allospora*), spores and cheilocystidia. — 20. '*Galerina ramicola*' (= *G. hypnorum*), spores, to the right three abnormal spores. — 21. '*Galerina sahleri* var. *clavipila*' (= *G.* cf. *calyptrata*), spores. All × 2000.

Galerina ramicola Barkman *nom. prov.*, Coolia 14 (1969) 63 — Fig. 20

Identified as: *Galerina hypnorum* (Schrank: Fr.) Kühner.

Pileus 5–9 mm broad, conical, dark dull reddish brown, fibrillose, translucently striate up to 3/4 of the radius. Lamellae [L = 18–20, l = 1(–3)] adnate with decurrent tooth, ascending, vividly reddish brown with white a floccose edge. Stipe 23–29 × 1.0–1.2 mm, cylindrical, the apex yellow-brown, pruinose, downwards reddish brown, base sometimes very dark, below apex with a small fibrillose annulus, downwards with scattered fibrils of veil.

Spores of two types: 'normal' spores 9.0–10.0(–10.5) × 5.0–5.5(–6.5) µm, Q = 1.6–1.9, ovoid-oblong to amygdaliform, smooth to roughened with irregularly loosening exospore; in addition larger and slightly thick-walled spores (10.0–)10.5–14.0 × 5.0–6.5(–7.0) µm, Q = 1.85–2.2, amygdaliform or mostly of irregular shape, more or less deformed, smooth or weakly rugulose. Basidia collapsed, according to Barkman 26–33 × 5.0–5.8 µm. Cheilocystidia hardly recognizable in exsiccatum, collapsed, according to Barkman lageniform to bar-bell shaped, 28–38 × 6–8.5 µm with a thick, cylindrical neck, c. 5 µm wide and subcapitate apex, c. 6–6.5 µm wide. Pleurocystidia absent. Pileipellis not reinflating, according to Barkman made up of interwoven, encrusted hyphae, 2.5–13 µm wide, in addition with few lageniform pileocystidia, 46–50 × 5–8 µm.

Collection examined. NETHERLANDS: prov. Overijssel, Buurse, 'Buurserzand', on dead twigs in scrub of *Juniperus communis*, 2 Nov. 1963, *J. J. Barkman 7691* (WBS).

This collection comprises two sporocarps in very bad condition. It was initially identified by Barkman as *G. hypnorum*. Later this name has been removed by him from the label and replaced by '*G. ramicola* nov. spec.'. The main difference with *G. hypnorum* was indicated as the presence of a well-developed fibrillose annulus (Barkman, 1969). In addition he noted that the spores were larger. In our opinion *G. hypnorum* usually has a thin, fibrillose veil, leaving fugacious traces below the apex of the stipe (Arnolds, 1983). However, the development of this veil is quite variable, from almost absent to rather copious, and we consider the described fibrillose annulus as an example of a well-developed veil without taxonomic relevance.

The variability in spore size and shape is quite remarkable. The spores, described here as 'normal', are characteristic of *G. hypnorum* with their irregularly loosening exospore. The larger spores are often obviously misshaped and are considered to be abnormalities, possibly caused by long preservation of sporocarps in a refrigerator.

It should be noted that the identity of *G. hypnorum* is still disputed. We follow here the species concept by Arnolds (1983), who described it as a small *Galerina* with yellow- to orange-brown pileus and initially honey yellow stipe, characterized by spores of 7.5–11 × 4.7–6.2 µm with quite variable ornamentation, caused by the loosening exospore on various places, in various grades and in variable proportions of the spores. The cheilocystidia are rather short with a thick, subcapitate neck. *Galerina hypnorum* is the most widespread species of *Galerina* in the Netherlands (Arnolds et al., 1995). In Barkman's key (1969) *G. hypnorum* in the above concept keys out under the names *G. decipiens* Smith & Sing. var. *decipiens* and var. *separans* Smith & Sing. The description of *G. hypnorum* by Watling & Gregory (1993) is rather similar, except for the spore size: (9–)10–12(–14) × 5–6(–7.5) µm. According to Horak & Miller (1992) *G. calyptrata* P.D. Orton is a synonym of *G. hypnorum*. In our opinion the two species are different, although often confused. *G. calyptrata* differs in a more acute, more vividly orange pileus and the slightly larger spores (9–13 × 5.5–7.5 µm) that are always smooth except for two smooth, exosporal blisters around the plage. It is usually possible to distinguish the two species already in the field.

Galerina sahleri (Quél.) Kühner var. **clavipila** Barkman *nom. prov.*, Coolia 14 (1969) 59 — Fig. 21

Identified as: *Galerina* cf. *calyptrata* P.D. Orton.

Pileus 7–8 mm, campanulate, ochraceous yellow-brown, long translucently striate. Lamellae [L = 12, l = 3] adnate with decurrent tooth, ascending, distant, concolorous with pileus, with paler edge. Stipe 25–30 × 1 mm, cylindrical, pale yellow-brown, base reddish brown, white fibrillose, apex pruinose (from Barkman's notes).

Spores 9.5–11.0 × (5.5–)5.0–6.5 µm, Q = 1.6–1.8 (according to Barkman 10.5–13.0 × 6.0–7.5 µm), ovoid-oblong, in front-view slightly broader, orange-brown, smooth, in majority with two large, smooth or wrinkled, exosporal blisters near plage (calyptrate). Cheilocystidia collapsed, short and with broad capitulum, according to Barkman 25–36 × 7–10 µm, neck 5 µm, apex 6.5–8 µm. Pleurocystidia absent. Pileipellis made up of repent hyphae, 3–9 µm wide, with yellow-brown encrusting pigment; structure not well visible

in exsiccata; according to Barkman with numerous clavate, smooth pileocystidia, 59–108 × 8–14 µm, but in exsiccata impossible to detect. Clamp-connections present.

Collection examined. NETHERLANDS: prov. Overijssel, Lemele, 'Lemelerberg', in scrub of *Juniperus communis*, 2 Nov. 1963, *J. J. Barkman 7692* (WBS).

This collection comprises three mature sporocarps in reasonable condition, but the tissues were not well reinflating in KOH and therefore difficult to study. It was provisionally described as a new variety of *G. sahleri* by Barkman (1969) on the basis of the presence of clavate pileocystidia, which are said to be absent in other collections of that species. We were unable to discover such structures in the exsiccatum, but this is not amazing in view of the poor condition of the dried tissues. Barkman (1969) described also varieties with clavate pileocystidia of two related species, viz. *G. calyptrata* and *G. hypnorum*, which let us doubt the taxonomic significance of these structures. They may in fact be prolonged extensions of superficial hyphae and might even be induced by long preservation of the sporocarps in a refrigerator. The presence of moulds on the surface of the pileus suggests that this was the case in this collection. See also remarks on *G. calyptrata* var. *clavipila*.

The identification of this fungus as *Galerina sahleri* is another matter of doubt. *G. sahleri* is usually interpreted in the sense of Favre (1948). That fungus is close to *G. calyptrata* P.D. Orton and shares calyptrate spores of approximately the same size. Differences between the species are: (1) the presence of a cobwebby, fibrillose veil on the pileus in *G. sahleri*; (2) the colour of the pileus is described as rather dark honey-brown in *G. sahleri*, and more vividly orange in *G. calyptrata*; (3) absence of a farinaceous smell and taste in *G. sahleri*, which are prominent in *G. calyptrata* and (4) longer, subcylindrical cheilocystidia (42–72 µm long) in *G. sahleri*. In the descriptive notes on the present collection no mention is made of veil on the pileus; taste or smell were not recorded and the size of the cheilocystidia is characteristic of *G. calyptrata*. Only the described colour of the pileus is in better agreement with *G. sahleri*, but in our opinion it is more likely that this fungus represents a somewhat dull coloured variant of *G. calyptrata*, which is a common fungus in the Netherlands. It is doubtful whether *G. sahleri* is really indigenous.

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FURTHER MYCENAS FROM THE STATE OF PARANÁ, BRAZIL

R.A. MAAS GEESTERANUS[1] & A.A.R. DE MEIJER[2]

Seven new species of *Mycena* from the State of Paraná, Brazil, are described in section *Sacchariferae*, one species each in sections *Nigrescentes* and *Granuliferae*, and complementary notes are given of one species in section *Polyadelphia*. A key is provided for the species of section *Sacchariferae* thus far found in Paraná.

Since the publication of 'Mycenae paranaenses' by the same authors of this paper (1997), a few more species remain that call for attention. Many more species of *Mycena*, the first author is convinced, await to be discovered in Paraná but, however desirable, the search cannot for various reasons be continued.

Section Sacchariferae Kühn. ex Sing.

Synonyms and descriptions, see Maas Geesteranus (1983: 403) and Desjardin (1995: 7).

Desjardin (1995: 9) subdivided the section into the stirpes *Amparoina, Alphitophora* and *Adscendens*, diagnostic descriptions of which were given in his paper on pages 14, 37 and 53.

If the dark contents of the acanthocysts in *Mycena fuscinea* and *M. fuliginea* described in the present paper are rated to possess taxonomic value, the two species should be separated from most other members of the section, whose acanthocysts possess hyaline contents. They would form a fourth stirps which is here called stirps *Fuscinea*, nom. prov., and differentiated in the following key.

KEY TO THE STIRPES OF SECTION SACCHARIFERAE

1. Cherocytes absent from the surface of the primordium or the pileus.
   2. Caulocystidia densely spinulose all over.
      3. Acanthocysts with dark contents ..... stirps *Fuscinea*
      3. Acanthocysts with hyaline contents ..... stirps *Alphitophora*
   2. Caulocystidia smooth or only partially spinulose ..... stirps *Adscendens*
1. Cherocytes present. In one case, the acanthocysts (characterized by dark contents) simulate cherocytes by their shape ..... stirps *Amparoina*

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KEY TO THE SPECIES THUS FAR FOUND IN PARANÁ

1. Surface of the primordium or the disc of the young pileus or the disc at the base of the stipe bearing cherocytes.
   2. Primordium and pileus not covered with long, needle-thin hairs.
      3. Cherocytes with striking spines.
         4. Spines of the cherocytes thick-walled to solid, smooth.
            5. Cheilocystidia covered with comparatively few excrescences.
               6. Cheilocystidia with narrowed base, apically covered with excrescences 1.8–3.5 × 0.9 µm. Hyphae of the pileipellis densely covered with excrescences.
                  7. Spores 8.1–9.0 × 5.4–6.3 µm (Q = 1.6). Cheilocystidia 18–24 µm long *M. impexa* (Maas G. & de Meijer, 1997: 22)
                  7. Spores 8.9–10.7(–11.6) × 4.4–5.4 (Q = 2.1). Cheilocystidia 10.5–16 µm long *M. paula* (Maas G. & de Meijer, 1997: 25)
               6. Cheilocystidia almost sessile, apically covered with excrescences 0.5–0.9 × 0.5 µm. Hyphae of the pileipellis not very densely covered with excrescences *M. propinqua* (Maas G. & de Meijer, 1997: 28)
            5. Cheilocystidia covered with very numerous excrescences *M. excelsa* (Maas G. & de Meijer, 1997: 21)
         4. Spines of the cherocytes moderately thick-walled, spinulose, at least at the base.
            8. Stipe with somewhat bulbous base. Spores (6–)7.2–8.1 µm long. Cheilocystidia short-stalked ..... *M. atrox* (Maas G. & de Meijer, 1997: 16)
            8. Stipe springing from a basal disc. Spores 9.4–10.7(–11.6) µm long. Cheilocystidia frequently long-stalked *M. chloroxantha* (Maas G. & de Meijer, 1997: 17)
      3. Cherocytes without spines.
         9. Spores subglobose, 8.5–9.8 × 6.7–7.6 µm (Q = 1.3). Cheilocystidia densely and almost entirely covered with excrescences. Cherocytes covered with fairly coarse excrescences ..... *M. capillata*
         9. Spores pip-shaped, 8.1–9.8 × 5.4–6.5 µm (Q = 1.6). Cheilocystidia not very densely and only apically covered with excrescences. Cherocytes covered with fine excrescences ..... *M. lasiopus*
   2. Primordium and pileus covered with long, needle-thin hairs. Cheilocystidia absent. Main body of the cherocytes densely covered with excrescences, the neck slender and smooth ..... *M. rhaphidocephala*
1. Surface of the primordium or the disc of the young pileus or the basal disc devoid of cherocytes.
   10. Acanthocysts with colourless contents.
      11. Caulocystidia densely covered with excrescences all over.
         12. Caulocystidia predominantly cylindrical.
            13. Spores up to 10.5 µm long.
               14. Stipe with clavate to subbulbous base. Cheilocystidia (presumably) fusiform. Spores 8.5–10.3 × 3.6–5.4 µm (Q = 2.1) ..... *M. umbratilis*
               14. Stipe springing from a white-powdered basal patch. Cheilocystidia clavate to obpyriform. Spores 7.6–9.4 × 4.5–5.4(–6) µm (Q = 1.8–1.9) *M. hylophila*
            13. Spores 11.6–15.2 µm long ... *M. pistacea* (Maas G. & de Meijer, 1997: 27)

12. Caulocystidia predominantly with terminal swelling. Cheilocystidia globose to spheropedunculate ..... *M. dissimiliis* (Maas G. & de Meijer, 1997: 19)
11. Caulocystidia smooth ..... *M. adscendens* (Maas G. & de Meijer, 1997: 15)

10. Acanthocysts with brownish contents.
15. Stipe springing from a basal disc. Caulocystidia cylindrical. Growing on fallen leaves ..... *M. fuscinea*
15. Stipe not springing from a basal disc. Caulocystidia clavate to subfusiform. On decayed wood and bark ..... *M. fuliginea*

Mycena capillata Maas G. & de Meijer, *spec. nov.* — Fig. 1

Basidiomata dispersa. Pileus 2–3.5 mm latus, primo subellipsoideus, fuscus, crinibus vitreis numerosis obtectus, postea convexus, siccus, sulcatus, striatus, fusco-pulverulentus, pallidus inter striis. Caro pertenuis, odore nullo. Lamellae c. 15 stipitem attingentes, molles, adscendentes, ventricosae, usque ad 0.7 mm latae, adnexae, albae, margine convexae, concolores. Stipes 2.5–7 × c. 0.4 mm, fistulosus, fragilis, aequalis, cylindraceus, siccus, levis, brunneo-puberulus, albus, e disco basali albo-pubescente natus.

Basidia 18–22.5 × 11–13.5 µm, obpyriformia, 2-sporigera, efibulata. Sporae 8.5–9.8 × 6.7–7.6 µm, subglobosae, leves, tenuiter amyloideae. Cheilocystidia 16–25 × 9–16 µm, clavata, obpyriformia, efibulata, dense spinulosa, surculis cylindraceis rectis 0.9–1.5 × 0.5 µm praedita. Pleurocystidia nulla. Trama lamellarum iodi ope brunneo-vinescens. Hyphae pileipellis 2.5–4.5 µm latae, efibulatae, leves. Acanthocystides 13.5–38 × 11.5–32 µm, globosae, sphaeropedunculatae, efibulatae, sucum brunneum continentes, dense spinulosae. Crines vitrei 500–800 µm, basi usque ad 90 µm lati, apice 20–25 µm. Velum universale e cherocytibus 36–55 × 23–30 µm, crasse-tunicatis spinulosisque formatum. Hyphae stipitis corticales 1.8–2.5 µm latae, leves, efibulatae. Caulocystidia 24–80 × 7–15 µm, clavata vel cylindracea, dense spinulosa.

Ramulicola.

Holotypus: *A. A. R. de Meijer MA-3152* (No. 990.200-030; L); notulae: MBM 212261.

Etymology: capillatus, hairy, referring to the hyaline hairs covering the young pileus.

Basidiomata scattered. Pileus 2–3.5 mm across; in the primordial stage subellipsoid, dark grey-brown (6E4) to almost black-brown (6F4), paler grey-brown (6D3) towards the margin, covered with numerous, long, smooth, firm, straight, hyaline hairs, falling off with age; later conico-convex to convex, dry, sulcate, translucent-striate, entirely dark brown-pulverulent, pale between the striae, pallescent with age. Context very thin. Odour absent. Lamellae c. 15 reaching the stipe, tender, ascending, ventricose, up to 0.7 mm broad, adnexed, white, with convex, concolorous edge. Stipe 2.5–7 × c. 0.4 mm, fistulose, fragile, equal, terete, dry, smooth, brown-puberulous, white, springing from a small, white-pubescent basal disc.

Basidia (immature) 18–22.5 × 11–13.5 µm, obpyriform, 2-spored, clampless. Spores 8.5–9.8 × 6.7–7.6 µm (Q = 1.3), subglobose, smooth, weakly amyloid. Cheilocystidia 16–25 × 9–16 µm, clavate, obpyriform, clampless, densely spinulose, with the excrescences cylindrical, straight, 0.9–1.5 × 0.5 µm. Pleurocystidia absent. Lamellar trama brownish vinescent in Melzer's reagent. Pileipellis a cutis of repent, radiately aligned hyphae which are 2.5–4.5 µm wide, clampless, smooth. Acanthocysts 13.5–38 × 11.5–32 µm, globose and almost sessile or spheropedunculate, clampless, thin-walled, with brownish contents, densely spinulose, with the excrescences 0.9–1.5 × 0.5 µm. Vitreous hairs 500–800 µm long, up to 90 µm broad at the base, 20–25 µm at the apex, very thick-walled (although the width of the wall is difficult to discern), smooth to sparsely spinulose below, equally sparsely covered at the apex with coarse excrescences. Cherocytes 36–55 × 23–30 µm, clavate, fusiform,

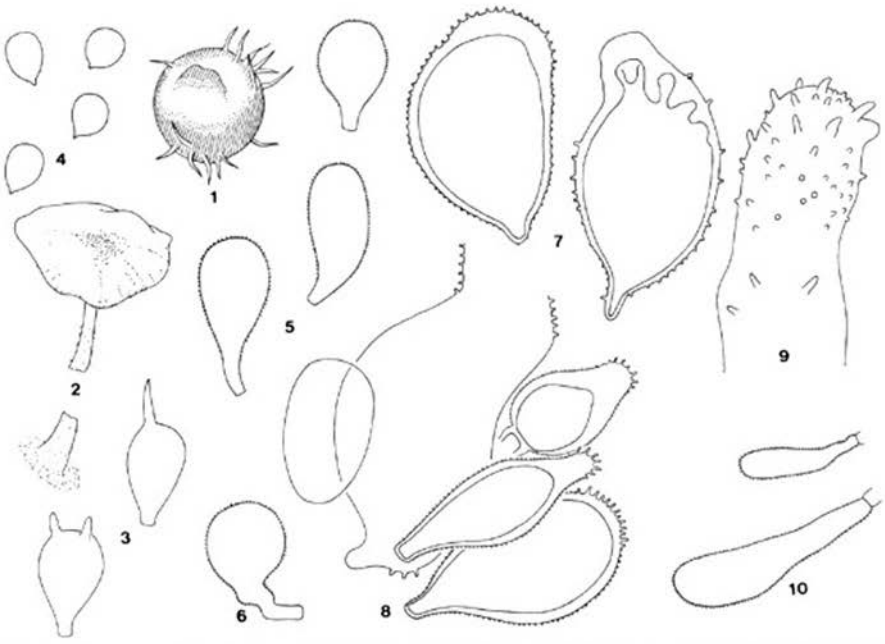

Fig. 1. *Mycena capillata* (holotype). 1. Young pileus covered with glass hairs, seen from above; 2. pileus and basal part of the stipe; 3. immature basidia; 4. spores; 5. cheilocystidia; 6. acanthocyst; 7. cherocytes at the base of the primordium; 8. glass hair and cherocytes; 9. glass hair, apical part; 10. caulocystidia. — Figs. 1 & 2, × 10; all others, × 700.

pyriform, thick-walled (0.9–1.5 µm, apically sometimes much more), densely spinulose (at the junction of stipe and basal disc sometimes more sparsely spinulose), with the excrescences 0.9–1.5 × 0.5–0.9 µm. Hyphae of the cortical layer of the stipe 1.8–2.5 µm wide, clampless, smooth. Caulocystidia 24–80 × 7–15 µm, clavate to cylindrical, clampless, thin-walled, apically broadly rounded, densely spinulose, with the excrescences 0.9–0.5 µm.

Growing on a decayed twig of a dicotyledonous tree, in mixed ombrophilous forest, 900 m alt.

Holotype: "*Mycena capillata* Maas G. & de Meijer / 25 July 1995 / Paraná: Piraquara Parque Marumbi, Mananciais da Serra / *A.A.R. de Meijer MA-3152*" (No. 990.200-030; L); notes and drawings: MBM 212261.

The name of the present species should not be confused with *Mycena capillaris* (Schum.: Fr.) Kummer, a member of section *Polyadelphia* Sing. ex Maas G., nor with *M. capillaris* P. Karst., which is a nomen dubium (Maas Geesteranus, 1981: 222).

Mycena capillata is a striking species which in the primordial stage is abundantly covered with long hyaline hairs and at a later stage (when most of these hairs have fallen off) by its cover of brown acanthocysts. Unfortunately, the scantiness of the material precluded a more detailed investigation, and several points remain unclear. It is unknown whether the vitreous hairs originate in the upper layer of the pileipellis or farther down; the cell-wall (of the one hair studied) remained uncoloured in a solution of Congo red, so that its thick-

ness could only be surmised. No definite answer can be given to the question whether or not the contents of the cherocytes are colourless.

In spite of these imperfections and even in the absence of primordia or young stages of the pileus, the species is easily recognizable by the combination of two-spored basidia, subglobose spores, brownish contents of the acanthocysts, shape of the cherocytes and relatively short caulocystidia.

Mycena fuscinea Maas G. & de Meijer, *spec. nov.* — Fig. 2

Basidiomata dispersa. Pileus usque ad 4 mm latus, usque ad 2 mm altus, e campanulato convexus, siccus, subsulcatus, striatus, brunneo-pruinosus, pallide griseobrunneus. Caro tenuis, odore nullo. Lamellae c. 14 stipitem attingentes, molles, adscendentes, ventricosae, c. 0.5 mm latae, anguste adnatae, albae, margine convexae, concolores. Stipes 8–35 × 0.2–0.4 mm, cavus, fragilis, aequalis, cylindraceus, siccus, levis, totus puberulus, albus, basi disco usque ad 1 mm lato, sulcato floccosoque substrato affixus.

Basidia (immatura) c. 16 × 10 µm, late clavata, 2?-sporigera, efibulata. Sporae 8.9–10.3(–11.6) × 4.9–5.4 µm, inaequilateraliter ellipsoideae, leves, amyloideae. Cheilocystidia 20–21 × 9–11 µm, clavata, efibulata, surculis cylindraceis 0.9 × 0.5 µm praedita. Pleurocystidia nulla. Trama lamellarum iodi ope brunneo-vinescens. Hyphae pileipellis 2.5–10 µm latae, efibulatae, sucum brunneum continentes, leves vel minute diverticulatae. Acanthocystides 16–36 × 13.5–27 µm, globosae vel late clavatae, sucum brunneum continentes, minute denseque spinulosae. Cherocytes haud visae. Hyphae stipitis corticales 1.8–2.5 µm latae, leves. Caulocystidia – c. 200 × 11–13.5 µm, cylindracea, dense spinulosa.

Foliicola.

Holotypus: *A.A.R. de Meijer GUa-3112* (No. 991.343-759; L); notulae: MBM 212257.

Etymology: fuscineus, an artificial word meant as a diminutive of fuscus (dark brown) and referring to the brown colour of the pruinose pileus.

Basidiomata scattered. Pileus up to 4 mm across, up to 2 mm high, at first campanulate, then convex, flattening with age, dry, smooth to somewhat sulcate along the margin, more pronouncedly sulcate when dried, translucent-striate, entirely brown-pruinose (acanthocysts), pale grey-brown under the pruina, turning fairly dark brown when dried. Context very thin. Odour absent. Lamellae c. 14 reaching the stipe, tender, ascending, ventricose, c. 0.5 mm broad, narrowly adnate, white, with convex, concolorous edge. Stipe 8–35 × 0.2–0.4 mm, hollow, fragile, equal, terete, dry, smooth, puberulous all over, white, arising from a sulcate, floccose, white basal disc up to 1 mm across.

Basidia (few seen, immature) c. 16 × 10 µm, broadly clavate, presumably 2-spored, clampless. Spores 8.9–10.3(–11.6) × 4.9–5.4 µm (Q = 2.2), pip-shaped, smooth, weakly amyloid. Cheilocystidia (only two seen) 20–21 × 9–11 µm, clavate, clampless, thin-walled, not very densely covered with evenly spaced, cylindrical, simple, straight excrescences 0.9 × 0.5 µm. Pleurocystidia absent. Lamellar trama brownish vinescent in Melzer's reagent. Pileipellis a cutis of repent, radiately aligned hyphae which are 2.5–10 µm wide, clampless, with brownish contents, smooth or densely covered with very small excrescences. Acanthocysts 16–36 × 13.5–27 µm, globose or broadly clavate, thin-walled, with brownish contents, densely covered with evenly spaced, cylindrical, simple, straight excrescences 0.9–1.5 × 0.5 µm. Cherocytes not observed. Hypoderm made up of parallel hyphae with inflated cells up to 25 µm wide. Hyphae of the cortical layer of the stipe 1.8–2.5 µm wide, smooth. Caulocystidia – c. 200 × 11–13.5 µm, cylindrical, thin-walled, with broadly rounded apex, densely covered with cylindrical, simple, straight excrescences 1.8–2.7 × 0.9 µm. Acanthocysts and caulocystidia from the basal disc covered with appreciably smaller excrescences; the acanthocysts with colourless contents.

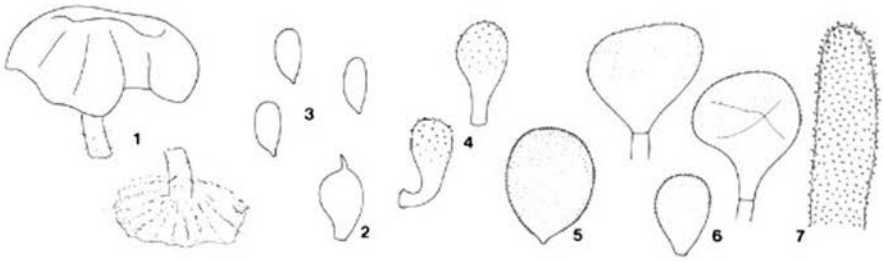

Fig. 2. *Mycena fuscinea* (holotype). 1. Pileus and basal disc; 2. immature basidium; 3. spores; 4. cheilocystidia; 5. acanthocyst; 6. acanthocysts taken from the basal disc; 7. caulocystidium. — Fig. 1, × 10; all others, × 700.

On fallen leaves of dicotyledonous trees in dense ombrophilous forest, 5 m above sea level.

Holotype: "*Mycena fuscinea* Maas G. & de Meijer / 5 July 1995 / Paraná: Guaraqueçaba, Potinga / *A. A. R. de Meijer GUa-3112* " (No. 991.343-759; L); notes and drawings: MBM 212257.

Desjardin (1995: 35), in his redescription of *Mycena sotae* Singer, stated that "the granulose pileus ... dries dark brown;" the stipe arises "from a broad, sulcate, pulverulent, white to grey basal disc;" the acanthocysts have "brown cytoplasmic contents;" and the basal disc cystidia (similar to the caulocystidia) are "densely spinulose overall." These are the same features which characterize *M. fuscinea*, but there are other characters which clearly show the two species to be different. The pileus of *M. sotae*, under its granular cover, is white; the acanthocysts are "angular or irregular in outline with 1–5 broadly rounded lobes;" the cheilocystidia are very densely covered with excrescences.

Mycena fuliginea Maas G. & de Meijer, *spec. nov.* — Fig. 3

Basidiomata solitaria. Pileus 1.5–3 mm latus, usque ad 2 mm altus, campanulatus, siccus, levis, estriatus, brunneo-pruinosus, obscure griseobrunneus, margine albus. Caro tenuis, odore nullo. Lamellae c. 10 stipitem attingentes, molles, adscendentes, ventricosae, c. 0.5 mm latae, subliberae, albae, margine convexae, concolores. Stipes 10–27 × 0.2–0.4 mm, cavus, fragilis, aequalis, cylindraceus, siccus, levis, totus puberulus, albus, disco basali destitutus.

Basidia haud visa. Sporae 8.7–10.3 × 4.7–5.4 µm, inaequilateraliter ellipsoideae, leves, amyloideae. Cheilocystidia 13.5–18 × 7–10 µm, clavata vel sphaeropedunculata, efibulata, surculis cylindraceis 0.9–0.5 µm instructa. Pleurocystidia nulla. Trama lamellarum iodi ope brunneovinescens. Hyphae pileipellis 2.7–4.5 µm latae, efibulatae, leves. Acanthocystides 14.5–20.5 × 13.5–20 µm, globosae vel ellipsoideae, sucum brunneum continentes, minute denseque spinulosae. Cherocytes haud visae. Hyphae stipitis corticales 1.8–3.5 µm latae, efibulatae, leves. Caulocystidia 10–60 × 5.5–11.5 µm, clavata vel subfusiformia, raro cylindracea, dense spinulosa.

Lignicola et corticola.

Holotypus: *A.A.R. de Meijer PAf-3080* (No. 991.343-760; L); notulae: MBM 212254.

Etymology: fuligineus, sooty, referring to the colour of the pileus.

Basidiomata solitary. Pileus 1.5–3 mm across, up to 2 mm high, campanulate, dry, smooth, not translucent-striate, brown-pruinose (acanthocysts), dark grey-brown under the pruina, white at the margin. Context very thin. Odour absent. Lamellae c. 10 reaching the stipe,

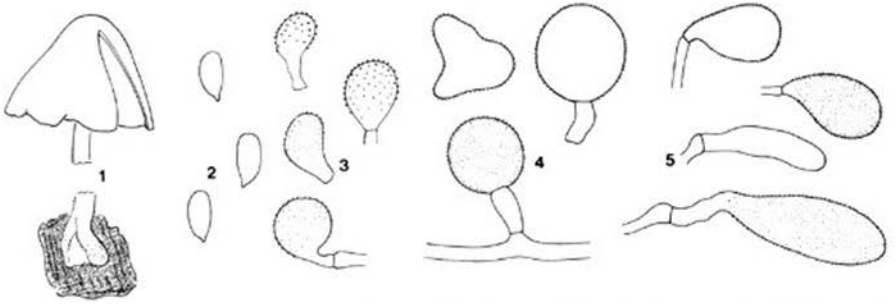

Fig. 3. *Mycena fuliginea* (holotype). 1. Pileus and basal part of the stipe; 2. spores; 3. cheilocystidia; 4. acanthocysts; 5. caulocystidia. — Fig. 1, × 10; all others, × 700.

tender, ascending, ventricose, c. 0.5 mm broad, almost free, white, with convex, concolorous edge. Stipe 10–27 × 0.2–0.4 mm, hollow, fragile, equal, terete, dry, smooth, puberulous throughout, white, not springing from a basal disc, directly attached to the substratum.

Basidia not observed. Spores (possibly not quite mature) 8.7–10.3 × 4.7–5.4 µm (Q = 2.0), pip-shaped, smooth, weakly amyloid. Cheilocystidia (few seen) 13.5–18 × 7–10 µm, clavate to spheropedunculate, clampless, thin-walled, almost entirely but not very densely covered with evenly spaced, cylindrical, simple, straight excrescences 0.9 × 0.5 µm. Pleurocystidia absent. Lamellar trama brownish vinescent in Melzer's reagent. Pileipellis a cutis of repent, radiately aligned hyphae which are 2.7–4.5 µm wide, clampless, smooth. Acanthocysts 14.5–20.5 × 13.5–20 µm, globose or broadly ellipsoid, thin-walled, with brownish homogeneous contents, minutely and densely spinulose, excrescences 0.9 × 0.5 µm. Cherocytes absent. Hypoderm made up of inflated hyphae. Hyphae of the cortical layer of the stipe 1.8–3.5 µm wide, smooth. Caulocystidia 10–60 × 5.5–11.5 µm, clavate to subfusiform, rarely cylindrical, thin-walled, with broadly rounded apex, minutely and densely spinulose, excrescences 0.9 × 0.5 µm.

On decayed wood and bark of dicotyledonous trees in dense, ombrophilous forest, 10 m altitude.

Holotypus: "*Mycena fuliginea* Maas G. & de Meijer / 22 June 1995 / Paraná: Paranaguá, Saquarema / *A. A. R. de Meijer PAf-3080*" (No. 991.343-760; L); notes and drawings: MBM 212254.

The differences between *M. fuliginea* and *M. fuscinea* indicated in the key are corroborated by the lamellae reaching the stipe numbering only c. 10 in *M. fuliginea* as against c. 14 in *M. fuscinea*.

Mycena hylophila Maas G. & de Meijer, *spec. nov.* — Figs. 4 & 5

Basidiomata dispersa. Pileus 0.5–3 mm latus, hemisphaericus vel convexus, aetate planus, interdum subdepressus, siccus, sulcatus, striatus, glaber ut videtur, pallide griseus. Caro pertenuis, odore indistincto. Lamellae 8–11(–14) stipitem attingentes, molles, adscendentes, ventricosae, usque ad 0.5 mm latae, liberae vel anguste adnatae, haud intervenosae, albae, margine convexae, concolores. Stipes 3–15 × c. 0.2 mm, fistulosus, fragilis, aequalis, cylindraceus, siccus, levis, puberulus, deorsum pubescens, albus, e disco basali minuto natus.

Basidia 13.5–18 × 8–10 µm, obpyriformia, 4-sporigera, efibulata. Sporae 7.6–9.4 × 4.5–5.4(–6) µm, inaequilateraliter ellipsoideae, leves, amyloideae. Cheilocystidia 13.5–24 × 6.5–15 µm, clavata, obpyriformia, raro subcylindracea, efibulata, apice surculis cylindraceis, rectis 0.9– > 1 × 0.5 munita. Pleurocystidia nulla. Trama lamellarum iodi ope brunneovinescens vel rubrobrunnea. Hyphae pileipellis 2.5–4.5 µm latae, efibulatae, partim spinulosae. Acanthocystides 15–26 × 18–21 µm, globosae vel obovoideae dense spinulosae. Cherocytes haud visae. Hyphae stipitis corticales leves. Caulocystidia 18–110 × 4.5–6.5 µm, cylindracea, apicibus obtusa, dense spinulosa.

Ramulicola, raro foliicola.

Holotypus: *A. A. R. de Meijer MA-2939* (No. 990.200-069; L); notulae: MBM 212252.

Etymology: hylophilus, dwelling in forests.

Basidiomata scattered. Primordium, one seen, less than 0.5 mm across, globose, white. Pileus 0.5–3 mm across, hemispherical to convex, flattening with age, sometimes becoming somewhat depressed at the centre, dry, sulcate, translucent-striate, appearing glabrous, pale grey at the centre, the striae very pale greyish, pure white between the striae, distinctly sulcate when drying out and turning white all over. Context very thin. Odour indistinct. Lamellae 8–11(–14) reaching the stipe, tender, ascending, ventricose, up to 0.5 mm broad, free or narrowly adnate, not intervenose, white, with convex, concolorous edge. Stipe 3–15 × c. 0.2 mm, fistulose, fragile, equal, terete, dry, smooth, puberulous, pubescent near the base, white, springing from a very small, white-powdered basal patch which appears obscured by the base of the stipe when fresh and is best observed when dry.

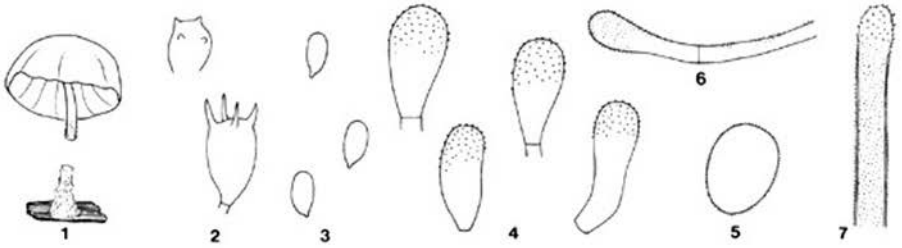

Fig. 4. *Mycena hylophila* (holotype). 1. Pileus and basal part of the stipe; 2. basidia; 3. spores; 4. cheilocystidia; 5. acanthocyst; 6. hypha of the pileipellis; 7. caulocystidium. — Fig. 1, × 10; all others, × 700.

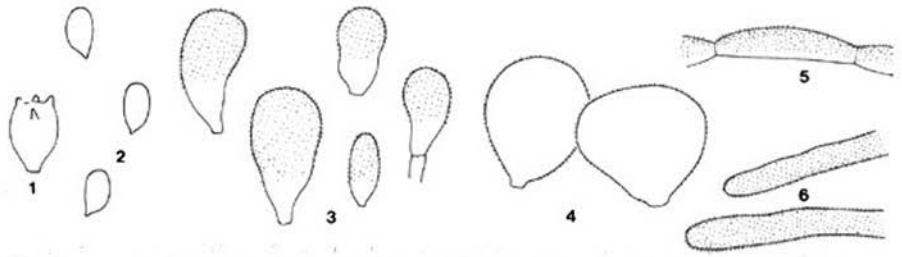

Fig. 5. *Mycena hylophila* (*de Meijer 3118*). 1. Basidium; 2. spores; 3. cheilocystidia; 4. acanthocysts; 5. hypha of the pileipellis; 6. caulocystidia. — All Figs., × 700.

Basidia 13.5–18 × 8–10 µm, obpyriform, 4-spored, clampless, with sterigmata up to 6.5 µm long. Spores 7.6–9.4 × 4.5–5.4(–6) µm (Q = 1.8–1.9), pip-shaped, smooth, amyloid. Cheilocystidia 13.5–24 × 6.5–15 µm, occurring mixed with the basidia, clavate, obpyriform, more rarely subcylindrical, clampless, apically fairly densely covered with evenly spaced, cylindrical, simple, straight excrescences 0.9– >1 × 0.5 µm. Pleurocystidia absent. Lamellar trama brownish vinescent or reddish brown in Melzer's reagent. Pileipellis a cutis of repent, radiately aligned hyphae which are 2.5–4.5 µm wide, clampless, in part smooth, in part spinulose or densely spinulose. Acanthocysts 15–26 × 18–21 µm, globose to subglobose or obovoid, thin-walled, densely and finely spinulose. Cherocytes not observed. Hyphae of the cortical layer of the stipe smooth. Caulocystidia 18–110 × 4.5–6.5 µm, cylindrical, thin-walled or with thickened cell-walls, apically obtuse, densely spinulose all over with the excrescences 0.9–1.8 × 0.5 µm.

On dead twigs, less frequently on dead leaves of dicotyledonous trees in dense ombrophilous forest, 850 m alt.

Holotype: "*Mycena hylophila* Maas G. & de Meijer / 17 Nov. 1994 / Paraná: Morretes, Parque Marumbi, BR-277 road / *A. A. R. de Meijer MA-2939*" (No. 990.200-069; L); notes and drawings: MBM 212252.

Additional material: "*Mycena hylophila* Maas G. & de Meijer / 5 July 1995 / Paraná: Guaraqueçaba, Potinga / *A.A.R. de Meijer GUa-3118*" (No. 990.200-171; L); notes and drawings: MBM 212259.

The present species would be identified in Desjardin's key (1995: 9) as *Mycena hemitrichialis* Sing., but the description of the latter by Singer (1989: 74) shows some inconsistencies that need comment. The pileus in *M. hylophila* is hemispherical to convex and tends to flatten with age (conical to campanulate in *hemitrichialis*, according to Singer); the stipe in *hylophila* arises from a small basal patch (in *hemitrichialis* there is "a well-developed flattened ring of hispid mycelium surrounding and covering the swelling that constitutes a rudimentary basal disc," as demonstrated by Desjardin); in *hylophila* the caulocystidia are densely covered with spinulae of the same size right to their tips (in *hemitrichialis*, according to Singer, the spinulae on [the] distal 25% [part of the caulocystidia] are sparse and longer [than the] spinulae on [the] proximal 75% part).

Mycena lasiopus Maas G. & de Meijer, *spec. nov.* — Fig. 6

Basidiomata dispersa. Pileus usque ad 4 mm latus, usque ad 2.5 mm altus, e campanulato convexus, siccus, levis, striatus, dense brunneo-pruinosus, obscure griseobrunneus, aetate pallidior. Caro tenuis, odore nullo. Lamellae c. 14 stipitem attingentes, molles, adscendentes, ventricosae, c. 1 mm latae, sublibera e, albae, margine convexae, concolores. Stipes 5–7 × c. 0.4 mm, cavus, fragilis, aequalis, cylindraceus, siccus, levis, infra villosus, supra puberulus, albus, basi, disco c. 1 mm lato, laciniatolamellato, albo substrato affixus.

Basidia (immatura) 15–18 × 10–11.5 µm, late clavata vel subglobosa, 4-sporigera. Sporae 8.1–9.8 × 5.4–6.5 µm, inaequilateraliter ellipsoideae, leves, tenuiter amyloideae. Cheilocystidia 16–22.5 × 8–14.5 µm obovata vel clavata, surculis haud numerosis, cylindraceis, 0.9– > 1 × 0.5 µm instructae. Pleurocystidia nulla. Trama lamellarum iodi ope brunneovinescens. Hyphae pileipellis 2.5–4.5 µm latae, sucum brunneum continentes, leves. Acanthocystides 13.5–27 × 11.5–22.5 µm, globosae, sucum brunneum continentes, minute denseque spinulosae. Cherocytes haud numerosae, 27–35 × 18–40 µm, versiformia, crasse tunicatae, minute denseque spinulosae. Hyphae stipitis corticales 1.8–3.5 µm latae, leves. Caulocystidia – c. 350 × 4.5–11.5 µm, cylindracea, dense spinulosae, apicibus tamen sublevia.

Corticola.
Holotypus: *A.A.R. de Meijer MA-3092* (No. 991.343-747; L); notulae: MBM 212255.
Etymology: λασιος, shaggy, and πους, foot, in reference to the shaggy lower part of the stipe.

Basidiomata scattered. Pileus up to 4 mm across, up to 2.5 mm high, at first campanulate, then convex, dry, smooth, translucent-striate, densely brown-pruinose, fresh dark grey-brown (5–6E4), pallescent with age, becoming fairly pale grey-brown (5C3–5D3) to pale greyish. Context very thin. Odour absent. Lamellae c. 14 reaching the stipe, tender, ascending, ventricose, c. 1 mm broad, almost free, white, with convex, concolorous edge. Stipe 5–7 × c. 0.4 mm, hollow, fragile, equal, terete, dry, smooth, villose below, puberulous above, white, springing from a radially lamellate basal disc c. 1 mm across, whose lamellae are white and minutely fimbriate-laciniate.

Basidia (immature) 15–18 × 10–11.5 µm, broadly clavate to subglobose, 4-spored. Spores 8.1–9.8 × 5.4–6.5 µm (Q = 1.6), pip-shaped, smooth, very weakly amyloid. Cheilocystidia 16–22.5 × 8–14.5 µm, broadly obovate to almost globose in the middle of the lamella, mixed with narrower, clavate ones near the pileus margin, not forming a sterile band, mostly occurring in small groups, covered with not very numerous, evenly spaced, cylindrical, simple, straight excrescences 0.9– > 1 × 0.5 µm which are barely visible in the obovate cystidia, more clearly visible in the clavate cystidia. Pleurocystidia absent. Lamellar trama brownish vinescent in Melzer's reagent. Pileipellis a cutis of repent, radiately aligned hyphae which are 2.5–4.5 µm wide, with brownish contents, smooth. Acanthocysts 13.5–27 × 11.5–22.5 µm, globose, thin-walled, with homogeneous brownish contents, densely covered with barely visible, evenly spaced, cylindrical, simple, straight excrescences 0.9 × 0.5 µm. Cherocytes not very numerous, 27–35 × 18–40 µm, variously shaped, short-stalked, thick-walled (1.8–3.5 µm), with homogeneous brownish contents, densely spinulose. Hypoderm made up of parallel hyphae with inflated cells up to 30 µm wide. Hyphae of the cortical layer of the stipe 1.8–3.5 µm wide, smooth. Caulocystidia – c. 350 × 4.5–11.5 µm, cylindrical, thin-walled, with broadly rounded apex, densely spinulose for the greater part, terminally almost smooth. Acanthocysts and an occasional cherocyte from the basal disc with colourless contents.

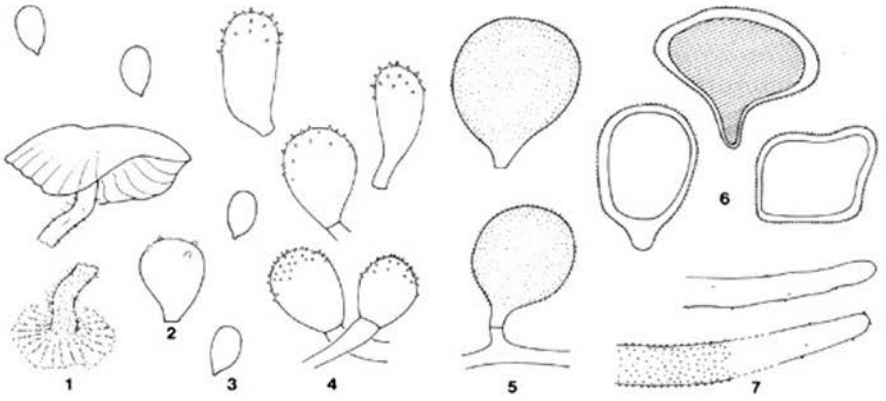

Fig. 6. *Mycena lasiopus* (holotype). 1. Pileus and basal disc; 2. basidium; 3. spores; 4. cheilocystidia; 5. acanthocysts; 6. cherocytes; 7. caulocystidia. — Fig. 1, × 8; all others, × 700.

Clamp-connections either not observed or not clearly seen.

On the cortex of a fallen twig of a dicotyledonous tree in dense ombrophilous forest, 20 m above sea level.

Holotype: "*Mycena lasiopus* Maas G. & de Meijer / 27 June 1995 / Paraná: Morretes, Porto de Cima, Parque Marumbi, rio Nhundiaquara / *A.A.R. de Meijer MA-3092*" (No. 991.343-747; L); notes on drawings: MBM 212255.

Desjardin (1995: 14) defined his stirps *Amparoina* among other features by stating that the cherocytes are thick-walled and possess spine-like projections and the caulocystidia are densely spinulose overall. However, it is probably not possible to define any subgeneric taxon without allowing one or more taxa to deviate in one or two of its characters. Sharp lines of demarcation are rare in Nature, and this led Desjardin to accept *Mycena sotae* Singer (p. 37) as a member of stirps *Amparoina* although the acanthocysts of the species are thin-walled and lack spine-like projections, the connecting element being the acanthocysts "overall morphology ... suggestive of cherocytes."

Mycena lasiopus constitutes a comparable case. Most of its characters agree with those of stirps *Amparoina* but the cherocytes lack spine-like projections and the caulocystidia, instead of being "densely spinulose overall," are almost smooth terminally.

Mycena rhaphidocephala Maas G. & de Meijer, *spec. nov.* — Fig. 7

Basidiomata dispersa. Pileus 0.5–2 mm latus, convexus, siccus subsulcatus, striatus, pulverulentus, acubus vitreis longissimis obtectus, pallide brunneo-griseus, hygrophanus. Caro pertenuis, odore nullo. Lamellae 6–10 stipitem attingentes, molles, adscendentes, ventricosae, usque ad 0.3 mm latae, liberae, albae, margine convexae, concolores. Stipes 2–7 × 0.1–0.2 mm, fistulosus, fragilis, aequalis, cylindraceus, siccus, levis, puberulus, albus, e disco basali albo natus.

Basidia c. 17 × 10–11.5 µm, obpyriformia, 2-sporigera, efibulata. Sporae 10–12 × 5–6 µm, inaequilateraliter ellipsoideae, leves, amyloideae. Cheilocystidia pleurocystidiaque nulla. Trama lamellarum iodi ope brunneovinescens. Hyphae pileipellis 2.5–3.5 µm latae, efibulatae, leves. Acanthocystides 9–15 × 6.5–9 µm, obpyriformes, efibulatae, dense spinulosae. Acus –3000 × 9–11 µm, basi usque ad 18 µm lati, leves. Velum universale e cherocytibus 45–65 × 13.5–21.5 µm, ellipsoideis, nonnihil crasse-tunicatis, spinulosis, collo angustiore 30–55 × 3.5–5.5 µm, tenui-tunicato, levi instructis formatum. Hyphae stipitis corticales leves. Caulocystidia –75 (vel ultra) × 13.5–18 × 5.5–9 µm, lageniformia, levia, tenui-tunicata.

Ramulicola.

Holotypus: *A.A.R. de Meijer MA-3098* (No. 990.200-185; L); notulae: MBM 212256.

Etymology: ραφις, needle; κεφαλη, head, referring to the needles covering the pileus.

Basidiomata scattered. Pileus 0.5–2 mm across, convex, dry, shallowly sulcate, translucent-striate, pulverulent, covered with needle-thin, long, hyaline hairs, the centre and striae pale brownish grey (5B2), white between the striae. Context very thin. Odour absent. Lamellae 6–10 reaching the stipe, tender, ascending, ventricose, up to 0.3 mm broad, free, white, with convex, concolorous edge. Stipe 2–7 × 0.1–0.2 mm, fistulose, fragile, equal, terete, dry, smooth, puberulous, white, springing from a radiately striate basal disc 0.5 mm across, the edges of which turn involute when dried.

Basidia (immature) c. 17 × 10–11.5 µm, obpyriform, with two incipient sterigmata, clampless. Spores 9–10.7 × 4.5–5.4 µm (Q = 2.0), pip-shaped, smooth, amyloid. Cheilocystidia absent. Pleurocystidia absent. Lamellar trama brownish vinescent in Melzer's reagent. Pileipellis a cutis of repent, radiately aligned hyphae which are 2.5–3.5 µm wide, clampless, smooth. Acanthocysts 9–15 × 6.5–9 µm, obpyriform, short-stalked, clampless, thin-walled,

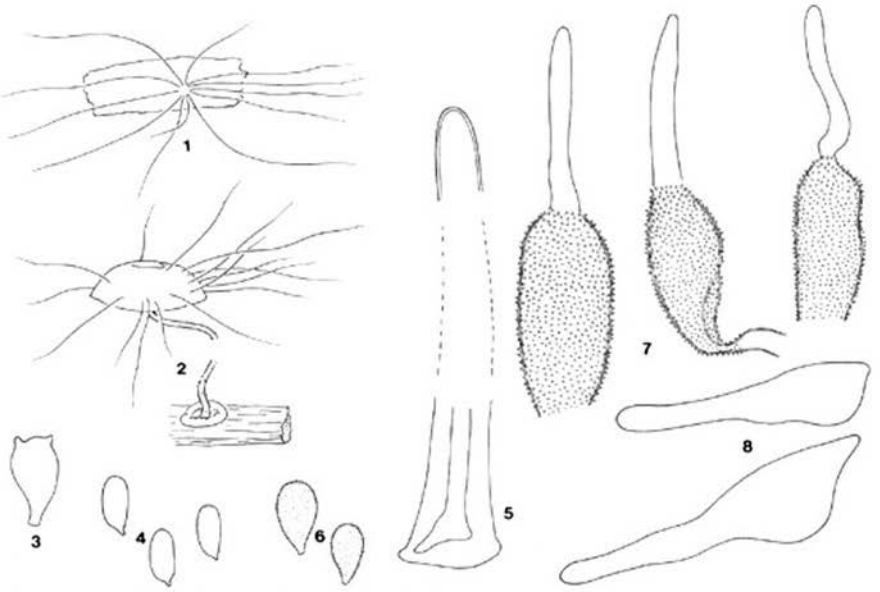

Fig. 7. *Mycena rhaphidocephala* (holotype). 1. Primordium; 2. pileus and basal disc; 3. immature basidium; 4. spores; 5. glass hair; 6. acanthocysts; 7. cherocytes; 8. caulocystidia. — Figs. 1 and 2, × 10; all others, × 700.

with hyaline contents, densely spinulose, with the excrescences 1–2 × < 1 µm. Vitreous hairs up to 3000 µm long, 9–11 µm broad, at the base up to 18 µm broad, thick-walled (1–2.5 µm), smooth. Cherocytes 45–65 × 13.5–21.5 µm, ellipsoid, somewhat thick-walled, densely spinulose, with the excrescences 2–2.5 × 1 µm, passing into a slender neck which is 30–55 × 3.5–5.5 µm, thin-walled, smooth. Hypoderm made up of parallel hyphae with inflated cells c. 20 µm wide. Hyphae of the cortical layer of the stipe smooth. Caulocystidia –75 (or longer) × 13.5–18 × 5.5–9 µm, lageniform, smooth, thin-walled.

On a dead twig of a dicotyledonous tree in dense ombrophilous forest, 20 m alt.

Holotype: "*Mycena rhaphidocephala* Maas G. & de Meijer / 27 June 1995 / Paraná: Morretes, Porto do Cima, Parque Marumbi, rio Nhundiaquara / *A.A.R. de Meijer MA-3098*" (No. 990.200-185; L); notes and drawings: MBM 212256.

The combination of long, needle-shaped vitreous hairs covering the pileus, the lack of cheilocystidia and smooth caulocystidia is not known in any other species of the section *Sacchariferae*.

Mycena umbratilis Maas G. & de Meijer, *spec. nov.* — Fig. 8

Basidiomata dispersa. Pileus usque ad 2.5 mm latus, convexus, siccus, subsulcatus, striatus, griseo-albus. Caro tenuis, alba, odore nullo. Lamellae c. 10 stipitem attingentes, molles, adscendentes, ventricosae, c. 0.3 mm latae, anguste adnatae, albae, margine convexae, concolores. Stipes –18 × 0.2 mm, fistulosus, fragilis, aequalis, cylindraceus, siccus, levis, totus puberulus, albus, basi subbulbosus.

Basidia (immatura) 7–8 µm lata, late clavata, 4-sporigera. Sporae 8.5–10.3 × 3.6–5.4 µm, inaequilateraliter ellipsoideae, leves, amyloideae. Cheilocystidia 9–10 µm lata, fusiformia, surculis cylindra-

ceis 0.9–1.5 × 0.5 µm instructa. Pleurocystidia nulla. Trama lamellarum iodi ope brunneovinescens. Hyphae pileipellis 2.5–4.5 µm latae, efibulatae, spinulosae. Acanthocystides 11–17 × 11–16 µm, globosae, minute denseque spinulosae. Cherocytes haud visae. Hyphae stipitis corticales 1.8–3.5 µm latae, leves. Caulocystidia –120 × 3–8 µm, cylindracea, dense spinulosa. Cystidia stipitis basi c. 20 × 9 µm, efibulata, dense spinulosa.

Foliicola.

Holotypus: *A.A.R. de Meijer GUa-3117* (No. 991.343-685; L); notulae: MBM 212258.

Etymology: umbratilis, remaining in the shadow.

Basidiomata scattered. Pileus up to 2.5 mm across, convex, dry, slightly sulcate along the margin, translucent-striate, centre and striae greyish white, pure white between the striae. Context thin, white. Odour absent. Lamellae c. 10 reaching the stipe, tender, ascending, ventricose, c. 0.3 mm broad, narrowly adnate, white, with convex, concolorous edge. Stipe –18 × 0.2 mm, fistulose, fragile, equal, terete, dry, smooth, puberulous throughout, white, with puberulous, clavate to subbulbous base which, when dry, looks like a small basal disc.

Basidia (immature) 7–8 µm broad, broadly clavate, 4-spored. Spores 8.5–10.3 × 3.6–5.4 µm (Q = 2.1), pip-shaped, smooth, amyloid. Cheilocystidia not numerous, occurring mixed with the basidia, 9–10 µm broad, (presumably) fusiform, apically covered with not numerous, evenly spaced, cylindrical, simple, straight excrescences 0.9–1.5 × 0.5 µm. Pleurocystidia absent. Lamellar trama brownish vinescent in Melzer's reagent. Pileipellis a cutis of repent, radiately aligned hyphae which are 2.5–4.5 µm wide, clampless, the upper side densely covered with minute excrescences 0.5 × 0.5 µm. Acanthocysts 11–17 × 11–16 µm, globose (with a single exception which is irregularly triangular and much larger, Fig. 6), thin-walled, with colourless contents, densely covered with evenly spaced, simple, straight excrescences 0.5 × 0.5 µm. Cherocytes not observed. Hypoderm made up of hyphae with inflated cells. Hyphae of the cortical layer of the stipe 1.8–3.5 µm wide, smooth. Caulocystidia –120 × 3–8 µm, cylindrical, thin-walled, with broadly rounded apex, densely spinulose, with the excrescences 0.9–1.5 × 0.5 µm. Cystidia at the base of the stipe c. 20 × 9 µm, clavate, thin-walled, clampless, densely spinulose.

On fallen leaves of dicotyledonous trees in dense ombrophilous forest, 5 m above sea level.

Holotype: "*Mycena umbratilis* Maas G. & de Meijer / 5 July 1995 / Paraná: Guaraqueçaba, Potinga / *A.A.R. de Meijer GUa-3117*" (No. 991.343-685; L); notes and drawings: MBM 212258.

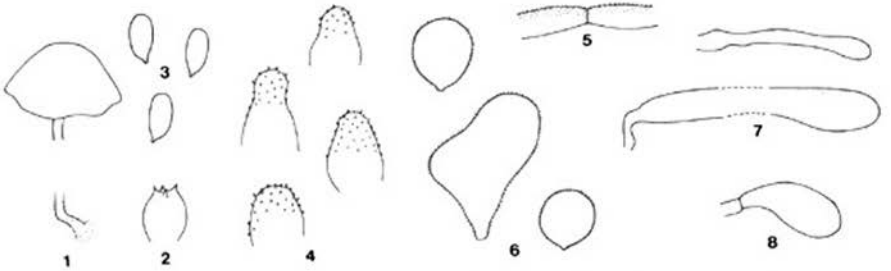

Fig. 8. *Mycena umbratilis* (holotype). 1. Pileus and basal part of the stipe; 2. basidium; 3. spores; 4. cheilocystidia; 5. fragment of a hypha of the pileipellis; 6. acanthocysts; 7. caulocystidia; 8. basal cystidium. — Fig. 1, × 10; all others, × 700.

Desjardin's key (1995: 9) to the species of section *Sacchariferae* would give no other choice but to name the present species *Mycena depilata* Sing., but the original description (Singer, 1989: 72) shows at least two clear differences from *M. umbratilis*. Singer found the acanthocysts of the pileus surface (which he called dermatocystidia) much larger (20–39 × 12–17–24 µm) than those of *M. umbratilis*, while his material apparently lacked cylindrical caulocystidia. Desjardin who reexamined the holotype (consisting "of one fragmented stipe") did not find long-cylindrical caulocystidia either.

It is most unfortunate that Singer's description gives so little detail (it is not known whether the fresh pileus was sulcate; how many lamellae reached the stipe; which part of the cheilocystidia was covered with excrescences and whether they were few in number or densely spaced; whether there were clamps), but going by his measurements of the pileus (1 mm across) and the stipe (up to 10 mm long) and considering that he found the spores only weakly amyloid, it seems that all differences taken together are sufficient proof to proclaim *M. depilata* and *M. umbratilis* two separate species.

Section Polyadelphia Sing. ex Maas G.

Synonyms and description, see Maas Geesteranus (1986: 159).

Mycena elongata Maas G. & de Meijer — Fig. 9

Mycena elongata Maas G. & de Meijer, Mycenae paranaenses (1997) 50.

The second collection of this species differs only very little macroscopically from the type, described in 1997, but additional microscopical data presenting the variability of the species should not be omitted.

Basidia (immature, few seen) c. 18 × 9 µm. Spores (immature?) 8.1–9.8 × 4.7–5.4 µm (Q = 2.2), pip-shaped, smooth, strongly amyloid. Cheilocystidia 13.5–22.5 × 10–13.5 µm, forming a sterile band, subclavate, subpyriform, broadly ellipsoid, (clamps not observed), thin-walled, covered with few, unevenly spaced, very coarse, cylindrical to subclavate or

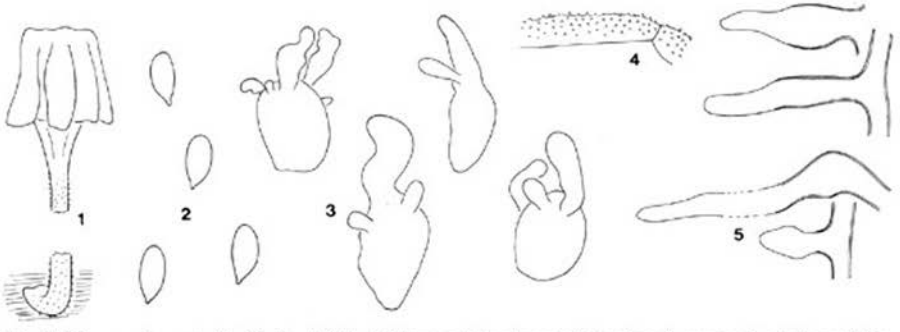

Fig. 9. *Mycena elongata* (*de Meijer 3120*). 1. Pileus and basal part of the stipe; 2. spores; 3. cheilocystidia; 4. fragment of a hypha of the pileipellis; 5. caulocystidia. — Fig. 1, × 10; all others, × 700.

variously shaped excrescences 6.5–18 × 4.5–7 µm. Pleurocystidia absent. Lamellar trama reddish brown (due to immaturity?) in Melzer's reagent. Hyphae of the pileipellis (few observed) c. 6.5 µm wide (clamps not observed), densely covered with evenly spaced warts or short cylindrical excrescences 0.9–1.5 × 0.9–1.5 µm. Hyphae of the hypoderm with inflated cells up to 25 µm wide. Hyphae of the cortical layer of the stipe 2.5–3.5 µm wide, one clamp observed, with somewhat thickened cell-walls, smooth, the caulocystidia 30–60 × 4.5–11 µm, lateral, sublageniform to cylindrical, smooth.

Growing on dead leaves of dicotyledonous trees in dense ombrophilous forest, 5 m above sea level.

Material examined: '*Mycena elongata* Maas G. & de Meijer / 5 July 1995 / Paraná: Guaraqueçaba, Potinga / *A.A.R. de Meijer GUa-3120*' (No. 990.200-199; L); notes and drawings: MBM 212260.

Section Nigrescentes Maas G. & de Meijer

Description, see Maas Geesteranus & de Meijer (1997: 74).

KEY TO THE SPECIES

1. Cheilocystidia short- to long-stalked.
   2. Cheilocystidia covered with excrescences
      M. nigrescens (Maas G. & de Meijer, 1997: 75)
   2. Cheilocystidia smooth or with one or two coarse outgrowths ..... *M. obscurata*
1. Cheilocystidia sessile ..... *M. furva* (Maas G. & de Meijer, 1997: 77)

Mycena obscurata Maas G. & de Meijer, *spec. nov.* — Fig. 10

Basidiomata gregaria. Pileus 2.5–10 mm latus, initio convexus, centro umbilicatus, siccus, striatus, glaber ut videtur, hygrophanus, centro striisque atrobrunneus, siccus nigrescens. Caro pileo concolor, odore fungoideo. Lamellae 14–18 stipitem attingentes, haud molles, arcuatae, 1.5(–2) mm latae, longe decurrentes, pallide brunneogriseae, margine atrobrunneo. Stipes 12–50 × 0.5–1.5 mm, cavus, fragilis, subaequalis, cylindraceus, siccus, levis, glaber, atrobrunneus, siccatus nigrescens, basi fibrillis tenuibus munitus.

Basidia 22.5–27 × 5.5–6.5 µm, anguste clavata, 2-sporigera, efibulata, sterigmatibus 6.5 µm longis praedita. Sporae 8.1–9.4 × 4.5–5.3 µm, inaequilateraliter ellipsoideae, leves, tenuiter amyloideae. Cheilocystidia 20–30 × (3–)4.5–10 µm, clavata, stipitata, efibulata, levia vel surculis crassis instructa, sucum brunneum continentia. Pleurocystidia nulla. Trama lamellarum iodi ope brunneo-vinescens. Hyphae pileipellis 2.5–4.5 µm latae, efibulatae, ramosae, sucum brunneum continentes, cellulae terminales surculis crassis 1.8–3.5 × 1.8–2.5 µm munitae. Hyphae stipitis corticales 1.8–2.5 µm latae, efibulatae, leves, sucum brunneum continentes, cellulae terminales surculis crassis 4–12 × 4–7 µm instructae.

Lignicola.

Holotypus: *A.A.R. de Meijer DN-3348* (No. 990.200-165; L); isotypus: MBM 212262.

Etymology: obscuratus, darkened, referring to the basidiomata almost blackening when dried.

Basidiomata gregarious. Pileus 2.5–10 mm across, convex, then with umbilicate centre, dry, translucent-striate, appearing glabrous, hygrophanous, the centre and striae dark brown (8F3–8F5), between the striae brownish grey (8D2), drying evenly greyish white, finally blackening. Context thin, concolorous with the pileus surface. Odour fungoid. Lamellae

14–18 reaching the stipe, not tender, arcuate, 1.5(–2) mm broad, broadly adnate, far decurrent, pale brownish grey (8C2), with dark brown edge (8F4). Stipe 12–50 × 0.5–1.5 mm, hollow, fragile, more or less equal, terete, broadened at the base, dry, smooth, appearing glabrous, the upper part darkish brown (6E4), the lower part black-brown (8F4), blackened when dry, the base covered with fine fibrils.

Basidia 22.5–27 × 5.5–6.5 µm, slender-clavate, 2-spored, clampless, with 6.5 µm long sterigmata. Spores 8.1–9.4 × 4.5–5.3 µm (Q = 1.9), pip-shaped, smooth, weakly amyloid. Cheilocystidia 20–30 × (3–)4.5–10 µm, occurring mixed with basidia, generally clavate, almost capitate, more rarely almost cylindrical, long-stalked, clampless, smooth or with one or two coarse outgrowths, filled with brown vacuolar pigment. Pleurocystidia absent. Lamellar trama vinescent in Melzer's reagent. Pileipellis a cutis of repent, radiately aligned hyphae which are 2.5–4.5 µm wide, clampless, branched, with brown vacuolar pigment, the terminal cells with coarse excrescences 1.8–3.5 × 1.8–2.5 µm. Hypoderm made up of inflated hyphae. Hyphae of the cortical layer of the stipe 1.8–2.5 µm wide, clampless, smooth, with brown vacuolar pigment in the lower part of the stipe, the terminal cells with coarse, sometimes branched excrescences 4–12 × 4–7 µm.

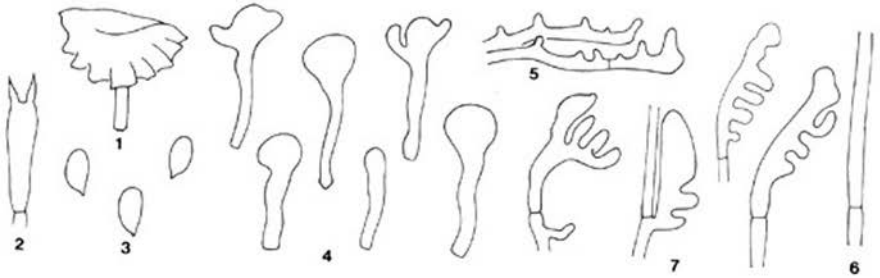

Fig. 10. *Mycena obscurata* (holotype). 1. Pileus; 2. basidium; 3. spores; 4. cheilocystidia; 5. hyphae of the pileipellis; 6. hypha of the cortical layer of the stipe; 7. terminal cells. — Fig. 1, × 3; all others, × 700.

On decayed trunk of a dicotyledonous tree in seasonal semi-deciduous submontane forest, 300 m alt.

Holotypus: "*Mycena obscurata* Maas G. & de Meijer / 15 March 1996 / Paraná: Diamante do Norte, Estação Ecológica do Caiuá / *A.A.R. de Meijer DN-3348*" (No. 990.200-167; L); isotype: MBM 212262.

Mycena fuscocystidiata Singer as described by its author (1989: 72) has the blackening pileus, pallid lamellae but with dark lamellar edge and smooth cheilocystidia in common with *M. obscurata*, and the two species could be confused. The former can be separated by the dingy purple pileus, inodorous context, appreciably longer spores and presence of pleurocystidia which are said to be "frequenter hyalinis."

Section Granuliferae Maas G. & de Meijer

Description, see Maas Geesteranus & de Meijer (1997: 121).

KEY TO THE SPECIES

1. Lamellae more or less pronouncedly arcuate; lamellar edge concave.
   2. Spores almost cylindrical, 8.9–10.7 µm long. Caulocystidia absent
      M. sertipes (Maas G. & de Meijer, 1997: 124)
   2. Spores pip-shaped, 7.2–8.1 µm long (but possibly not quite mature). Caulocystidia present ..... *M. extenuata*
1. Lamellae ascending; lamellar edge convex. Hyphae of the cortical layer of the stipe diverticulate ..... *M. granulifera* (Maas G. & de Meijer, 1997: 122)

Mycena extenuata Maas G. & de Meijer, *spec. nov.* — Fig. 11

Basidiomata dispersa. Pileus usque ad 3 mm latus, usque ad 2.7 mm altus, campanulatus, sulcatus, striatus, minute pruinosus, glabrescens, siccus, albus, aetate interdum pallide flavus. Caro tenuis, odore nullo. Lamellae 8–10 stipitem attingentes, molles, arcuatae, usque ad 1.3 mm latae, longe decurrentes, albae, margine concavo, concolore. Stipes 6–30 × 0.1–0.3 mm, fistulosus, fragilis, aequalis, cylindraceus, siccus, levis, minute pruinosus, albus, e disco basali parvo minute fibrilloso natus.

Basidia 22.5–27 × 6.5–7 µm, clavata, haud fibulata. Sporae 7.2–8.1 × 4.5–4.9 µm, inaequilateraliter ellipsoideae, leves, inamyloideae. Cheilocystidia 18–27 × 2.5–6.5 µm, clavata, haud fibulata, apice furcata vel subramosa, surculis 1.5–5.5 × 1–2.5 µm praedita. Pleurocystidia nulla. Trama lamellarum iodi ope haud vinescens. Hyphae pileipellis 1.8–3.5 µm latae, haud fibulatae, diverticulatae. Hyphae stipitis corticales 1.8–2.7 µm latae, haud fibulatae, sparse diverticulatae, cellulae terminales – c. 18 × 3.5–4.5 µm, varieformes.

Lignicola.

Holotypus: *A.A.R. de Meijer CUf-3062* (No. 990.200-274; L); notulae: MBM 212253.

Etymology: extenuatus, stretched lengthwise, in reference to the comparatively long stipe.

Basidiomata scattered. Pileus up to 3 mm across, up to 2.7 mm high, campanulate, sulcate, translucent-striate, at first minutely pruinose, glabrescent, dry, pure white, with age sometimes turning very pale yellow (3A3–4A3). Context thin. Odour absent. Lamellae 8–10 reaching the stipe, tender, arcuate, up to 1.3 mm broad, far decurrent, white, with concave, concolorous edge. Stipe 6–30 × 0.1–0.3 mm, fistulose, fragile, equal, terete, dry, smooth, minutely pruinose, white, springing from a small basal patch made up of radiating, very fine, silky, white fibrils which tend to disappear at maturity.

Basidia (immature) 22.5–27 × 6.5–7 µm, clavate, clampless. Spores (not quite mature?) 7.2–8.1 × 4.5–4.9 µm (Q = 1.9), pip-shaped, smooth, inamyloid. Cheilocystidia 18–27 × 2.5–6.5 µm, forming a sterile band, clavate, clampless, apically furcate to somewhat

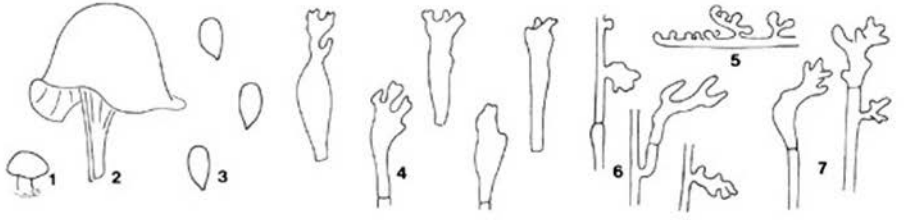

Fig. 11. *Mycena extenuata* (holotype). 1. Young specimen, showing the stipe with its basal patch; 2. pileus; 3. spores; 4. cheilocystidia; 5. hypha of the pileipellis; 6. hyphae of the cortical layer of the stipe; 7. terminal cells. — Fig. 1 and 2, × 10; all others, × 700.

branched, the terminal excrescences 1.5–5.5 × 1–2.5 µm. Pleurocystidia absent. Lamellar trama not vinescent in Melzer's reagent. Pileipellis a cutis of repent hyphae which are 1.8–3.5 µm wide, clampless, covered with simple or furcate to branched, cylindrical excrescences –10 × 1.8–2.5 µm. Hypoderm consisting of parallel hyphae with inflated cells up to 30 µm wide. Hyphae of the cortical layer of the stipe 1.8–2.7 µm wide, clampless, covered with scattered, variously shaped to somewhat branched caulocystidia 1.8–27 × 1.8–3.5 µm, the terminal cells – c. 18 × 3.5–4.5 µm, apically furcate to more or less branched.

On decayed woody fruit of *Bignoniaceae* sp. in mixed ombrophilous forest, 900 m alt.

Holotype: "*Mycena extenuata* Maas G. & de Meijer / 23 April 1995 / Paraná: Curitiba, Parque Municipal do Iguaçu, Zoológico / *A.A.R. de Meijer CUf-3062*" (No. 990.200-274; L); notes and drawings: MBM 212253.

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Maas Geesteranus, R.A. 1981. Studies in Mycenas 26. The Mycenas described by P.A. Karsten. Proc. K. Ned. Akad. Wet. (Ser. C) 84: 221–231.

Maas Geesteranus, R.A. 1983. Conspectus of the Mycenas of the Northern Hemisphere – 1. Sections Sacchariferae, Basipedes, Bulbosae, Clavulares, Exiguae, and Longisetae. Proc. K. Ned. Akad. Wet. (Ser. C) 86: 401–421.

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Singer, R. 1989. New taxa and new combinations of Agaricales (Diagnoses fungorum novorum Agaricalium) IV. Fieldiana (Botany) 21: 1–133.

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AN ANNOTATED LIST OF THE PUBLISHED NAMES IN ASTEROMELLA

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All species described in the coelomycetous genus *Asteromella* are listed with synonyms, literature data, and teleomorph connections, compiled from an extended literature. Measurements of pycnidia, diameter of the ostiolum and conidia of all species are given in a condensed form.

Asteromella is a large genus of plant-inhabiting coelomycetous fungi characterized by numerous globose or subglobose, thick-walled, dark brown, separate or more frequently aggregated pycnidial conidiomata with more or less papillate ostioles that are sometimes not well delineated or lacking. The conidia are very small, rod-shaped, bacterioid, one-celled, and hyaline.

The genus was described by Passerini & Thümen in 1880, and more than 160 species have been published up to now (Allescher, 1901; von Arx, 1981, 1983; Batista & Peres, 1961; Batista et al., 1960; Cash & Trotter, 1972; Corlett, 1991; Farr et al., 1989; Hawksworth et al., 1995; Rupprecht, 1957, 1959; Saccardo, 1882–1931; Sivanesan, 1984; Sutton, 1980; Tomilin, 1979).

Klebahn (1918) precisely described *Asteromella*-like pycnidial sporulation in the life cycle of some *Mycosphaerella* species, without applying any specific epithets. Later Higgins (1920, 1929, 1936) studied the connection between perfect and imperfect states of *Mycosphaerella* including *Asteromella*-like pycnidial forms.

In the modern mycotaxonomic literature, all *Asteromella* species are regarded as micropycnidial or spermogonial states of *Mycosphaerella* species (von Arx, 1949; Barr, 1972; Corlett, 1991; Sivanesan, 1984; Tomilin, 1979).

Most of the species included now in *Asteromella* have been described earlier as *Phyllosticta* or *Phoma*. Petrak (see Samuels, 1981). Rupprecht (1957, 1959) and many other authors have created numerous new combinations, transferring many *Phyllosticta* and *Phoma* species with very small, bacterioid conidia into *Asteromella*.

Despite its importance, ubiquity and abundance, *Asteromella* has never been monographed. No extensive compilation or taxonomic revision concerned with *Asteromella* has been published after the papers of Batista et al. (1960) and Batista & Peres (1961) dealing with some *Asteromella* species, and the annotated index of the names of new taxa and combinations in Petrak's publications compiled by Samuels (1982).

The present compilation is aimed to provide an alphabetical listing of the published specific and infraspecific names in *Asteromella*, to list the original place of publication for each name, to determine the basionym of each species transferred into *Asteromella*, and to provide data about the size of pycnidia, ostioles (o.) and conidia (c.) when available. Also the hosts and countries, if listed in the original description, are indicated.

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2) Centraalbureau voor Schimmelcultures, P.O. Box 273, 3740 AG Baarn, The Netherlands.

In a few cases when the original publications were unavailable to the authors, the data are cited according to Saccardo's (1882–1931) Sylloge Fungorum or some other sources.

The author's names and their abbreviations are in accordance with Brummitt & Powell (1992). Abbreviations of periodicals were listed as in the World List of Scientific Periodicals (Brown & Stratton, 1963–1965).

LIST OF PUBLISHED NAMES

ASTEROMELLA Passerini & Thüm. in Thüm., Mycotheca Universalis 1689, 1880; Sacc., Syll. Fung. 3 (1884) 182. — Type species: *A. ovata* Thüm.

Apiosporella Speg., An. Mus. nac. Hist. nat. B. Aires 23 (1912) 106, [non Speg. 1910, nec Höhn. 1909].

Aplosporidium Speg., An. Mus. nac. Hist. nat. B. Aires 23 (1912) 130.

Stictochorella Höhn., Ber. dt. bot. Ges. 35 (1917) 253.

Stictochorellina Petr., Annls mycol. 20 (1922) 337.

?*Phyllonochaeta* Gonz. Frag. & Cif., Boln. Soc. esp. Hist. nat. 27 (1927) 171.

Specific names

acaciae Cooke, Grevillea 19 (1890–1891) 5.

Pycnidia: up to 25 µm diam.; c.: 2.5 1 µm. — On *Acacia* sp. (Fabaceae); Australia. — Teleomorph: unknown.

acorella (Sacc. & Penz.) H. Ruppr., Sydowia 13 (1959) 10. — Basionym: *Phyllosticta acorella* Sacc. & Penz., Michelia 2 (1882) 620.

Conidia: 3.5–4 × 1–1.5 µm. — On *Acorus calamus* (Araceae); France. — Teleomorph: unknown.

adeana Petr., Annls mycol. 29 (1931) 122.

Pycnidia: 50–80 µm diam.; c.: 2.5 × 1 µm. — On *Viburnum tinus* (Caprifoliaceae); Spain. — Teleomorph: unknown.

aegopodii (Currey) Petr., Sydowia 4 (1950) 25. — Basionym not cited.

On Umbelliferae. — Teleomorph: unknown.

aesculicarpa Cooke & Massee, Grevillea 16 (1887–1888) 7.

Conidia: 10–12 × 3–4 µm. — On *Aesculus hippocastanum* (Hippocastanaceae); United Kingdom. — Teleomorph: unknown.

aesculicola (Sacc.) Petr., Sydowia 10 (1956) 266. — Basionym: *Phyllosticta aesculicola* Sacc., Michelia 1 (1879) 134.

Pycnidia: up to 120 µm diam.; o.: 40–80 µm; c.: 4–6 × 1–1.5 µm. — On *Aesculus hippocastanum* (Hippocastanaceae); Italy. With *Septoria* sp. as synanamorph. — Teleomorph: unknown.

agropyri Petr., Hedwigia 74 (1934) 53.

Pycnidia: 40–70(–90) µm diam.; o.: up to 20 µm diam.; c.: 4.5–8 × 0.5–0.8 µm. — On *Agropyron orientale* (Poaceae); Russia. — Teleomorph: unknown.

alpigena (Sacc.) H. Ruppr., Sydowia 13 (1959) 10. — Basionym: *Phyllosticta alpigena* Sacc., Annls mycol. 1 (1903) 26.

Pycnidia: 96–120 µm diam.; o.: 12 µm diam.; c.: 3.6–4.8 × 0.8 µm. — On *Lonicera alpigena* (Caprifoliaceae); Germany. — Teleomorph: unknown.

ambiens (H. & P. Sydow) Petr., Sydowia 4 (1950) 25. — Basionym: *Phoma ambiens* H. & P. Sydow, Annls mycol. 6 (1908) 53.

Pycnidia: 120–200 µm diam.; c.: 2.5–3.5 × 1 µm. — On *Prangos uloptera* (Apiaceae); Iran. — Teleomorph: unknown.

andrewsii Petr. *nom. nov.* in J.J. Davis, Trans. Wis. Acad. Sci. Arts Lett. 24 (1929) 269. = *Phyllosticta gentianaecola* (DC.) sensu Ellis & Everh., North Amer. Fungi No. 2766; non sensu DC.

On *Gentiana andrewsii* (Gentianaceae); USA. — Teleomorph: (?) *Mycosphaerella andrewsii* Sacc. (fide Davis, l.c.).

angelicae (Sacc.) Moesz in Bat. & Peres, Mems Soc. broteriana 14 (1961) 6. — Basionym: *Phyllosticta angelicae* Sacc., Michelia 2 (1882) 620.

Pycnidia: 80–95 µm diam.; c.: 2–4 × 1–1.5 µm. — On *Angelica silvestris* (Apiaceae); France and Italy. — Teleomorph: unknown.

angustifoliorum Ramaley, Mycotaxon 40 (1991) 19.

Pycnidia: 120 µm diam.; c.: 4–6 × 1–2 µm. — On *Populus angustifolia* (Salicaceae); USA. — Teleomorph: Mycosphaerella angustifolium (fide Ramaley, l.c.).

anthemidis (H. Ruppr.) H. Ruppr., Sydowia 11 (1957) 426. — Basionym: *Phoma anthemidis* H. Ruppr., Sydowia 11 (1957) 127.

Pycnidia: 170 µm diam.; o.: 12 µm diam.; c.: 4.8–6 × 1.4–2 µm. — On *Anthemis arvensis* (Asteraceae); Germany. — Teleomorph: *Mycosphaerella anthemidina* Petr. (fide Rupprecht, l.c.).

artemisiae E. Müller, Sydowia 4 (1950) 288.

Pycnidia: 120–150 µm diam.; c.: 2–3 × 1 µm. — On *Alyssum* sp. (Brassicaceae), *Artemisia campestris* (Asteraceae), *Clematis* sp. (Ranunculaceae), and *Epilobium* sp. (Onagraceae); Switzerland. — Teleomorph: ? *Leptosphaeria artemisiae* (Fuckel) Auersw. (fide Müller, l.c.).

asteris Peck, Bull. N.Y. St. Mus. 167 (1912) 38.

Pycnidia: 250 µm diam.; c.: 6–8 × 2–2.5 µm. — On *Aster paniculatus* (Asteraceae); USA. — Teleomorph: unknown.

astragalicola (C. Massal.) Petr., Annls mycol. 21 (1923) 300. — Basionym: *Phyllosticta astragalicola* C. Massal., Bot. Centbl. 26 (1890) 386.

Pycnidia: 60–80 µm diam.; c.: 3–4 × 1–1.5 µm. — On *Astragalus glycyphylloides* (Fabaceae); Italy. — Teleomorph: unknown.

aterrima Petr., Sydowia 10 (1956) 298.

Pycnidia: 90–130 µm diam.; o.: 20–25(–65) µm diam.; c.: 4.5–6 × 1 µm. — On *Colchicum* sp. (Liliaceae); Greece (Rhodos Island). — Teleomorph: unknown.

atronitens Petr. & Cif., Annls mycol. 28 (1930) 403.

Pycnidia: 70–100 µm diam.; c.: 3–6 × 1–1.5 µm. — On *Guettarda* sp. (Rubiaceae); Dominican Republic. — Teleomorph: unknown.

austriaca (Sacc.) H. Ruppr., Sydowia 11 (1957) 426. — Basionym: *Phyllosticta austriaca* Sacc., Malpighia 11 (1897) 305.

Pycnidia: 80–120 µm diam.; o.: 12 µm diam.; c.: 4.8–6 × 1.2 µm. — On *Doronicum austriacum* (Asteraceae); Italy. — Teleomorph: unknown.

avicullariae (West.) Petr., Sydowia 10 (1956) 302. — Basionym: *Melasmia avicullariae* West., Bull. Acad. r. Sci. Belg., Sér. 2, 2 (1857) 570.

On *Polygonum aviculare* (Polygonaceae); Belgium. — Teleomorph: unknown.

bacillaris Pass. & Beltran, Fungi Sic. No. 24, (Sacc., Syll. Fung. 3 (1887) 183).

Conidia: 2.5–3 × 0.75–1 µm. — On *Morus nigra* (Moraceae); Italy (Sicily). — Teleomorph: unknown.

bacteriiformis (Pass.) Petr., Fl. Boh. Morav. Exs., Ser. 11, Abt. 1. Pilze, Lfg. 39, No. 1901 (1925). — Basionym: *Ascochyta bacteriiformis* Pass., Mycoth. univ. No. 994 (Sacc., Syll. Fung. 3 (1884) 34).

On *Populus nigra* (Salicaceae); Italy. — Teleomorph: unknown.

bacterioides (Vuill.) Moesz, Arb. ung. biol. ForschInst. 13 (1941) 179. — Basionym: *Phyllosticta bacterioides* Vuill., Annls mycol. 3 (1905) 425.

Pycnidia: 42–73 µm diam.; c.: 2.5–3 × 0.5–1 µm. — On *Tilia sylvestris* (Tiliaceae); France. — With *Passalora microsora* (Sacc.) U. Braun as synanamorph. — Teleomorph: *Mycosphaerella* sp. (fide Moesz, l.c.); *Mycosphaerella microsora* Syd. (fide Tomilin, 1979).

baldensis (C. Massal.) H. Ruppr., Sydowia 13 (1959) 11. — Basionym: *Phyllosticta baldensis* C. Massal., Memorie Accad. Agr. Sci. Verona, Sér. 3, 65 (1889) 82.

Pycnidia: 60–80 µm diam.; c.: 3–6 × 1.5 µm. — On *Paeonia peregrina* (Ranunculaceae); Italy. — Teleomorph: unknown.

bellunensis Syd., Annls mycol. 30 (1932) 397.

Pycnidia: 60–90 µm diam.; o.: 12 µm diam.; c.: 2–3 × 0.5–0.8 µm. — On *Chrysanthemum corymbosum* (Asteraceae); Germany. — With *Ramularia bellunensis* Speg. as synanamorph. — Teleomorph: unknown.

bellunensis (N. Martelli) Boerema & Dorenb., Stud. Mycol. 3 (1973) 50 [homonym of *A. bellunensis* Syd.]. — Basionym: *Phyllosticta bellunensis* N. Mart., Nuovo G. bot. ital. 20 (1888) 395.

On *Ulmus* sp. (Ulmaceae); Italy. — Teleomorph: *Mycosphaerella ulmi* Kleb. (fide Boerema & Dorenb., l.c.).

brassicae (E. Chev.) Boerema & van Kesteren, Persoonia 3 (1964) 18. — Basionym: *Asteroma brassicae* E. Chev., Fl. Gén. Envir. Paris 1 (1826) 449.

Pycnidia: 39–90 µm diam.; c.: 3–4 × 0.75–1 µm. — On *Brassica oleracea* (Brassicaceae); France. — Teleomorph: *Mycosphaerella brassicicola* (Duby) Oudem. (fide Dring, Trans. Br. mycol. Soc. 44 (1961) 253).

brassicina (Sacc.) H. Ruppr., Sydowia 13 (1959) 11. — Basionym: *Phyllosticta brassicina* Sacc., Annls mycol. 11 (1913) 16.

Pycnidia: 80–90 µm diam.; c.: 3–4 × 0.5–1 µm. — On *Brassica oleracea* (Brassicaceae); Malta. — Teleomorph: unknown.

burserae (Gonz. Frag. & Cif.) Syd., Annls mycol. 28 (1930) 175. — Basionym: *Phyllosticta burserae* Gonz. Frag. & Cif., Boln. R. Soc. esp. Hist. nat., Madrid 27 (1927) 168.

Pycnidia: 40–60(–95) µm diam.; c.: 3–4 × 1.3 µm. — On *Bursera gumifera* (Burseraceae); Dominican Republic. — Teleomorph: unknown.

buteae S.M. Singh, Indian Phytopath. 31 (1978) 178 [as '*butea*'].

Pycnidia: up to 235 µm diam.; c.: 4.5–9.5 × 1.5–2.5 µm (average 6.5 × 2 µm). — On *Butea monosperma* (Fabaceae); India. — Teleomorph: unknown.

carlinae Petr., Annls mycol. 25 (1927) 270.

Pycnidia: 65–90 µm diam.; c.: 3.5–5.5 × 1–1.5 µm. — On *Carlina vulgaris* (Asteraceae); Czech Republic. — Teleomorph: *Mycosphaerella carlinae* (Wint.) Lindau (fide Petrak, l.c.).

carpatica (Petr.) Petr., Annls mycol. 21 (1923) 203. — Basionym: *Stictochorellina carpatica* Petr., Annls mycol. 20 (1923) 337.

Pycnidia: 50–80 µm diam.; c.: 3.5–5 × 1–1.25 µm. — On *Scopolia carniolica* (Solanaceae); Ukraine. — Teleomorph: unknown.

castaneicola (Ellis & Everh.) Petr., Sydowia 11 (1957) 341 [as '*castanicola*']. — Basionym: *Phyllosticta castanicola* Ellis & Everh., Proc. Acad. nat. Sci. Philad. 1895 (1896) 431.

Pycnidia: 80–100 µm diam.; c.: 3–3.5 × 1.25–1.5 µm. — On *Castanea chrysophylla*, and *Quercus lanuginosa* (Fagaceae); USA. — Teleomorph: *Mycosphaerella janus* (Berk. & M.A. Curtis) Petr. (fide Petrak, l.c.).

cedrelae Petr., Annls mycol. 27 (1929) 404.

Pycnidia: 50–80 µm diam.; o.: 10–15 µm diam.; c.: 2–3.5 × 0.5–1 µm. — On *Cedrela tonduzii* (Meliaceae); Costa Rica. — Teleomorph: unknown.

cerasicola (Speg.) H. Ruppr., Sydowia 13 (1959) 12. — Basionym: *Phyllosticta cerasicola* Speg., An. Soc. cient. argent. 10 (1880) 152.

Pycnidia: 80–90 µm diam.; c.: 4 × 1 µm. — On *Prunus cerasus* (Rosaceae); Argentina. — Teleomorph: *Mycosphaerella* sp. (fide Rupprecht, l.c.).

chaerophylli (C. Massal.) Petr., Annls mycol. 38 (1940) 264. — Basionym: *Phyllosticta chaerophylli* C. Massal., Memorie Accad. Agric. Sci. Verona 65 (1889) 83.

Pycnidia: up to 100 µm diam.; o.: 12–15 µm diam.; c.: 2.5–5 × 1–1.5 µm. — On *Angelica* sp., *Heracleum* sp., and *Chaerophyllum hirsutum* (Apiaceae); Italy. — Teleomorph: ? *Mycosphaerella morthieri* (Fuckel) Petr. (fide Petrak, l.c.).

chamaebuxi Petr., Sydowia 13 (1959) 79.

Pycnidia: 40–100 µm diam.; c.: 5–8(–10) × 1–1.5 µm. — On *Polygala chamaebuxus* (Polygalaceae); Austria. — Teleomorph: unknown.

claytoniae Murashk. in Murashk. & Ziling, Trudy omsk. sel'khoz. Inst. 3 (1) (1927) 5.

Pycnidia: 90–100 × 75–85 µm; c.: 3–4.5 × 0.6–0.8 µm. — On *Claytonia joaneana* (Portulacaceae); Russia. — Teleomorph: unknown.

clemensae Syd. in Syd. & Petr., Annls mycol. 26 (1928) 439.

Pycnidia: up to 1000 µm diam.; o.: 35–60 µm diam.; c.: 2–3 × 0.5 µm. — On *Sterculia cuneata* (Sterculiaceae); Philippines. — Teleomorph: unknown.

coccothrinacis Petr. & Cif., Annls mycol. 28 (1930) 404.

Pycnidia: 50–90 µm diam.; o.: 7–12(–20) µm diam.; c.: 2–3 × 0.7 µm. — On *Coccothrinax argentea* (Palmae); Dominican Republic. — Teleomorph: *Mycosphaerella* sp. (fide Petrak & Sydow, l.c.).

cocoes Bat. & J.L. Bezerra, Mycopath. Mycol. appl. 25 (1956) 3.

Pycnidia: 70–130 × 75–150 µm diam.; o.: 7.5–10 µm diam.; c.: 3–4 × 0.8–1 µm. — On *Cocos nucifera* (Palmae); Brazil. — Teleomorph: unknown.

cocogena Boerema, Loer. & Hamers, Persoonia 16 (1996) 157.

Pycnidia: 52–100 µm; o.: 11–13 µm diam.; c.: 4–4.5 × 1 µm. — On *Cocos nucifera* (Palmae); Taiwan. — Teleomorph: ? *Mycosphaerella* sp. (fide Boerema et al., l.c.).

compositarum Bat., J.L. Bezerra & Poroca, Atas Inst. Micol. Recife 5 (1967) 74.

Pycnidia: 48–55 µm diam.; c.: 2–4 × 0.75–1.5 µm. — On Asteraceae; Brazil. — Teleomorph: ? *Mycosphaerella ixodiae* Hansf. (fide Batista et al., l.c.).

confusa (Bubák) Petr., Hedwigia 65 (1925) 253. — Basionym: *Phyllosticta confusa* Bubák, apud Tranzschel & Serebrianikow, Mycoth. Rossica No. 330 (1912); Hedwigia 57 (1916) 339.

Pycnidia: 130–180 µm diam.; o.: 10–15 µm diam.; c.: 3–4 × 1.5 µm. — On *Chenopodium* sp. (Chenopodiaceae); Ukraine. — Teleomorph: unknown.

convallariae (Cavara) Petr., Annls mycol. 21 (1923) 205. — Basionym: *Dendrophoma convallariae* Cavara, Mat. Lomb., p. 18, t. 2, f. 6; Sacc., Syll. Fung. 10 (1892) 211.

Pycnidia: 70–90 µm diam.; c.: 4–5 × 1.25 µm. — On *Convallaria majalis* (Liliaceae); Italy. — Teleomorph: ? *Mycosphaerella brunneola* (Fr.: Fr.) Johanson ex Oudem. (fide Petrak, l.c.).

corcontica (Kabát & Bubák) Moesz in Bat. & Peres, Mems Soc. broteriana 14 (1961) 12. — Basionym: *Phyllosticta corcontica* Kabát & Bubák, Sber. K. böhm. Ges. Wiss., Math.-naturw. Kl. 11 (1903) 2.

Pycnidia: 50–70 µm diam.; c.: 3.5–5 × 1.5 µm. — On *Hieracium alpinum* (Asteraceae); Czech Republic. — With *Ramularia corcontica* Bubák & Kabát as synanamorph. — Teleomorph: unknown.

coriariae Petr., Annls mycol. 29 (1931) 270.

Pycnidia: 25–70(–120) µm diam.; o.: 6–12 µm diam.; c.: 2.5–4 × 0.5–1 µm. — On *Coriaria intermedia* (Coriariaceae); Philippines. — Teleomorph: unknown.

coryphae Petr. & Syd., Annls mycol. 21 (1923) 373.

Pycnidia: 80–110 µm diam.; o.: 25 µm diam.; c.: 2.5–3.5 × 1 µm. — On *Corypha umbraculifera* (Palmae); Philippines. — Teleomorph: unknown.

cretica Petr. in Rechinger, Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1, 105 (2) (1943) 21.

On *Lactuca* sp. (Asteraceae); Greece (Crete). — Teleomorph: unknown.

cynanchicola Petr., Annls mycol. 21 (1923) 104.

Pycnidia: 50–80 µm diam.; c.: 2–3 × 1 µm. — On *Cynanchum vincetoxicum* (Asclepiadaceae); Czech Republic — Teleomorph: ? *Mycosphaerella albescens* (Rabenh.) Lindau (fide Petrak, l.c.).

delphinii Petr., Sydowia 3 (1949) 315.

Pycnidia: 60–80(–100) µm diam.; c.: 2.5–4 × 0.5–1 µm. — On *Delphinium* sp. (Ranunculaceae); Iran. — Teleomorph: unknown.

dentariae (Kabát & Bubák) H. Ruppr., Sydowia 11 (1957) 122. — Basionym: *Phyllosticta dentariae* Kabát & Bubák, Hedwigia 57 (1907) 288.

Pycnidia: 120–165 µm diam.; c.: 3–5 × 1.5–2 µm. — On *Dentaria enneaphyllos* (Brassicaceae); Austria. — Teleomorph: unknown.

dictamni Petr., Ber. bayer. bot. Ges. 2 (1931) 182.

Pycnidia: 50–90 µm diam.; c.: 2.5–3 × 0.5–0.8 µm. — On *Dictamnus fraxinella* (Rutaceae); Germany. — With *Septoria dictamni* Fuckel as synanamorph. — Teleomorph: *Mycosphaerella dictamni* Petr. (fide Petrak, Sydowia 1: 145, 1947).

digitalis ambiguae Arx, Sydowia 3 (1949) 94.

Pycnidia: 65–100 µm diam.; o.: 10–15 µm diam.; c.: 2–3.5 × 0.75–1 µm. — On *Digitalis ambigua* (Scrophulariaceae); Switzerland. — With *Ramularia digitalis-ambiguae* Arx as synanamorph. — Teleomorph: *Mycosphaerella digitalis-ambiguae* Arx (fide von Arx, l.c.).

dombeyae Petr., Sydowia 13 (1959) 229.

Pycnidia: 50–75 µm diam.; o.: 15–20 µm diam.; c.: 2.5–3.5 × 0.6–1 µm. — On *Dombeya* sp. (Bignoniaceae); Tanzania. — With *Septoria dombeyae* Petr. as synanamorph. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

doronicigena (Bubák) Petr. in Murashk. & Ziling, Mater. Pilzfl. Altaj & Sajany (1929) 20. — Basionym: *Phyllosticta doronicigena* Bubák, Növ. Közl. 4 (1907) 23.

Pycnidia: 90–120 µm diam.; c.: 3–4.5 × 1 µm. — On *Doronicum cordatum* (Asteraceae); Hungary. — Teleomorph: ? *Mycosphaerella aronici* Volkart (fide Brandenburger, Paras. Pilze Gefässpfl. Europa (1985) 645).

drymariae Syd., Annls mycol. 37 (1939) 406.

Pycnidia: 60–110 µm diam.; o.: 6–8 µm diam.; c.: 2–3.5 × 0.5–0.8 µm. — On *Drymaria cordata* (Caryophyllaceae); Ecuador. — Teleomorph: ? *Mycosphaerella drymariae* H. & P. Syd. (fide Sydow, l.c.).

ebuli (Fuckel) Moesz in Bat. & Peres, Mems Soc. broteriana 14 (1961) 14. — Basionym: *Ascochyta ebuli* Fuckel, Symb. Mycol. (1870) 386.

Pycnidia: 57.5–87.5 µm diam.; o.: 7–12 µm diam.; c.: 4–8.5 × 1.4 µm. — On *Sambucus ebulus* (Caprifoliaceae); Germany. — Teleomorph: unknown.

epitrema Cooke, Grevillea 20 (1891–1892) 6.

Conidia: 10–12 × 3 µm. — On *Trema aspera* (Ulmaceae); Australia. — Teleomorph: unknown.

eupatoriicola (Kabát & Bubák) H. Ruppr., Sydowia 11 (1957) 122. — Basionym: *Phyllosticta eupatoriicola* Kabát & Bubák, Hedwigia 66 (1907) 288.

Pycnidia: 50–85 µm diam.; c.: 3–4(–5) × 1–1.5 µm. — On *Eupatorium cannabinum* (Asteraceae); Austria. — Teleomorph: *Mycosphaerella* sp. (fide Rupprecht, l.c.).

ferulina Petr., Annln naturhist. Mus. Wien 52 (1941) 369.

Pycnidia: 70–150 µm diam.; c.: 3.5–6 × 1–2 µm. — On *Ferula foetida* (Apiaceae); Iran. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, Sydowia 3 (1949) 316).

fibrillosa (Desm.) Sacc., Syll. fung. 11 (1885) 499. — Basionym: *Perisporium fibrillosum* Desm., Bull. Soc. bot. Fr. 4 (1857) 862.

Pycnidia: 110–130 µm diam.; o.: 30 µm diam.; c.: 3–5 µm. — On *Scrophularia aquatica* (Scrophulariaceae); France.

fibrillosa var. ***prodicta*** Roberge in Desm., Bull. Soc. bot. Fr. 4 (1857) 862.

On *Stachys* sp., *Ballota* sp., and *Mentha* sp. (Lamiaceae); France. — Teleomorph: unknown.

fici Peres & J.L. Bezerra in Lopes & Heringer, Archos Jard. bot. Rio de J. 25 ('1981', in 1982) 107.

Pycnidia: 180–270 µm diam.; o.: 15.5–22 µm diam.; c.: 7.5 × 1.5 µm. — On *Ficus elastica* (Moraceae); Brazil. — With *Phyllosticta tayuvae* Viégas as synanamorph. — Teleomorph: *Mycosphaerella fici-ovatae* Hansford (fide Peres & Bezerra, l.c.).

fraxini (Berk. & M.A. Curtis) Petr., Annls mycol. 21 (1923) 269. — Basionym: *Diggotia fraxini* Berk. & M.A. Curtis, North Amer. Fungi No. 433-bis (Sacc., Syll. Fung. 3 (1884) 637).

Conidia: 5–7 µm. — On *Fraxinus* sp. (Oleaceae); USA. — Teleomorph: *Mycosphaerella effigurata* (Schwein.) House (fide Wolf & Davidson, Mycologia 33 (1941) 533).

gaboonensis Cooke & Massee, Grevillea 15 (1886–1887) 111.

Conidia: 6 × 4 µm. — On withering herbaceous plants; Gabon. — Teleomorph: unknown.

galii Moesz & Lindtner, Bot. Közl. 39 (1942) 192.

Pycnidia: 75–137 µm diam.; o.: 10–13 µm diam.; c.: 3.5–5 × 1 µm. — On *Galium schultesii* (Rubiaceae); Serbia. — With *Phyllosticta asperulae* Sacc. & Fautr. as synanamorph. — Teleomorph: unknown.

galii-schultesii Moesz in Bat. & Peres, Mems Soc. broteriana 14 (1961) 14 (*nom. inval.* – Art. 36.1).

Pycnidia: 50–115.5 µm diam.; o.: 14–17.5 µm diam.; c.: 3–7 × 0.7–1.4 µm. — On *Galium schultesii* (Rubiaceae); Hungary. — Teleomorph: unknown.

gentianellae (C. Massal.) Petr., Hedwigia 65 (1925) 253. — Basionym: *Phyllosticta gentianellae* C. Massal., Malpighia 8 (1894) 196.

Pycnidia: 40–55 µm diam.; c.: 2.5–4 × 0.7–1 µm. — On *Gentiana asclepiadea* (Gentianaceae); Italy. — Teleomorph: *Mycosphaerella gentianae* (Niessl) Lindau (fide Petrak, Hedwigia 65 (1924–1925) 254).

gorholtii H. Ruppr., Sydowia 11 (1957) 122.

Pycnidia: 50–75 µm diam.; o.: 15–20 µm diam.; c.: 3.6–4.8 × 0.8 µm. — On *Corylus avellana* (Betulaceae); Germany. — Teleomorph: unknown.

gratissima Petr. & Cif., Annls mycol. 28 (1930) 405.

Pycnidia: 35–50 µm diam.; c.: 2–3 × 0.6 µm. — On *Persea gratissima* (Lauraceae); Dominican Republic. — Teleomorph: unknown.

gregariella Petr., Hedwigia 74 (1934) 52.

Pycnidia: 50–80(–100) µm diam.; o.: 10–30 µm diam.; c.: 2.5–4 × 0.5–0.8 µm. — On *Serratula coronata* (Asteraceae); Russia. — Teleomorph: unknown.

gymnosporiae Syd. in Syd. & Petr., Annls mycol. 29 (1931) 271.

Pycnidia: 40–80 µm diam.; o.: 10 µm diam.; c.: 3–5 × 0.7–1 µm. — On *Gymnosporia spinosa* (Celastraceae); Philippines. — Teleomorph: unknown.

hederacea Petr., Sydowia 11 (1957) 348. = *Asteromella hederae* (Sacc. & Roum.) Petr., Sydowia 10 (1956) 303, non *A. hederae* C. Massal. — Basionym: *Phyllosticta hederae* Sacc. & Roum., Michelia 2 (1882) 620.

Pycnidia: 130 µm diam.; c.: 4 × 1 µm. — On *Hedera helix* (Araliaceae); France. — Teleomorph: *Mycosphaerella hedericola* (Desm.) Lindau (fide Petrak, l.c.).

hederae C. Massal., Atti Ist. veneto Sci., Sci. mat. nat. 61, 2 (1900) 684.

Conidia: 2–3 × 1–1.5 µm. — On *Hedera helix* (Araliaceae); Italy. — Teleomorph: unknown.

hederae Petr. in Bremer et al., Istanb. Üniv. Fen. Fak. Mecm., Ser. B., Cilt 17 (1953) 260 (*nom. inval.*, Art. 36.1).

On *Hedera helix* (Araliaceae); Turkey. — With *Phyllosticta hedericola* Durrieu & Mont. and *Vermicularia trichella* Fr. as synanamorphs (acc. to Petrak, l.c.). — Teleomorph: unknown.

hederae (Sacc. & Roum.) Petr., Sydowia 10 (1956) 303. — Basionym: *Phyllosticta hederae* Sacc. & Roum., Michelia 2 (1882) 620.

Pycnidia: 130 µm diam.; c.: 4 × 1 µm. — On *Hedera helix* (Araliaceae); France, Belgium. — Teleomorph: unknown.

helleboricola (C. Massal.) Moesz, Bot. Közl. 35 (1938) 64. — Basionym: *Phyllosticta helleboricola* C. Massal., Memorie Accad. Agric. Sci. Verona, Sér 3, 65 (1889) 81.

Pycnidia: 70–100 µm diam.; o.: 7–14 µm diam.; c.: 3–7 × 1–1.5 µm. — On *Helleborus viridis* (Ranunculaceae); Italy. — Teleomorph: unknown.

heringeri Bat. & J.L. Bezerra in Bat., J.L. Bezerra & Cif., Ann. Congr. Soc. bot. Brasil 13 ('1962', in 1964) 477.

On Leguminosae leaves. — Teleomorph: unknown.

heuchera (Ellis & Everh.) Petr., Sydowia 9 (1955) 493. — Basionym: *Phyllosticta heucherae* Ellis & Everh., Am. Nat. 31 (1897) 428.

Pycnidia: 110 µm diam.; c.: 5–6 × 1–1.25 µm. — On *Heuchera cylindrica* (Saxifragaceae); USA. — Teleomorph: *Mycosphaerella heucherae* (Ellis & Everh.) Petr. (fide Petrak, Sydowia 11 (1957) 340).

homalanthi Cooke & Massee, Grevillea 20 (1891–1892) 65.

Conidia: 5 × 3 µm. — On *Homalanthus populifolius* (Euphorbiaceae); Australia. — Teleomorph: unknown.

hranicensis Petr., Sydowia 6 (1952) 235 (*nom. inval.* – Art. 36.1).

On *Quercus lanuginosa* (Fagaceae); Austria. — With *Septoria* sp. as synanamorph. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

hybridae (Mig.) H. Ruppr., Sydowia 13 (1959) 11. — Basionym: *Phyllosticta hybridae* Mig., Cryptog. Germ., Austriae & Helv. exs., fasc. 56 and 57, Pilze No. 399.

Pycnidia: 70 µm diam.; c.: 3–4.5 × 1 µm. — On *Sorbus hybrida* (Rosaceae); Germany. — Teleomorph: unknown.

innumera (Cooke & Harkn.) Petr., Sydowia 9 (1955) 494. — Basionym: *Phyllosticta innumera* Cooke & Harkn., Bull. Calif. Acad. Sci. 1 (1884) 14.

Conidia: 4.5 × 2 µm. — On unknown plant ?; USA. — Teleomorph: unknown.

inulae Petr., Sydowia 1 (1947) 134.

Pycnidia: 70–150 µm diam.; o.: 8–12 µm diam.; c.: 3–5 × 1–1.5 µm. — On *Inula hirta* (Asteraceae); Austria. — Teleomorph: unknown.

isopyri (Thüm.) Petr. & Syd., Annls mycol. 23 (1925) 249. — Basionym: *Sphaeropsis isopyri* Thüm., Bull. Soc. Imp. Nat. Mosc. 55 (1880) 226.

Conidia: 12 × 5.5–6.5 µm, acc. to Thümen (4–5 × 1 µm, acc. to Petrak & Sydow, l.c.). — On *Isopyrum fumarioides* (Ranunculaceae); Russia. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

jasminicola (Desm.) Petr., Annls mycol. 32 (1934) 397. — Basionym: *Sphaeria jasminicola* Desm., Annls Sci. nat. (Bot.), Sér. 3, 6 (1846) 83.

Pycnidia: 50–60 µm diam.; o.: 8–10 µm diam.; c.: 2–3 × 0.5 µm. — On *Jasminum officinale* (Oleaceae); France. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

kalmiicola (Schwein.) Petr. in Syd. & Petr., Annls mycol. 22 (1924) 396 [as '*kalmicola*']. — Basionym: *Sphaeria kalmicola* Schwein., Trans. Am. phil. Soc. 2 (4) (1832) 226.

Pycnidia: 50–80 µm diam.; c.: 2–4 × 0.5–0.7 µm. — On *Kalmia latifolia* (Ericaceae); USA. — Teleomorph: unknown.

kuemmerlei Moesz, Bot. Közl. 28 (1931) 162.

Pycnidia: 40–50 × 48–55 µm; o.: 7–10 µm diam.; c.: 3–5 × 1 µm. — On *Asphodelus microcarpa* (Liliaceae); Croatia. — Teleomorph: unknown.

lagotidis Murashk. & Ziling, Mater. Pilzfl. Altaj Sajany (1929) 20.

On *Lagotis glauca* (Scrophulariaceae); Russia. — Teleomorph: unknown.

lantanae Petr., Sydowia 7 (1953) 398.

Pycnidia: 50–120 µm diam.; o.: 12–15 µm diam.; c.: 3–7 × 2–2.5 µm. — On *Lantana camara* (Verbenaceae); USA (Hawaii). — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

latemarensis (Kabát & Bubák) H. Ruppr., Sydowia 13 (1959) 12. — Basionym: *Phyllosticta latemarensis* Kabát & Bubák, Öst. bot. Z. 55 (1905) 77.

Pycnidia: 60–160 µm diam.; c.: 4–6 × 0.7–1 µm. — On *Colchicum autumnale* (Liliaceae); Italy. — With *Septoria gallica* Sacc. & Syd. as synanamorph. — Teleomorph: unknown.

lathyri-silvestris H. Ruppr., Sydowia 11 (1957) 123.

Pycnidia: 120 µm diam.; o.: up to 24 µm diam.; c.: 3.6–4.8 × 1.2 µm. — On *Lathyrus silvestris* (Fabaceae); Germany. — Teleomorph: unknown.

longissima (Persoon) Petr., Mycoth. Gen. (1801). — Basionym: *Sphaeria longissima* Pers., Syn. Meth. Fung. (1801) 31.

Conidia: 4–6 × 1.5–2 µm. — On *Chenopodium album* (Chenopodiaceae) and *Chaerophyllum bulbosum* (Apiaceae); France. — Teleomorph: unknown.

ludwigii Petr. in Syd., Annls mycol. 21 (1923) 174.

On *Epilobium hirsutum* (Onagraceae); Germany. — Among *Coleosporium* sp. (Uredinales). — Teleomorph: unknown.

lupini (Ellis & Everh.) Petr., Sydowia 9 (1955) 495. — Basionym: *Phoma lupini* Ellis & Everh., Bull. Wash. Coll. Lab. nat. Hist. 1 (1886) 6.

Pycnidia: 120–200 µm diam.; c.: 3–4 × 0.75–1.2 µm. — On *Lupinus* sp. (Fabaceae); USA. — Teleomorph: unknown.

luzulae-nemorosae Petr., Fl. Bohem. & Morav. Exs. Ser. 11, 1 Abt. Pilze, Lfg 34, 1666 (1923).

On *Luzula nemorosa* (Juncaceae); Czech Republic. — Teleomorph: unknown.

luzulina Syd., Annls mycol. 30 (1932) 108.

Pycnidia: 35–70 µm diam.; c.: 4–6 × 1 µm. — On *Luzula maxima* (Juncaceae); Germany. — Teleomorph: unknown.

maculiformis (Sacc.) Petr., Bot. Jahrb. 62 (4) (1928) 145. — Basionym: *Phyllosticta maculiformis* Sacc., Michelia 2 (1882) 538.

Pycnidia: 80–100 µm diam.; c.: 4 × 1 µm. — On *Castanea sativa*, *Fagus* sp. (Fagaceae), and *Fraxinus* sp. (Oleaceae); Italy. — Teleomorph: ? *Mycosphaerella maculiformis* (Pers.: Fr.) Schröt. (= *Sphaerella maculiformis* Pers.: Fr. – fide Saccardo, Syll. Fung. 3 (1884) 34).

mali (Briard) Boerema, in Boerema & Dorenb., Versl. plziektenk. Dienst 142 (Jaarb. 1964; 1965) 149. — Basionym: *Phyllosticta mali* Briard, Fl. crypt. Aube, Suppl. Catal. Troyes (1888) 79.

Pycnidia: 80–100 µm diam.; c.: 4–5 × 1.5–2 µm. — On *Malus communis* (Rosaceae); France. — Teleomorph: unknown.

melanoplaca (Thüm.) Petr., Annls mycol. 25 (1927) 373. — Basionym: *Phyllosticta melanoplaca* Thüm., Byull. mosk. Obshch. Ispyt Prir 55 (1880) 230.

Conidia: 4–5 × 2 µm. — On *Veratrum album* (Liliaceae); Russia. — Teleomorph: unknown.

mespili (Roberge & Desm.) Petr., Annls mycol. 25 (1927) 211. — Basionym: *Asteroma mespili* Roberge & Desm., Annls Sci. nat. (Bot.), Sér. 3, 14 (1850) 6.

On *Mespilus germanica* (Rosaceae); France. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

metopii Petr., Annls mycol. 30 (1932) 263.

Pycnidia: 40–60 µm diam.; o.: 5–8 µm diam.; c.: 2–3 × 0.7–0.9 µm. — On *Metopium brownei* (Anacardiaceae); Dominican Republic. — Teleomorph: unknown.

microsticta Petr. & Cif., Annls mycol. 28 (1930) 406.

Pycnidia: 70–100 µm diam.; o.: 7–12 µm diam.; c.: 2–3 × 0.7–1.3 µm. — On *Desmodium tortuosum* (Fabaceae); Dominican Republic. — Teleomorph: unknown.

moliniae Syd., Annls mycol. 32 (1934) 295.

Pycnidia: 40–60 µm diam.; o.: 6–8.5 µm diam.; c.: 3–4 × 0.6–0.8 µm. — On *Molinia coerulea* (Poaceae); Germany. — Teleomorph: unknown.

monardellae (W.B. Cooke) Petr., Sydowia 10 (1956) 303. — Basionym: *Phyllosticta monardellae* W.B. Cooke, Mycobiota North Am. 20 (1940).

On *Monardella* sp. (Lamiaceae); USA. — Teleomorph: unknown.

morgan-jonesii (as *morgan-jonii*) Sharma, Curr. Sci. 45 (17) (1976) 641.

Pycnidia: 70–130 µm diam.; c.: 2–2.8 × 1.2–1.5 µm. — On *Citrus maxima* (Rutaceae); India. — Teleomorph: unknown.

muscorum (Rostr.) Moesz, Folia cryptog., Szeged 1 (1932) 1108. — Basionym: *Phoma muscorum* Rostr., Bot. Tidsskr. 25 (1903) 318.

Conidia: 5–6 × 1.2 µm. — On *Orthotrichum almatum* (Orthotrichaceae) and *Tetraplodon bryoides* (Splachnaceae); Denmark, Hungary. — Teleomorph: unknown.

myriadea Cooke, Grevillea 19 (1890–1891) 3.

Conidia: 12 × 2–3 µm. — On coriaceous leaves (?); New Zealand. — Teleomorph: unknown.

nogalesi Urries, An. Inst. bot. A.J. Cavanilles 14 (1956) 165.

Pycnidia: 50 µm diam.; c.: 2.5–4 × 1.5 µm. — On *Cytisus prolifer* (Fabaceae); Spain (Canary Islands). — Teleomorph: unknown.

osteospora (Sacc.) H. Ruppr., Sydowia 13 (1959) 12. — Basionym: *Phyllosticta osteospora* Sacc., Michelia 1 (1879) 531.

Pycnidia: 80–90 µm diam.; c.: 6–7 × 1 µm. — On *Populus nigra* (Salicaceae), *Fraxinus* sp. (Oleaceae), *Morus* sp. (Moraceae), and *Rhamnus* sp. (Rhamnaceae); Italy, France. — Teleomorph: unknown.

ourateae Bat., J.L. Bezerra & Poroca, Atas Inst. Micol. Univ. Recife 3 (1956) 152.

Pycnidia: 60–90 × 45–75 µm; c.: 1.5–3 × 0.75–1.5 µm. — On *Ouratea* sp. (Ochnaceae); Brazil. — With *Cercospora* sp. as synanamorph — Teleomorph: unknown.

ovata Thüm., Mycoth. univ. No. 1689 (1880); Sacc., Syll. Fung. 3 (1884) 182.

Conidia: 2.5–3 × 1.5–2 µm. — On *Acer pseudoplatanus* (Aceraceae) and *Menispermum canadense* (Menispermaceae); Austria, Italy. — Teleomorph: unknown.

ovata var. ***tiliophila*** Ferraris, Malpighia (1904) 494.

Conidia: 3–3.5 × 1–1.5 µm. — On *Tilia europaea* (Tiliaceae); Italy. — Teleomorph: unknown.

oxytropis Murashk. in Murashk. & Ziling, Mater. Pilzfl. Altaj & Sajany (1929) 20.

On *Oxytropis alpina* (Fabaceae); Russia. — Teleomorph: unknown.

paliuri (Lév.) Arx, Verh. K. Ned. Akad. Wet., Afd. Natuurk. 51 (3) (1957) 114. — Basionym: *Dothidea paliuri* Lév. in Demidoff, Voyage Russ. mérid., Crimée, Hongrie, Valachie, Mold. 1837, 2 (publ. 1842) 107; t. 5 (publ. 1842) f. 6; Herb. Berk. 9145 (Sacc., Syll. Fung. 10 (1892) 111).

Pycnidia: 50–80 µm diam.; c.: 3–5 × 0.7–1 µm. — On *Paliurus aculeatus* (Rhamnaceae); Russia. — Teleomorph: *Mycosphaerella* sp. (fide von Arx, l.c.).

paradisiaca Petr., Annls mycol. 21 (1923) 313.

Pycnidia: 75–100 µm diam.; o.: up to 10 µm diam.; c.: 2–3 × 0.5–0.75 µm. — On *Musa textilis* and *M. paradisiaca* (Musaceae); Philippines. — Teleomorph: *Mycosphaerella musae* (Speg.) Syd. (fide Petrak, l.c.).

pedicularidis (Solheim) Petr., Sydowia 15 (1961) 214. — Basionym: *Phyllosticta pedicularidis* Solheim, Univ. Wyo. Publs. 24 (1960) 44.

Pycnidia: 40–80 µm diam.; c.: 3–4.5 × 1 µm. — On *Pedicularis paysonia* (Scrophulariaceae); Germany. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.)

perpusilla Speg., Bol. Acad. nac. Cienc. Cordoba 11, 4 (1889) 596.

Pycnidia: 40–50 µm diam.; c.: 7–8 × 2.5–3 µm. — On non-identified plants; Brazil. — Teleomorph: unknown.

personata (Allesch.) H. Ruppr., Sydowia 13 (1959) 13. — Basionym: *Phyllosticta personata* Allesch., Allg. bot. Z. 2 (1895) 25.

Pycnidia: 90–120 µm diam.; c.: 3.6–4.8 × 1 µm. — On *Carduus personatus* (Asteraceae); Germany. — Teleomorph: unknown.

petasitidis Petr., Annls mycol. 21 (1923) 282.

Pycnidia: 40–50 µm diam.; c.: 2–3 × 1.5 µm. — On *Petasites officinalis* (Asteraceae); Czech Republic. — With *Ramularia* sp. as synanamorph. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

phalaridis Syd., Annls mycol. 38 (1940) 469.

Pycnidia: 100–150 µm diam.; o.: 8–12 µm diam.; c.: 3–5 × 1 µm. — On *Phalaris arundinacea* (Poaceae); Germany. — Teleomorph: unknown.

phyteumatis Petr., Annls mycol. 23 (1925) 140.

Pycnidia: 60–100 µm diam.; c.: 3–4(–5) × 0.5–0.8 µm. — On *Phyteuma spicatum* (Campanulaceae); Slovak Republic. — With *Ramularia phyteumatis* Sacc. & Wint. as synanamorph. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

picbaueri Petr., Annls mycol. 22 (1924) 104.

Pycnidia: 70–100 µm diam.; c.: 5–8(–10) × 1–1.5 µm. — On *Astragalus cicer* (Fabaceae); Czech Republic. — With *Septoria astragali* (Desm.) Sacc. as synanamorph. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

piricola (Sacc. & Speg.) Moesz, Bot. Közl. 39 (1942) 192. — Basionym: *Phyllosticta piricola* Sacc. & Speg., Michelia 1 (1878) 153.

Pycnidia: 62–150 µm diam.; c.: 2.5–5 × 0.75–1 µm. — On *Pyrus pyraster* (Rosaceae); Italy. — Teleomorph: unknown.

pistaciarum Bremer & Petr., Sydowia 1 (1947) 253.

Pycnidia: 45–110 µm diam.; c.: 3–5 × 1 µm. — On *Pistacia vera* (Anacardiaceae); Turkey. — With *Septoria pistaciarum* Carac. as synanamorph. — Teleomorph: *Mycosphaerella* sp. (fide Bremer et al., Istanb. Univ. Fen. Fak. Mecm. Ser. B, 17 (3) (1952) 260).

pivensis (Bubák) Moesz, apud Bat. & Peres, Mems Soc. broteriana 14 (1961) 20. — Basionym: *Phyllosticta pivensis* Bubák, Bot. Közl. (1915) 62.

Pycnidia: 70–105 µm diam.; o.: 16–24.5 µm diam.; c.: 3–6 × 0.7–1.4 µm. — With *Ramularia geranii-phaei* (C. Massal.) Magn. as synanamorph. — On *Geranium phaeum* and *Geranium reflexum* (Geraniaceae); Yugoslavia (Montenegro). — Teleomorph: unknown.

platanoidis (Sacc.) Petrak, Hedwigia 65 (1925) 254. — Basionym: *Phyllosticta platanoidis* Sacc., Michelia 1 (1879) 360.

Pycnidia: 70–80 µm diam.; c.: 2–4 × 0.5–1 µm. — On *Acer platanoides*, *Acer pseudoplatanus*, *Acer negundo*, and *Acer truncatum* (Aceraceae); Italy, France. — Teleomorph: unknown.

pleurospermi (Died.) Petr., Sydowia 13 (1959) 82. — Basionym: *Phyllosticta pleurospermi* Died., Hedwigia 42 (1903) (165).

Pycnidia: 50–70 µm diam.; c.: 3 × 1 µm. — On *Pleurospermum austriacum* (Apiaceae); Germany. — Teleomorph: unknown.

podocarpi Syd., Annls mycol. 28 (1930) 176.

Pycnidia: 80–120 µm diam.; o.: 10 µm diam.; c.: 3–4 × 1–1.8 µm. — On *Podocarpus coriaceae* (Podocarpaceae); Venezuela. — Teleomorph: unknown.

poeverleinii Petrak, Annls mycol. 29 (1931) 355.

Pycnidia: 45–75 µm diam.; o.: up to 10 µm diam.; c.: 3–6 × 0.7–1 µm. — On *Hypochaeris uniflora* (Asteraceae); Switzerland. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

pomi Boerema, Loer. & Hamers, Persoonia 16 (1996) 168.

Pycnidia: 50–115 µm diam.; c.: 2–2.5(–3.5) × 0.8–1 µm. — On *Malus sylvestris* (= *M. pumila*, Rosaceae); Australia. — With *Pseudocercosporella pomi* (Brooks) Noordel. & Boerema as synanamorph. — Teleomorph: *Mycosphaerella* sp. (fide Walton & Penrose, Science 63 (1926) 236).

praetervisa (Bubák) H. Ruppr., Sydowia 11 (1957) 122. — Basionym: *Phyllosticta praetervisa* Bubák, Annls mycol. 2 (1904) 397.

Pycnidia: 30–70 µm diam.; c.: 4–5 × 1 µm. — On *Tilia parvifolia* and *T. platyphyllos* (Tiliaceae); Czech Republic, Germany. — Teleomorph: unknown.

pulmonariae Moesz in Bat. & Peres, Mems Soc. broteriana 14 (1961) 21 (*nom. inval.* – Art. 36.1).

Pycnidia: 50–87 × 56–105 µm; o.: 17.5–20 µm diam.; c.: 2–4 × 1.5 µm. — On *Pulmonaria officinalis* (Boraginaceae); Hungary. — Teleomorph: unknown.

quercifolii C. Massal., Memorie Accad. Agric. Sci. Verona, Sér. 3, 65 (1889) 131.

Conidia: 2–4 × 0.7–1 µm. — On *Quercus robur* (Fagaceae); Italy. — Teleomorph: unknown.

resedae (Oudem.) Petr., Annls mycol. 27 (1929) 405. — Basionym: *Phoma resedae* Oudem., Beih. bot. Zbl 11 (1902) 534 (Extr.: 12).

Conidia: 2 × 0.5 µm. — On *Reseda odorata* (Resedaceae); the Netherlands. — Teleomorph: unknown.

rhipsalidicola (Speg.) Cif., Quad. Ist. bot. Univ. Lab. crittogam. Pavia 19 (1961) 250. — Basionym: *Phoma rhipsalidicola* Speg., An. Mus. nac. Hist. nat. B. Aires 23 (1912) 112.

Conidia: 10–13 × 5–6 µm. — On *Rhipsalis lorentiana* (Cactaceae); Argentina. — Teleomorph: unknown.

rhodiolae Petr., Sydowia 10 (1956) 256.

Pycnidia: 60–80 µm diam.; o.: 15 µm diam.; c.: 3–3.5 × 1–1.5 µm. — On *Sedum rhodiola* (Crassulaceae); Sweden. — Teleomorph: unknown.

rosicola (C. Massal.) H. Ruppr., Sydowia 13 (1959) 14. — Basionym: *Phyllosticta rosicola* C. Massal., Atti Ist. veneto Sci. Lett. Arti 59 (1900) 687.

Pycnidia: 60–80 µm diam.; c.: 2.5–4 × 1 µm. — On *Rosa gallica* (Rosaceae); Italy. — Teleomorph: unknown.

saccardoi (Thüm.) Petr., Hedwigia 74 (1934) 54. — Basionym: *Phyllosticta saccardoi* Thüm., Instituto, Coimbra 28 (1881) 550.

Pycnidia: 50 µm diam.; c.: 4 × 1 µm. — On *Rhododendron ponticum* (Ericaceae); France, Portugal. — Teleomorph: unknown.

saginae Urries, An. Inst. bot. A.J. Cavanilles 14 (1956) 164.

Pycnidia: 20–50 µm diam.; c.: 2–3 × 1 µm. — On *Sagina procumbens* var. *apetala* (Caryophyllaceae); Spain (Canary Islands). — Teleomorph: *Mycosphaerella saginae* Urries (l.c. 161).

saponariae (Fuckel) Petr., Sydowia 9 (1955) 492. — Basionym: *Ascochyta saponariae* Fuckel, Symb. Mycol. (1870) 388.

Pycnidia: 80 µm diam.; c.: 4 × 0.5 µm. — On *Saponaria officinalis* (Caryophyllaceae); Italy, Germany. — With *Septoria* sp. as synanamorph. — Teleomorph: unknown.

scaevolae Petr., Sydowia 7 (1953) 399.

Pycnidia: 50–100 µm diam.; o.: 9–12 µm diam.; c.: 2.5–4 × 1.5–2 µm. — On *Scaevola* sp. (Goodeniaceae); USA (Hawaii). — Teleomorph: *Mycosphaerella scaevolae* Shear & Stevens (fide Petrak, l.c.).

schultziae Murashk. in Murashk. & Ziling, Ber. Sibir. Inst. Land-u. Forstw, 9 (4) (1928) 7.

Pycnidia: 80(–74–85) × 55–65 µm; c.: 3.5–5.5 × 0.8 µm. — On *Schultzia compacta* (Apiaceae); Russia. — With *Septoria schultziae* Murashk. as synanamorph. — Teleomorph: unknown.

scorzonerae (Petr.) Petr., Hedwigia 65 (1924–25) 254. — Basionym: *Phyllosticta scorzonerae* Petr., Annls mycol. 19 (1921) 86.

Pycnidia: 60–100 µm diam.; o.: 30 µm diam.; c.: 3–5 × 1 µm. — On *Scorzonera humilis* (Asteraceae); Ukraine. — With *Cercospora scorzonerae* Höhn. as synanamorph. — Teleomorph: unknown.

scrophulariae (P. Karst.) H. Ruppr., Sydowia 11 (1957) 426. — Basionym: *Phoma scrophularina* P. Karst., Acta Fauna Fl. fenn. 27 (4) (1905) 8.

Pycnidia: 180–200 × 130 µm; o.: 18 µm diam.; c.: 3.5–5 × 1.2 µm. — On *Scrophularia nodosa* (Scrophulariaceae); Finland, Germany. — Teleomorph: unknown.

semelicola Urries, An. Inst. bot. A.J. Cavanilles 14 (1956) 164.

Pycnidia: 25–50 µm diam.; c.: 2–3 × 1 µm. — On *Semele androgyna* var. *gayae* (Liliaceae); Spain (Canary Islands). — Teleomorph: *Mycosphaerella* sp. [non *Mycosphaerella semeles* Urries (fide Urries, l.c.)].

silvarum Petr., Annls mycol. 23 (1925) 112.

Pycnidia: 40–60 µm diam.; c.: 2.5–3.5(–4) × 1.5–2 µm. — On *Carex sylvatica* (Cyperaceae); Czech Republic. — Teleomorph: *Mycosphaerella hranicensis* Petr. (fide Petrak, l.c.).

solani (Gonz. Frag. & Cif.) Cif., Quad. Ist. bot. Univ. Pavia 19 (1961) 250. — Basionym: *Phyllonochaeta solani* Gonz. Frag. & Cif., Estac. Agron. Haina. Ser. Bot. 8 (1927) 44.

Pycnidia: 70–100 µm diam.; c.: 4–6.5 × 1.5 µm. — On *Solanum torvum* (Solanaceae); Dominican Republic. — Teleomorph: unknown.

sphaerospora Sacc. & Traverso, Annls mycol. 1 (1903) 439.

Pycnidia: 250–500 µm diam.; c.: 12–15 × 11–14 µm. — On *Triticum vulgare* (Poaceae); Italy (Sardinia). — Teleomorph: unknown.

stachydis (Brunaud) Petr., Hedwigia 65 (1925) 254. — Basionym: *Phyllosticta stachydis* Brunaud, Acta Soc. linn. Bordeaux 44 (1890) 273–311 [extr.: 35].

Conidia: 4–6 × 2 µm. — On *Stachys sylvatica* (Lamiaceae); France. — With *Septoria stachydis* Roberge & Desm. as synanamorph (according to Petrak, l.c.). — Teleomorph: unknown.

staphyleicola (Oudem.) Petr., Annls. mycol. 23 (1925) 114. — Basionym: *Phyllosticta staphyleicola* Oudem., Beih. bot. Zbl. Bot. 11 (1902) [extr. 13].

Pycnidia: 45–70 µm diam.; c.: 4–5 × 1.5–2 µm. — On *Staphylea pinnata* (Staphyleaceae); the Netherlands. — Teleomorph: unknown.

stemmatea (Fr.) Petr., Annls mycol. 22 (1924) 40. — Basionym: *Sphaeria* (*Depazea*) *stemmatea* Fr.: Fr., Syst. mycol. 2 (1823) 528.

Conidia: 6–10 × 1–1.5 µm. — On *Vaccinium vitis-idaea* (Ericaceae); Sweden, Germany, Italy, Russia. — Teleomorph: *Mycosphaerella stemmatea* (Fr.: Fr.) Petr. (fide Petrak, l.c.).

striolata (Sacc.) H. Ruppr., Sydowia 13 (1959) 14. — Basionym: *Phyllosticta striolata* Sacc., Nuovo G. bot. ital. 22 (1915) 45.

Pycnidia: 50–60 µm diam.; o.: 25–30 µm diam.; c.: 2.5–3 × 1 µm. — On *Brachypodium distachyon* (Poaceae); Italy. — Teleomorph: unknown.

thalictrina Petr., Hedwigia 74 (1934) 56.

Pycnidia: 40–70 µm diam.; o.: 15–20 µm diam.; c.: 3–4(–5) × 0.5–0.8 µm. — On *Thalictrum minus* (Ranunculaceae); Russia. — Teleomorph: unknown.

thlaspeos Murashk. in Murashk. & Ziling, Mater. Pilzfl. Altaj & Sajany, (1929) 20.

On *Thlaspi cochleariforme* (Brassicaceae); Russia. — Teleomorph: unknown.

thlaspeos Moesz & Smarods, Bot. Közl. 35 (1–2) (1938) 52 (homonym).

Pycnidia: 100–190 µm diam.; o.: 25 µm diam.; c.: 3.5–5 × 1.5 µm. — On *Thlaspi arvense* (Brassicaceae); Latvia. — Teleomorph: unknown.

tiliae (F. Rudolphi) Butin & Kehr, Mycol. Res. 99 (10) (1995) 1193. — Basionym: *Asteroma tiliae* F. Rudolphi, Linnaea 4 (1829) 509.

Pycnidia: 60–120 µm diam.; o.: 10–15 µm diam.; c.: 4–5 × 1.5–2 µm. — On *Tilia platyphyllos* (Tiliaceae); Austria. — Teleomorph: *Didymosphaeria petrakiana* Sacc. (fide Butin & Kehr, l.c.).

tiliicola (Oudem.) Arx, Verh. K. Ned. Akad. Wet., Afd. Natuurk. 51 (3) (1957) 149. — Basionym: *Phyllosticta tiliicola* Oudem., Ned. kruidk. Archf, Sér. 3, 2 (1902) 747.

Pycnidia: 100 µm diam.; c.: 2 × 0.5 µm. — On *Tilia ulmifolia* (Tiliaceae); the Netherlands. — With *Cercospora microsora* Sacc. as synanamorph. — Teleomorph: *Mycosphaerella millegrana* (Cooke) Schröt. (fide von Arx, l.c.).

tragii (Bubák) Petr., Sydowia 15 (1961) 215. — Basionym: *Phyllosticta tragii* Bubák, Annln naturh. Mus. Wien 28 (1914) 205.

Pycnidia: 150–180 µm diam.; c.: 3–4 × 1.5–2 µm. — On *Pimpinella tragii* (Apiaceae); Turkey. — Teleomorph: *Mycosphaerella* sp. (fide Petrak, l.c.).

trautmannia (Moesz) Moesz, Bot. Közl. 39 (1942) 314. — Basionym: *Phyllosticta trautmanniana* Moesz, Bot. Közl. 22 (1924) 43.

Pycnidia: 100–180 µm diam.; c.: 4.5–7.5 × 1–1.5 µm. — On *Sorbus torminalis* (Rosaceae); Hungary. — Teleomorph: unknown.

trollii (Trail) H. Ruppr., Sydowia 13 (1959) 14. — Basionym: *Phyllosticta trollii* Trail, Scott. Nat. n.s. 4 (1889) 70.

Pycnidia: 120–130 µm diam.; c.: 4 × 1 µm. — On *Trollius europaeus* (Ranunculaceae); Great Britain (Scotland). — Teleomorph: unknown.

urgineae Bremer in Bremer & Petr., Sydowia 2 (1948) 311.

Pycnidia: 50–80 µm diam.; c.: 2.5–5 × 0.7–1 µm. — On *Urginea maritima* (Liliaceae); Turkey. — Teleomorph: unknown.

vandae (Namysl.) H. Ruppr., Sydowia 13 (1959) 14. — Basionym: *Phyllosticta vandae* Namysl., Kosmos 33 (1908) 329.

Pycnidia: 60–80 µm diam.; c.: 3–4 µm. — On *Dipsacus sylvestris* (Dipsacaceae); Poland, France. — Teleomorph: unknown.

velata Petr., Sydowia 1 (1947) 132.

Pycnidia: 70–150 µm diam.; o.: 8–12 µm diam.; c.: 2–4.5 × 1–1.5 µm. — On *Acer platanoides* (Aceraceae) with *Rhytisma acerinum* (Pers.) Fr. (anamorph *Melasmia acerina* Lév.); Austria. — Teleomorph: unknown.

vestita Petr., Sydowia 16 (1962) 183 (*nom. nud.*). — fide Petrak (l.c.) this species should have been described in Annls mycol. 42 (1944) 112, but was never published.

On *Acer pseudoplatanus* (Aceraceae); Austria. — Teleomorph: unknown.

vogelii (Henkel) Petr., Annls mycol. 22 (1924) 135. — Basionym: *Stictochorella vogelii* Henkel, Annls mycol. 21 (1923) 144.

Pycnidia: 70–90 µm diam.; c.: 5–6 × 1–1.5 µm. — On *Rhamnus cathartica* (Rhamnaceae); Germany. — With *Cercospora rhamni* Fuckel as synanamorph. — Teleomorph: *Mycosphaerella vogeli* (Syd.) Tomilin (fide Petrak, Sydowia 16 (1962) 196).

vulgaris Thüm., Mycoth. univ. 1892 & 2092, 1878 (Sacc., Syll. Fung. 10 (1892) 211).

Conidia: 3.5–4 × 1 µm. — On *Crataegus oxyacanthoides* (Rosaceae), *Gleditsia triacanthos* (Fabaceae); Italy. — Teleomorph: unknown.

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NOTULAE AD FLORAM AGARICINAM NEERLANDICAM – XXXII
Macrolepiota

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Critical notes on the taxonomy and nomenclature of the Dutch *Macrolepiota* species with ring with double crown are given. *Macrolepiota bohemica* (Wichanský) Krieglst. & Pázmány is regarded as a synonym of *M. rachodes* (Vitt.) Sing. The new combination *M. rachodes* f. *olivieri* (Barla) de Kok is made. *Macrolepiota mastoidea* (Fr.: Fr.) Sing., *M. gracilenta* (Fr.) Mos. and *M. rickenii* (Velen.) Bellù & Lanzoni are synonymized. *Macrolepiota permixta* (Barla) Mos. is considered merely a variant of *M. procera* (Scop.: Fr.) Sing.; notes on the nomenclature of *M. nympharum* (Kalchbr.) Wasser are presented. *Agaricus emplastrum* Cooke & Mass. and *A. tepidarius* Weinm. are regarded as nomina dubia.

The genus *Macrolepiota* Sing. is, within the family Agaricaceae, characterized by having dextrinoid, strongly congophilous, metachromatic and large (7–20 × 5–10 µm) spores, with a truncate apex and a large germ pore. The velum universale is an intricate trichoderm, and a volva is absent. The number of species recognized in western Europe varies from 11 (Moser, 1983) to 18 (Bon, 1993). Six species occur in the Netherlands (de Kok, 1992). Only *M. rachodes* and *M. procera* are common; *M. excoriata* is uncommon, and has declined considerably since 1950 due to changes in agriculture; *M. konradii* and *M. mastoidea* are both rare species in the country, and *M. nympharum* was found once in southern Limburg in 1986 (see also Nauta & Vellinga, 1995 and Vellinga in Arnolds et al., 1995).

Macrolepiota rachodes and its synonyms, and the complex of *M. mastoidea* are discussed in detail. Nomenclatural notes on *M. procera* and *M. nympharum* are provided.

Fresh and herbarium material of all Dutch species have been studied. Colour codes are according to Munsell (1975). Spores were measured in 5% $KOH_{(aq)}$ or 10% $NH_{3(aq)}$, stained with Congo red; spores were measured in side view. The notation [630, 59, 53] stands for '630 spores from 59 basidiocarps of 53 collections measured'. The following abbreviations are used: Q = quotient of length and width, av. = average. All collections are in L.

This research was begun as part of an undergraduate project in 1990–1991 at the Rijksherbarium in Leiden. An unpublished report contains more data and a detailed discussion on the Dutch *Macrolepiota* species (de Kok, 1991).

1. **Macrolepiota rachodes** (Vitt.) Sing.

Agaricus rachodes Vitt., Descr. Funghi. Italia (1835) 158; *Agaricus procerus rachodes* Rab., Deutschl. Krypt. Fl. 1 (1844) 574; *Lepiota rachodes* (Vitt.) Quél., Mém. Soc. Émul. Montbéliard. sér. II, 5 (1872) 5 (Champ. Jura Vosges 1); *Leucocoprinus rhacodes* (Vitt.) Pat., Ess. tax. Hym. (1900) 171; *Lepiotophyl-*

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lum rhacodes (Vitt.) Locq., Bull. mens. Soc. linn. Lyon 11 (1942) 40; *Macrolepiota rachodes* (Vitt.) Sing., Lilloa 22 ('1949'; 1951) 417. — *Hypophyllum columella* Paul., Tr. Champ. (1808–1835) pl. 135, fig. 15 (not validly published, art. 41.2). — *Agaricus subtomentosus* Krombh., Nat. Abb. Beschr. Schw. (1836) 9, pl. 4; *Agaricus procerus subtomentosus* (Krombh.) Rab., Deutschl. Krypt. Fl. (1844) 574. — *Lepiota subprocera* Saut., Hedwigia 15 (1876) 152. — *Lepiota bohemica* Wichanský, Mykol. Sb. 38 (1961) 103; *Macrolepiota bohemica* (Wichanský) Krieglst., Z. Mykol. 47 (1981) 83 (not validly published, basionym not mentioned); *Macrolepiota bohemica* (Wichanský) Krieglst. & Pázmány, Z. Mykol. 51 (1985) 52; *Macrolepiota rachodes* var. *bohemica* (Wichanský) Bellù & Lanzoni, Beitr. Kenntn. Pilze Mitteleur. 3 (1987) 191.

Misapplied. Lepiota badhamii B. & Br. sensu Michael & Hennig, Handb. Pilzfr. 3 (1964) 139, pl. 16. — *Lepiota rachodes* var. *hortensis* sensu Pilát & Usák, Naše Houby 1 (1952) 111; *Macrolepiota rhacodes* var. *hortensis* sensu Wasser, Fl. Fung. R.S.S. Ucrainicae, Agaricaceae (1980) 298.

The spelling of the name rachodes is somewhat controversial. The word rachodes lacks a meaning, but the word rhacodes is derived from the Greek word 'ραχος' meaning rag (Muller, 1926). This has led many authors (Fries, 1857; Locquin, 1942; Wasser, 1980) to believe that Vittadini (1835) had made a spelling mistake. This however is unlikely, as he is very consistent in the spelling of this taxon. We therefore agree with Singer (1951) in using Vittadini's spelling for the name of this taxon.

The taxon *M. rachodes* is macroscopically very variable; this has led some authors to split the species up. Two names are important in this aspect, viz. hortensis and bohemica. Pilát (1951: 422) described a new variety *Lepiota rachodes* var. *hortensis*; as no Latin description was given this variety is not validly published. Pilát presented only a macroscopical description and a reference to an illustration in Michael (1918: pl. 195). The thin ring of the species illustrated makes it clear that this new species belongs to the *Excoriata*-group of *Macrolepiota* (simple ring and smooth stipe), and not to the *Rachodes*-group (ring with a double crown and smooth stipe). This same plate (Michael, 1918: pl. 195) was cited by Bon (in Bon et al., 1979: 13), when he described the new species *M. venenata*, which is characterized by a thin annulus.

In Pilát & Usák (1952: pl. 111) another illustration of *Lepiota rachodes* var. *hortensis* is given. The specimen depicted here, has a distinct ring with a double crown, implying that this specimen belongs to the *Rachodes*-group. And this interpretation of var. *hortensis* has been followed by subsequent authors.

Macrolepiota bohemica, described by Wichanský (1961: 102), is considered to be very closely related to *M. rachodes*. All material of *M. bohemica* and *M. rachodes* available in Leiden was examined, and the following observations were made. According to the original description of *M. bohemica* the variation in spore length and width is 11–13 × 7.5–9.5 µm. In Fig. 1 the average spore length and width of all examined specimens are depicted. Clearly *M. rachodes* is very variable in spore length and width, and the variation of *M. bohemica* falls completely within its range. This is in accordance with the results of other authors (Bon, 1981: 73–74; Candusso & Lanzoni, 1990: 534, 540).

The germ pore is mentioned by some authors (Bon, 1981: 73–74 and Candusso & Lanzoni 1990: 534–540) as a good character to distinguish *M. bohemica* (germ pore narrower than 1 µm) from *M. rachodes* (germ pore wider than 1 µm). In the specimens examined no discontinuity was found for this character.

Bon (1981: 73–74), Candusso & Lanzoni (1990: 532 & 538) and Bellù & Lanzoni (1987: 191–192) mentioned that the stipe and the bulb of *M. bohemica* are wider than those of

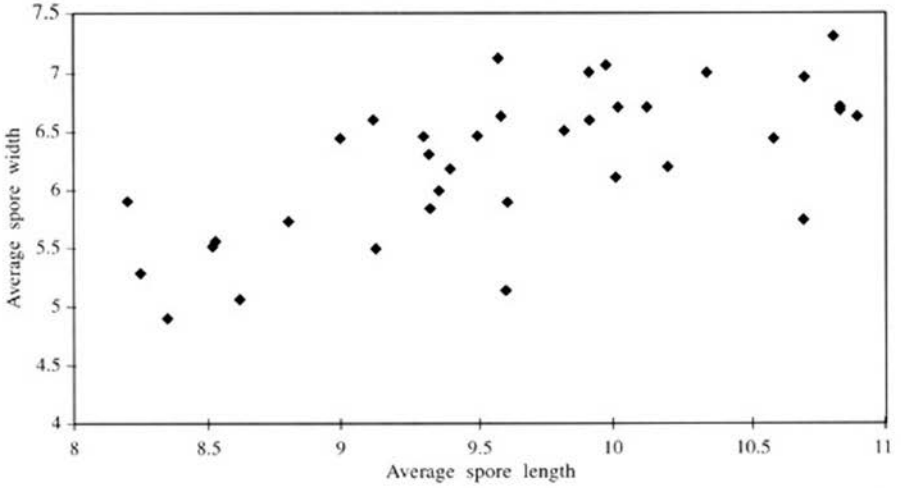

Fig. 1. *Macrolepiota rachodes*. Scatterdiagram of average spore length against average spore width (in µm).

M. rachodes. In accordance with the results of Lavorato (1989: 274–276), no discontinuity in the variation of this character was found.

Other characters used to distinguish the taxa are: shape of velum, colour of velum and shape of the annulus (Moser, 1983: 245, and Bellù & Lanzoni, 1987: 191–192). Environmental factors like moisture and temperature influence the expression of these characters, and can therefore not be used to separate the taxa. As a result *M. bohemica* is considered a synonym of *M. rachodes*.

During fieldwork in the Netherlands it was observed that *M. rachodes* specimens found in conifer woods were generally darker than the ones from other habitats (Fig. 2). If one plots the average spore length of a specimen against the light/dark indicators (Munsell colour code) of its pileus surface (i.e. not the veil) (Fig. 2), a separation based on these two characters is visible. The small-spored specimens (average spore length < 9.2 µm) have in general a darker pileus than the larger spored specimens (average spore length > 8.6 µm). Furthermore all small-spored darker specimens have been found near conifers (Fig. 2) (in the Netherlands near *Picea*). There is overlap between the two groups, but most specimens can be easily assigned to one or to the other. No doubt this darker, smaller spored group of *M. rachodes* represents a different forma. Fortunately, a name is already available. In examining the type of *Lepiota olivieri* Barla, Bellù & Lanzoni (1987: 195) found that it had a spore range of 7–8.5(–9.5) × 4.5–6 µm. The average spore length must be well below 8.6 µm. The specimen depicted by Barla (1889: pl. 9bis, figs. 6–10) is also darker then the typical *M. rachodes* specimen depicted on the same plate. Furthermore the type of *Lepiota olivieri* Barla is clearly depicted as standing in the litter of a conifer. This specimen must be a representative of the small-spored dark form of *M. rachodes*.

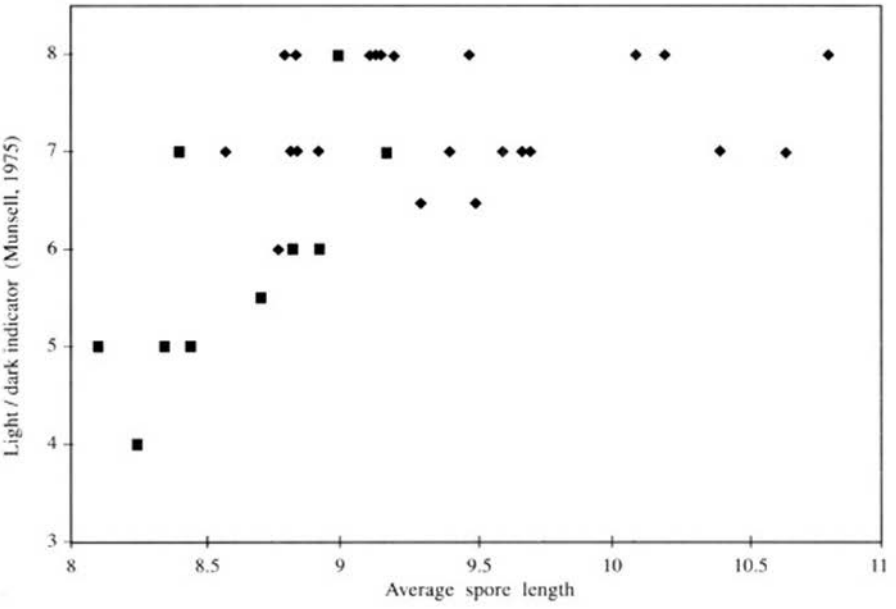

Fig. 2. *Macrolepiota rachodes* f. *rachodes* and f. *olivieri*. Scatterdiagram of average spore length (in µm) against light/dark indicator (Munsell, 1975); ■ = found in *Picea* woods, ◆ = found in other habitats.

KEY TO THE FORMAE OF MACROLEPIOTA RACHODES

1a. Pileus surface (not the veil) white to (very) light brown or reddish yellow, sometimes light yellow or yellowish red (10 YR 8/2, 5–8/3–4, 7.5 YR 6/4, 7/6, 2.5 Y 7/4, 6/6, 5 YR 5/8, 6/4); spores in average 8.7–11 × (5.2–)5.5–7.5 µm .. *M. rachodes* f. *rachodes*

b. Pileus surface (not the veil) yellowish brown to light brown (10 YR 5–6/3–4, 7/3, 7.5 YR 6/4, 3/2); spores in average 8.1–9.0 × 5.0–6.0 µm ..... *M. rachodes* f. *olivieri*

Macrolepiota rachodes f. rachodes

Selected icons. Barla, Fl. mycol. ill. (1889) pl. 9bis, figs. 1–5; Candusso & Lanzoni, Lepiota s.l. (1990) pl. 69 (as *M. rachodes* var. *bohemica*); Cetto, Funghi Vero, Ed. 5, 1 (1975) pl. 21 (as *L. rhacodes*); R. Phillips, Paddest. Schimm. (1981) 25 (as *M. rachodes* var. *bohemica*); Vitt., Descr. Funghi. mang. Italia. (1835) pl. 20; Wasser, Fl. Fung. R.S.S. Ucrainicae, Agaricaceae (1980) pl. 27 (except for dark specimen at the right).

Pileus 42–205 mm, when young hemispherical, expanding to plano-convex, depressed to umbonate, white to (very) light brown or reddish yellow, sometimes light yellow or yellowish red (e.g. 10 YR 8/2, 10 YR 5–8/3–4, 7.5 YR 6/4, 7.5 YR 7/6, 2.5 Y 7/4, 6/6, 5 YR 5/8, 6/4), smooth to ragged; velum at centre 24–100 mm in diameter, starshaped to round,

with indistinct border, sometimes cracked, surrounded by irregular concentric rings of squamular patches, flat or curved upwards, dark red to yellowish red or (deep) brown (2.5 YR 3/6, 5 YR 3–6/2–8, 10 YR 4–5/3–4, 10 YR 6/3–6, 5/6, 7.5 YR 5/8, 3/4, 6/4, 5/6, 4/4), always the darkest at centre. Lamellae, L = 7–17 per 10 mm halfway radius, free, 1–4 mm remote from stipe, 4–18.5 mm wide, sometimes forked, white (10 YR 8/3), when touched reddish yellow (5 YR 7/6) to light red (10 R 6/8), orange (7.5 YR 7/8), or yellow, later brown (7.5 YR 5/4), usually with light to dark brown, sometimes olive (5 Y 5/6), even to eroded edge. Stipe 26–160(–225) × 7–26(–29) mm, cylindrical with (marginate) bulb, 17–45(–60) mm wide, hollow, white, when touched light brown or yellowish red (10 YR 7/4, 5/4, 6/6, 5 YR 5/6, 7.5 YR 6/4, 5/6, 7/6, 4/4, 5/8), smooth, sometimes with rhizomorphs at base. Ring membranous, with double crown, 18–57 mm wide, 1–12 mm thick, whitish to buff brown (5 YR 7/3) above, sometimes adhered, brown (5 YR 6/3–10 YR 6/6, 8/4) at underside. Context white, turning brown when aging (7.5 YR 5/4), when cut sometimes first turning yellow (10 YR 7–8/6), then reddish yellow (7.5 YR 8–6/6–8, 5 YR 6–7/6–8 or 5 YR 5/8) to weakly red (10 R 5–6/6–8 or 2.5 YR 6/6, 4/8, 6/8), and finally brown (5 YR 3/3, 10 R 5/8), in pileus 5–18 mm thick. Smell fungoid, earth-like or like rubber. Taste fungoid or earth-like.

Spores [± 630, 59, 53] 7.5–12(–14) × 4.5–8.5 µm, in average 8.7–11 × (5.2–)5.5–7.5 µm, Q = 1.1–2.1, av. Q = 1.35–1.9. Basidia 4-spored, with clamp-connections. Cheilocystidia clavate, after a frost-period sometimes rostrate. Velum on pileus an intricate trichoderm, with clavate terminal elements, with vacuolar pigment, usually situated in upper part of trichoderm. Hymenophoral trama (sub)regular. Clamp-connections present.

Habitat & distribution – Solitary or gregarious, saprotrophic and terrestrial, on rather nutrient-rich soil, in gardens, orchards, grasslands, greenhouses, deciduous and coniferous woods, and on roadsides and compost heaps. Common, (April–)Sept.–Dec.

Collections examined. THE NETHERLANDS: prov. Friesland, Beetsterzwaag, 9-IX-1953, collector unknown; prov. Groningen, Boertange, 15-X-1990, 'excursie NMV'; Egypteseind, 18-X-1990, *de Kok*; Haren, X-1966, *Wildevanck*; prov. Drenthe, Zwarte meer, 17-X-1990, *de Kok* (2 collections); prov. Overijssel, Mastenbroek, 21-XI-1990, *Chrispijn*; Singraven, 23-X-1960, *Kits van Waveren*; prov. Flevoland, Zuidelijk Flevoland, Horsterwold 7-XI-1990, *van Zanen*; Noordoostpolder, Schokkerbos 7-XI-1990, *de Kok* (2 collections); Urkerbos, 4-XI-1987, *Vellinga*; Urkerbos, 7-XI-1990, *de Kok*; prov. Noord-Holland, Amsterdam, 4-5-XII-1986, and 8-XII-1986, *Ietswaart*; Amsterdam, 21-VIII-1987, *Ietswaart*; Amsterdam, 4-X-1990, *Chrispijn*; Amstelveen, 25-9-1990, *Reijnders*; Amstelveen, 26-9-1990, *van Zanen*; 's-Graveland, Boekesteijn, IX-1969, *Daams*; 's-Graveland, 20-IX-1958, *Daams*; 's-Graveland, IX-1969, *Daams*; 's-Graveland, 28-X-1969, *Daams 474*; Kortenhoef, 18-XI-1982, *Daams 82-25*; prov. Zuid-Holland, Boskoop, 24-IX-1990, *Uljé*; Den Haag, 17-X-1990, *Jalink*; Leiden, 24-X-1944, *Koster 992*; Leiden, 7-IV-1961, *Ballego*; Leiden, 10-IX-1990, *Bas*; Leiden, 25-IX-1990, *Adema*; Leiden, De Bak, 5-X-1990, *Kienjet*; Leiden, Witte Singel, 8-X-1990, *de Kok*; Leiden, Bizetpad, 18-XI-1990, *Bas*; Leidschendam, 1-XII-1979, *Prud'homme van Reine*; Meyendel, 30-X-1955, *Schravesande*; Oegstgeest, 12-XII-1953, *Bas*; Rijnsburg, 15-XII-1989, *Ietswaart*; prov. Gelderland, Hoog-Keppel, 17-IX-1990, *Piepenbroek*; Wageningen, 8-XII-1972, *Huijsman 379*; Wichmond, 4-XI-1982, *Boekhout 1082*; Wilp, 26-IX-1990, *Piepenbroek 1814b*; prov. Zeeland, Goes, 13-X-1982, *Kuijs*; prov. Noord-Brabant, Breda, summer 1969, *Jansen*; Breda, 13-14-VI-1969, *Jansen 69-113*; prov. Limburg, Mook, 12-X-1964, *Kits van Waveren*; Wijlre, 14-X-1969, *Jansen*; Gulpen, 12-X-1952, *Uffelie*. — GERMANY: Rheinland-Pfalz, Dohm, 21-IX-1990, collector unknown. — GREAT BRITAIN: Surrey, Boxhill, 23-IX-1963, *Pegler 458635*. — HUNGARY: Budapest, 25-VI-1985, *Albert*. — CZECH REPUBLIC: Moravia, Palkovice, 16-XI-1981, *Kuthan*. — USA: Massachusetts, Brighton, IX-1907, *Farlow*; California, Berkeley, IV-1961, *Tavares*. — SWITZERLAND: ct. Bern, Ins, 17-X-1959, *Huijsman*; ct. Neuchâtel, Neuchâtel, 15-IX-1966, *Huijsman*.

Macrolepiota rachodes f. **olivieri** (Barla) de Kok, *comb. & stat. nov.*

Lepiota olivieri Barla, Bull. Soc. mycol. Fr. 2 (1886) 113; *Lepiota rachodes* var. *olivieri* (Barla) Barla, Fl. mycol. ill. (1889) 27; *Macrolepiota olivieri* (Barla) Wasser, Fl. Fung. R.S.S. Ucrainicae, Agaricaceae (1980) 298.

Excluded. Macrolepiota olivieri sensu Wasser, Fl. Fung. R.S.S. Ucrainicae, Agaricaceae (1980) 298 (= *M. rachodes* f. *rachodes*); sensu Wasser, Libri bot. 9 (1993) 87 (= *M. rachodes* f. *rachodes*).

Selected icons. Barla, Fl. mycol. ill. (1889) pl. 9bis. figs 6–10; Bellù, Boll. Gr. micol. G. Bres. 25 (1982) 113 (as *M. rhacodes* var. *rhacodes*); Candusso & Lanzoni, Lepiota s.l. (1990) pl. 67 (as *M. rachodes* var. *rachodes*); J. Lange, Fl. agar. dan. 1 (1935) pl. 9C. (as *L. rhacodes*); R. Phillips, Paddest. Schimm. (1981) 25 (as *M. rachodes* var. *rachodes*); Pilát & Usák, Naše Houby 1 (1980) pl. 110 (as *L. rhacodes*).

Pileus 46–127 mm, when mature plano-convex, applanate, sometimes (sub)umbonate, yellowish brown to light brown (10 YR 5–6/3–4, 7/3, 7.5 YR 6/4, 3/2), smooth to ragged; velum star-shaped to circular, with indistinct border, 21–38 mm wide, with concentrical zones of applanate or upwards curving squamulose patches, dark brown to reddish brown (7.5 YR 3/4, 3/2, 5 YR 3/4, 10 YR 5/4–6, 7/3), at centre always the darkest. Lamellae 10–14 per 10 mm halfway radius, free, 1–7 mm remote from stipe, 8.5–15 mm wide, whitish, when touched light red (2.5 YR 6/8) to yellowish red, with dark brown eroded edge. Stipe (45–)80–190 7–13 mm, smooth, bulbous to subbulbous, with 21–32 mm wide bulb, white, when touched (darker) yellowish brown or darker reddish brown (10 YR 4/4, 10 YR 5/4–6, 5 YR 3/4, 7.5 R 3/4). Ring membranous, with double crown, 25–30 mm in diameter, 1–5 mm thick, very light brown (10 YR 7/4) at upper side, sometimes adhered, lower side coloured as pileus. Context white, 7–17 mm thick in pileus, when cut turning reddish yellow (7.5 YR 6–7/8, 5 YR 6/8), later red (10 R 4–6/6–8 or 2.5 YR 5/6). Smell none, earth-like or fungoid. Taste unpleasant.

Spores [± 200, 13, 13] 7.0–10.5(–11.2) × 4.0–6.5 µm, on average 8.1–9.0 × 5–6 µm, Q = 1.2–2, av. Q = 1.4–1.7. Basidia 4-spored, with clamp-connection. Cheilocystidia clavate, not rostrate. Velum on pileus an intricate trichoderm with clavate terminal elements, with vacuolar pigment. Hymenophoral trama subregular.

Habitat & distribution – Solitary or gregarious, saprotrophic and terrestrial in woods with coniferous trees (in the Netherlands only with *Picea*). Rather rare, Sept.–Nov.

Collections examined. THE NETHERLANDS: prov. Groningen, Sellingerbeetse, 17-X-1990, *Sieben*; prov. Noord-Holland, Hilversum, 9-IX-1956, *Daams*; prov. Flevoland, Noordoostpolder, Schokkerbos, 7-XI-1990, *de Kok* (several collections); Urkerbos, 25-IX-1990, *van Zanen*; Urkerbos, 7-XI-1990, *de Kok* (3 collections); prov. Utrecht, Soest, 5-IX-1912, *Lefebure*; prov. Gelderland, Wilp, 26-IX-1990, *Piepenbroek 1814a*; Windesheim, 2-IX-1954, *Bas.* — SWITZERLAND: ct. Bern, Ins, 28-X-1968, *Huijsman 266*.

2. **Macrolepiota mastoidea** (Fr.: Fr.) Sing.

Agaricus mastoideus Fr.: Fr., Syst. mycol. 1 (1821) 20; *Lepiota mastoidea* (Fr.: Fr.) Kumm., Führ. Pilzk. (1871) 135; *Lepiota excoriata* subsp. *mastoidea* (Fr.: Fr.) Quél., Fl. mycol. (1881) 301; *Leucocoprinus mastoideus* (Fr.: Fr.) Sing., Rev. Mycol. 4 (1939) 67; *Lepiotophyllum mastoideum* (Fr.: Fr.) Locq., Bull. mens. Soc. linn. Lyon 11 (1942) 40; *Leucocoprinus mastoideus* (Fr.: Fr.) Locq., Bull. mens. Soc. linn. Lyon 14 (1945) 46; *Macrolepiota mastoidea* (Fr.: Fr.) Sing., Lilloa 22 ('1949'; 1951) 417. — *Agaricus gracilentus* Krombh., Nat. Abb. Beschr. Schw. 4 (1836) 8, pl. 24. figs. 13–14; *Lepiota gracilenta* (Krombh.) Quél., Mém. Soc. Émul. Montbéliard, sér. II, 5 (1872) 71 (Champ. Jura Vosges 1);

Macrolepiota gracilenta (Krombh.) Mos., Blätter-, Bauchpilze, 1. Aufl. (1953) 114 (not valid, basionym not mentioned); *Macrolepiota gracilenta* (Krombh.) Wasser, Ukr. Bot. Zh. 35 (1978) 516. — *Lepiota rickenii* Velen., Novit. mycol (1939) 47; *Macrolepiota rickenii* (Velen.) Bellù & Lanzoni, Beitr. Kenntn. Pilze Mitteleur. 3 (1987) 196.

Excluded. Lepiota excoriata subsp. *mastoidea* sensu Konr. & M., Ic. sel. Fung. 1 (1924) pl. 10 (= *M. konradii*).

Selected icons. Barla, Fl. mycol. ill. (1889) pl. 11, figs. 1–10; M. Bon, Champ. Eur. occid. (1989) 291 (as *M. gracilenta* & *M. konradii*); Breitenb. & Kränzl., Pilze Schweiz 4 (1995) 251; Bres., Iconogr. mycol. 1 (1927) pl. 21 (as *L. gracilenta*) & 23 (as *L. mastoidea*); Candusso & Lanzoni, Lepiota s.l. (1990) pl. 73 & 74, fig. 127; Cooke, Ill. Brit. Fung. 1 (1881) fig. 24, (23) (as *Agaricus mastoideus*); J. Lange, Fl. agar. dan. 1 (1935) pl. 8c (as *L. umbonata*).

Ever since the description of *M. gracilenta* in 1836, taxonomists have struggled to find characters to separate *M. mastoidea* from *M. gracilenta*. Among the characters used, are spore length and width. *Macrolepiota gracilenta* is supposed to have slightly smaller spores than *M. mastoidea*. In this research, based on 18 collections from seven countries, no gap in the variation of the average spore width and length was found (de Kok, 1991).

According to Pázmány (1985: 54–55), who studied ten collections from Rumania in detail, in *M. mastoidea* the ratio of pileus diameter and stipe length (measured on exsiccates) is 0.5–0.83 and in *M. gracilenta* 0.35–0.6. Furthermore, he found a correlation between this character and the spore length and width. After combining Pázmány's data with the present data (measured on exsiccates), no discontinuity or correlation between these two characters was found (Fig. 3).

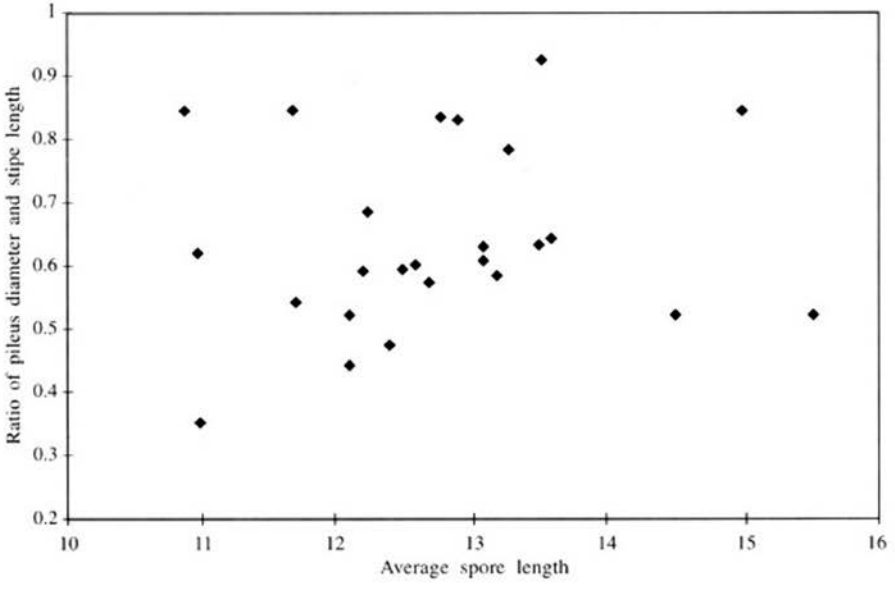

Fig. 3. *Macrolepiota mastoidea*. Scatterdiagram of average spore length (in µm) against ratio of pileus diameter and stipe length.

Table I. Velum colour in *M. mastoidea*, *M. gracilenta*, and *M. rickenii* according to various authors.

M. mastoidea	*M. gracilenta*	Authors
Ocker-gelbbräunlich	hellbraun	Pázmány (1985)
Ockerbräunlich	hell fleischocker	Moser (1983)
Café au lait	ochrace grisâtre	Bon (1981)
M. mastoidea	*M. rickenii*	Authors
(not mentioned)	dunkelbraun-intensiv milchkaffeebraun	Bellù & Lanzoni (1987)
Ocra	bruno caffelatte	Candusso & Lanzoni (1990)
Brun ochracé	brun châtain	Bon (1993)
Ocker-gelbbräunlich	intensiv milchkaffeebraun	Candusso & Lanzoni (1990)

Pázmány (1985: 54–55) stated that the ratio of stipe length and stipe diameter of *M. mastoidea* is 10–23 and in *M. gracilenta* 25–30 (measured on exsiccata). In the combined data set, most collections have relatively short stipes (ratio 10–15; measured on exsiccates), the longest stiped specimens having been found in Rumania. However, there is a continuum, and no correlation between this character and the average spore length could be found.

Velum colour is considered to be an important character by several authors. An overview of the literature is given in Table I. *Macrolepiota mastoidea* is considered darker, and more distinctly ochraceous, whereas *M. gracilenta* is paler, and slightly pink-coloured. Two collections, among the 18 studied, clearly show an intermediate colour range: *Bas 7381* from Austria: reddish yellow to very light brown (7.5 YR 6/6 to 10 YR 8/3), and *Boekhout 1026* from Belgium with pileus pink (7.5 YR 7/3) to beige brown.

Other characters like pileus and stipe diameter, pattern of velum on pileus and stipe, and shape of the cheilocystidia are either too much influenced by environmental factors, or else the differences are too small to justify a separation into separate species. Therefore, *M. gracilenta* is considered a synonym of *M. mastoidea*.

Some authors (Bellù & Lanzoni, 1987; Bon, 1993) do not use the name *M. gracilenta* anymore, as in the original diagnosis the lamellae are stated to be pale greenish ('pallide virescentibus'), reminding of a representative of the genus *Chlorophyllum*. The name *M. rickenii* (Velen.) Bellù & Lanzoni is used instead, for the interpretation of *M. gracilenta*, without greenish lamellae. *Macrolepiota rickenii* is considered to be as dark as or even darker than *M. mastoidea* (Bellù & Lanzoni, 1987; Candusso & Lanzoni, 1990; Bon, 1993). For an overview of the colours see also Table I. In view of the colour variation, and the absence of correlating characters, *M. rickenii* is also synonymized with *M. mastoidea*.

3. **Macrolepiota procera** (Scop.: Fr.) Sing.

Agaricus procerus Scop., Fl. carn. 2 (1772) 418; *Agaricus procerus* Scop.: Fr., Syst. mycol. 1 (1821) 20; *Lepiota procera* (Scop.: Fr.) S.F. Gray, Nat. Arr. Brit. Pl. 1 (1821) 601; *Mastocephalus procerus* (Scop.: Fr.) Pat., Essai tax. Hym. (1900) 171; *Lepiotophyllum procerum* (Scop.: Fr.) Locq., Bull. mens. Soc. linn. Lyon 11 (1942) 40; *Macrolepiota procera* (Scop.: Fr.) Sing., Papers Mich. Acad. Sci., Arts Letters 32 (1946) 141. — *Lepiota permixta* Barla, Bull. Soc. mycol. Fr. 2 (1886) 114. *Leucocoprinus permixtus* (Barla) Locq., Bull. mens. Soc. linn. Lyon 14 (1945) 91; *Macrolepiota permixta* (Barla) Mos.,

Blätter-, Bauchpilze, 1. Aufl. (1953) 114 (not valid, basionym not mentioned); *Macrolepiota permixta* (Barla) Pacioni, Micol. ital. 8 (3) (1979) 13; *Macrolepiota procera* var. *permixta* (Barla) Candusso in Candusso & Lanzoni, Lepiota s.l. (1990) 518.

Selected icons. Bellù, Boll. Gr. micol. G. Bres. 25 (1982) 120 (as *M. permixta*); Breitenb. & Kränzl., Pilze Schweiz 4 (1995) pl. 253, 254 (as *M. permixta* and *M. procera* resp.); Candusso & Lanzoni, Lepiota s.l. (1990) pl. 63 & 65 (as *M. procera* var. *procera* and var. *permixta* resp.); Dähncke, 1200 Pilze (1993) 521; J. Lange, Fl. agar. dan. 1 (1935) pl. 8b; R. Phillips, Paddest. Schimm. (1981) 24.

Macrolepiota permixta Barla (1886) has always been considered to be very closely related to *M. procera*. The main difference between the two species is that unlike that of *M. procera*, the context of *M. permixta* turns red when cut (Barla, 1886). Most *Macrolepiota* species turn reddish brown when they are cut. Such reddening of basidiocarps is considered to be a sign of tyrosinase activity (Marr, 1984). In some cases, varietal status is given on account of this discoloration (e.g. *M. excoriata* var. *rubescens* (Dufour) M. Bon, *M. mastoidea* var. *coccineobasalis* (Locq.) M. Bon). The discoloration largely depends on the age of the fruit-body and other conditions like moisture and temperature. Collections of *Macrolepiota* species (including *M. procera*) can be found in which some specimens discolour red when cut, while others, in the same collection, hardly discolour at all. Therefore, discolouring is considered an unreliable character within this genus. Consequently, *M. permixta* is regarded as a synonym of *M. procera*.

4. **Macrolepiota nympharum** (Kalchbr.) Wasser

Agaricus nympharum Kalchbr., Ic. sel. Hymenomyc. Hungariae (1873) 10, pl. 2, fig. 2; *Lepiota nympharum* (Kalchbr.) Kalchbr., Fungi Sibiria America Austr. (1879) 7; *Leucoagaricus nympharum* (Kalchbr.) M. Bon, Doc. mycol. 7 (27–28) (1977) 19; *Macrolepiota nympharum* (Kalchbr.) Wasser, Agarikovye Griby S.S.S.R. (1985) 114. — *Lepiota densesquamosa* Velen., Česká Houby (1920) 206. — *Agaricus rhacodes* var. *puellaris* Fr., Monogr. Hymenomyc. Suec. 2 (1863) 285; *Agaricus rhacodes puellaris* Fr., Hymenomyc. eur. (1874) 29; *Lepiota rhacodes* var. *puellaris* (Fr.) Sacc., Syll. Fung. 5 (1887) 29; *Lepiota procera* var. *puellaris* (Fr.) Mass., Brit. Fung. Fl. 3 (1893) 235; *Lepiota puellaris* (Fr.) Rea, Brit. Basidiomyc. (1922) 65; *Lepiotophyllum rhacodes* var. *puellaris* (Fr.) Locq., Bull. mens. Soc. linn. Lyon 11 (1942) 40; *Leucocoprinus puellaris* (Fr.) Locq., Bull. mens. Soc. linn. Lyon 14 (1945) 91; *Macrolepiota puellaris* (Fr.) Mos., Blätter-, Bauchpilze, 1. Aufl. (1953) 114 (not valid, basionym not mentioned); *Macrolepiota puellaris* (Fr.) Mos., Röhrlinge Blätterpilze, 3. Aufl. (1967) 184.

Misapplied. *Lepiota cepaestipes* Sow. sensu Michael, Führ. Pilzfr., Ausg. B, 2 (1918) pl. 194.

Excluded. *Leucoagaricus nympharum* sensu M. Bon, Doc. myc. 7 (27–28) (1977) 19 (= ?); *Lepiota puellaris* sensu Rea, Brit. Basidiomyc. (1922) 65 (= ?); *Macrolepiota puellaris* sensu M. Bon, Doc. myc. 7 (27–28) (1977) 19 (= *M. rachodes*).

Selected icons. Bellù, Boll. Gr. micol. G. Bres. 25 (1982) 112 (as *M. puellaris*); Breitenb. & Kränzl., Pilze Schweiz 4 (1995) pl. 255 (as *M. puellaris*); Candusso & Lanzoni, Lepiota s.l. (1990) pl. 66 (as *M. puellaris*); Cetto, Funghi Vero, Ed. 5, 1 (1975) pl. 23 (as *L. puellaris*); J. Lange, Fl. agar. dan. 1 (1935) pl. 9b (as *L. rhacodes* var. *puellaris*); Kalchbr., Ic. sel. Hymenomyc. Hungariae (1873) pl. 2, fig. 2; Migl. & Bizio, Funghi Amb. 66 (1994) 14 (as *M. puellaris*).

Macrolepiota nympharum was first described by Fries (1863: 285) as *Agaricus hacodes* puellaris* (i.e. *Agaricus rhacodes* var. *puellaris*). Later authors named this taxon as a subspecies or forma of *M. rachodes* or *M. procera*. Only as late as 1922 was it recognized on species level (Rea, 1922: 65).

Kalchbrenner's (1873: 10, pl. 2, fig. 1) description and illustration of the new species *Agaricus nympharum* clearly show a *Macrolepiota* of the *Rachodes*-group (double crowned ring and smooth stipe). The colour of the pileus and habitat (conifer woods) makes it clear

that this taxon is similar to *M. puellaris*. *Macrolepiota nympharum* is the oldest valid name on species level, and is therefore the correct name for this taxon.

NOMINA DUBIA

Agaricus tepidarius Weinm. in Hornschuch, Syll. Pl. nov. 1 (1822) 69; non *Agaricus tepidarius* Otth in Trog, Mitth. naturf. Ges. Bern (1857) 27.

Agaricus tepidarius Weinm. was described as a large mushroom, growing in a greenhouse, hence the name. Judging from the description it is clear that this taxon belongs to the genus *Macrolepiota*. However, a ring is not mentioned. Without particulars of the ring or a microscopical examination of the type specimen it is impossible to identify this species as either *M. rachodes* or *M. venenata*. The epithet was well known in the last century. Fries (1836–1838: 13), Saccardo (1887: 29) and also Kickx (1867: 130) mentioned it as a synonym of *M. rachodes*. However, until the type collection is found *Agaricus tepidarius* remains a nomen dubium.

Agaricus emplastrum Cooke & Mass. in Cooke, Grevillea 18 (1889) 51; *Lepiota emplastrum* (Cooke & Mass.) Sacc., Syll. Fung. 9 (1891) 8.

Lepiota emplastrum resembles *M. rachodes*, except for the spores. The spores of *Lepiota emplastrum* measure 20 × 10–12 µm, and are angular. No material of the type or other Cooke & Massee specimens of this taxon could be found at Kew. However, a drawing of this species by Miss Wakefield exists. She worked with Massee in her early years, and she might have known the species. In her drawing the spores are smaller than those of the original description, but are still too large for *M. rachodes*. In Miss Wakefield's drawing a ring is conspicuous in the mature specimen, and there is even a young specimen depicted with a closed partial veil.

Hora (1960: 447–448) described a collection, which he identified as *L. emplastrum*, on account of the striking resemblances with Cooke & Massee's fungus, as depicted in Cooke, 1890: pl. 1164 (1106), and because of the same habitat. Hora's collection, however, is provided with a fugacious ring, but also with distinct evidence of a volva. Hora suggested that Massee, who made the drawing of *L. emplastrum*, mistook the circumscissile volva for a dropped movable ring, and lifted it in his painting. A volva is absent in *Macrolepiota* species, but present in the closely related genus *Volvolepiota*, which is so far only known from South America (Singer, 1986; Heinemann & de Meijer, 1996). The spores of Hora's specimen are 10–12 × 7–8 µm, and lack a germ pore. According to Hora a germ pore is lacking in *M. rachodes* as well, which is contradictory to our findings. Hora also presumed that the original Cooke & Massee collection had been contaminated with *Entoloma*-spores.

Until the type collection or better material of *L. emplastrum* is found this epithet is best regarded as a nomen dubium.

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CONTRIBUTIONS TOWARDS A MONOGRAPH OF PHOMA (COELOMYCETES) – VII

Section Sclerophomella: Taxa with thick-walled pseudoparenchymatous pycnidia

G. H. BOEREMA[1] & J. DE GRUYTER[2]

This paper deals with ten species of *Phoma*, characterized by thick-walled pseudoparenchymatous pycnidia. They superficially resemble the thick-walled pycnidial phenotype in species of *Phoma* sect. *Plenodomus*, but scleroplectenchyma is lacking and teleomorphs belong to *Didymella*, not *Leptosphaeria*. Keys and indices of host-fungus and fungus-host relations are provided and short comments on the ecology and distribution of the taxa are given.

The species of *Phoma* section *Sclerophomella* (Höhn.) Boerema et al. (Boerema, 1997) are characterized by thick-walled pseudoparenchymatous pycnidia (Fig. 1A, B) which superficially resemble the thick-walled pycnidial phenotype in species of *Phoma* sect. *Plenodomus* (Contributions III–1/2; Boerema et al., 1994, 1996). Just as in sect. *Plenodomus* the pycnidium is initially closed, the opening occurs only late in the growing process, i.e. the pycnidium has a pore instead of a predetermined ostiole. In some species there is also retarded development of the pycnidial cavity, formation of a 'pycnosclerotium', containing a compact mass of cells which afterwards disintegrates (histolysis) (Fig. 1C). However, scleroplectenchyma (hyaline cells with thick walls and a relatively small lumen), characteristic for sect. *Plenodomus* is always lacking. Members of sect. *Sclerophomella* are related to the ascomycetous genus *Didymella* Sacc. ex Sacc. and not to *Leptosphaeria* as is the case in sect. *Plenodomus*.

In vitro, the hyaline conidia of species in sect. *Sclerophomella* are mainly aseptate, i.e. *Phoma*-like. Secondary septation of the conidia may occur and is a typical phenomenon in the type species of the section, *Phoma complanata* (Tode: Fr.) Desm. In host tissue, the pycnidia of this species usually contain only aseptate conidia of 'common *Phoma*-size'. But sometimes a high percentage of the conidia becomes larger and 1-septate. They may be distinctly *Ascochyta*-like, resembling the large conidial dimorph in *Phoma* sect. *Heterospora* (Contribution IV, Boerema et al., 1997). Old pycnidia often contain many swollen, dark, 1-septate conidia as in species of *Phoma* sect. *Peyronellaea* (Contribution II, Boerema, 1993). In vitro, the conidia of *P. complanata* are highly variable in shape and size, but usually aseptate in fresh cultures; in old cultures distinctly large *Ascochyta*-like conidia may occur.

In the description of the original genus *Sclerophomella* by von Höhnel (1917: 237) the conidiogenesis in the type species was misinterpreted. The ontogeny of the conidia in *P. complanata* agrees completely with conidiogenesis in *P. herbarum*, the type species of *Phoma* (electron-microscopic study by Boerema & Bollen, 1975). Another generic synonym of the section, *Sclerochaetella* Höhn. (Höhnel, 1917: 251–252), is based on a sample of *P. complanata* mixed with a *Vermicularia* species (Contribution III–2 under *Diploplenodomus rivini* (Allesch.) Petr.; Boerema et al., 1996).

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The section includes species with and without chlamydospores. If present the chlamydospores are one-celled, solitary or produced in series or complexes. Two species of this section have been treated in the Addendum of Contribution I–1 (de Gruyter & Noordeloos, 1992).

MATERIALS AND METHODS

The isolates and herbarium specimens were studied as described in the previous Contributions I–1 & 2 of this series (de Gruyter & Noordeloos, 1992 and de Gruyter et al., 1993). The colour terminology used is according to Rayner (1970). Colony diameter on oatmeal agar (OA), malt agar (MA) and cherry-decoction agar (CA) was measured after 7 days. The outline of the colony is described as 'regular' or 'irregular', respectively. Q, representing the length/width ratio of conidia, as well as the average dimensions (av.) of conidia refer to 30 measurements with oil-immersion at 1250 ×. If data have been obtained from more isolates the ranges of averages are given. To check the absence of scleroplectenchyma (characteristic for sect. *Plenodomus*) freezing microtome sections of the pycnidia were stained with Lugol's iodine (JKJ). In scleroplectenchyma the thick cell walls become red by adsorption of the iodine, but in members of sect. *Sclerophomella* the walls of the cells in the peridium of the pycnidia do not absorb the iodine; instead the contents of the cells usually become red.

KEY TO THE SPECIES[3]

1a. Conidia small, not exceeding 5.5 µm, aseptate 2
b. Conidia larger, aseptate or septate 3
2a. Conidia cylindrical to bacilliform, Q > 3; growth-rate slow on OA, MA and CA, upto 22 mm; diffusable pigment produced on OA and MA, staining the agar ochraceous to ochre; conidia 3–4 × 0.5–1 µm; pathogen of *Olea europaea* (olive) .. 1. *P. incompta*
b. Conidia ellipsoidal, sometimes reniform, average Q < 3; growth-rate moderate to fast on OA, MA and CA, 47–68 mm; diffusable pigment absent; conidia 4–5.5 × 1.5–2.5 µm; pathogen of *Dictamnus albus* ..... 2. *P. dictamnicola*
3a. Growth-rate relatively slow, 30–32 mm on OA and 19–20 mm on MA; colonies producing minute pseudosclerotia in the agar; conidia aseptate, 4.5–11 × 2.5–4 µm or 1(–2)-septate, up to 16 × 3.5 µm; on rotting roots of *Gentiana sino-ornata* 3. *P. gentianae-sino-ornatae*
b. Growth-rate moderate to fast, 40–82 mm on OA, 30–79 mm on MA; pseudosclerotia absent; conidia aseptate, sometimes with some larger septate conidia 4
4a. NaOH reaction positive, yellow-green, later red (E^+ reaction); specific to semi-parasitic Scrophulariaceae 5
b. NaOH reaction negative or not specific; not on semi-parasitic Scrophulariaceae . 6
5a. Dendritic crystals present; conidia aseptate, mostly 4–7.5 × 2–3.5 µm, occasionally septate, ascochytoid, up to 18 × 8 µm; on *Melampyrum, Rhinanthus* and *Pedicularis* spp. ..... 4. *P. alectorolophi* teleomorph *Didymella alectorolophi*
b. Crystals absent; conidia aseptate, 3.5–6 × 1–2 µm; on *Melampyrum sylvaticum* 5. *P. sylvatica*

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3) For the two insufficiently known species in the Addendum of this paper (nos 9 & 10) see the note at the end of this key.

6a. Pycnidium globose to depressed globose, usually at first containing a compact mass of cells ('pycnosclerotium') which afterwards disintegrates and finally results in a pycnidial cavity lined with conidiogenous cells; conidia aseptate, 4.5–8 × 2–3 µm; on dead stems of herbaceous plants in Europe ..... 6. *P. versabilis*

b. Pycnidia globose to irregular; typical 'pycnosclerotia' absent 7

7a. Growth-rate 60–82 mm on OA and 59–79 mm on MA; colony colourless to primrose, sometimes with citrine-green to olivaceous tinges on MA, reverse similar; conidia highly variable, mainly aseptate, usually 4–10 × 2–3 µm, occasionally also distinctly larger, 1-septate, ascochytoid, up to 34 × 10 µm; on Umbelliferae . 7. *P. complanata*

b. Growth-rate 48–56 mm on OA and 31–46 mm on MA; colony grey olivaceous to olivaceous grey on MA, sometimes with greenish olivaceous sectors, reverse leaden grey to leaden black; conidia aseptate, 4.5–10.5 × 1.5–4 µm; on wild and cultivated Cruciferae 8. *P. nigrificans* teleomorph *Didymella macropodii*

Note

Two insufficiently known species of this section (nos 9 & 10) are discussed in the Addendum; they can be differentiated only by their conidial dimensions in vivo and by their specific host relations: i.e. no. 9. *P. boerhaviae*, produces relatively large aseptate conidia, 8–13.5 × 2.5–4 µm and is a specific pathogen of *Boerhavia diffusa* in India and Pakistan (spots on leaves and twigs); no. 10. *P. syriaca*, has conidia 6–8 × 3.5–6 µm, and was found together with the teleomorph, *Didymella syriaca*, on dead stems of *Phlomis brevilabris* in Lebanon.

HOST–FUNGUS INDEX

Plurivorous	*P. versabilis* (6)
Frequently found on specific plants:	
Boerhavia sp. (Nyctaginaceae)	*P. boerhaviae* (9)
Cruciferae (e.g. *Armoracia rusticana, Brassica napus* var. *oleifera*)	*P. nigrificans* (8) (teleom. *Didymella macropodii*)
Dictamnus albus (Rutaceae)	*P. dictamnicola* (2)
Gentiana sino-ornata (Gentianaceae)	*P. gentianae-sino-ornatae* (3)
Melampyrum spp. (Scrophulariaceae; semi-parasitic)	*P. sylvatica* (5) (also *P. alectorolophi*, see below)
Olea europaea (Oleaceae)	*P. incompta* (1)
Phlomis brevilabris (Labiatae)	*P. syriaca* (10)
Scrophulariaceae (semi-parasitic *Melampyrum, Rhinanthus* and *Pedicularia* spp.)	*P. alectorolophi* (4) (teleom. *Didymella alectorolophi*)
Umbelliferae (e.g. *Pastinaca sativa, Petroselinum crispum* and *Daucus carota*)	*P. complanata* (7)

FUNGUS–HOST INDEX

P. alectorolophi (4) (teleom. *Didymella alectorolophi*)	Scrophulariaceae (semi-parasitic *Melampyrum, Rhinanthus* and *Pedicularia* spp.)
P. boerhaviae (9)	*Boerhavia* sp. (Nyctaginaceae)
P. complanata (7)	Umbelliferae (e.g. *Pastinaca sativa, Petroselinum crispum* and *Daucus carota*)
P. dictamnicola (2)	*Dictamnus albus* (Rutaceae)
P. gentianae-sino-ornatae (3)	*Gentiana sino-ornata* (Gentianaceae)
P. incompta (1)	*Olea europaea* (Oleaceae)
P. nigrificans (8) (teleom. *Didymella macropodii*)	Cruciferae (e.g. *Armoracia rusticana, Brassica napus* var. *oleifera*)
P. sylvatica (5)	*Melampyrum* spp. (Scrophulariaceae; semi-parasitic)
P. syriaca (10)	*Phlomis brevilabris* (Labiatae)
P. versabilis (6)	plurivorous

DESCRIPTIVE PART

Section Sclerophomella

1. **Phoma incompta** Sacc. & C. Mart.

Phoma incompta Sacc. & C. Mart., Sylloge Fung. 10 (1892) 146.
Selected literature. Malathrakis (1979).

Additional data in the provisional treatment under *Phoma* sect. *Sclerophomella* in Contribution I–1 no. 19.

Description in vitro

A detailed description in vitro has been given in Contribution I–1. Distinctive are the usually dense clustered, initially closed thick-walled pycnidia, dark olivaceous to rusty-blackish in colour, the relatively slow growth-rate on OA, MA and CA (up to 22 mm), the production of a diffusable pigment on OA and MA staining the agar ochraceous to ochre and relatively small, aseptate conidia, (2–)3–4(–5) × 0.5–1(–1.5) µm (Q = 3–4.5), narrowly cylindrical.

NaOH spot test: positive, red-brown with bluish margin.

Description in vivo (Olea europaea)

The pycnidia on the host, especially those occurring on the dead shoots of heavily infected olive trees, are often aggregated, strikingly black, globose and poroid. The conidia are usually somewhat larger than those in vitro, mostly 3–5 × 1.5–2 µm, av. 4.3 × 1.6 µm.

Ecology and distribution. A specific pathogen of the olive, *Olea europaea*, causing Shoot Wilt and recorded in southern Europe (Crete, Greece and Italy). The main symptoms are a progressive withering of young shoots, which later die without defoliation, and a dark discol-

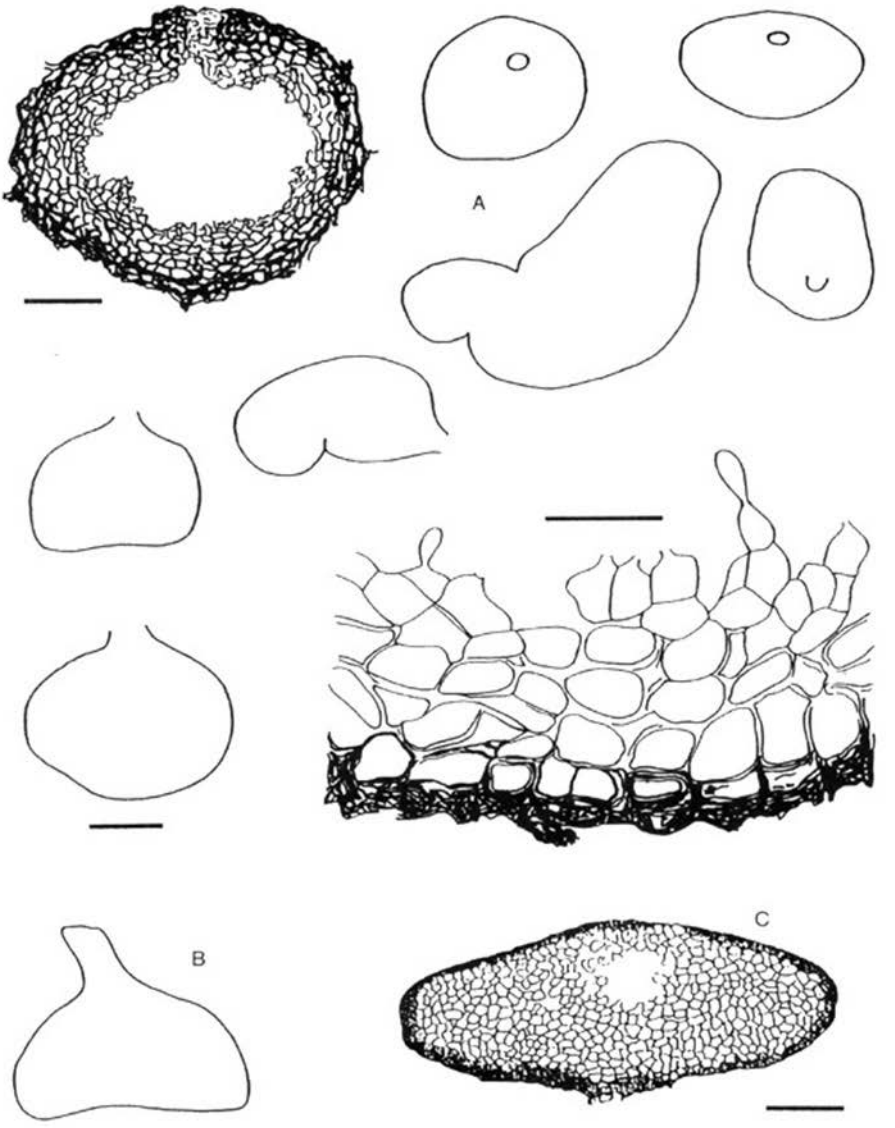

Fig. 1. A. *Phoma complanata*, type species of section *Sclerophomella*. Vertical section of thick-walled pycnidium in vivo, shape of pycnidia in vitro and detail of pycnidial wall with conidiogenous cells. — B. *Phoma nigrificans*. Pycnidium with elongated neck. — C. *Phoma versabilis*. Vertical section of 'pycnosclerotium', the central cells gradually disintegrate, which process finally results in a pycnidial cavity. Vertical section: bar = 50 µm; pycnidial shapes: bar = 100 µm; and detail pycnidial wall: bar = 10 µm.

ouration of the xylem which extends all along the infected branches (Malathrakis, 1979). In the rainy season infection occurs through wounds, especially leaf scars. The disease may be confused with Verticillium Wilt of olive caused by *Verticillium dahliae* Kleb. (Tosi & Zazzerini, 1994).

Representative culture. CBS 526.82 (PD 82/786) ex *Olea europaea* (Oleaceae), Italy.

2. **Phoma dictamnicola** Boerema et al.

Phoma dictamnicola Boerema, de Gruyter & Noordel. in de Gruyter & Noordel., Persoonia 15 (1) (1992) 90–91. — *Ascochyta nobilis* Kabát & Bubák, Öst. bot. Z. 54 (1904) 3; not *Phoma nobilis* Sacc., Michelia 2 (3) (1882) 16 [= *Phomopsis* sp.].

Selected literature. De Gruyter & Noordeloos (1992).

Description in vitro

A detailed description in vitro has been given in the provisional treatment under sect. *Sclerophomella* in Contribution I–1 (de Gruyter & Noordeloos, 1992). Distinctive are the subglobose, initially closed thick-walled pycnidia, greenish olivaceous in colour, the moderate to fast growth-rate on OA, MA and CA (47–68 mm), the absence of pigment production and the relatively small, always aseptate conidia, 4–5.5 × 1.5–2.5 µm (Q = 2.0–3.1), ellipsoidal to reniform and eguttulate.

Description in vivo (Dictamnus albus)

The pycnidia which form in irregular leaf spots and on dead stems are subglobose-conical with a central pore, dark brown to black in colour. The conidia are extremely variable. Those from pycnidia on dead stems resemble the conidia in vitro, usually aseptate 4–5 × 2 µm, but sometimes also larger, 6–8 × 3–4 µm and then often 1-septate. The pycnidia on the leaf spots always contain relatively large conidia, usually partly aseptate (8–)11–14(–14.5) × 3–3.5 µm, but mainly 1(–2)-septate, 13.5–15.5(–16) × 3.5–4.0(–4.5) µm: ascochytoid dimorph.

Ecology and distribution. A specific pathogen of the 'firework plant', *Dictamnus albus* (Rutaceae), frequently recorded in Eurasia and North America. The fungus causes white or light-brown irregular spots on the tips or margins of the leaves: Leaf Spot. The pathogen probably overwinters as pycnidia on dead stems.

Representative culture. CBS 507.91 (PD 74/148) ex *Dictamnus albus* (Rutaceae), the Netherlands.

3. **Phoma gentianae-sino-ornatae** Punith. & Harling — Figs. 2A, B

Phoma gentianae-sino-ornatae Punith. & Harling, Mycol. Res. 97 (11) (1993) 1299.

Selected literature. Punithalingam & Harling (1993).

Description in vitro (partly adopted from Punithalingam & Harling, 1993)

OA: growth-rate 30–32 mm, (14 days: 58–59 mm), regular, with woolly to floccose, white to smoke grey aerial mycelium; colony colourless to grey olivaceous or vinaceous buff to fawn, reverse similar to olivaceous black.

MA: growth-rate 19–20 mm, (14 days: 35–38 mm), regular to irregular, with compact, finely floccose, white to olivaceous grey/grey olivaceous aerial mycelium; colony similar due to the compact aerial mycelium; reverse leaden grey to olivaceous black, greenish olivaceous at margin.

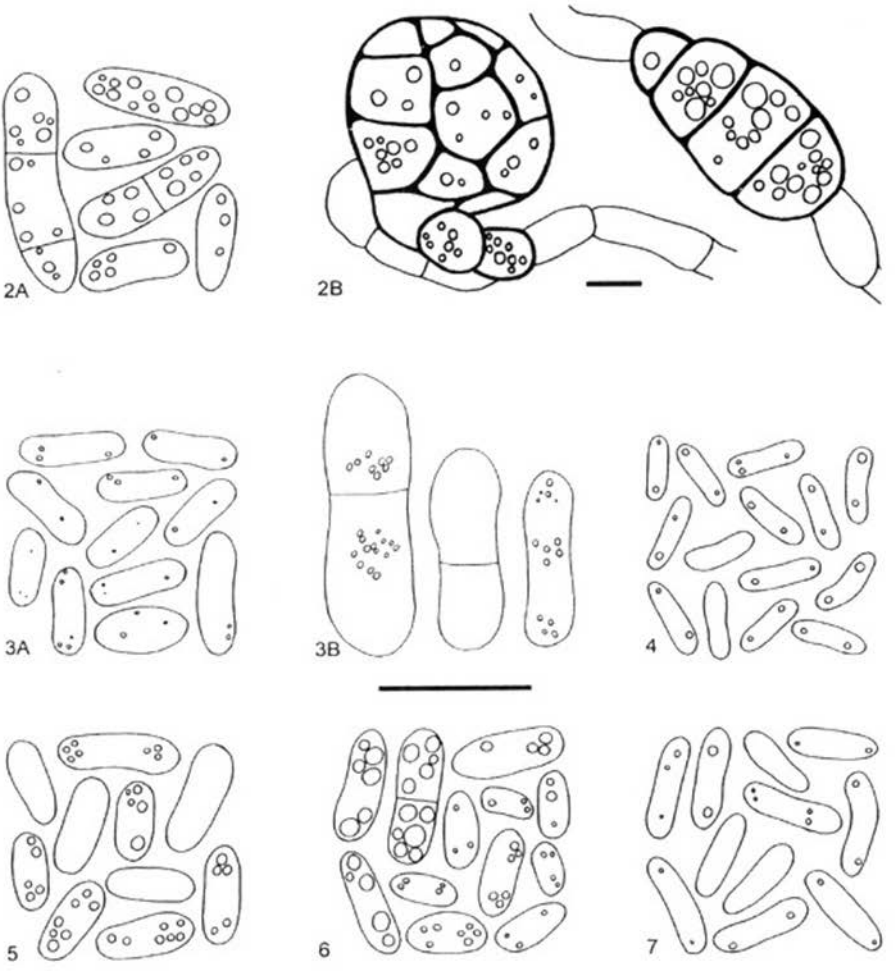

Fig. 2. *Phoma gentianae-sino-ornatae*. A. Conidia; B. chlamydospores and pseudosclerotium. — Fig. 3. *Phoma alectorolophi*. A. Conidia in vitro; B. conidia in vivo. — Figs. 4–7. Conidia. 4. *Phoma sylvatica*; 5. *Phoma versabilis*; 6. *Phoma complanata*; 7. *Phoma nigrificans*. — Bar = 10 µm.

CA: growth-rate 23–24 mm, (14 days: 35–37 mm), regular, with floccose to woolly, grey olivaceous to dull green aerial mycelium; colony grey olivaceous to dull green; reverse similar to olivaceous, with leaden grey to olivaceous patches.

Pycnidia 180–250 µm diam., subglobose, usually solitary, glabrous, with 1 papillate pore, olivaceous, later olivaceous black; walls made up of 2–7 layers of cells, outer layers pigmented; conidial exudate whitish. Conidiogenous cells 4–8 × 4–8 µm, globose to bottle-

shaped. Conidia aseptate, (4.5–)6–9.5(–11) × 2.5–4 µm, av. 7.7 × 2.8 µm, Q = 1.9–3.6, av. Q = 2.8, ellipsoidal to ovoid, sometimes curved, with several guttules, occasionally 1(–2)-septate, up to 16 × 3.5 µm.

Chlamydospores and minute pseudosclerotia are formed in the agar, dark olivaceous to olivaceous black, chlamydospores unicellular to multicellular, 8–20 µm diam., pseudosclerotia olivaceous black, 35–110 µm diam.

Ecology and distribution. So far this fungus is only recorded in Scotland, where it has been isolated from rotting roots of living *Gentiana sino-ornata* plants, showing a severe root rot and blackening of tissue. The disease, first noticed in 1989, is characterized by the occurrence of numerous minute pseudosclerotia on and within the infected tissue. [These pseudosclerotia are anatomically similar to those of *Macrophomina phaseolina* (Tassi) Goid., cf. Punithalingam & Harling, 1993.]

Representative culture. IMI 341116 (CBS 878.97, PD 95/2514) ex *Gentiana sino-ornata* (Gentianaceae), United Kingdom.

4. **Phoma alectorolophi** Boerema et al. — Figs. 3A, B

Teleomorph: *Didymella alectorolophi* Rehm.

Phoma alectorolophi Boerema, de Gruyter & Noordel., Persoonia 16 (3) (1997) 366–367.

Selected literature. Corbaz (1957, under *D. alectorolophi* and *D. pedicularidis* Arx); Boerema et al. (1997).

Description in vitro

OA: growth-rate 67–68 mm, regular, with floccose, white aerial mycelium; colony colourless to pale greenish olivaceous at margin; reverse similar.

MA: growth-rate 51–53 mm, regular, with velvety, white aerial mycelium; colony colourless with concentric citrine zones; reverse similar.

CA: growth-rate 58–60 mm, regular, with scanty, woolly, white aerial mycelium; colony colourless with pale olivaceous centre; reverse similar.

Pycnidia 90–310 µm diam., globose to irregular, solitary or confluent, glabrous, with 1–2 often indistinct, sometimes papillate pores, honey to citrine, later olivaceous, walls made up of 2–5 layers of cells, outer layers pigmented, with white to salmon exuded conidial masses; abundant, on and in the agar; micropycnidia present, 60–90 µm diam., often remaining sterile.

Conidiogenous cells 4–7 × 5–9 µm, bottle-shaped. Conidia usually aseptate, variable in size, 4–9(–14) × 2–6 µm, but mostly 4–7.5 × 2–3.5 µm, av. 6.0 × 2.2 µm, Q = 2.0–3.2, av. Q = 2.7, cylindrical to oblong ellipsoidal, with or without a few, small guttules. Occasionally some large 1-septate ascochytoid conidia occur, (10–)14–18 × (4–)5–6(–8) µm, ellipsoidal or ovoid, septum usually not median.

Chlamydospores absent.

NaOH spot test: positive on OA and MA; greenish, then red (E^+ reaction).

Dendritic crystals present.

Description in vivo (especially on *Rhinanthus angustifolius*)

Pycnidia (on dry calyces, capsules, peduncles and stems) subglobose to flattened, up to 300 µm diam., usually followed by pseudothecia (single identity proved by Corbaz, 1957).

Pycnidial primordia stromatic ('pycnosclerotia' often indistinguishable from immature ascocarps). The pycnidia usually produce only aseptate conidia in vivo. They are mostly oval to cylindrical and less variable than those in vitro, (4–)5–7(–9) × 2–2.5(–4) µm. So far larger ascochytoid conidia have only occasionally been found in old pycnidia.

Pseudothecia (on dead stems) subglobose with flattened base, mostly 250–300 × 140–160 µm, laterally and basally thick-walled-pseudoparenchymatous, unstable (cells easily come off). Pseudoparaphyses filiform, 2–3 µm wide, septate at intervals of about 10 µm, persisting. Ascospores (16–)18–21(–24) × (4.5–)5–7.5(–8) µm, obovoid to oval, 1-septate, constricted at the septum, upper cell usually larger and wider than the lower cell.

In addition to immature ascomata with only pseudoparaphyses[4], similar structures containing numerous microconidia (or spermatia) were occasionally observed, 2–3.5 × 1–1.5 µm.

Ecology and distribution. This fungus has been recorded on dead tissue of three genera of semi-parasitic Scrophulariaceae in Europe: i.e. *Melampyrum, Rhinanthus* and *Pedicularia*. The fungus has been repeatedly confused with *Phoma complanata* (Tode: Fr.) Desm. (this paper no. 7) and *Phoma sylvatica* Sacc. (this paper no. 5).

Representative culture. CBS 132.96 (PD 93/853) ex *Rhinanthus angustifolius* (Scrophulariaceae), the Netherlands.

5. **Phoma sylvatica** Sacc. — Fig. 4

Possible teleomorph: *Didymella winteriana* (Sacc.) Petr.

Phoma sylvatica Sacc., Michelia 2 (2) (1881) 337; Sylloge Fung. 3 (1884) 128 [as '*silvatica*']. — *Plenodomus sylvaticus* (Sacc.) Ruppr., Sydowia 13 (1959) 21 [as '*silvatica*'; misapplied].

Selected literature. Boerema et al. (1996).

Description in vitro

OA: growth-rate 68–75 mm, regular to slightly irregular, with floccose, (pale) olivaceous grey aerial mycelium; colony colourless to rosy buff, with grey olivaceous to olivaceous grey at centre; reverse similar.

MA: growth-rate 58–65 mm, regular to slightly irregular, with woolly, dull green to (pale) olivaceous grey aerial mycelium; colony (pale) olivaceous grey, with dull green sectors, to dull green; reverse greenish olivaceous to dull green, partly with vinaceous buff tinges, olivaceous black at centre.

CA: growth-rate 59–61 mm, irregular, with compact, woolly to floccose, (pale) olivaceous grey aerial mycelium; colony (pale) olivaceous grey to olivaceous, staining the agar sienna to scarlet due to the release of a diffusable pigment; reverse olivaceous to sepia.

Pycnidia 110–330 µm diam., globose to subglobose, solitary or confluent, with mycelial outgrowths, with 1(–2) often indistinct, non-papillate or slightly papillate pore(s), greenish

4) Immature ascomata with pseudoparaphyses erroneously have been reported under different Coelomycete names; compare Grove (1935: 99):
Sphaeronaema rhinanthi Lib., Plant. Crypt. Ard. No. 63. — *Zythia rhinanthi* (Lib.) Fr., Summa veg. Scand. 408.
Phoma deusta Fuckel, Symb. mycol. 377.
Phoma melampyri P. Karst., Acta Soc. Fauna Fl. fenn. 27 (4) (1905) 14.

olivaceous to olivaceous black, walls made up of 5–9 layers of cells (occasionally up to 20 layers of cells were observed), outer layers pigmented, conidial exudate not observed; on and in the agar, more or less in concentric zones.

Conidiogenous cells 3–6 × 3–6 µm, bottle-shaped. Conidia aseptate, 3.5–6 × 1–2 µm, av. 5.0–5.1 × 1.5–1.6 µm, Q = 2.7–4.7, av. Q = 3.3–3.4, cylindrical, sometimes slightly allantoid, with usually 2 small, polar guttules.

Chlamydospores absent.

NaOH spot test: positive on OA and MA; greenish, then red (E' reaction).

Crystals absent.

Description in vivo (Melampyrum sylvaticum)

Pycnidia (on dead stems, scattered or in groups) mostly 150 µm diam., with a relatively thick wall made up of polygonal cells. Conidia similar to those in vitro, mostly (3.5–)4–5 × 1–1.5(–2) µm. [Pseudothecia of *D. winteriana* also occur on dead stems, often in close association with the pycnidia of *P. sylvatica* and are comparable in size and anatomical appearance with those of *D. alectorolophi* (no. 4) but differ by a thinner peridium, c. 20 µm thick, shorter asci, usually 45–60 µm long, and smaller ascospores, often 15–18 × c. 4 µm. (For a fuller description see Munk, 1957: 337.)]

Ecology and distribution. Widespread in Europe on different species of *Melampyrum* (Scrophulariaceae, semi-parasites on roots of Gramineae). *Phoma sylvatica* is often confused with *Phoma petrakii* Boerema & Kest., a member of sect. *Plenodomus*, also common on stems of *Melampyrum* spp. (Contribution III–1, Boerema et al., 1994). The supposed teleomorph, *Didymella winteriana* (Petrak, 1922: 323), has been confused with *Didymella alectorolophi* Rehm (anamorph *Phoma alectorolophi* Boerema et al.; this paper no. 4), recorded and isolated from different semi-parasitic Scrophulariaceae in Europe, including *Melampyrum sylvaticum*. A single identity of *P. sylvatica* with *D. winteriana* is plausible but has not yet been proved with isolates in pure culture.

Representative culture. CBS 874.97 (PD 93/764) and CBS 135.93 (PD 83/87) ex *Melampyrum sylvaticum* (Scrophulariaceae), the Netherlands.

6. **Phoma versabilis** Boerema et al. — Figs. 1C, 5

Phoma versabilis Boerema, Loer. & Hamers, Persoonia 16 (2) (1996) 154.

Description in vitro

OA: growth-rate 40–43 mm, regular, with finely floccose to woolly, white to pale olivaceous grey aerial mycelium; colony colourless to dark herbage green/dull green at margin; reverse similar.

MA: growth-rate 30–32 mm, (14 days: 63–64 mm), regular to slightly irregular, with woolly, pale olivaceous grey to olivaceous grey aerial mycelium; colony dark herbage green to dull green; reverse leaden grey to leaden black, dull green to buff near margin.

CA: growth-rate 40–43 mm, regular, with scanty, floccose to finely woolly, white to pale olivaceous grey aerial mycelium; colony colourless, with a dull green to olivaceous black appearance due to developing pycnidia; reverse similar.

Pycnidia 100–260 µm diam., globose to globose-depressed, solitary to confluent, without distinct opening, honey/citrine to olivaceous/olivaceous black, initially containing a compact mass of cells ('pycnosclerotia') which afterwards disintegrates and finally results in a

pycnidial cavity lined with conidiogenous cells, or occasionally with a pore, walls made up of 3–8 layers of cells, outer layers pigmented, with buff to rosy buff exuded conidial masses, abundant, on and in the agar; micropycnidia present, 30–60 µm diam.

Conidiogenous cells 5–7 × 4–7 µm, bottle-shaped. Conidia aseptate, 4.5–8 × 2–3 µm, av. 5.8 × 2.4 µm, Q = 1.6–3.1, av. Q = 2.4, ellipsoidal to ovoid, with or without several guttules.

Chlamydospores absent.

NaOH spot test: negative, but on OA and MA a non-specific reddish discolouration may occur.

Crystals absent.

Description in vivo

Pycnidia globose-depressed, dark brown, immersed; initially containing a compact mass of cells ('pycnosclerotia') which afterwards disintegrates and finally results in a pycnidial cavity lined with dolioform or ampulliform conidiogenous cells. Conidia variable in size, mostly 5–7 × 2–2.5 µm.

Ecology and distribution. Recorded on dead stems of diverse herbaceous plants in Europe. The species has much in common with *Phoma alectorolophi* (no. 4) and *Phoma sylvatica* (no. 5).

Representative culture. CBS 876.97 (PD 82/1008) ex *Silene* sp. (Caryophyllaceae), the Netherlands.

7. **Phoma complanata** (Tode: Fr.) Desm. — Figs. 1A, 6

Phoma complanata (Tode: Fr.) Desm., Annls Sci. nat. (Bot.) III, 16 (1851) 299–300. — *Sphaeria complanata* Tode, Fungi mecklenb. Sel. 2 (1791) 22; Fries, Syst. mycol. 2 [Sect. 2] (1823) 508. — *Sclerophomella complanata* (Tode: Fr.) Höhn., Hedwigia 59 (1918) 238. — '*Plenodomus complanatus* (Tode: Fr.) Ruppr.', manuscript name (Herb. Ludwig, B).

Pyrenochaeta rivini Allesch. in P. Sydow, Hedwigia 36 (1897) 161. — *Sclerochaetella rivini* (Allesch.) Höhn., Hedwigia 59 (1918) 251. — *Diploplenodomus rivini* (Allesch.) Petr., Annls mycol. 42 (1944) 62 [synonyms based on specimen with discordant setae-bearing element, see Boerema et al., 1996].

Phoma anethicola Allesch. in Rab. Kryptog.-Flora [ed. 2] Pilze 6 [Lief. 63] (1898) 298. — *Phoma herbarum* var. *anethi* Westend. in Thüm., Fungi austr., Cent. 10 (1874) No. 982 [nomen nudum; Boerema, 1970].

Phoma punctoidea P. Karst., Acta Soc. Fauna Flora fenn. 27 (4) (1905) 7 [Type in H].

Selected literature. Cerkauskas (1985), Boerema et al. (1996, 1997).

Description in vitro

OA: growth-rate 60–82 mm, regular, with finely floccose to woolly, sometimes compact white to pale olivaceous grey aerial mycelium; colony colourless or buff to greenish olivaceous; reverse primrose to salmon or citrine green to olivaceous in centre.

MA: growth-rate 59–79 mm, regular, with velvety to finely floccose woolly, compact white to pale olivaceous grey/grey olivaceous aerial mycelium; colony colourless to primrose, sometimes with citrine green to olivaceous tinges; reverse similar.

CA: growth-rate 49–79 mm, regular to slightly irregular, with woolly to floccose, white aerial mycelium; colony colourless/saffron to greenish olivaceous or olivaceous; reverse saffron/fulvous to olivaceous.

Pycnidia 80–240 µm diam., globose to irregular, solitary to confluent, glabrous, with usually 1 non-papillate pore, honey/citrine to rosy buff, later olivaceous black, walls made up of 2–6 layers of cells, outer layers pigmented, with buff to rosy buff exuded conidial masses; on and in the agar.

Conidiogenous cells 3–8 × 5–6.5 µm, globose to bottle-shaped, thin-walled. Conidia highly variable, mostly aseptate, 3–11 × 1.5–4 µm (in some strains usually 5–10 × 2–3 µm, av. 7.4 × 2.4 µm, in others 3–8 × 3.5–4 µm), av. 4.3–6.5 × 2.2–2.8 µm, Q = 1.3–3.9, av. Q = 1.9–3.0, they may be subglobose/ellipsoidal, but also cylindrical to fusiform, with or without guttules. Occasionally in fresh cultures some larger 1-septate conidia occur, up to 16 × 4 µm; in older cultures particularly large ascochytoid conidia, 22–34 × 6–10 µm, av. 27.2 × 8.1 µm, may be present.

Chlamydospores absent.

NaOH spot test: negative.

Crystals absent.

Description in vivo (Umbelliferae)

Pycnidia (on dead stems and in lesions on leaves, petioles and roots, scattered or aggregated, immersed or partly immersed) up to 300–400 µm diam., subglobose with a dark brown to black outer wall and a central pore. Conidia usually aseptate, 5–9 × 2–3.5 µm, but sometimes a high percentage of the conidia becomes large and 1-septate, often (10–)12–15(–16) × 2.5–3.5(–4) µm. Pycnidia on old stem lesions may contain distinctly large 1-septate ascochytoid conidia, av. c. 27 × 8 µm, resembling those found in old cultures. The conidial mass, initially buff to flesh coloured, darkens with age to brown or black; the conidia then mostly appear 1-septate, swollen and dark.

Ecology and distribution. A very common fungus in temperate Eurasia and North America on last year's dead stems of wild Umbelliferae. A seed-borne pathogen of parsnip (*Pastinaca sativa*), parsley (*Petroselinum crispum*) and carrot (*Daucus carota*): Canker (lesions on petioles and roots), Leaf Spot.

Representative culture. CBS 268.92 (PD 75/3) ex *Angelica sylvestris* (Umbelliferae), the Netherlands.

8. **Phoma nigrificans** (P. Karst.) Boerema et al. — Figs. 1B, 7

Teleomorph: *Didymella macropodii* Petr.

Phoma nigrificans (P. Karst.) Boerema, Loer. & Wittern, Jl Phytopath. [Phytopath. Z.] 115 (1986) 270. — *Sphaeronaema nigrificans* P. Karst., Meddn. Soc. Fauna Flora fenn. 16 (1888) 17. — *'Rhynchophomella nigrificans'* in Herb. P. Karsten, H [manuscript name].

Plenodomus macropodii Petr., Hedwigia 68 (1929) 237.

Selected literature. Loerakker & Boerema (1987), Jedrycza et al. (1995).

Description in vitro

A detailed description has been given by Marcinkowska & de Gruyter, 1996. Distinctive are the thick-walled, greenish olivaceous, later olivaceous pycnidia, with one, initially indistinct opening and the relatively large, aseptate conidia, 5–10 × 1.5–4 µm (av. 6.4–6.6 × 1.9–2.7 µm), ellipsoidal to allantoid, with small guttules. The growth-rate is 48–61 mm on OA and CA and 31–46 mm on MA.

Description in vivo (Cruciferae)

Pycnidia (on the base of dead stems and in black discoloured stem lesions; scattered or in groups, first immersed, later superficial) mostly 175–375 µm diam., black, massive, depressed globose, usually with a conspicuous neck ('*Plenodomus*-like'), thick-walled (mostly 50–70 µm, up to 120 µm at the base) pseudoparenchymatous. Conidia oblong-ellipsoidal to subcylindrical, mostly 6–8.5(–10) × 1.5–2.5(–3) µm, eguttulate or with a small guttule at each end.

Pseudothecia (on basal parts of dead stems, usually together with pycnidia) relatively large, often 300–450 µm diam., depressed globose with a short papillate and poroid neck, thick-walled (40–70 µm thick) pseudoparenchymatous. Asci clavate to short cylindrical, mostly 65–80 × 10–12 µm, relatively thick-walled, 4–8-spored, irregularly biseriate. Ascospores cylindrical to ellipsoidal, straight or slightly curved, broadly rounded at both ends, mostly 14.5–19 × 4–5.5 µm, unequally 2-celled, upper cell sometimes wider, only slightly constricted at the septum. Pseudoparaphyses scarce, atypical, firm filiform, septate and branched. (For detailed description see the original diagnosis in Petrak, 1929: 219.)

Ecology and distribution. This is a cold-tolerant pathogen in northern Eurasia recorded on wild and cultivated Cruciferae, including oilseed rape, *Brassica napus* var. *oleifera*. The primary host seems to be horseradish, *Armoracia rusticana*. The fungus causes blackleg symptoms resembling those on *Brassica* crops caused by *Phoma lingam* (Tode: Fr.) Desm., teleom. *Leptosphaeria maculans* (Desm.) Ces. & De Not. (treated in Contributions III–1, Boerema et al., 1994). It has been suggested that in northern Europe isolates from *Brassica* species termed 'Tox° isol. *L. maculans*' are really *P. nigrificans* (Jedrycza et al., 1995). *Phoma nigrificans* can be easily distinguished from *P. lingam* by its larger conidia and its lower optimal temperature for growth in vitro (Boerema et al., 1986).

Representative culture. CBS 100190 (PD 82/736) ex *Brassica napus* (Cruciferae), Germany; CBS 100191 (Phb) ex *Thlaspi arvense* (Cruciferae), Poland.

Addendum (9–10)

In our opinion the species treated below belong to the section *Sclerophomella*, but active growing cultures were not studied in the usual way. Therefore, we have been confined to the original diagnosis and descriptions and to our own observations on dried material.

9. **Phoma boerhaviae** Shreem.

Phoma boerhaviae Shreem., Indian J. Mycol. Pl. Path. 2 (1972) 84.
Phoma nyctaginea var. *boerhaviae* S. Ahmad, Sydowia 2 (1948) 78.

Description in vitro (adapted from Shreemali, 1972)

On 'Asthana and Hawker's medium': Hyphae light brown to dark brown, richly branched, poorly septate, 3.8–2.7 µm wide. Pycnidia globose with elongated neck, dark brown to black, solitary, wall thick and persistent, 168 × 130.4 µm (av. 142.6 µm) diam.

Conidia cylindrical, hyaline, aseptate, 8–13.5 × 2.5–4 µm (av. 10.6 × 3.8 µm).

Chlamydospores absent.

Description in vivo (Boerhavia diffusa)

Pycnidia (in lesions on twigs and on dead branches) pinhead size, containing elongated ellipsoidal aseptate conidia, often 7.5–10.6 × 3.5–4.5 µm (Ahmad, 1948).

Ecology and distribution. Known from *Boerhavia diffusa* (Nyctaginaceae) in South-West Asia (India, Pakistan), but probably also elsewhere with the host. It produced leaf spots and dark grey lesions girdling the twigs. The fungus has been confused with the plurivorous, soil-borne opportunistic plant pathogen *Phoma multirostrata* (Mathur et al.) Dorenb. & Boerema, see Boerema (1986: 31).

Representative culture. IMI 130821 (dried).

10. **Phoma syriaca** (Petr.) Boerema et al.

Probable teleomorph: *Didymella syriaca* Petr.

Phoma syriaca (Petr.) Boerema, Loer. & Hamers, Persoonia 16 (2) (1996) 180. — *Plenodomus syriacus* Petr., Sydowia 1 (1947) 42.

Description in vivo (Phlomis brevilabris)

Pycnidia (subepidermal, scattered or arranged in small groups on dead stems) 200–350 µm diam., subglobose with at the sides dark twisting short-celled hyphae, thick-walled (35–50 µm thick), initially closed. Conidia notably broad, ovate-ellipsoidal; occasionally with somewhat truncate ends, mostly 6–8 × 3.5–6 µm.

[Pseudothecia (also subepidermal on dead stems in association with above pycnidia) mostly 200–300 µm diam., depressed globose, thick-walled-pseudoparenchymatous. Asci initially clavate, later cylindrical, mostly 80–110 × 23–28 µm, thick-walled, 8-spored, more or less biseriate. Ascospores straight or slightly curved, 18–23(–27) × 9–11 µm, 1-septate at about the middle, upper cell wider than lower cell, slightly constricted to scarcely, constricted at the septum. Pseudoparaphyses scarce, filiform, septate, but soon dissolving.]

Ecology and distribution. So far only known from *Phlomis brevilabris* (Labiatae) in the subalpine region of Mt. Sania (1700–1900 m), Lebanon, but probably also elsewhere with the host.

Representative specimens. Two packets of Flora syriaca No. 1340 (as type specimens of *Plenodomus syriaca* n.sp. and *Didymella syriaca* n.sp.) in Herb. Petrak (W).

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TYPE STUDIES IN THE GENUS COPRINUS (COPRINACEAE, AGARICALES) COPRINUS XEROPHILUS A NEW RECORD IN EUROPE

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In the present study a comparison of the holotypes of *Coprinus calyptratus*, *C. vosoustii*, *C. asterophorus* and *C. asterophoroides* has been carried out. As a conclusion of the latter we can state that all of them are conspecific, the correct name of this taxon being *C. calyptratus*. On the other hand the study of the type of *Coprinus xerophilus*, a vernal species which occurs in xerothermic plant communities on calcareous and gypsiferous soils, shows that this taxon is very close to *C. calyptratus*. Finally, we have studied the type of *C. arenarius*, a species which shares the same habitat as both *C. calyptratus* and *C. xerophilus*, and conclude that the former is different, being a species in its own right, known only from Africa. *Coprinus xerophilus* is a new record for the European mycobiota.

The xerothermic plant communities which thrive on calcareous and gypsiferous soils in the Iberian Peninsula are of great biological interest since they are composed of very selective and endemic species. The extreme environmental conditions such as drought, saline soils and high evaporation rates, characterize them as unfavourable habitats for a great majority of organisms. Therefore, only a small number of specifically adapted plants (such as mosses) and fungi (including some basidiomycetes and lichens) are able to colonize these ecologically harsh habitats. It is interesting to note that in the last few years several new fungi have been described in these habitats. In this respect we may quote the description of four new species in such different taxonomic groups as *Simocybe iberica* G. Moreno & Esteve-Rav. (Moreno & Esteve-Raventós, 1991), *Tulostoma pseudopulchellum* G. Moreno, Altés & Wright (Moreno et al., 1992), *Phaeomarasmius gypsophilus* Esteve-Rav., Villarreal, Heykoop & Horak (Esteve-Raventós et al., 1998) and *Marasmius celtibericus* G. Moreno & Raitviir (Moreno & Raitviir, 1998).

In this new contribution we describe a species of the genus *Coprinus*, *C. xerophilus*, which we already knew for sixteen years but which, due to its vernal fructification united to the great drought of the last years, could not be collected again until now. On the other hand, after having carried out a thorough bibliographic study in order to confirm or rule out the presence of this species in other areas, we became aware that several other species of *Coprinus* such as *C. calyptratus* Peck, *C. vosoustii* Pilát, *C. asterophorus* Long & Miller, *C. asterophoroides* Bogart and *C. arenarius* Pat. have been described from similar habitats. Therefore, and after having observed numerous similarities in their original descriptions we decided to compare their holotypes to elucidate the exact taxonomic status of all these taxa.

MATERIALS AND METHODS

The microscopical examinations have been carried out in NH_4OH 5% and Congo red. The microphotographs were made under a Nikon microscope, model Optiphot, with an incorporated system of automatic photography. The film used is Kodak Plus X Pan 125 ASA. The SEM photographs were made with a Zeiss DSM-950 microscope using the following technique: gills and spores were rehydrated with concentrated ammonium hydroxide (28–30%) for 30 min., dehydrated in aqueous ethanol (70%) for 1–1.5 hours, and, after fixing for 2 hours in pure ethylene glycol dimethyl ether (= 1,2-dimethoxymethane), immersed in pure acetone for at least 2 hours followed by critical point drying and sputtering with gold-palladium.

The abbreviations AH and FVDB refer respectively to the Herbarium of the University of Alcalá and the private Herbarium of Fred van de Bogart (deposited in WTU).

Coprinus calyptratus Peck — Figs. 1–24

Coprinus calyptratus Peck, Bull. Torrey. bot. Club 22 (1895) 205–206.
Coprinus vosoustii Pilát, Stud. Bot. Cech. 5 (1942) 207.
Coprinus asterophorus Long & Miller, Mycologia 37 (1945) 120.
Coprinus asterophoroides Bogart, Mycotaxon 4 (1976) 252–254.

Pileus at first ovoid, then flat, 2–4 cm diam., 3–5 cm in height, white, covered with an ochraceous thick and persisting (not deliquescent) star-shaped universal veil. Margin fibrous and sulcate. Gills free, ascending, deliquescent, at first white, then turning pink, and finally blackish at maturity. Stipe 4.5–13 × 0.2–0.5 cm, white, cylindrical, hollow, fragile, somewhat bulbous (0.5–0.9 cm diam.) and slightly rooting. Taste and smell not distinctive.

Spores 17–20(–23) × 10–12(–14) µm, ellipsoid, smooth, dark brown to blackish, with eccentric germ-pore located on the abaxial side. Basidia 4-spored, clavate, 35–50 × 22–26 µm, with strong brown parietal pigment, especially towards the apex. Cheilocystidia almost always collapsed (due to deliquescence), but when present globose to ellipsoid. Pleurocystidia not observed. Clamp-connections present. Universal veil consisting of branched densely packed hyphae, very variable in shape and size, dissociating with difficulty when mounted under the microscope.

Collections examined

Collections labelled as *Coprinus calyptratus*. — NORTH AMERICA: Rockport, Kansas, open cultivated ground, Aug., *F. Bartholomew* (typus, FH).

Collections labelled as *Coprinus vosoustii*. — CZECH REPUBLIC: Bohemia centralis, Bohnice prope Pragam, May 1942, *Bedrich Vosoust* (typus, PRM 626858). — MEXICO: Baja California, Sierra de San Pedro Mártir, in strongly manured grassland, 31.VI.1986, *N. Ayala* (BCMEX 4359); Baja California, in the campus of the Universidad Autónoma de Baja California, Unidad Ensenada, in urban garden, 2.IV.1992, *M. Lizárraga* (BCMEX 4791); ibid., 16.II.1993, *Medina* (BCMEX 4787). — SPAIN: Madrid, Facultad de Farmacia y Medicina, Universidad Complutense, in manured gardens, on acid soils, 13.V.1976, *K. Tabba* (AH 556); ibid., 19.V.1976, *G. Moreno* (AH 1218); ibid., 8.V.1977, *G. Moreno* (AH 1284); ibid., 1.X.1977, *G. Moreno* (AH 11584).

Collections labelled as *Coprinus asterophorus*. — NORTH AMERICA: New Mexico, four miles north of Albuquerque on Guadalupe Trail on the west end of the Denton Addition, on sandy soil, 12.VI.1941, *W.H. Long* (type *W.H. Long 9354*, UC); Bernadillo County, in an old cow pasture 2 miles south of the Alameda Bridge on the west side of the Río Grande river, elevation 5000 feet, 7.III.1941, *W.H. Long*; ibid., *W.H. Long 9305* (labelled as 'Co-type', UC; misidentified, it corresponds to *C. xerophilus*).

Collection labelled as *Coprinus asterophoroides*. — NORTH AMERICA: Beverly, comitato Grant, pago Washingtonis, in solo arenario in deserto, 5.VIII.1974, *J. Ebenal* (FVDB 3333, typus in WTU).

Results of the type studies

(1) The type material of *Coprinus calyptratus* (Figs. 1–5) consists of one well-preserved basidioma with the following characters: pileus 4 cm diam., universal veil forming a thick ochraceous star-shaped layer (with six arms). Stipe 10.5 × 0.5 cm, whitish, hollow, cylindrical with bulbous base (0.8 cm diam.). Microscopically the universal veil is formed by ellipsoid to sometimes subglobose cells, very variable in size, densely packed and dissociating with difficulty when mounted under the microscope. Spores 18–20 × 10–12 µm, ellipsoid, dark brown, with eccentric germ-pore on the abaxial side.

(2) The type material of *Coprinus vosoustii* (Figs. 6–10) consists of nine basidiomata, some of them strongly fragmented, with the following characters: pileus 2–3 cm diam., universal veil ochraceous and well-developed, forming a thick layer which breaks up radially into a star-shaped structure. Stipe 4.5–7 × 0.2–0.5 cm, hollow, cylindrical, with bulbous and whitish base (0.5–0.9 mm diam.). Universal veil formed by cells very variable in shape and size, dissociating with difficulty when mounted under the microscope. Spores 17–19 × 11–12 µm, ellipsoid, dark brown, with eccentric germ-pore on the abaxial side.

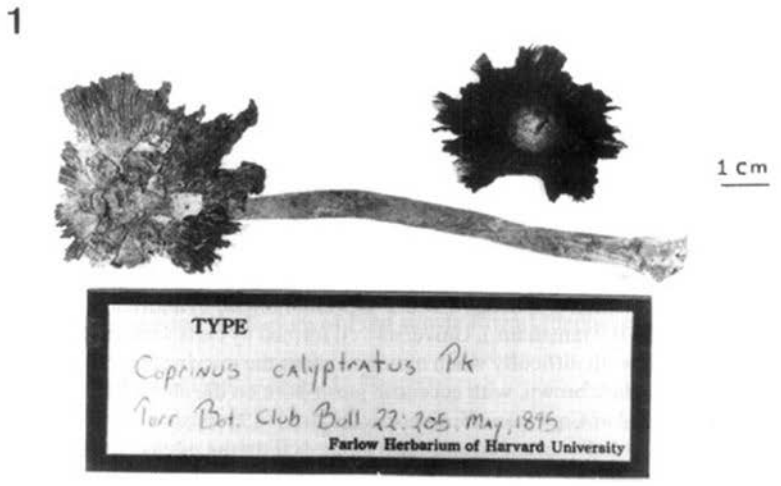
(3) The type material of *Coprinus asterophorus* (Figs. 11–19) consists of two basidiomata in which the typical radially arranged structure of the veil on the pileus is well preserved, whereas the gills are completely collapsed making it difficult to study them under the microscope. The following characters were nevertheless observed: spores 17–19 × 11–12 µm, ellipsoid, dark brown, with eccentric germ-pore on the abaxial side. Universal veil formed by branched hyphae, very variable in shape and width, dissociating with difficulty when mounted under the microscope. The material labelled as 'Co-type' has been misidentified by Long & Miller and corresponds to *C. xerophilus* (see comments on this species).

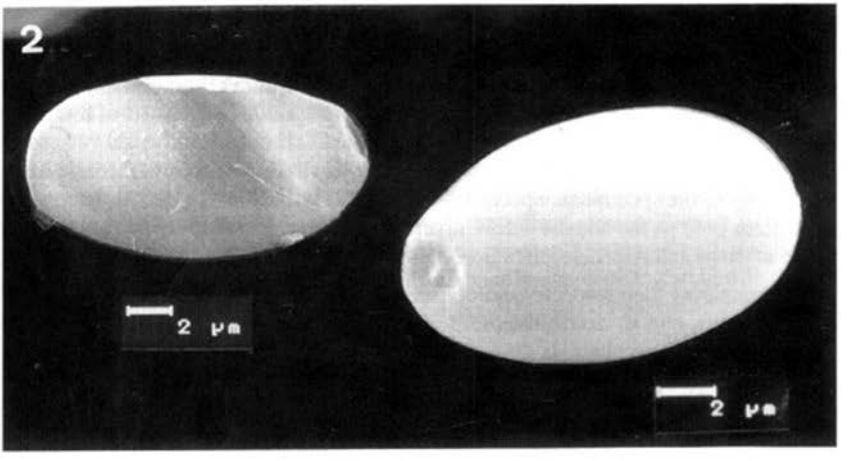
(4) The type material of *Coprinus asterophoroides* (Figs. 20–24) consists of five basidiomata, two of them strongly fragmented, with the typical star-shaped universal veil (with six arms). The following characters were observed: stipe cylindrical, hollow, the base not preserved in any of the specimens. Spores 18–19 × 10–12 µm, ellipsoid, dark brown, with excentric germ-pore on the abaxial side. Universal veil formed by densely packed cells, very variable in shape and size, dissociating with difficulty when mounted under the microscope.

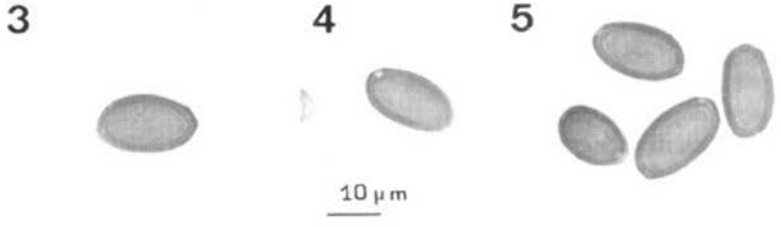
After comparing their respective holotypes we must conclude that *Coprinus calyptratus*, *C. asterophorus*, and *C. asterophoroides*, described from America, are conspecific with the European species known as *C. vosoustii*. According to art. 11.4 of the International Code of Botanical Nomenclature (Greuter et al., 1994) the correct name must be *Coprinus calyptratus* Peck, introduced by this author (Peck, 1895) when he described this taxon for the first time.

The most striking features of this species are its habit similar to small forms of *Coprinus comatus*, the persistence, even in dried herbarium material, of the star-shaped universal veil and its spores with eccentric germ-pore located on the abaxial side. We must indicate that Smith (1948) was the first author who considered both *Coprinus calyptratus* and *C. asterophorus* as synonyms, a statement on which we fully agree. Besides, Donelli & Simonini (1989) when describing *Coprinus vosoustii* as new to Italy made a very clever observation: "La specie de Pilát sembra molto vicina a due specie americane delle quali la specie europea sembre essere – il trait d'union –. *Coprinus asterophorus* Long & Miller e *Coprinus asterophoroides* Van de Bogart". However, this hypothesis was never tested satisfactorily.

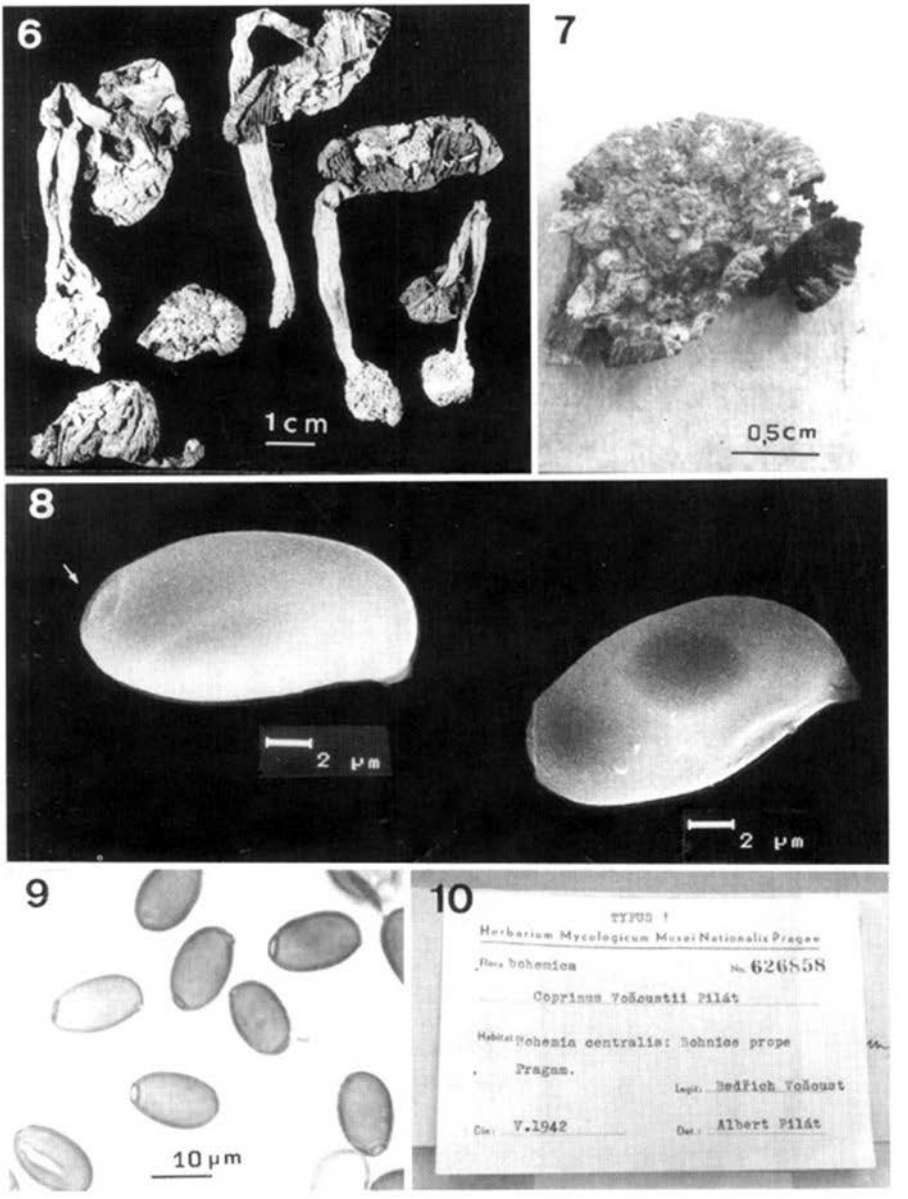
For the diagnostic criteria by which *Coprinus calyptratus* and *C. xerophilus* can be distinguished see observations on the latter.



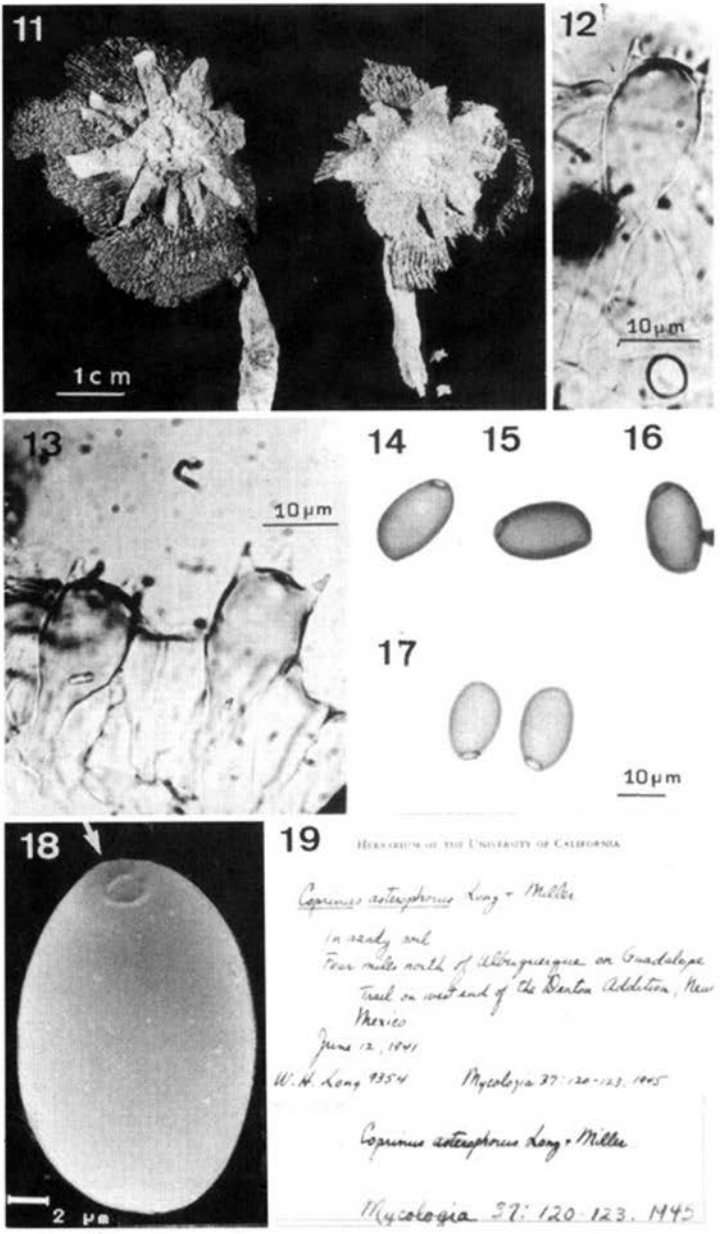




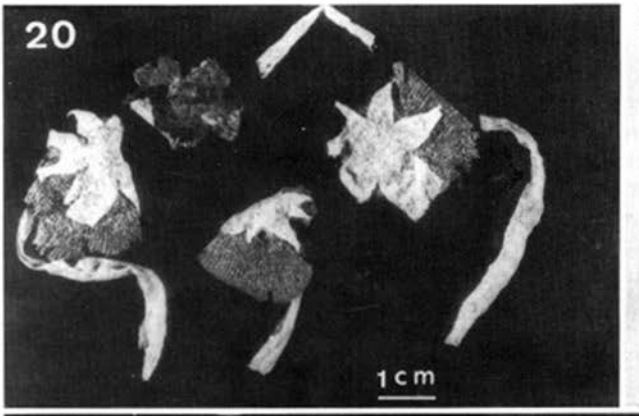
Figs. 1–5. *Coprinus calyptratus* (holotype). 1. Basidiomata; 2. spores with germ-pore on the abaxial side under SEM; 3–5. spores with germ-pore on the abaxial side under light microscope.

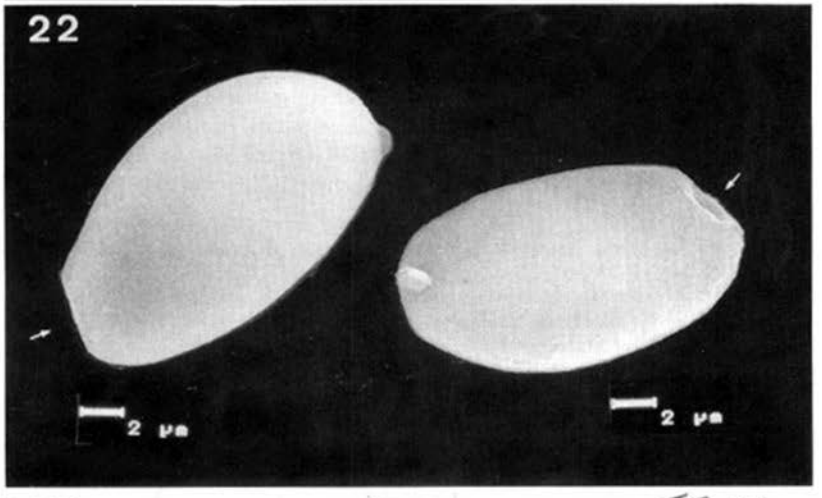


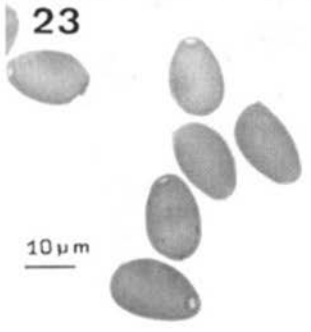
Figs. 6–10. *Coprinus vosoustii* (holotype). 6. Basidiomata; 7. detail of the apex of pileus; 8. spores with germ-pore on the abaxial side under SEM; 9. spores with germ-pore on the abaxial side under light microscope; 10. original herbarium label.

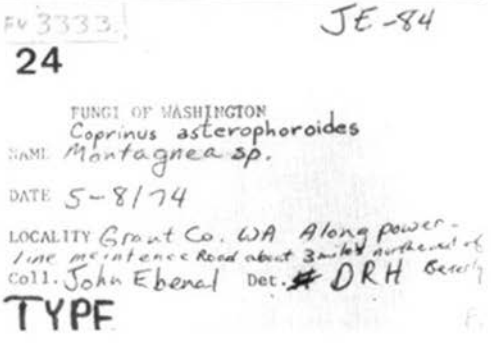


Figs. 11–19. *Coprinus asterophorus* (holotype). 11. Basidiomata; 12–13. basidia; 14–17. spores with germ-pore on the abaxial side under light microscope; 18. spore with germ-pore on the abaxial side under SEM; 19. original herbarium label.









Figs. 20–24. *Coprinus asterophoroides* (holotype). 20. Basidiomata; 21. hyphae of the universal veil; 22. spores with germ-pore on the abaxial side under SEM; 23. spores with germ-pore on the abaxial side under light microscope; 24. original herbarium label.

Coprinus xerophilus Bogart — Figs. 25–53

Coprinus xerophilus Bogart, Mycotaxon 4 (1976) 255–256.

Pileus conical to campanulate, 1.8–2.5 cm in height, 1.8–3.5 cm wide, pure white, covered with a large universal veil, white to cream-whitish, very patent towards the centre of pileus, showing a typical imbricate pattern and breaking up into thick scales which recall the cap of *Strobylomyces strobilaceus*. Margin sulcate, incurved when dry. Gills barely deliquescent, free, close, separate from the stem apex by a distinct collar which recalls *Coprinus plicatilis*. Stipe cylindrical, white, smooth, 3–5.7 × 0.2–0.3 cm, with marginate basal bulb, 0.6–0.9 cm in diam., often with white mycelial cords at the base. Taste and smell not distinctive.

Spores very dark black, (14–)17–20 × 11–13 (frontal view) × 8.5–10 µm (lateral view), smooth, ellipsoid, sometimes with somewhat enlarged base, germ-pore patent (up to 2 µm in diam.) and eccentric on the abaxial side. Basidia tetrasporic, with strong brown parietal pigment, especially towards the apex; walls refringent and somewhat thickened (e.g. 74 × 22 µm). Pleurocystidia not observed. Cheilocystidia probably present in young specimens, but the material studied was always very mature, with the gill-edge completely deliquesced. Clamp-connections absent or very rare. Universal veil consisting of hyaline radially arranged cylindrical hyphae, constricted at the septa and dissociating easily when mounted under the microscope; velar cells variable in shape and size, varying from nearly globose to more or less cylindrical (the last cell measuring for instance 95 × 20 µm).

Collections examined

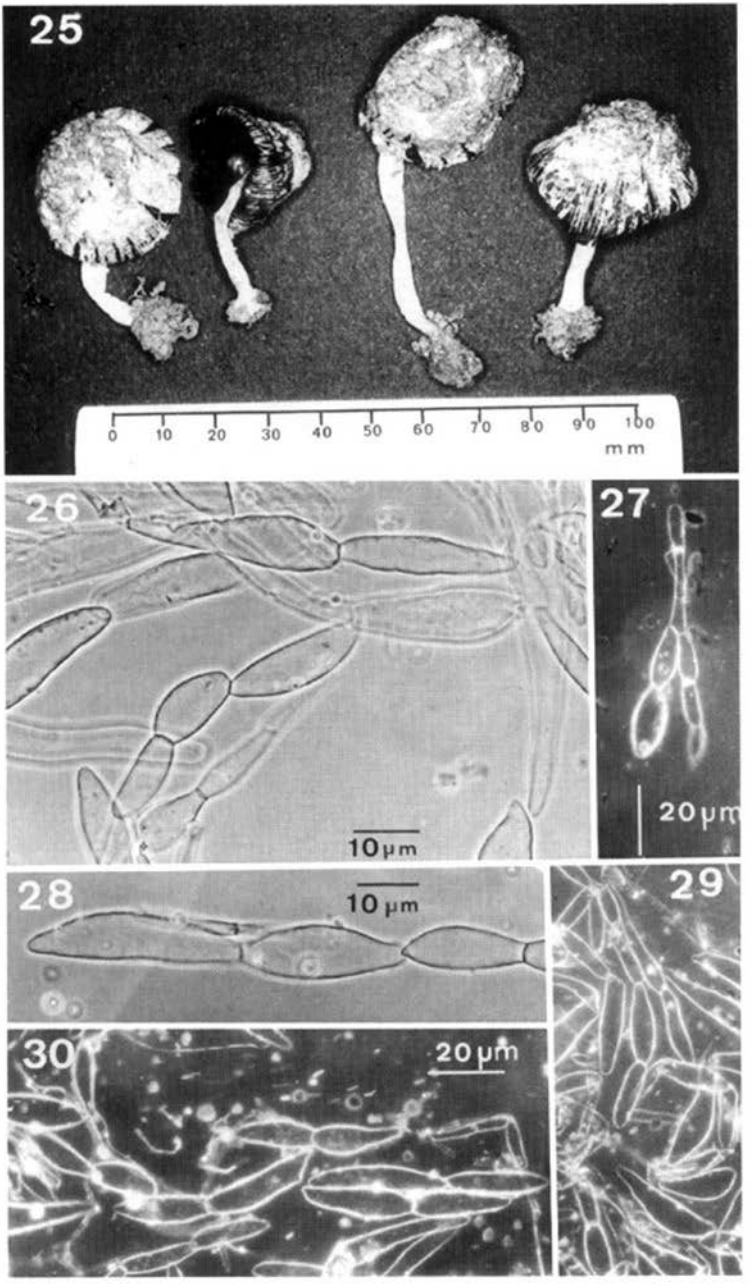
NORTH AMERICA: Nephi, comitato Juab, pago Utah, terrestris, in solo arenario vel glareosa locorum, 15.VI.1975, *S. G. Beougtt* (FVDB 2159, typus in WTU); near Pateros, Wn., 1941 (FVDB 2155, paratypus in WTU). — SPAIN: Prov. Madrid, between Aranjuez and Ontigola, in grassland on gypsiferous soil, among *Teucrium gnaphalodes* L'Hér., *Stipa pennata* L., *Phlomis lychnitis* L., 17.V.1980, *C. Lado & G. Moreno* (AH 14860); Prov. Madrid, Villar del Olmo, in calcareous grassland, among *Thymus zygis* L., 10.VI.1984, *J.L. Manjón* (AH 14861); Prov. Zaragoza, between Retuerta de Pina and Pina de Ebro, solitary on gypsiferous soil, in a ploughed field with *Juniperus thurifera* L., 23.VI.1989, *J. Blasco* (AH 18386); Prov. Guadalajara, between Lupiana and Brihuega, in calcareous grassland, among *Convolvulus lineatus* L., *Thymus zygis* L., *Eryngium campestre* L., 19.VI.1992, *A. Altés & G. Moreno* (AH 14862); Prov. Madrid, Aranjuez, on gypsiferous soil among *Salsola vermiculata* L., 5.VI.93, *J. Rejos* (AH 21051).

Other collections examined

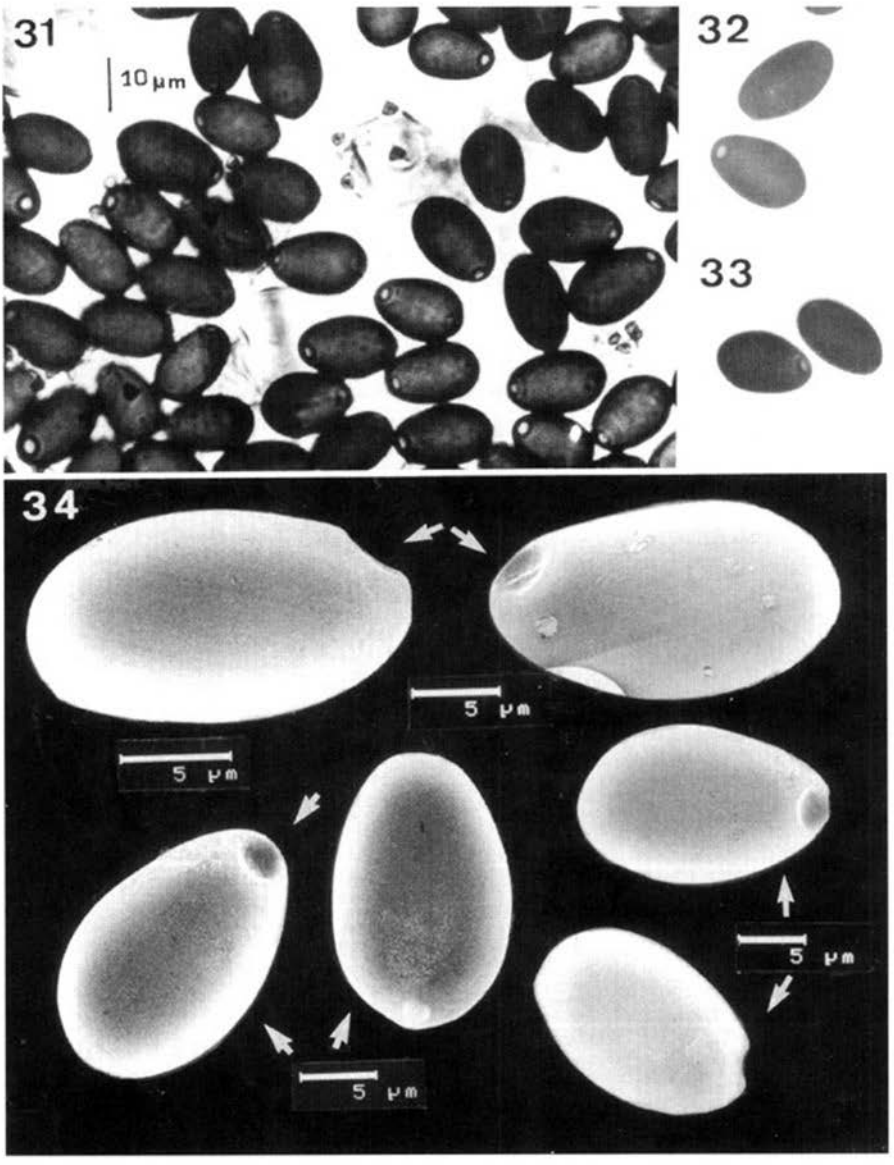
NORTH AMERICA: New Mexico, Bernadillo County, in an old cow pasture 2 miles south of the Alameda Bridge on the west side of the Río Grande river, elevation 5000 feet, 7.III.1941, *W.H. Long* (material identified and labelled as *Coprinus asterophorus* by Long & Miller (1945); labelled as 'Co-type' *W.H. Long 9305*, UC). — TUNISIA: Between Bir-Sidi and Bir-Medkidès, partly burried in the sand, 20.III.1891, *N. Patouillard* (type of *Coprinus arenarius*; Herb. Patouillard 93, FH).

Results of the type studies

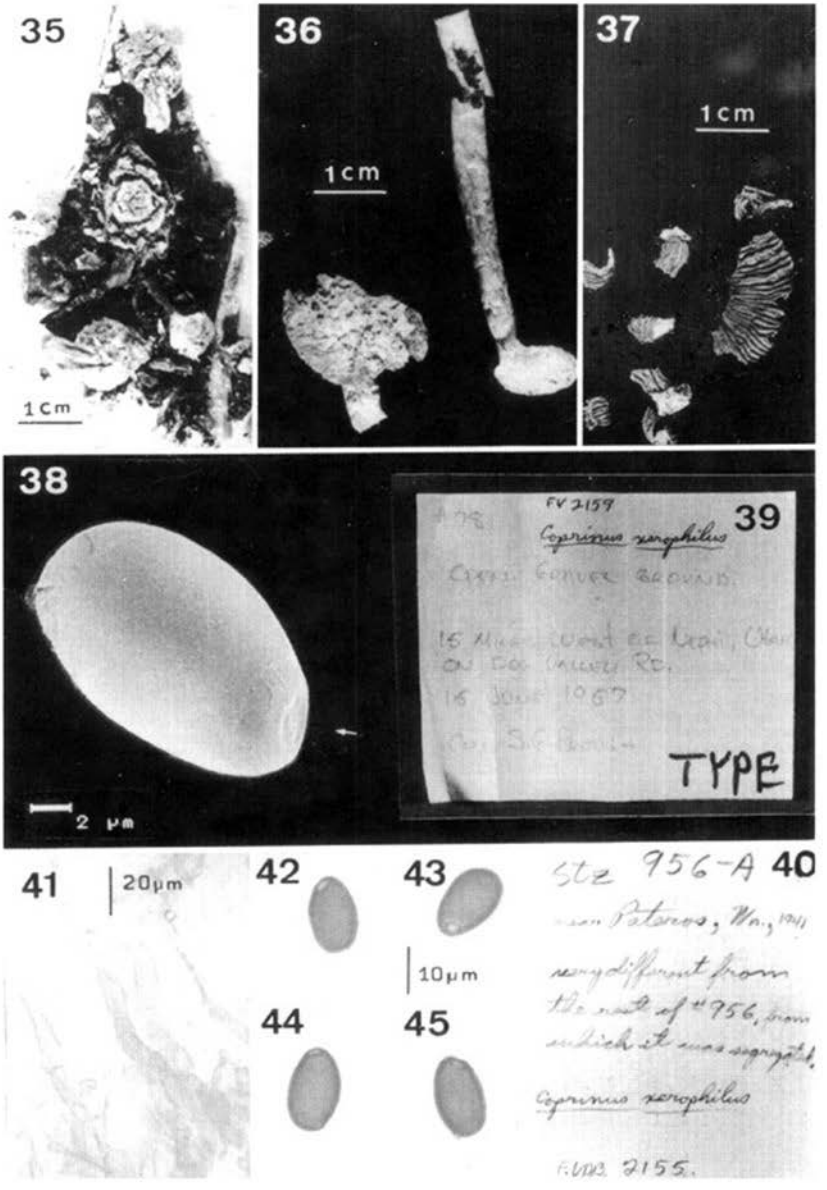
(1) The type material of *Coprinus xerophilus* (Figs. 35, 38, 40 and 41) is strongly fragmented. Nevertheless, it has been possible to observe four bulbous stipes (0.4–0.7 mm diam.) as well as the typical imbricate pattern of the universal veil which breaks up into thick scales, similar to that of the Spanish specimens collected by us. The universal veil dissociates easily when mounted under the microscope and consists of septate branched hyphae, which are formed by extended cells, constricted at the septa, clamped, and variable in shape and width (× 12–35 µm diam.). Spores 18–19 × 10–12 µm, ellipsoid, dark brown, with eccentric germ-pore on the abaxial side.



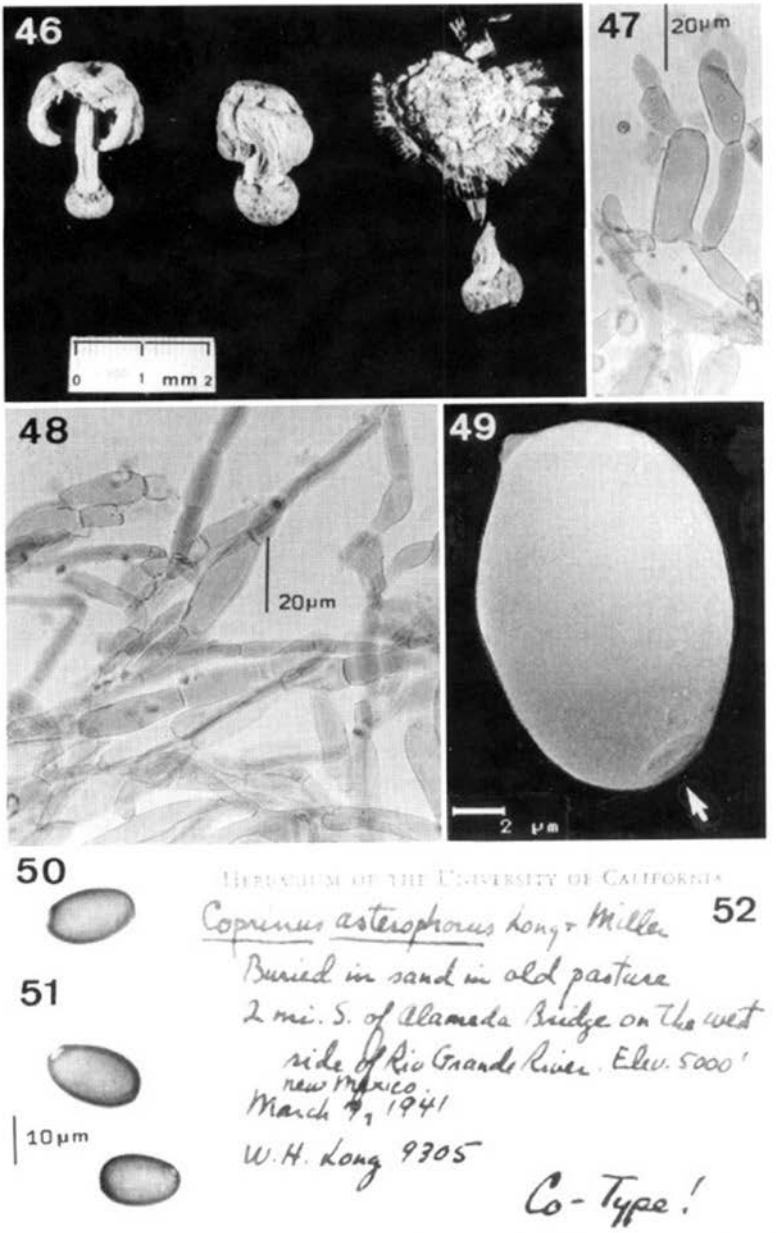
Figs. 25–30. *Coprinus xerophilus* (AH 14862). 25. Basidiomata; 26–30. hyphae of the universal veil.



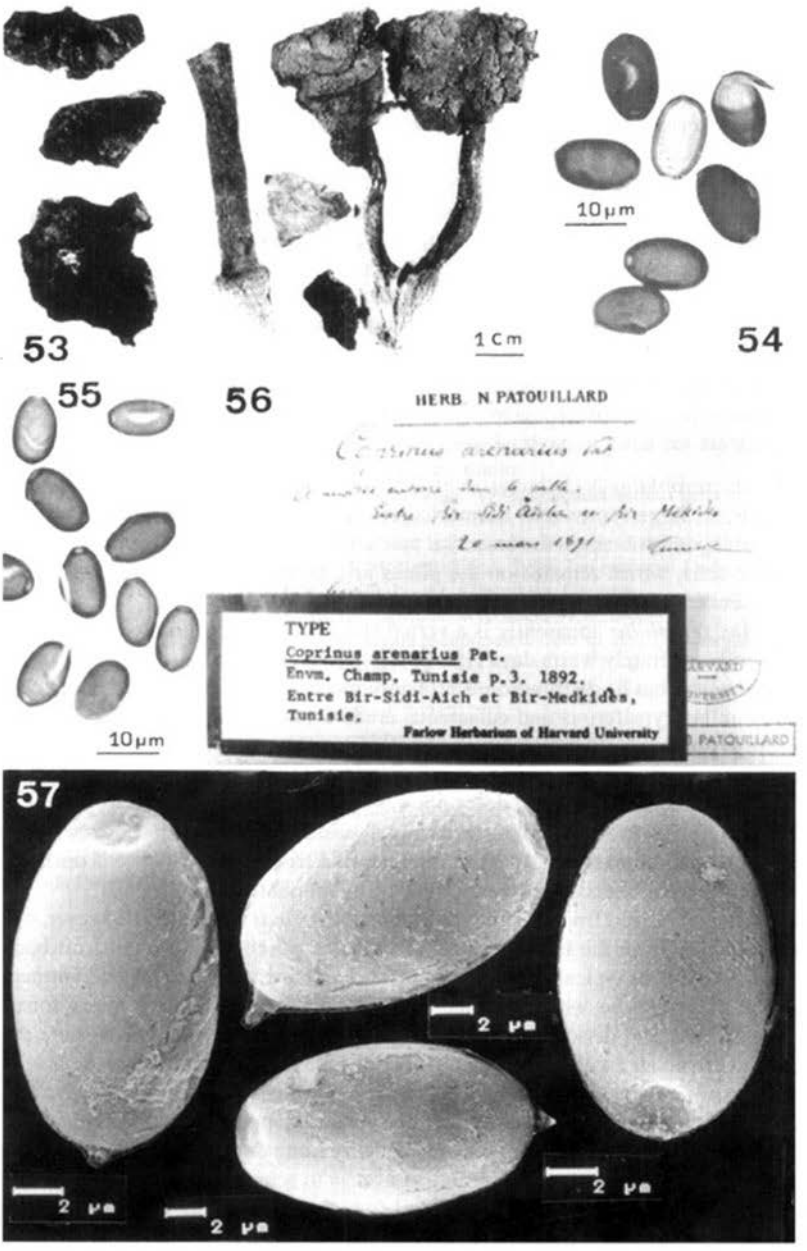
Figs. 31–34. *Coprinus xerophilus* (AH 14862). 31–33. Spores with germ-pore on the abaxial side under light microscope; 34. spores with germ-pore on the abaxial side under SEM.



Figs. 35, 38, 39, 41–43. *Coprinus xerophilus* (holotype). 35. Detail of the pileus surface; 38. spore with germ-pore on the abaxial side under SEM; 39. original herbarium label; 41. hyphae of the universal veil; 42 & 43. spores with germ-pore on the abaxial side under light microscope. — Figs. 36, 37, 40, 44, 45. *Coprinus xerophilus* (paratype). 36. Basidioma; 37. remains of gills; 40. original herbarium label; 44 & 45. spores with germ-pore on the abaxial side under light microscope.



Figs. 46–52. *Coprinus asterophorus* (co-type). 46. Basidiomata; 47 & 48. hyphae of the universal veil; 49. spore with germ-pore on the abaxial side under SEM; 50 & 51. spores with germ-pore on the abaxial side under light microscope; 52. original herbarium label.



Figs. 53–57. *Coprinus arenarius* (holotype). 53. Basidiomata; 54 & 55. spores under light microscope; 56. original herbarium label; 57. spores with apical germ-pore under SEM.

(2) The paratype of *Coprinus xerophilus* (Figs. 36, 37, 44–46) consists of one mature, though somewhat fragmented, basidioma in which the following characters have been observed: universal veil imbricate breaking up into thick scales, stipe 7 × 0.4 cm, cylindrical, hollow, with whitish and bulbous base (1 cm diam.).

(3) The material labelled as 'Co-type' of *Coprinus asterophorus* (Figs. 47–53) consists of one small basidioma. It shows the typical imbricate universal veil breaking up into thick scales. The latter is formed by septate, branched and clampless hyphae with extended cells, constricted at the septa dissociating easily when mounted under the microscope. Spores ellipsoid, dark brown, with eccentric germ-pore on the abaxial side.

(4) The type material of *Coprinus arenarius* (Figs. 54–58), a species which shares a similar habitat, consists of three basidiomata, two of which are complete and one fragmented, pressed and fixed on a thin cardboard. The gills of these specimens are very poorly preserved but, nevertheless, we can assert that *C. arenarius* Pat. is different from *C. xerophilus* because of its fairly narrower ellipsoid spores (15–17 × 8.5–10.5 µm) with apical germ-pore. *Coprinus arenarius* is very similar, macroscopically, to *C. comatus* (Mull.: Fr.) Pers.; it differs, however, from the latter in having broader spores.

Coprinus xerophilus is characterized by its very thick and patently imbricate universal veil, and by its large spores with eccentric germ-pore on the abaxial side. Because of the radially arranged structure of the universal veil, consisting of hyphae formed by cylindrical to globose cells, which remains on the pileus as a hood, this species belongs to section *Coprinus* Pers.: S.F. Gray (= *Comati* Fr. emend. Lange).

Coprinus xerophilus apparently is a vernal species, fruiting with the first rainfalls and after several moderately warm days (15–20°C). We know it from the provinces of Madrid and Guadalajara, but its distribution is probably much wider and it will certainly be found in other similar gypsiferous and calcareous areas of the Iberian Peninsula. We have not been able to observe neither the presence of cheilocystidia nor pleurocystidia, and so these characteres should be confirmed in further collections. Nevertheless, the absence of cystidia was also indicated in the original description of van de Bogart (1976).

Coprinus flocculosus D.C.: Fr. is similar to *C. xerophilus* in having spores with a germ-pore located on the abaxial side, but the latter are smaller (11.5–16.5 × 6–9.5 µm); besides, the universal veil is floccose and neither thick nor imbricate.

Coprinus calyptratus fruits in similar habitats as *Coprinus xerophilus*. However, it differs macroscopically from the latter because of its habit which recalls small fruit-bodies of *C. comatus*, and by its typically star-shaped instead of imbricate universal veil. Furthermore, the veil of *C. xerophilus* when mounted under the microscope is filamentous, formed by branched hyphae and dissociates easily, whereas that of *C. calyptratus* is more densely packed and dissociates with great difficulty. Finally, the features of the spores such as shape, size and germ-pore are similar in both species. On the basis of their microscopic and ecological similarities we can conclude that both species, though clearly different, are closely related. We think this was precisely the reason why Long & Miller (1945) mixed them up when they described *Coprinus asterophorus* as new to science from America, designating a specimen with the typical star-shaped veil (which characterizes *C. calyptratus*) as the holotype and a specimen with imbricate veil easily dissociating when mounted under the microscope as 'co-type' (which corresponds to *C. xerophilus*).

Until now *Coprinus xerophilus* was known only from North America, and exclusively from its original description (van de Bogart, 1976), representing therefore a new record for the European mycobiota[1].

ACKNOWLEDGEMENTS

We wish to express our gratitude to Prof. H. Romagnesi (Paris) for his valuable comments. We also thank the curators of the herbaria FH, PRM, UC, WTU, and AH, for the loan of the specimens mentioned in the text. We especially thank J.A. Pérez and A. Priego for their invaluable assistance with the SEM. This paper has been partially funded by the research project DGICYT PB 95-0129 and by the 'Programa de Cooperación con Iberoamérica' of the Ministry of Education and Science, Spain.

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Vila, J., A. Rocabruna, M. Tabarès & X. Llimona. 1997. Algunos hongos nuevos o interesantes de la Península Ibérica. Revista Catalana Micol. 20: 169–176.

1) When this paper was in the press we became aware of the recent publication of a record of *Coprinus xerophilus* from Valladolid (Spain) in a similar habitat as where we collected our material (Vila et al., 1997). Therefore, the material studied by us represents the second for Spain and Europe. It can, nevertheless, be considered a very rare species.

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PHOLIOTA GYMNOPODIA, COMB. NOV. A REDESCRIPTION OF A FORGOTTEN SPECIES

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A description is given of the remarkable species *Pholiota* (*Flammula*) *gymnopodia*, which was found in 1939. It was identified by Mr. A.C.S. Schweers; since then, this species has not been recorded from the Netherlands nor from any other country in Europe. It is mentioned in most taxonomic works of the end of the 19th and the beginning of the 20th century, but it is completely absent from the more recent literature. The new combination *Pholiota gymnopodia* is proposed.

In the author's herbarium, there is an exsiccatum of a find of 1939 under the name of *Flammula gymnopodia* (Bull.: Fr.) Fr. The fungus was identified by Mr. A.C.S. Schweers, a prominent member of the Dutch Mycological Society, probably with the help of Rea (1922). Because this species was unknown from the Netherlands and seemed to be very rare elsewhere, we decided not to publish this collection and to wait for new records. The fungus was depicted in a water-colour painting by Mr. A.M. Middelhoek, an excellent illustrator of micro-organisms and fungi (Fig. 2).

The species is based on Fries' (1874) interpretation of Plate 601 of Bulliard (1791–1798). In Persoon (1801) the species is included but without mention of the colour of the spores. Fries (1874) described the spore colour as 'ferruginous' and placed the species in *Flammula*. Disregarding this important character, Quélet (1888) classed *Agaricus gymnopodia* in *Clitocybe*, which was followed by Costantin & Dufour (1910), Bresadola (1927–1933), and even by Kühner & Romagnesi (1953). The unpublished description of the species by Mr. Schweers is translated and supplemented by the author, and the occurrence of this species in the mycological literature is discussed.

Pholiota gymnopodia (Bull.: Fr.) A.F.M. Reijnders, *comb. nov.* — Figs. 1, 2

Agaricus gymnopodius Bull., Herb. Fr. (1798) pl. 601, fig. 1 (basionym); Hist. Champ. Fr. (1809) 531 (accompanying text). — *Agaricus gymnopodius* Bull.: Fr., Syst. Mycol. 3 (Index) (1832) 23. — *Agaricus* (*Flammula*) *gymnopodius* (Bull.: Fr.) Fries, Hymen. Europ. (1874) 244. — Type: represented by Bulliard, Herb. Fr. (1798) pl. 601, fig. 1; Hist. Champ. Fr. (1809) 531. Type locality: France. Type specimen: not known to exist. — Epitype (illustrative specimen; chosen here): The Netherlands, Prov. Utrecht, near Amersfoort, Oct. 1939, *A.F.M. Reijnders* (L 996.339-999).

Selected illustrations. Bulliard, Herb. Fr. (1798) pl. 601, fig. 1 (as *Agaricus gymnopodius*); Cooke, Illustr. Br. Fungi (1884) pl. 431 (as *A. gymnopodius*); Britzelmayer, Hymen. Südbayern (1890) pl. 415 (as *Flammula gymnopodia*; doubtful).

Description. Cap 45–50 mm diam., plano-campanulate, obtusely umbonate, minutely squamulose, scales rusty-brown; general colour of the pileus orange-brown, with a much brighter yellow marginal zone; margin curved downward. Gills yellow-orange; edge uneven and brighter by the presence of filiform cheilocystidia; L = 40–50, shorter gills of 3 lengths,

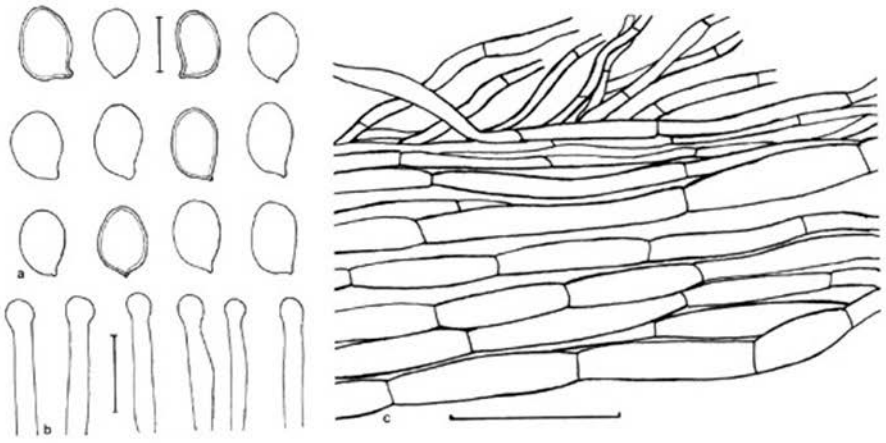

Fig. 1. *Pholiota gymnopodia* (L 996.339-999, epitype). a. Basidiospores (bar = 5 µm); b. cheilocystidia (bar = 20 µm); c. pileipellis, radial section (bar = 100 µm).

height 4–5 mm; deeply decurrent and forming striations on the uppermost part of the stem; thin near the stem and the pileus margin. Stem 6–8 cm × 6–11 mm, cylindrical tapering downwards, fasciculate; upper part yellow-white, lower part brown; fibrillose, slightly rimose, at the top somewhat flocculose but white and velvety at the base. Flesh yellow-white in cap and stem; taste bitter; smell absent.

Spores broadly ellipsoid, 7–7.5 × 5–5.5 µm. Cheilocystidia filiform; mostly 18–20 µm long.

Additional observations following a study of the exsiccatum. A spore print is unfortunately lacking. Spores (after treatment with heated 8% NH_4OH) broadly ellipsoid, smooth; yellow-brown under the microscope, somewhat depressed at the hilum, without a germ-pore, (5.75–)6.4–8.3 × 4.5–5.4 µm (average 7.1 × 5.0 µm) (Fig. 1a). Cheilocystidia filiform, often somewhat broadened (subcapitate) at the apex, up to 30 µm long (Fig. 1b). Pileipellis a cutis with an irregular outline caused by scattered tufts of hyphae, probably remnants of the inconspicuous veil (Fig. 1c); the cutis usually about 100 µm thick; hyphae 3–8 µm diam., rather dark brown, contrasting with the paler coloured pileus trama, though the latter has also darker strips; pigment probably membranal, because walls yellow.

Spore wall staining pink (dextrinoid) in Melzer's reagent and blue (cyanophilous) in cotton blue.

Specimen examined. THE NETHERLANDS: Prov. Utrecht, near Amersfoort, on rotten wood (pine?), Oct. 1939, *A.F.M. Reijnders* (L 996.339-999).

DISCUSSION

Taxonomic position of Flammula gymnopodia

Among the ochrosporous Agaricales, a species with such deeply decurrent lamellae is an exception. The only genus of such fungi where strongly decurrent gills are observed is

Fig. 2. *Pholiota gymnopodia*. Basidiocarps (× 1), after a water-colour painting by Mr. A.M. Middelhoek.

Tubaria, but classification in this genus is not possible because of significant differences in the clothing of the stem, the dimensions, the colour, and other characters.

A genus like *Gymnopilus* can be excluded on account of the smooth spores in our species.

Pholiota gymnopodia shares a set of characters with *Pholiota alnicola* (Fr.: Fr.) Sing.: such as the colour of the spores, the absence of pleurocystidia, the presence of cheilocystidia, the dextrinoid spore wall, and the inconspicuous veil. But there are also many differences, like the much taller basidiomata, the deeply decurrent lamellae, the naked stem, and the shorter spores, reaching 8–10(–12) × 4.5–5.5 µm in *P. alnicola*. *Pholiota alnicola* is a very variable species (see e.g. Tjallingii-Beukers, 1987). Even less or not bitter varieties seem to exist, but it is not well possible to include our fungus in this complex of various forms.

Jacobsson (1986) studied in detail the taxonomic position of the '*Pholiota alnicola*' group. He recognized three species: *Pholiota alnicola* (Fr.) Sing., *P. pinicola* Jacobsson, and *P. salicicola* (Fr. ex Quél.) Arnolds. The fact that *P. alnicola* sensu lato grows on pine wood as well as on wood of deciduous trees has been observed before by many mycologists. Jacobsson (1986) distinguished separate species on account of colour shades and a somewhat different smell. He stressed much the taste as a taxonomic character and therefore distinguished *P. salicicola* on account of its bitter taste. As our species also tasted bitter, as Mr. Schweers mentioned explicitly, the comparison with *P. salicicola* may be more appropriate than that with *P. pinicola*. Jacobsson's description of the latter species is somewhat fragmentary but complete enough to establish several differences with *P. gymnopodia*. According to Jacobsson, the smell of *P. salicicola* is strong and unpleasant, whereas our species was odourless (Schweers). The spores of *P. gymnopodia* are somewhat shorter and we did not observe a germ pore. But, above all, the deeply decurrent lamellae are not present in *P. salicicola*, or any other species of the *Pholiota alnicola* group, they seem to be also less dense in Middelhoek's painting. The shape of the cheilocystidia seems also to be somewhat different (Fig. 1b). According to Jacobsson's restricted conception of the species (Jacobsson, 1986), *P. gymnopodia* must be considered to be a distinct species. This relates even more to the comparison with *P. pinicola*. In a study of cultural characters in species of *Pholiota* Jacobsson (1989) found *P. alnicola* and *P. pinicola* very similar, but the interspecific matings between isolates of these species were unsuccessful.

Jacobsson (1990) reconsidered the position of *P. salicicola* and placed it with some doubt into the synonymy of *P. alnicola*, mainly because of the absence of additional material and different interpretations of the name in the older literature.

In conclusion, there seems to be sufficient evidence to maintain *Pholiota gymnopodia* as a separate species allied to *Pholiota alnicola*. It is to be regretted that data on the compatibility of the mycelia of these species are not available.

The occurrence of P. gymnopodia in the mycological literature

After Fries' (1874) redescription, the species is mentioned many times in the early British literature, e.g. in Cooke (1884), where we find that Plate 431 remarkably resembles our species with its decurrent, rather distant lamellae, its orange-brown pileus colour, its size and stout, striate stipe. Furthermore, the species is present in Massee (1893), who wrote: "a very distinct species" and in Rea (1922), but it is absent from Greville (1823–1828) and Berkeley (1844–1856).

An important indication of the existence of the species is its presence in Saccardo (1887): "species major, caespitose, distinctissima; stipites ultra longi, ...". Fries (1874) and Saccardo (1887) mentioned that the species had been observed in 'Vogesis' by Mougeot (1887). In

the French literature of the 19th century (e.g. Léveillé, 1855; Gillet, 1874) the species is absent as it is also from the Finnish work of Karsten (1876).

On the other hand, it is more frequently encountered in the earlier German mycological literature, starting with Britzelmayer (1891–1894), whose illustration was cited by Killermann (1928). Moreover, the species was included in the compilations of Winter (1884) and Migula (1912), but is absent in Ricken (1915), Michael et al. (1968–1975), and Moser (1978), whilst in the Netherlands the species was previously unknown (Oudemans, 1905). These citations are confined to the older literature, where the species has been repeatedly mentioned. However, how many times it really has been observed is rather uncertain, though Cooke's plate and Saccardo's record (Mougeot) give reliable evidence.

Statements about the habitat are vague: on the ground (Fries,1874; Persoon, 1801; Saccardo, 1887; Winter, 1884; Migula, 1912), on pine sawdust (Cooke, 1881–1891), on both (Massee, 1892–1895; Smith, 1908; Rea, 1922). Probably Cooke had observed the species growing on pine sawdust and the other authors copied this statement. Unfortunately, the habitat of our fungus is somewhat uncertain, but it probably grew on (pine?) wood.

In the recent literature on Higher Basidiomycetes, the species is no longer mentioned. The last note about it can be found in Part II of Dennis et al. (1960), as '*gymnopodia, Flammula*: doubtful'. No mention of it appears in the large compilations of agarics of the beginning or middle of this century (Bresadola, 1927–1933; Lange, 1935–1940; Konrad & Maublanc, 1949; Kühner & Romagnesi, 1953), nor does it occur in Singer (1986) or in the specific American works on *Pholiota* (Smith & Hesler, 1968).

So we must conclude that this well-characterized species, representing a distinct taxon, is strongly declining or has perhaps become completely extinct.

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TWO RARE COPROPHILOUS ASCOMYCETES FROM NORWAY

J. VAN BRUMMELEN[1] & R. KRISTIANSEN[2]

Two uncommon coprophilous ascomycetes, *Ascobolus cervinus* and *Caccobius minusculus*, only recorded once, each from two different continents, are reported for the first time from Norway. Both are provided with new descriptions and compared with authentic material.

During the last few years, the second author has found a number of rare or unusual coprophilous discomycetes new to the mycoflora of Norway, such as *Pseudascozonus racemosporus* Brumm. (Kristiansen & Schumacher, 1993), *Coprotus breviascus* (Velen.) Kimbr. et al., *Ascobolus degluptus* Brumm., *Saccobolus citrinus* Boud. & Torrend (Kristiansen, 1993), *Ascodesmis nana* Brumm., *Ascodesmis nigricans* Tiegh., *Ascodesmis sphaerosporus* Obrist (Kristiansen, 1994), and *Pseudombrophila virginea* (Svrček & Moravec) Brumm. (van Brummelen, 1995).

Now two very uncommon species of coprophilous ascomycetes, *Ascobolus cervinus* Berk. & Broome and *Caccobius minusculus* Kimbr. in Kimbr. & Korf, have been collected from Norway. Both species were only known from their type localities in Sri Lanka (Ceylon) and Canada, respectively. Full descriptions, based on recent findings in Norway and study of authentic material, are provided.

Ascobolus cervinus — Figs. 1, 2

Ascobolus cervinus Berk. & Broome, J. Linn. Soc. Lond. (Bot.) 15 (1876) 85.
Holotype: Sri Lanka (Ceylon), Peradeniya, on dung of deer (?), II.1869, *Thwaites 1122* (K).
Illustration. J.-O. Aanæs, Blekksoppen 24 (69) (1996) 22. 1996 (rather old fruit-bodies).

Ascomata apothecial, gregarious or crowded, superficial, sessile, on a broad base, up to 2.5 mm across and 1 mm high. Receptacle at first closed and subglobular, then opening at the top and hemispherical, finally expanding and becoming scutellate, often irregularly shaped by mutual pressure, brownish olive-green, rather dark at maturity, fleshy, finely verrucose or furfuraceous, with a prominent margin. Disc at first concave to flat, finally often slightly convex, roughened by the protruding tips of ripe asci, at first yellow-green to pale olive-green, then dark olive, becoming dark brown to almost black at maturity. Hymenium about 190 µm thick. Hypothecium clearly differentiated, 28–35 µm thick, of isodiametric thin-walled cells 5–11 µm wide. Medullary excipulum 160–250 µm thick, hyaline, consisting of fairly thin-walled isodiametric to oblong cells, 7–45 × 5–20 µm and a few subcylindrical hyphae about 4–5 µm wide (textura globulosa). Cortical excipulum near the base 35–150 µm thick, at the margin 18–40 µm wide, with brownish to dark brown amorphous intercellular pigment, consisting of closely compacted thick-walled subglobular cells 5–45 × 5–35 µm (textura globulosa), over the whole surface with increasing deposits of

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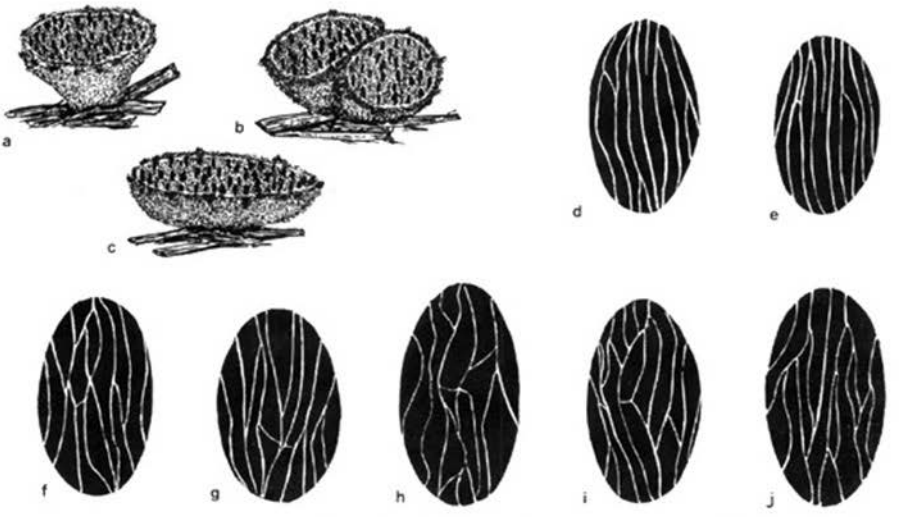

Fig. 1. *Ascobolus cervinus*. — a–c. Habit of fruit-bodies, × 16; d–j. ascospores, × 1600 (a–c, f–j, from *R. Kristiansen RK 96.18*; d, e, from holotype).

granular and amorphous brown pigment, covered with small, often rather sparse, irregular groups of isodiametric and oblong strongly pigmented cells 5–15 × 4–9 µm. Asci cylindrical, gradually narrower towards the base, rounded above, 165–185 × 14–17 µm, 8-spored, the wall staining faintly blue with iodine. Ascospores 1–2-seriate, ellipsoid (length-width ratio (Q) 1.7–1.9, average 1.83), at first hyaline, then purplish, becoming purplish brown at maturity, (14.1–)15.4–16.0(–17.7) × (7.4–)8.0–9.0(–9.6) µm (ornamentation included), without oil-globules or granules, ornamented with a pattern of more or less longitudinal anastomosing fine lines (6–8 visible at lateral view). Paraphyses frequent, septate, cylindrical, branched, hyaline, 2.0–2.5 µm thick, not or scarcely enlarged up to 2–4 µm at the tip, embedded in yellowish green to olive brown mucus strongly darkening with age.

On dung of elk (*Alces alces*) and probably of deer.

Specimens examined. NORWAY: Buskerud, Øvre Eiker, Røkkebergtjern, c. 200 m alt., on elk dung in spruce wood, 4.VI.1995, *R. Kristiansen RK 95.62* (L); Hedmark, Sør-Odal, Galterud, Molykkja, c. 300 m alt., on elk dung in spruce wood, 25.V.1996, *A. Sagbakken & R. Kristiansen RK 96.13* (L); idem, 23.VI.1996, *RK 96.18* (L); Hedmark, Kongsvinger, Serkilampi nature reserve, c. 300 m alt., on elk dung ir spruce wood, 24.VI.1996, *R. Kristiansen RK 96.19* (L); Hordaland, Voss, on elk dung, IV.1976, *I. Trøen 57b* (BG); Finnmark, Sør-Varanger, Øvre Pasvik National Park, on elk dung, 13.VII.1968, *S. Sivertsen* (TRH); Oppland, Vågamoi, Glitteheim-road, on elk dung, 27.VII.1998, *R. Kristiansen RK 98. 76* (L). — SRI LANKA: Peradeniya, on dung of deer (?), II.1869, *Thwaites 1122* (holotype of *Ascobolus cervinus* Berk. & Broome; K).

For a long time, *Ascobolus cervinus* was only known from Berkeley & Broome's original short description and later from the more complete redescription, based on the rather sparse and not yet fully mature type material, by van Brummelen (1967).

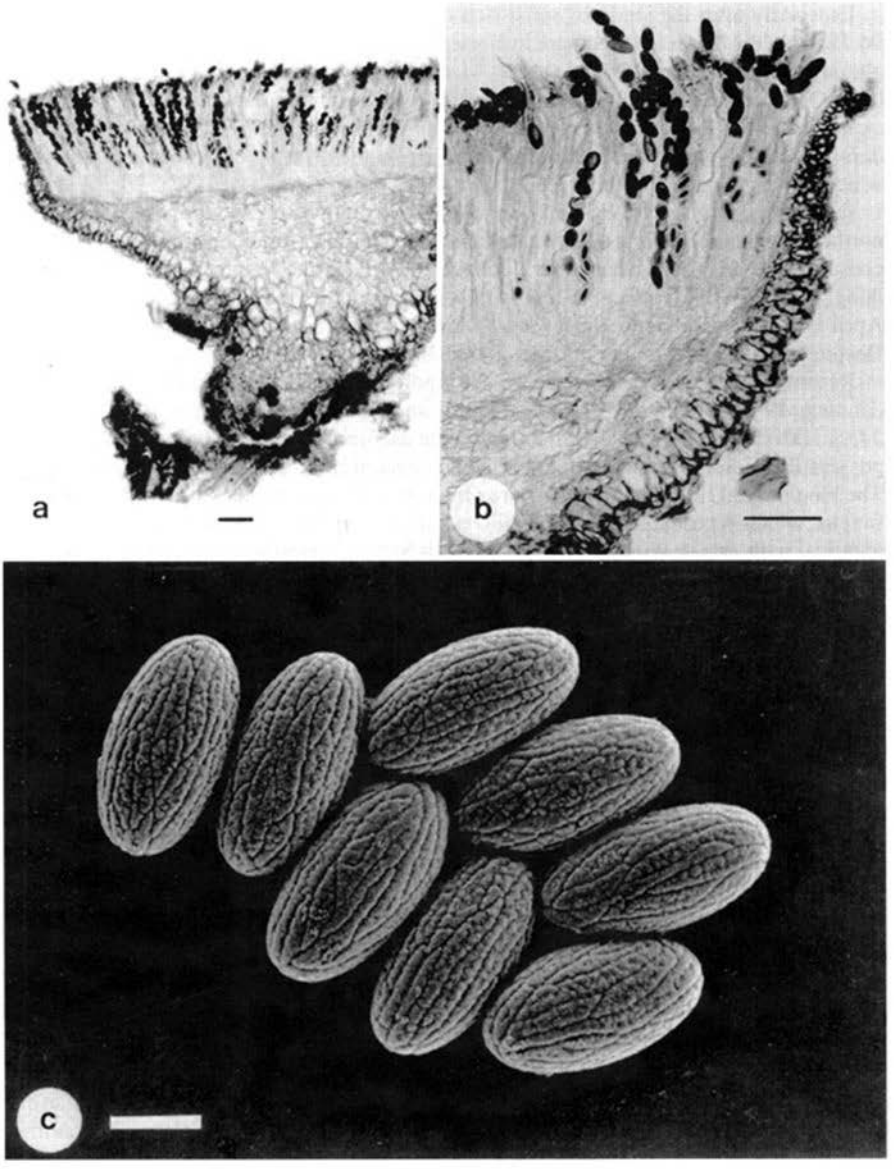

Fig. 2. *Ascobolus cervinus*. — a. Photomicrograph of part of median section through ripe fruit-body (bar = 50 µm); b. idem, detail near margin (bar = 50 µm); c. scanning electron micrograph of ascospores (bar = 5 µm) (all from *R. Kristiansen RK 96.18*).

Especially after the study of some rich collections (*R. Kristiansen RK 96.18* and *RK 96.19*) from the district of Hedmark in Norway, *A. cervinus* can be identified with certainty, although investigation of several earlier Norwegian collections from the herbaria of Trondheim (TRH) and Bergen (BG) proved them to belong also to this species.

In a thesis on Norwegian coprophilous discomycetes, Aas (1978: 21) described an '*Ascobolus* sp.' based on a collection from elk dung from the district of Hordaland (*Troen 57b*), which proves to belong to this species.

In Norway, this species has only been found on dung of elk, both in the southern and northern parts of the country. It is remarkable that it has not been found in the south-eastern coastal areas, despite elk being very common there and the frequent examination of elk dung. Based on the Norwegian records, the species seems to have a vernal appearance, April to July, depending on the latitude; which also proves that it tolerates a cold climate. Despite intense search, it has not been found anywhere during summer or autumn.

Recently, *Ascobolus cervinus* has been reported from the Shaanxi province of China (Zhuang, 1996). But a study of the description and the material concerned (*Q.-M. Ma et al. 2485*, HMAS 33705), revealed that the mature ascospores are wholly hyaline and do not possess the violet or purplish pigment layer, characteristic of the genus *Ascobolus* Pers. The longitudinal ridges of the ascospore ornamentation easily stain with methyl blue. This fungus, which is probably not coprophilous but growing on vegetable debris, proved to be identical with *Peziza urinophila* Y.-Z. Wang & Sagara, described from Taiwan and Japan from vegetable debris and forest litter after application of urea or after decomposition of animal matter (Wang & Sagara, 1997).

By this more extensive study, it becomes easier to distinguish *Ascobolus cervinus* from some related species, such as *A. crenulatus* P. Karst., *A. michaudii* Boud., *A. castorensis* Aas, and *A. fushanus* Y.-Z. Wang & Brumm. A macroscopic distinctive feature of *A. cervinus* is the absence of yellowish or yellowish green pigments, present in the receptacle and disc of the other four species. On the contrary, *A. cervinus* becomes dark brown by the presence of considerable amounts of an olive green to dark olive brown amorphous pigment; moreover, the surface of the receptacle is the least warty or furfuraceous among these species.

Apart from other characters, there are microscopically mostly clear differences in the shape and size of the ascospores. As compared with *A. cervinus*, the ascospores in *A. fushanus* (Wang & van Brummelen, 1997) have only a few longitudinal striae and are of about the same length, but more narrowly ellipsoid in shape (14–18 × 6.5–8 µm; Q = 2.01–2.36). In *A. michaudii* the ascospores are considerably larger (17–22 × 9.5–12 µm), while in *A. crenulatus*, the ascospores are clearly smaller and more broadly ellipsoid (11.1–12.9 × 6.1–7.6 µm; Q = 1.53–1.72). *Ascobolus castorensis*, which seems to be restricted to dung of beaver (*Castor fiber*), has ascospores of about the same size as *A. cervinus*, but is well-characterized by the presence of many prominent yellow-orange warts on the upper part of the receptacle (Aas, 1977).

Caccobius minusculus — Fig. 3

Caccobius minusculus Kimbr. in Kimbr. & Korf, Am. J. Bot. 54 (1967) 22, figs. 4a–f. — Type: South of Whitney, Nipissing Distr., Ontario, Canada, on rabbit dung, 26.IX.1956, *R.F. Cain* (holotype CUP 47615; isotype TRTC 32390).

Ascomata apothecial, solitary or in small groups, superficial, sessile, 0.12–0.20 mm diam., 0.18–0.25 mm high. Receptacle cylindrical to obconical, sometimes becoming pulvinate,

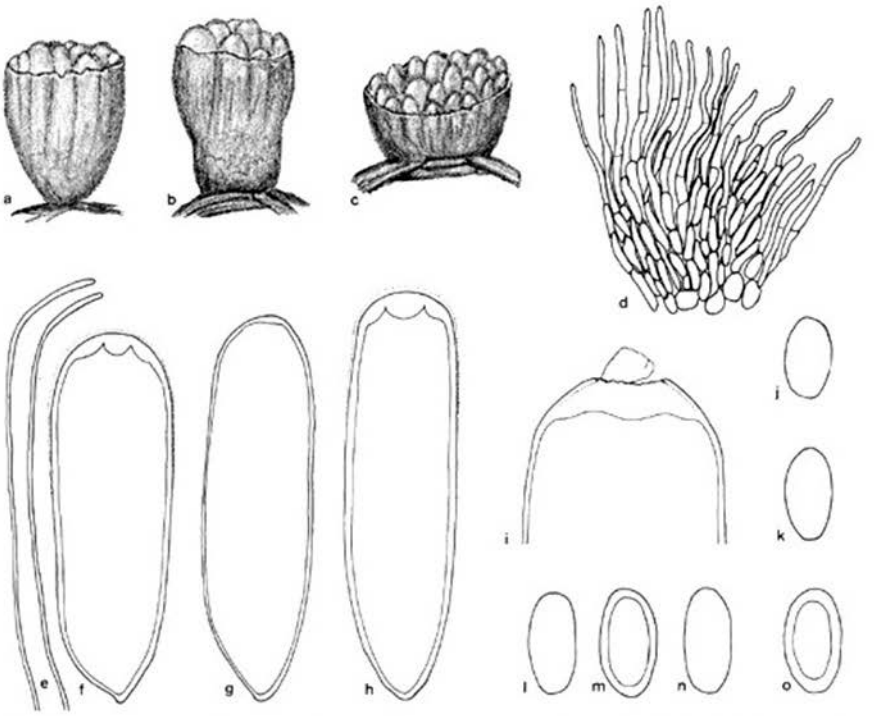

Fig. 3. *Caccobius minusculus*. — a–c. Habit of fruit-bodies, x 90; d. detail of excipulum seen from outside, × 250; e. paraphyses, × 500; f–h. asci, × 500; f, h, in 10% NH_4OH, g in water; i. detail of top of dehisced ascus, × 800; j–o. ascospores, × 2700 (all from *R. Kristiansen & A. Sagbakken RK 96.130*).

pinkish red; margin not differentiated. Disc flat to convex, roughened by the prominent tips of asci, pinkish red. Hymenium about 150 µm thick. Hypothecium scarcely differentiated. Excipulum not clearly differentiated in a cortex and a medulla, near the base 50–70 µm thick of isodiametric cells 5–9 µm diam. (textura globulo-angularis), only a single layer of rows of hyaline oblong cells at the sides, 10–16 × 2.5–5.0 µm (textura porrecta), smooth. Asci broadly cylindrical with a short stalk, rounded above, the ascus wall strongly swelling or even dissolving in 10% NH_4OH, (80–)130–150 × 33–36 µm, about 1000-spored, with the apex strongly thickened on the inner side (2.5–5.0 µm), not blue with iodine. Ascospores ellipsoid (length-width ratio 2.0–2.8, average 2.2), hyaline, (4.5–)5.4–6.0 × 2.3–2.8 µm, without oil globules, air bubbles, or granules, smooth. Paraphyses frequent, septate, cylindrical, simple, hyaline to pale pinkish, 1.8–2.5 µm thick, not or slightly enlarged up to 3.5 µm at the tip, not embedded in mucus.

On rather old rabbit dung.

Specimens examined. NORWAY: Østfold, Hvaler, N. Kirkøy, Utengen, on rabbit dung, 16.XI.1996 and 5.XII.1996, *R. Kristiansen & A. Sagbakken RK 96.130* (L); id. 18.X.1997, *R. Kristiansen RK 97.20* (L). — CANADA: Ontario, Nipissing Distr., South of Whitney, on rabbit dung, 26.IX.1956, *R.F. Cain* (isotype of *Caccobius minusculus* Kimbr. in Kimbr. & Korf; TRTC 32390).

Caccobius minusculus was described from a specimen in Dr. R.F. Cain's herbarium, collected in 1956 in Ontario, Canada (Kimbrough & Korf, 1967). The new genus *Caccobius* Kimbr. in Kimbr. & Korf was created 'for species intermediate between *Ascozonus* and *Thelebolus*'.

The species is presumably psychrophilic or strongly tolerant of cold growing conditions, since it was found after a long period of cold weather and snow. The Norwegian locality is situated on a group of islands at the south-eastern outlet of the Oslofjord, close to the Swedish border. The locality is an accessible point on acidic rock. The sparse vegetation consists mostly of small pines (*Pinus sylvestris*) and carpets of heather (*Calluna vulgaris*) with some shallow marshes. The place is frequented by deer and elk, judging from the amounts of dung of these animals. Other coprophilous species recorded simultaneously on these substrates are *Ascozonus woolhopensis* (Berk. & Br. in Renny) Boud., *Thelebolus polysporus* (P. Karst.) Otani & Kanzawa, *Thelebolus stercoreus* Tode: Fr., *Trichobolus sphaerosporus* Kimbr. in Kimbr. & Korf, *Ascobolus brassicae* Crouan, and *Ascobolus saccharifer*us Brumm.

The pinkish red colour of the fresh fruit-bodies, already observed in the field, is a constant character, which may gradually fade in dried material. The Canadian material was described as 'pallid to white'.

The 'mucilaginous sheath around each ascus', as described by Kimbrough (Kimbrough & Korf, 1967), is certainly due to the presence of a very thick periascus (van Brummelen, 1998). The paraphyses are long and often overarch the ascus top, but in both collections of *Caccobius minusculus* studied, no evidence was found for the presence of an epithecium or 'pseudoexcipulum above the true excipulum' as described by Kimbrough (l.c.).

Caccobius was considered to be related to non-operculate genera of the Thelebolaceae (Korf, 1972; Kimbrough, 1972) or even to the 'inoperculates', because of the presence of a 'plug' in the top of the ascus, staining with Waterman's blue-black ink (Samuelson, 1978; Samuelson & Kimbrough, 1978).

A more detailed study of the ascus structure in the genera of the Thelebolaceae (van Brummelen, 1998) revealed a wide variation in structure and even more in the function of the opening mechanism of the ascus.

Large amounts of inner wall material form a central thickening at the top of the ascus. Usually the thickening is central, but it may also be located more towards the side of the apex. In *Caccobius*, as well as in *Ramgea*, *Pseudascozonus*, and some species of *Thelebolus*, opening of the ascus occurs after splitting within the inner wall layer in the apex more or less parallel to the ascus surface. This is considered the typical *Thelebolus*-type of ascus structure (van Brummelen, 1998). The central thickening in *Caccobius* may reach a thickness of 3 µm and a width of 4–6 µm and is sharply delimited by sharp folds in the inner wall layer in the subapical region. At first, this thickening shows little or no differentiation. Later it becomes clearly stratified by strata of alternating low and strong reactivity after the Thiéry-test. On still further ripening, the stratification becomes less evident, but can still be seen as fine horizontal lines. When treated with Waterman's blue-black ink, the irregular boundary planes of the cavities and the fine lines within the central thickening especially stain blue.

In a recent phylogenetic analysis of 21 selected species of Ascomycotina with DNA sequencing techniques (Landvik et al., 1998), three species of Thelebolaceae (*Thelebolus stercoreus* Tode: Fr., *Ascozonus woolhopensis* (Berk. & Br. in Renny) Boud., and *Caccobius minusculus*) were included. The results show, that these Thelebolaceae group together and

indicate a closer phylogenetic relationship with representatives of the inoperculate discomycetes, like *Leotia lubrica* Pers. and *Microglossum viride* (Pers.) Gillet, than with members of the operculate Pezizales. This confirms earlier sequencing studies by Momol & Kimbrough (1994), who found that an unidentified species of *Thelebolus* was not related to seven members of operculate Pezizales. With their methods, Landvik et al. (1998) were not able to resolve the phylogenetic relationships within this group of three Thelebolaceae.

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STUDIES OF LACTARIUS FROM MEXICO: A NEW SPECIES IN SUBGENUS PIPERITES

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Lactarius lacteolutescens is described as a new member in subgenus *Piperites* subsect. *Croceini*. It was found growing in a mixed forest of *Pinus* spp. and *Abies hickellii*, at Mt. Cofre de Perote, Central Region of the State of Veracruz (Gulf Area, Mexico).

The mycobiota ectotrophically associated with the Pinaceae of Mexico is of particular interest, since a great number of species of *Pinus*, at present known in the world, occur in this country, including several taxa restricted to its territory and neighbouring areas (Rzedowski, 1978; Perry, 1991). At present several species of *Lactarius* associated with these conifers in Mexico have been reported (Guevara et al., 1987; Montoya et al., 1990, 1996; Montoya & Bandala, 1996), including a new species (Kong-Luz & Estrada Torres, 1994). In the Cofre de Perote Region, in the central area of the State of Veracruz, an interesting species of *Lactarius* has been found growing in association with *Pinus* (*P. patula, P. pseudostrobus*, and *P. montezumae*). Because of its distinctive characters (yellow staining latex, size and shape of cystidia, and basidiospore ornamentation) it is considered a new species in the subgenus *Piperites* (Fr.) Kauffman subsect. *Croceini* (Burl.) Sing. sensu Hesler & Smith (1979).

Methods. This study is based on the analysis of fresh and dried specimens. Annotations of colours in brackets were codified according to Kornerup & Wanscher (1978) colour manual. Microscopic analysis was carried out on sections mounted in 5% KOH. The basidiospores were observed in Melzer's reagent and were measured in side view. The dimensions of the basidiospores do not include the ornamentation; their height is indicated separately.

The ranges of spore measurements correspond to the absolute values measured (25 basidiospores per collection) and the range of the means is mentioned in brackets. L (mean length) and W (mean width) correspond to the mean of means ± standard deviation (sd). The range of the means of quotient Q (= length/width) and the mean of means ± sd are also included.

Line drawings were made with the aid of a drawing tube and micrographs of the basidiospores were prepared with a scanning electron microscope.

Herbarium acronyms are according to Holmgren et al. (1990).

Lactarius lacteolutescens Montoya, Bandala & G. Moreno *spec. nov.* — Figs. 1–19

Pileus 17–63 mm latus, convexus vel plano-convexus, acuto- vel conico-papillatus, aurantiaco-brunneus. Stipes 40–120 × 6–17 mm, obclavatus, roseo-salmoneus, late e basi vinosus, basi villoso-strigosus. Latex lacteus, lutescens, superficio luteo-, late brunneotinctus. Sapor acer. Sporae in massa bubalinae vel luteolae roseotinctae. Basidiosporae 7.2–8.8(–9.6) × (4.8–)5.6–6.4(–7.2) µm, reticulatae vel subreticulatae, verrucae et cristae singularia praesentia, ornamentum 0.8–1.2 µm altum. Pleurocystidia

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76–106 × 8–12 µm, subfusiformes, frequente apicibus mucronatis, conspicua. Cheilocystidia similia, 40–64 × 8–12 µm. Pellicula ex ixocutis compositur. Hymeniotrama heteromera. Gregarius sub *Pinus*.

Holotypus: Mexico, Veracruz, Municipio de Xico, E Cofre de Perote, Los Gallos, 1.5 km ad septentriones ex Ingenio El Rosario, *Montoya 3222* (XAL).

Etymology: due to its white latex becoming yellow.

Pileus 17–63 mm in diam., convex when young to plano-convex, at times undulated, depressed in age, with an acute or conic papilla, glabrous, viscid to subviscid in dry weather, hygrophanous, azonate or at times with obscure zonations due to the loss of humidity and hence appearing canescent areas, orange brown, dark ochraceous salmon to cinnamon brown (6B6, 6C8, 6-8D7) with vinaceous tinges (7E7, 8E8-F8) in wet portions, generally yellowish orange at margin and dark orange brown to vinaceous brown (8E6) at the disc when loosing humidity; margin at times incurved, somewhat striate. Lamellae dense, arcuate, medium broad, adnate, pale pinkish buff to yellowish orange (5A2-3, 6A3), becoming vinaceous (9E6-7) or dark vinaceous (pale 10E7), finally ferruginous brown; edge continuous to slightly irregular; lamellulae numerous and of different length. Stipe 40–120 × 6–17 mm, obclavate to subcylindric sinuous and broadened towards the base, dry to slightly sticky, fibrillose, fistulose, pinkish buff (5A2), pinkish salmon to orange, vinaceous at the base in young specimens, upwards darkening to vinaceous (8E6) when mature, then with almost 3/4 of the stipe in dark vinaceous brown (10F5) and only the apex remaining pinkish buff; base villose-strigose, villosity whitish to pinkish brown (7-8B3) with greyish vinaceous tinges. Latex milky, after 3–5 seconds changing to yellow (4A5-B6), staining the cut areas yellow and later brown; taste astringent to slightly acrid. Context pale flesh colour to pale pinkish buff at pileus and above the stipe, pinkish brown in most of the stipe, vinaceous brown (8E6) in wet conditions, staining yellow; odour agreeable; taste slightly bitter. KOH on latex orange and on pileus olivaceous. Phenol on context negative, yellowish on latex. Spore print buff to yellowish (4A2-3) with pinkish tinges.

Basidiospores 7.2–8.8(–9.6) × (4.8–)5.6–6.4(–7.2) µm (8.03–8.32 × 5.95–6.43; L = 8.20 ± 0.06; W = 6.24 ± 0.09); Q = 1.27–1.36; 1.32 ± 0.02 (n = 25 spor es per 5 specimens), ellipsoid, yellowish, more or less densely ornamented; reticulum 0.8–1.2 µm high, more or less complete; warts and crests joined by low and high bands, forming continuous reticulations; isolated verrucae and crests also present; suprahilar plage conspicuous, inamyloid. Basidia 40–50 × 4.8–6.4 µm, clavate, tetrasporic, hyaline; sterigma 4.8–6.4 µm long. Macropleurocystidia 76–106 × 8–12 µm, subfusiform, frequently mucronate at apex, thin-walled or with wall up to 0.8 µm thick, numerous and conspicuous, projecting (beyond the hymenial layer), hyaline to yellowish. Cheilocystidia 40–64 × 8–12 µm, subfusiform, frequent, conspicuous, thin-walled, similar in shape to pleurocystidia, hyaline to yellowish. Pileipellis an ixocutis, 70–96 µm thick; hyphae 2.4–4 µm in diam., compactly arranged,

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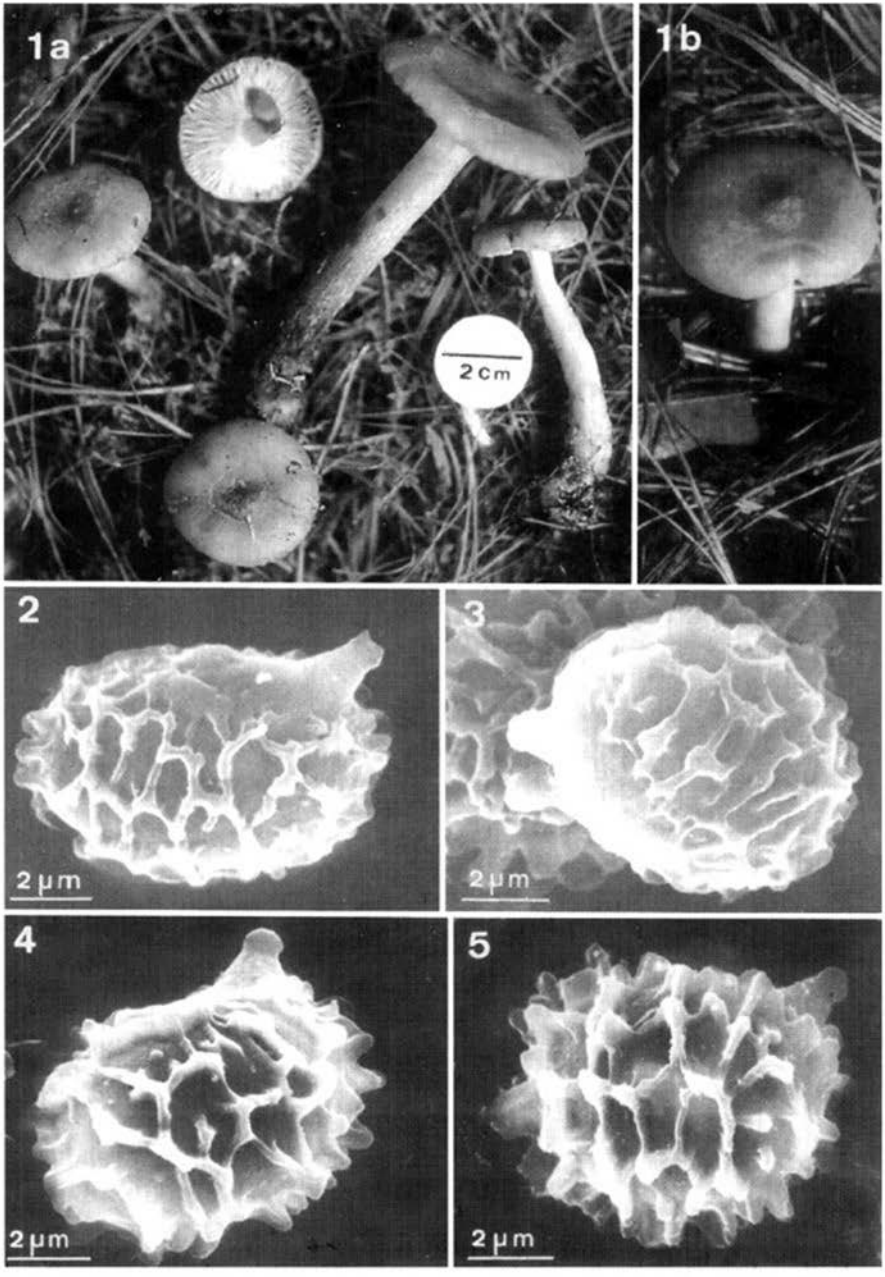
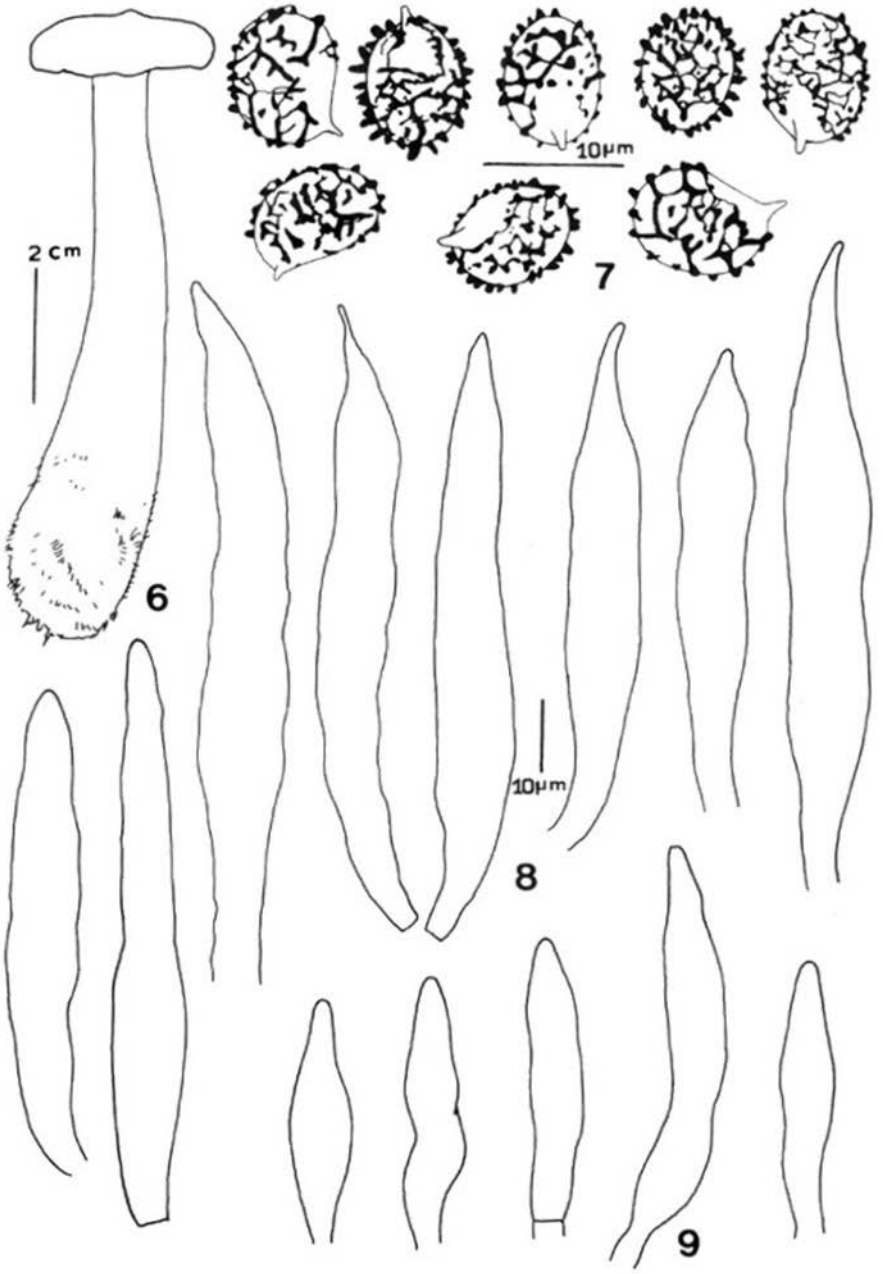
Figs. 1–5. *Lactarius lacteolutescens*. 1a. Basidiomata; 1b. detail of the pileus papilla; 2–5. basidiospores with SEM (*Montoya 3222*, holotype).

Figs. 6–9. *Lactarius lacteolutescens*. 6. Basidiome; 7. basidiospores; 8. pleurocystidia; 9. cheilocystidia (*Montoya 3222*, holotype).

Figs. 10–12. *Lactarius colorascens*. 10. Basidiospores; 11. pleurocystidia; 12. cheilocystidia (*Atkinson s.n.*, holotype). — Figs. 13–15. *Lactarius vinaceorufescens*. 13. Basidiospores; 14. pleurocystidia; 15. cheilocystidia (*Smith 6020*, holotype).



Figs. 1–5 (legend on p. 128).



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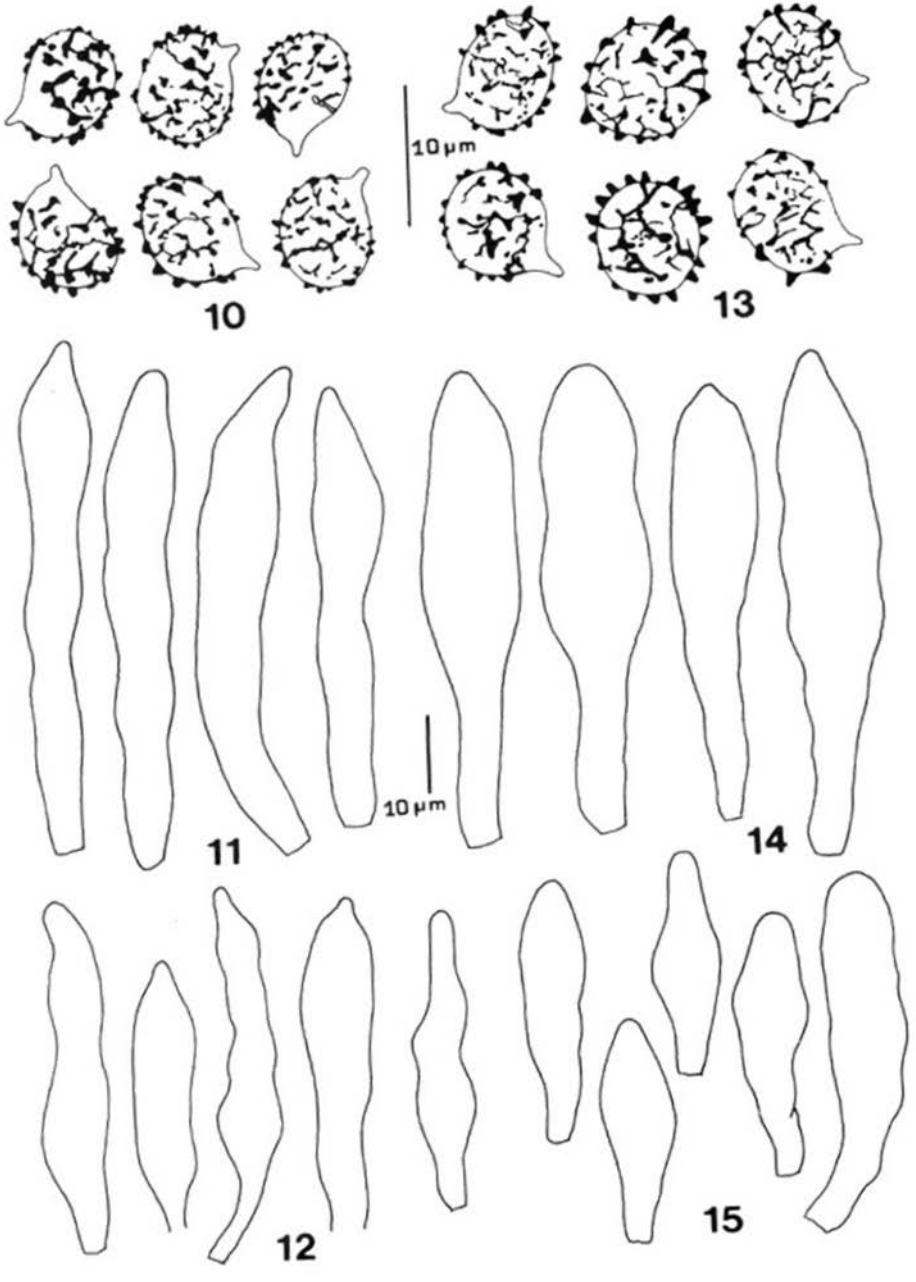
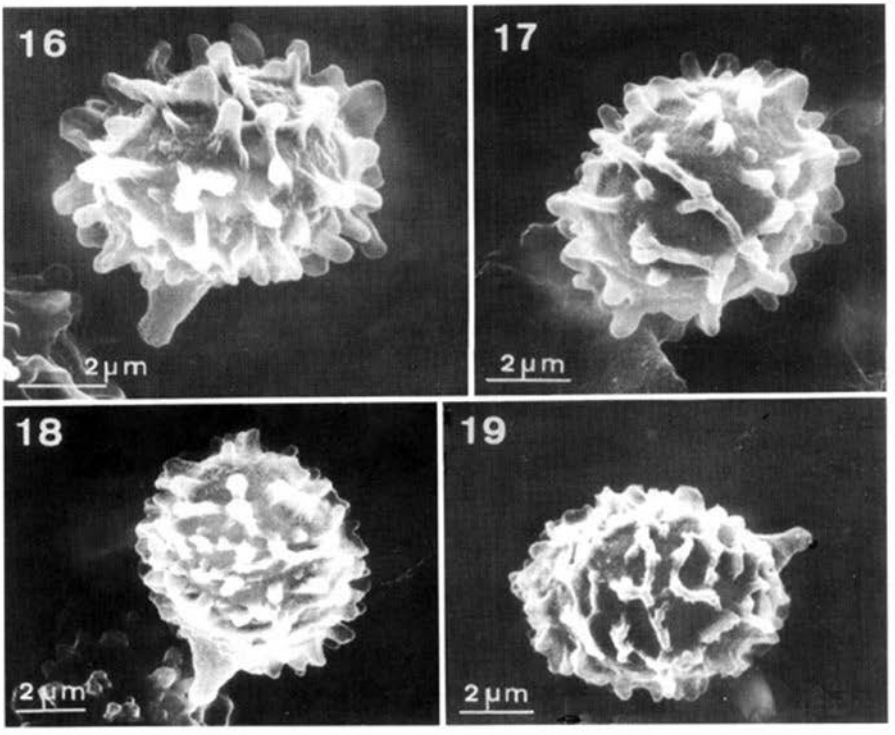


Figs. 10–15 (legend on p. 128).



Figs. 16–19. Basidiospores with SEM. — 16 & 17. *Lactarius vinaceorufescens* (*Smith 6020*, holotype). — 18 & 19. *Lactarius colorascens* (*Atkinson s.n.*, holotype).

scarcely gelatinized; elements hyaline to yellowish. Pileus context heteromerous; sphaerocytes 12–36 µm in diam., yellowish, numerous, with walls up to 2.4 µm thick; hyphae 4–9.6 µm in diam., hyaline to yellowish, infrequent; laticiferous hyphae 5.6–9.6 µm in diam., honey yellow. Hymenophoral trama heteromerous; sphaerocytes 6.4–24 µm in diam., yellowish, conspicuous, in rosettes; hyphae 3.2–6.4(–9.6) µm in diam., intermixed, tightly arranged, hyaline to yellowish; laticiferous hyphae 5.6–8 µm in diam., yellowish, scarce.

Habitat – Gregarious, in a *Pinus–Abies* forest (*Abies hickellii* Flous & Gaussen, *P. ayacahuite* Ehrenb., *P. montezumae* Lambert, *P. patula* Schlecht. & Cham., and *P. pseudostrobus* Lindl.), always collected under associations of *P. patula*, *P. pseudostrobus*, and *P. montezumae*, also nearby *P. patula*.

Material studied. MEXICO: Veracruz, Municipio de Xico, E Cofre de Perote, Los Gallos, 1.5 km al N de Ingenio El Rosario, *Bandala 1865, 2565, 3019, 3023, 3032 & 3036; Castillo 870, 873, 874, 878, 879, 880 & 881; Montoya 1057, 1402, 2172, 2274, 2360, 3222* (holotype, XAL), *3223, 3234, 3272, 3273, 3311, 3414, 3422 & 3428; Ochoa 155; Peralta 23; Nieves 598, 665, 666, 902 & 930* (all at XAL).

Other collections examined. *Lactarius vinaceorufescens*, USA: Michigan, Muskegon Co., *A. H. Smith 6020* (holotype, MICH). *Lactarius colorascens*, USA: New York, Port Jefferson, Aug. 1904, *G. F. Atkinson* (holotype, NYS).

Distinguishing features of this species are the size of the basidiomata, the colour change of latex on exposure, and the darkening of the stipe and lamellae surfaces with age. Microscopically the size and shape of cystidia which are abundant and conspicuous and the basidiospore ornamentation are diagnostic. The presence of rosettes in the hymenophoral trama is also noticeable. The distinctive and immediate yellow staining of the latex, combined with the pileipellis structure support the position of *Lactarius lacteolutescens* in the subgenus *Piperites* subsect. *Croceini* sensu Hesler & Smith (1979). In this group, the species keys out close with *L. colorascens* Peck and *L. vinaceorufescens* A.H. Sm.

According to descriptions by Hesler & Smith (1960, 1979) and the re-examination of the type material, in *Lactarius vinaceorufescens* and *L. colorascens* the basidiomata have a pileus diameter more or less equal to the stipe length (or larger), while in *L. lacteolutescens* the stipe is twice as long as the pileus diameter. *Lactarius vinaceorufescens* has a pileus of 40–120 mm diam. and a stipe of 40–70 × 10–25 mm, and *L. colorascens* a pileus of 25–50 mm diam. and stipe 25–35 × 3–5 mm. Moreover, *L. vinaceorufescens* was reported with paler basidiomata and (apparently) without papillate pileus. On the other hand, microscopic analysis showed that *L. colorascens* (Figs. 10–12 and 18–19) has smaller basidiospores 6–7.2(–8) × 4.8–5.6 µm (L = 7.04 ± 0.10; W = 5.30 ± 0.08; Q = 1.34 ± 0.02), with a less reticulate ornamentation, having more isolated ridges and verrucae, which at times are combined with discontinuous low bands. It has infrequent and shorter cystidia (44–66 × 6.4–8 µm) and scattered isolated sphaerocytes in the lamellae trama. *Lactarius vinaceorufescens* (Figs. 13–15 and 16–17) presents slightly smaller and more globose basidiospores (6.4–)7.2–8 × 5.6–6.4 µm (L = 7.42 ± 0.11; W = 6.08 ± 0.08; Q = 1.22 ± 0.02) bearing isolated ridges and verrucae; cystidia 36–60 × 8.8–12(–13.6) µm, clavate or rarely mucronate and scattered; hymenophoral trama lacking rosettes. Table I shows a comparison of spore dimensions of the three taxa.

Table I. Comparison of the spore dimensions of three different species of *Lactarius* studied.

taxon	dimensions	L ± sd	W ± sd	Q ± sd	n	specimen
L. lacteolutescens	7.2–9.6 × 5.6–6.4	8.27 ± 0.12	6.11 ± 0.07	1.36 ± 0.02	25	holotype
	7.2–8.8 × (5.6–)6.4	8.09 ± 0.12	6.37 ± 0.03	1.27 ± 0.02	25	*Bandala 3036*
	7.2–8.8(–9.6) × 5.6–6.4	8.29 ± 0.13	6.34 ± 0.04	1.31 ± 0.02	25	*Castillo 870*
	8–8.8(–9.6) × 5.6–6.4(–7.2)	8.32 ± 0.09	6.43 ± 0.07	1.30 ± 0.02	25	*Nieves 902*
	7.2–8.8 × (4.8–)5.6–6.4	8.03 ± 0.09	5.95 ± 0.09	1.35 ± 0.02	25	*Montoya 2172*
	7.2–8.8(–9.6) × (4.8–)5.6–6.4(–7.2)	8.20 ± 0.06	6.24 ± 0.09	1.32 ± 0.02		
L. vinaceorufescens	(6.4–)7.2–8 × 5.6–6.4	7.42 ± 0.11	6.08 ± 0.08	1.22 ± 0.02	25	*Smith 6020*
L. colorascens	6.4–7.2(–8) × 4.8–5.6	7.04 ± 0.10	5.30 ± 0.08	1.34 ± 0.02	25	*Atkinson s.n.*

L = mean length; W = mean width; sd = standard deviation; Q = mean of quotient; n = spore number.

ACKNOWLEDGEMENTS

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PERSOONIA
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SQUAMANITA CITRICOLOR, A NEW SPECIES FROM CENTRAL AFRICA

C. BAS[1] & D. THOEN[2]

The new *Squamanita citricolor* is described from Zaire (Democratic Republic of Congo). It has a medium-sized basidiocarp characterized by a glabrous yellow pileus, a whitish to yellowish stipe rising from an ochraceous yellow, obconical, deeply rooting basal bulb, and very thick-walled fusiform pleuro- and cheilocystidia. Because it has to be assumed now that all *Squamanita* species are mycoparasites and that the basal body formerly called protocarpic tuber is in fact a deformed basidiocarp of another species infected by *Squamanita* mycelium it is proposed that the term 'protocarpic tuber' is replaced by the new term 'cecidiocarp'.

In 1971 the second author collected in Zaire a remarkable agaric with a smooth yellow pileus, whitish lamellae, and a whitish to yellowish stipe with remnants of a cortina and rising from a prominent radicating ochraceous-yellow bulb. This collection turned out to represent an undescribed species of *Squamanita*, actually the first species of this genus recorded from Africa.

On account of its large fusiform cystidia this new species, named here *S. citricolor*, seems to be closely related to the widespread *S. umbonata*, known now from North America, Europe and Asia. However, it differs from the latter in its smooth pileus and the very thick wall of the cystidia.

In a very interesting paper Redhead et al. (1994) described the case of basidiocarps of a species of *Squamanita*, named *S. contortipes*, found to be growing on deformed but still recognizable basidiocarps of *Galerina* spp. Although several authors had earlier suggested that members of *Squamanita* are parasites on other agarics (for a survey see Redhead et al., 1994: 1815) this was the first solid proof of the parasitic nature of species of *Squamanita* and persuative evidence that all Squamanitas are mycoparasites.

When it is accepted that the more or less tuber-like basal bodies in *Squamanita* are deformed basidiocarps of other agarics, two major problems concerning the morphology of *Squamanita* are resolved.

The first of these problems was the fact that in the group of species with orange to yellow or yellow-brown pilei these tuber-like bodies have the acrophysalidic tissue typical for *Amanita* and *Limacella* species, whereas in the species with blue-grey pilei acrophysalides are completely lacking. This looked like such a fundamental difference that generic separation of the two groups would be unavoidable. However, when we assume that the acrophysalidic nature of some tubers is a character of the host parasitized by a species of *Squamanita*, it has no bearing on the taxonomy of the genus *Squamanita*.

The second problem was the curious fact that some species of *Squamanita* seem to have two universal veils, viz. one forming a volval limb on the basal tuber and another forming scales at the base of the stipe proper and on the pileus (see Bas, 1965: 353–354).

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This is most apparent in *S. squarrulosa*, described by Ridley (1988) from New Zealand, and would be a unique construction in the agarics. But if the outer volval limb (very evident in some species, hardly visible or absent in others) is interpreted as a remnant of the outer layer of the parasitized basidiocarp of the host and caused by the primordium of the *Squamanita* breaking out of the tissues of the host, then this problem also no longer exists.

Bas (1965: 356) introduced the term protocarpic tuber for the fleshy, short-lived, basal, more or less tuber-like body of Squamanitas from which one or more basidiocarps may arise, and the term was adopted by Singer (1975: 22; 1986: 17). Redhead et al. (1994: 1816) rejected this designation, when it became clear that these protocarpic tubers do not belong to the *Squamanita* basidiocarps but are galls provoked by infection of basidiocarps of other species of agarics with *Squamanita* mycelium. We concur but propose a new term for these galls for two reasons. Firstly, these galls have a very special nature as it is likely that they always produce chlamydospores. In *S. odorata*, they often fail to produce *Squamanita* basidiocarps, but always produce large amounts of chlamydospores, and therefore represent a biologically very important part of the life cycle of *S. odorata*. Secondly, it is useful to have a term available that can be used unaltered in all languages. Therefore we propose replacing the term 'protocarpic tuber' with 'cecidiocarp'.

Squamanita citricolor Thoen, *spec. nov.* — Fig. 1

Pileus 30–40 mm latus, convexus umbonatusque, flavus vel brunneo-flavus, glaber, laevis, siccus, margine appendiculatus. Lamellae subconfertae, adnatae, albidae. Stipes 80–100 × 15–20 mm, parte superiore cylindraceus, albidus vel flavus, cortinae fibrillis albidis ornatus, parte inferiore incrassatus, profunde radicatus, ochraceo-flavus. Sporae 5.7–6.3 × 3.8–4.6 µm, ellipsoideae vel subreniformes vel ovoideae, hyaline, inamyloideae. Cheilocystidia pleurocystidiaque 35–73 × 7–17 mm, fusiformia, crassetunicata, abundantia. Pilei cutis hyphis intricatis vel subradiatis, 2.5–10 µm latis, pallide flavidis composita. Lamellarum trama regularis. Fibulae abundantes.

Holotypus: 'Zaïre, Haut-Shaba, Luiswishi, 14 Dec. 1971, *D. Thoen 5125*' (BR; isotypi L, LFG).

Pileus 30–40 mm wide, first convex with fairly acute, conical umbo, expanding to planoconvex with umbo, uniformly bright yellow in the beginning, later becoming brown-yellow at centre and straw yellow at margin, smooth, glabrous, dry, at margin appendiculate with fibrillose remnants of partial veil. Lamellae moderately crowded, adnate, rather narrow (c. 3 mm wide), white at first, later becoming pale pinkish buff, with entire, concolorous edge. Stipe 80–100 × 15–20 mm (rooting base included); stem proper c. 30–35 × 5 mm, cylindrical, solid, at first whitish and covered with whitish fibrils of partial veil, later concolorous with cap; cecidiocarp c. 50–65 × 15–20 mm, elongate-napiform, tapering towards base, deeply rooting, solid, ochraceous-yellow, without volval scales at transitional zone between stipe and cecidiocarp. Flesh white in pileus and stipe, pinkish brown in cecidiocarp. Smell and taste not recorded. Colour of spore print unknown (probably white or very pale).

Spores [20/1] 5.7–6.7(–7.3) × (3.6–)3.8–4.6 µm, Q 1.35–1.75, average Q 1.55–1.6, ellipsoid to subreniform, sometimes subamygdaliform or ovoid, always with broadly rounded apex, with small abrupt apiculus, with very slightly thickened (c. 0.2–0.25 µm), in NH_4OH 10% pale yellowish, homogeneous wall, smooth, inamyloid, not or weakly metachromatic in cresyl blue, not accumulating Congo red, only a few weakly cyanophilous.

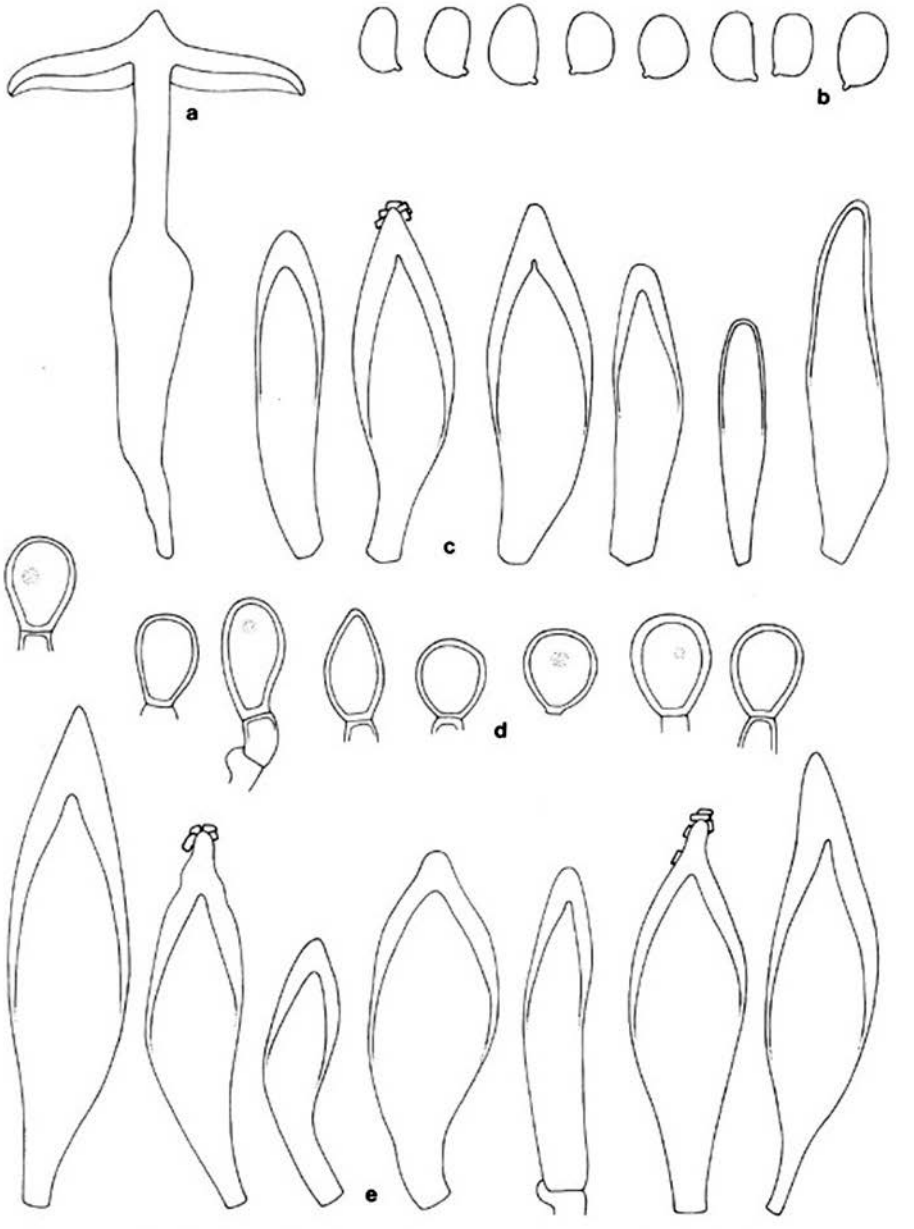

Fig. 1. *Squamanita citricolor* (holotype). a. Basidiocarp on cecidiocarp, × 1; b. basidiospores, × 1500; c. cheilocystidia, × 1000; d. chlamydospores from cecidiocarp, × 1500; e. pleurocystidia, × 1000.

Basidia 4-spored, 27–36 × 7–10 µm, with clamp. Pleurocystidia (39–73 × 8.5–17 µm) and cheilocystidia (35–52 × 7–14.5 µm, intermixed with basidia), very abundant, usually fusiform to ventricose-fusiform, more rarely narrowly clavate, with obtuse to rather acute apex, sometimes mucronate, frequently with small, easily disappearing apical cluster of crystals or lumps of amorphous matter, thin-walled in lower half but very thick-walled in upper part; thickened wall vaguely layered, colourless to yellowish in NH_4OH, weakly metachromatic in cresyl blue, deeply colouring in Congo red, not cyanophilous. Pileipellis a cutis of (near centre) interwoven to (near margin) subradial, 2.5–10 µm wide, thin-walled to very slightly thick-walled, pale yellowish hyphae with clamps and a few usually narrow, refractive hyphae; cutis in radial section from c. 800 µm thick near centre to c. 400 µm thick near margin; hyphae densely packed and more or less agglutinate; pigment difficult to localize. Hymenophoral trama regular, but very slightly divergent in narrow, 10–15 µm thick outer layer, made up of 4–18 µm wide hyphae (narrow near subhymenium, broad and constricted at septa in central part), with scattered but rather abundant elongate packets, 2.5–10 × 1–3 µm, of intercellular crystals. Subhymenium very narrow, 10–15 µm, ramose. Trama of stipe consisting of up to 25 µm wide, thin-walled, colourless hyphae with small clamps and scattered yellowish refractive hyphae. Trama of cecidiocarp abruptly different from that of stipe, composed, of (i) 4–25 µm wide, thin-walled, colourless, branching hyphae, varying from narrow and long-celled to broad and short-celled; (ii) fairly abundant, erect, clavate, thin-walled, terminal cells (acrophysalides), 130–310 × 35–75 µm, sometimes with yellowish contents; (iii) abundant brownish yellow, coiling and undulating, 5–20(–30) µm wide, refractive hyphae, and (iv) small, scattered, solitary, obovoid to clavate, rarely ventricose-fusiform, very thick-walled (1.2–1.5 µm), yellow-brown, terminal chlamydospores, 7.5–8.5(–10.5) × 5.5–7(–8.5) µm, inamyloid, not accumulating Congo red, with inner layer very slowly metachromatic in cresyl blue, not cyanophilous, rather abundant in cortical layer, rare elsewhere. Clamps abundant.

Habitat —Terrestrial in dense, dry forest; found in rainy season.

Distribution —Known only from type-locality in Zaire.

Collection examined. ZAIRE: distr. Haut-Shaba, Luiswishi 22 NNE of Lumbumbashi, 1,210 m alt., 14 Dec. 1971, *D. Thoen 5125* (holotype, BR; isotype, L and LFG).

Squamanita citricolor is very well characterized by the glabrous, bright yellow to yellow-brown cap, the glabrous base of the stem and upper part of the cecidiocarp, and the thick-walled pleuro- and cheilocystidia.

In view of the heavy fibrillose-squamose volval decoration of the pileus and the base of the stipe in the related species *S. umbonata* and *S. schreieri*, the total absence of volval remnants from the mature basidiocarp of *S. citricolor* is rather surprising. It looks as if the distribution of the vela in this species is a sixth to be added to the five types illustrated by Bas (1965: 353). The hyphae of the pileipellis being agglutinate, it is, however, possible that under very wet conditions the cap is viscid and that in the type-collection the volval remnants have been washed away. But in that case one would expect to find at least a few volval fragments at the base of the stipe and/or on the top of the cecidiocarp. The true nature of the volva in this species will be revealed only when some very young basidiocarps are collected.

RÉSUMÉ

Une nouvelle espèce, *Squamanita citricolor*, est décrite du Zaïre (actuellement 'République démocratique du Congo'). Il s'agit de la première espèce du genre en Afrique. Le basidiocarpe de dimension moyenne est caractérisé par un chapeau jaune, glabre, un stipe blanchâtre à jaunâtre émergeant d'un bulbe basal obconique, jaune ocre, profondément radicant, ainsi que par des pleuro- et des cheilocystides fusiformes, à parois très épaisse. Par ses larges cystides fusiform, *S. citricolor* rappelle *S. umbonata*, une espèce à vaste aire de répartition, connue actuellement d'Amerique du Nord, d'Europe et d'Asie. *Squamanita citricolor* n'es connu que de la localité type où il croît au sol, dans une forêt dense sèche (appelée localement 'muhulu') de la province du Haut-Shaba (anciennement 'Haut-Katanga').

En raison du mycoparasitisme probable de toutes les espèces du genre *Squamanita*, la partie basale, qualifiée précédemment de 'tubercule protocarpique', est en fait un basidiocarpe déformé d'une autre espèce infectée par le mycélium du *Squamanita*. En conséquences, les auteurs proposent de remplacer le terme 'tubercule protocarpique' par le nouveau terme 'cécidiocarpe'.

ACKNOWLEDGEMENTS

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VALIDATION OF HYDROPUS SCABRIPES VAR. QUADRISPORUS AND PSEUDOBAEOSPORA FRIESLANDICA

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Arnolds et al. (1995: 232) announced the publication of *Hydropus scabripes* var. *quadrisporus*, but until now this did not appear. The creation of this variety became necessary when it turned out that the type of *H. scabripes* (Murrill) Sing. has 2-spored basidia.

Hydropus scabripes var. **quadrisporus** Bas, *var. nov.*

Varietatis typicae similis, sed basidia tetraspora. — Typus: '*J. Schreurs 738*, 6 October 1982, Belgium, prov. Namur, Payenne south of Celles' (L).

Main characters of the type collection: Pileus up to 26 mm in diam., plano-convex with umbo, dark grey-brown (Munsell 5YR 4/2), but paler towards translucently striate margin, becoming rugulose on drying. Lamellae pale grey with concolorous edge. Stipe up to 90 × 2.5 mm, silvery white above to greyish cream at base, minutely pruinose.

Spores 7.9–9.9(–11.1) × 4.5–5.2 µm, Q = 1.55–1.95, average Q 1.8, amyloid, ellipsoid to oblong, often slightly tapering towards apiculus, thin-walled. Basidia 4-spored, with clamp-connections. Pleurocystidia abundant, 65–86 × 13.5–18.5 µm, lageniform to subutriform or narrowly conical, always with broadly rounded apex, usually with abrupt, long, narrow pedicel, thin-walled. Cheilocystidia similar but often somewhat smaller. Pileipellis a cutis with scattered terminal or lateral clavate to subcylindrical pileocystidia with brown vacuolar pigment. Caulocystidia single or in clusters, 27–44 × 7–17 µm, slenderly to broadly clavate, colourless.

Habitat —Terrestrial in deciduous forest.

Pseudobaeospora frieslandica has been fully described and illustrated in the third volume of the Flora agaricina neerlandica and was supposed to be validated later on (Bas, 1996). Unfortunately, it was omitted then to indicate where the type is deposited.

Pseudobaeospora frieslandica Bas ex Bas, *spec. nov.*

Pseudobaeospora frieslandica Bas in Bas et al., Fl. agar. neerl. 3 (1995) 135, fig. 135 (inval.); ditto Bas, Persoonia 16 (1996) 255 (inval.).

Typus: '*J. Wisman*, 18.X.1984, Netherlands, prov. Friesland, Ouderhornstercompagnie' (L).

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ENTOLOMA EXIGUUM, A NEW SPECIES OF SUBGENUS CLAUDOPUS (ENTOLOMATACEAE, AGARICALES) FROM SPAIN

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Entoloma exiguum sp. nov. is described. It belongs to subgenus *Claudopus* and is characterized by the tiny size, very reduced stipe, white colours of the fruit-bodies, tapering pileus hairs and spores with 6–8 angles. A discussion about some other close taxa is given, as well as drawings of micromorphological characters.

During the summer of 1997, a species of *Entoloma* (Fr.) P. Kumm. with tiny fruit-bodies, belonging to the subgenus *Claudopus* Gillet, was discovered growing gregarious among detritus under herbaceous plants at the edge of a reservoir. The locality is situated on marl and limestone, and was formerly used as a vegetable garden remaining abandoned since the construction of a dam. The river banks where the fruit-bodies were found become flooded only in rainy years. They remain inundated only for a short period during the summer, before water is taken from the reservoir to irrigate downstream fields. As a consequence of this, a particular amphibious vegetation develops similar to that of calcareous vernal ponds, with *Gnaphalium luteo-album*, *Pulicaria paludosa*, *Potentilla supina*, *Juncus gerardii*, *Plantago major* subsp. *intermedia*, *Crypsis schoenoides*, etc. (de la Cruz et al., 1995). Deposition of floating organic matter, mainly mud and plant debris, takes place over this vegetation, generating a belt of nitrophilous vegetation around the banks of the reservoir. *Polygonum lapathifolium*, *Polygonum persicaria*, *Eragrostis minor* and other herbaceous species, under which the fruit-bodies were collected, usually cover this belt.

According to Hawksworth et al. (1995), the number of *Claudopus* taxa known is about 20, mostly from the northern hemisphere. In Europe, according to Noordeloos (1992, 1995), in section *Claudopus* seven species have been recognized, but some others will probably be discovered in future. In this section, the small size of the basidiomata and some possible confusions with other 'crepidotoid' agarics are probably the cause of this actual reduced number. The taxa belonging to section *Claudopus* show little macroscopic variation and their colours range predominantly from whitish to greyish (exceptionally bluish!); nevertheless, microscopic characters, especially related to sporal shape and type of covering layers, are quite different and permit a clear distinction among many taxa. In this section some species show a characteristic farinaceous or mephitic (garlic-like) smell, such as *Entoloma mephiticus* (Murrill) Hesler or a still undescribed new species recently found in Spain (Horak et al., in prep.), but many of them are odourless. Other species show a peculiar parasitic or saprophytic relationship with other fungi, e.g. *Entoloma parasiticum* (Quél.) Kreisel or *E. pseudoparasiticum* Noordel.

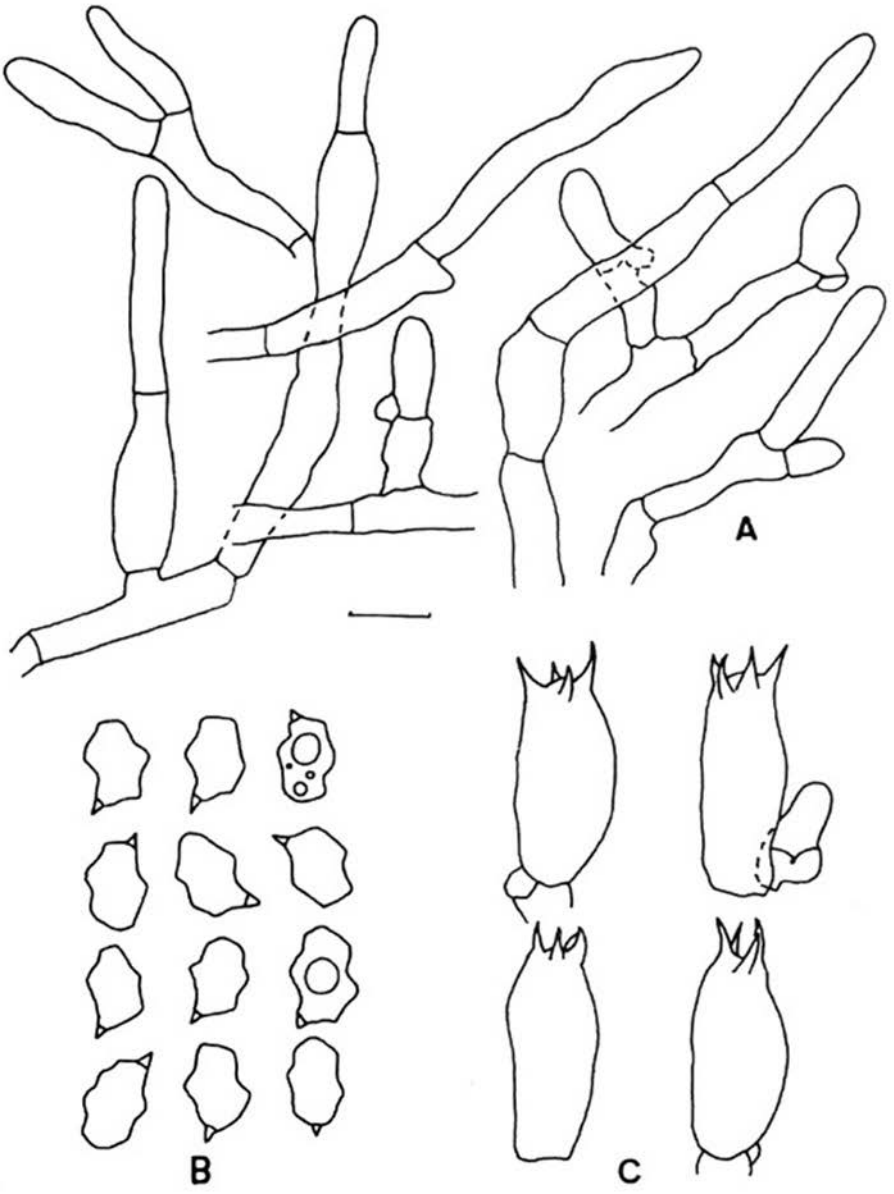

Fig. 1. *Entoloma exiguum* (AH 23321, holotypus). A. Terminal cells of the pileipellis; B. spores; C. basidia. — Bar = 10 µm.

Entoloma exiguum Esteve-Rav. & M. de la Cruz, *spec. nov.* — Fig. 1

Pileus 2–5 mm latus, plano-convexus vel applanatus, haud hygrophanus, haud translucido-striatus, candidus, pubescenter tomentosus; lamellae distantes, adnatae vel decurrentes, primo candidae, demum roseae, acie lamellarum concolore. Stipes usque ad 1.5 × 0.3–0.5 mm, excentricus vel lateralis, curvatus, candidus, pubescenter tomentosus. Odore nullo. Sporae 9.5–12 × 6.5–8.3 µm, Q = 1.15–1.75, 6–8 angulatae. Basidia utriformia, 4-spora. Cheilocystidia et pleurocystidia desunt. Tegimen pilei in trichoderma abiens, hyphis 4–12 µm latis, septatis cylindricis, extremis partibus attenuatis. Fibulae praesentes ad basim basidiorum. Pigmentum desunt. In detritis putridis et residuus plantarum.

Holotypus: Hispania, Guadalajara, Palmaces, 17 Aug. 1997, *M. de la Cruz & M. Martínez*, in herb. Alcalá (AH 23321) conservatur.

Pileus 2–5 mm diam., plano-convex to applanate, becoming slightly depressed when old, not hygrophanous, not translucently striate, white, white pinkish when old because of the colour of the lamellae, uniformly hairy-furfuraceous, especially at the centre, less so when old. Lamellae well-developed, L = 7–12, distant, adnate to distinctly decurrent, sometimes forked, at first white, then becoming pink, with concolorous, entire edge; lamellulae l = 0–1. Stipe up to 1.5 × 0.3–0.5 mm, central to distinctly eccentric, white, tomentose. Smell none.

Spores 9.4–12 × 6.4–8.3 µm (average 10.8 × 7.4 µm), Q = 1.15–1.75, average Q = 1.45 (n = 21), 6–8 angled in side-view, some with subundulating outline. Basidia 25–32 × 11–12.5 µm, typically utriform, with clamp-connection at the base. Lamella edge fertile. Pileipellis a trichodermis with attenuated, septate hyphal ends, constricted at the septa, 4–12 µm wide, without pigment. Lamellar trama regular to almost regular, made up of branched hyphae 3–10 µm wide. Stipe covering similar to that of pileus. Clamps present in the hymenium, scattered in the other parts of the fruit-body.

Material studied. SPAIN: Guadalajara, Pálmaces, Pálmaces reservoir, north edge, 30TWL0545, 890 m alt., 17 Aug. 1997, among plant detritus in half-flooded calcareous soils, *M. de la Cruz & M. Martínez* (holotype, AH 23321).

The 'crepidotoid' habit of *E. exiguum* clearly places this species in *Entoloma* subgenus *Claudopus* section *Claudopus*. The combination of typically attenuated and septate hairs of the pileipellis, together with the utriform, short basidia, the spores with very angular to subundulate outline and the presence of clamp-connections are characteristic.

Species with white colours, of which habit and ecology might resemble *E. exiguum*, are *E. albotomentosum* Noordel. & Hauskn. and *E. jahnii* Wölfel & Winterh. Both have been found growing on plant and grass debris, in paludicolous and silvicolous habitats. *Entoloma albotomentosum* is very similar to *E. exiguum*, but it is clampless, has larger basidia, and the spores are less angular (4–6 angled) with a different shape (Noordeloos & Hausknecht, 1989). *Entoloma jahnii* is characterized by the presence of clavate to subcapitate hairs in the pileipellis and stipitipellis and, like *E. exiguum*, has clamps in the hymenium, though its spores seem to be different too (Wölfel & Winterhoff, 1993).

Though it shows an encrusting greyish pigment in the fruit-bodies, *E. ollare* Ludwig & Rödig somewhat resembles our new species in the pileipellis structure, but was found in a very peculiar habitat, a flower-pot, and its farinaceous smell and a well developed stipe would place it occupying an intermediate position between sections *Claudopus* and *Undati* (Ebert et al., 1992).

From North America, none of the *Claudopus* taxa described or commented on by Hesler (1967), Noordeloos (1988), Baroni (1990), and Largent (1994) fit in with *E. exiguum*. In literature concerning *Entoloma* sensu lato from areas in central America and the southern hemisphere (Dennis, 1961; Horak, 1973, 1978, 1980, 1982; Pegler, 1977a, 1977b, 1986, 1988; Romagnesi, 1941; Romagnesi & Gilles, 1979), we have not been able to find any taxon showing the combination of characters of the new species. It seems that the subgenus *Claudopus* is poorly represented at these latitudes too.

ACKNOWLEDGEMENTS

One of the authors (F.E.R.) wishes to thank the DGICYT (Ministerio de Educación y Cultura) for granting the Research Project 'Flora Micológica Ibérica III' PB 95-0129, in which these results are included. We also want to thank Dr. M.E. Noordeloos (Leiden) for critical revision of the manuscript.

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PERSOONIA
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MYCENA VERNA, A NEW SPRINGTIME SPECIES OF SECTION FRAGILIPEDES FROM GERMANY

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Mycena verna, a vernal species collected in western Germany, is described as a member of section *Fragilipedes* and compared with other species of the section.

Recently, the Rijksherbarium received two dried specimens of an agaric, along with macroscopical notes and a colour photograph. The collector, Mr. M. Meusers, Meerbusch, Germany, took the specimens home for inspection, only to discover under the microscope they were not the species he had expected to find: *Mycena abramsii* (Murrill) Murrill. The species appears to be an undescribed member of section *Fragilipedes*.

Mycena verna Maas G., *spec. nov.* — Figs. 1–5

Basidiomata caespitosa. Pileus 15–30 mm latus, e convexo applanatus, late umbonatus, striatus, siccus, leviter pruinosus, pallide flavido-brunneus, centro obscurior. Caro odore tenui, subalcalino. Lamellae 28–33 stipitem attingentes, molles, adscendentes, c. 2 mm latae, ventricosae, anguste adnatae vel dente decurrentes, aetate venosae, albidae, margine concolores. Stipes 60–70 × 2–3 mm, cavus, fragilis, aequalis, cylindraceus, siccus, levis, glaber, pallide brunneolus, sursum albidus, basi albo-fibrillosus.

Basidia 27–30 × 7–8 µm, clavata, 4-sporigera, fibulata. Sporae 8.5–9.8 × 5.2–5.4 µm, inaequilateraliter ellipsoideae, leves, amyloideae. Cheilocystidia 30–36 × 5.5–9 × 2.7–4.5 µm, haud numerosa, subfusiformia, sublageniformia, fibulata, levia. Pleurocystidia similia. Trama lamellarum iodi ope rubrobrunnea. Hyphae pileipellis 3.5–6.5 µm latae, fibulatae, diverticulatae. Hyphae stipitis corticales 1.5–2.5 µm latae, fibulatae, leves.

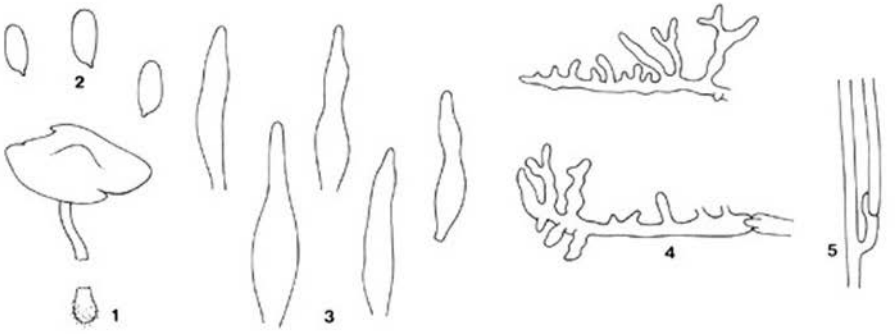
Ramicola.

Holotypus: *M. Meusers E3487* (L, No. 996.157-274); isotypus: Herb. M. Meusers.

Etymology: vernus, appearing in the spring.

Basidiomata cespitose. Pileus 15–30 mm across, at first convex, then flattening, with broad umbo, translucent-striate, dry, finely pruinose beige-brownish, darker at the centre. Context with weak alkaline odour. Lamellae 28–33 reaching the stipe, tender, ascending, c. 2 mm broad, ventricose, narrowly adnate or decurrent with a tooth, venose-anastomosing at the base, whitish, with concolorous edge. Stipe 60–70 × 2–3 mm, hollow, fragile, equal, terete, dry, smooth, fully glabrous, pallid-brownish, apically whitish, the base densely covered with whitish fibrils.

Basidia (immature) 27–30 × 7–8 µm, clavate, 4-spored, clamped. Spores 8.5–9.8 × 5.2–5.4 µm, pip-shaped, Q = 2.2, smooth, amyloid. Cheilocystidia 30–36 × 5.5–9 × 2.7–4.5 µm, not numerous, not forming a sterile band, hardly protruding, subfusiform, sublageniform, clamped, smooth. Pleurocystidia similar to the cheilocystidia, scarce. Lamellar trama red-brown in Melzer's reagent. Pileipellis a cutis of repent, radiately aligned hyphae which



Figs. 1–5. *Mycena verna* (holotype). 1. Pileus and basal part of the stipe; 2. spores; 3. cheilocystidia; 4. fragments of the hyphae of the pileipellis; 5. hyphae of the cortical layer of the stipe. — Fig. 1, × 0.5; all others, × 700.

are 3.5–6.5 µm wide, clamped, not embedded in gelatinous matter, covered with simple to furcate, cylindrical to somewhat irregular, moniliform excrescences 2–18 × 2.5–4.5 µm. Hypoderm made up of hyphae with inflated cells. Hyphae of the cortical layer of the stipe 1.5–2.5 µm wide, clamped, smooth, not embedded in gelatinous matter.

Growing on a fallen, decayed branch of a broad-leaved tree.

Holotype: 'Fungi germanici, Nordrhein-Westfalen, Mönchengladbach, 7 May 1994, *M. Meusers, E3487*' (L, 996.157-274); isotype: herb. M. Meusers (P.O. Box 2355, 40646 Meerbusch, Germany).

Mycena verna is a member of section *Fragilipedes* and seems, at least in the key to the species (Maas Geesteranus, 1988a: 45), to be close to *Mycena subexcisa* (P. Karst.) Sacc. The arguments for this supposed proximity are (1) diverticulate hyphae of the pileipellis which are not embedded in gelatinous matter; (2) presence of pleurocystidia; (3) and a rather large number of lamellae. *Mycena verna* differs, however, from *M. subexcisa* (Maas Geesteranus, 1981a: 228) among other things in the occurrence among broad-leaved trees, cespitose habit, fully glabrous stipe, hardly prominent cheilocystidia, manifestly broader spores, those of *M. subexcisa* being Q = about 1.8.

Among the European members of section *Fragilipedes*, there are two further vernal species which exhibit a cespitose or subfasciculate habit and grow on debris of deciduous trees. These are *M. abramsii* (Murrill) Murrill (Maas Geesteranus, 1988a: 50) and *M. laevigatoides* Maas G. (1988b: 132). The former species may already be recognized in the field by its raphanoid smell when collected, as well as by the copious, watery juice when its stipe is broken. Microscopically, *M. abramsii* may be told by most of the cheilocystidia having sharp-pointed necks. The second species can be distinguished from *M. verna* by the ivory white pileus, its pruinose stipe and the cheilocystidia forming a sterile band.

If a combination of features such as smooth cheilocystidia, presence of pleurocystidia, diverticulate hyphae of the pileipellis and smooth hyphae of the stipe cortex may be considered an indication of close affinity, *Mycena verna*, *M. fragillima* A.H. Smith (Maas Geesteranus, 1988a: 79) and *M. leptocephala* (Pers.: Fr.) Gillet (Maas Geesteranus, 1988b: 134) would have to be regarded as related species. However, both *M. fragillima* and *M. leptocephala* deviate from *M. verna* in having striking caulocystidia.

The names of two species should be briefly mentioned on account of possible confusion. *Mycena vernalis* Velen. (1920: 316), to all appearance (Maas Geesteranus, 1984: 316), is no other than *Mycena galericulata* (Scop.: Fr.) S.F. Gray.

Mycena vernalis H. von Post ex Lundell (1937: 187), subsequently renamed *Mycena majalis* Lundell (Lundell & Nannfeldt, Fungi exs. suec., praes. upsal., Fasc. 19–20: 46. 1941), was discovered by Moser to be identical with *Mycena strobilicola* Favre & Kühn. (Maas Geesteranus, 1981b: 436).

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DERMOLOMA CYSTIDIATUM, A NEW SPECIES OF DERMOLOMA (AGARICALES) FROM INDIA

P. MANIMOHAN[1] & E. ARNOLDS[2]

Dermoloma cystidiatum, collected in grassland in Kerala, India, is proposed as a new species belonging in section *Atrobrunnea*. It is compared with other species of this section. The sterile lamella edge lined with cheilocystidia is unique in *Dermoloma* so far.

An undescribed species of *Dermoloma* has been collected on several occasions in large quantities in Kerala, India. It is similar in macroscopic appearance to most other species of this genus but differs from all species described so far in the grey discoloration of the lamellae on bruising and the sterile edge of the lamellae, lined with cheilocystidia. It is described in this paper as *Dermoloma cystidiatum*. Colour notations used (K&W) are those of Kornerup & Wanscher (1978).

Dermoloma cystidiatum Manimohan & Arnolds, *spec. nov.* — Fig. 1

Pileus 10–70 mm latus, conico-convexus vel convexus, obtuse umbonatus, dein applanatus vel depressus, obscure griseo-brunneus, dein pallide brunneus vel brunneo-griseus, siccus, glaber. Lamellae adnatae dente decurrente vel subdecurrente, albae, dein griseo-albae vel violaceo-griseae, griseascens, margine concolore. Stipes 20–60 × 3–15 mm, aequalis, solidus, albidus, griseo-brunneus pruinatus. Caro crassa, griseola, fragilis, odore nullo, sapore farinaceo. Sporae albae.

Basidia (15–)20–29 × 4–6.5 µm, clavata, 4-sporigera. Sporae 3.5–5.5(–6.0) × 3.0–4.0(–4.5) µm, late ellipsoideae vel ellipsoideae, leves, hyalinae, amyloideae. Cheilocystidia 17–36 × 2.5–5.5 µm, subcylindracea, clavata vel lageniformia, levia vel apice subramosae. Pleurocystidia nulla. Trama lamellarum subregularis, inamyloidea. Pileipellis hymenidermium pluristratum vel unistratum, cellulae subglobosae, clavatae vel pyriformes 8–45 × 6–18 µm, saepe tunicis brunneis. Stipitipellis cutis, hyphae 2–8 µm latae. Caulocystidia gregaria, clavata vel subcylindracea, 10–50 × 7–18 µm. Fibulae frequentes. Ad terram in pratis.

Holotypus: India, Kerala State, Calicut University Campus, 28.VI.1995, *P. Manimohan M627C* (WBS; isotypus in L).

Pileus 10–70 mm wide, conico-convex to convex, often somewhat obtusely umbonate, with inflexed margin, then applanate, finally slightly depressed in some sporocarps, initially dark greyish brown (K&W 8F2, 8F3, 7F4, 7F3), fading to brown, pale brown, or pale brownish grey (7E4, 6D4, 5D4, 8D2) dry, smooth, not striate, when dry with dull, pruinose appearance. Lamellae adnate with decurrent tooth to subdecurrent, crowded, up to 5 mm wide, often interveined, white, soon greyish white (5B2), gradually becoming violet-grey from edge upwards, turning greyish when bruised, with entire, concolorous edge. Stipe

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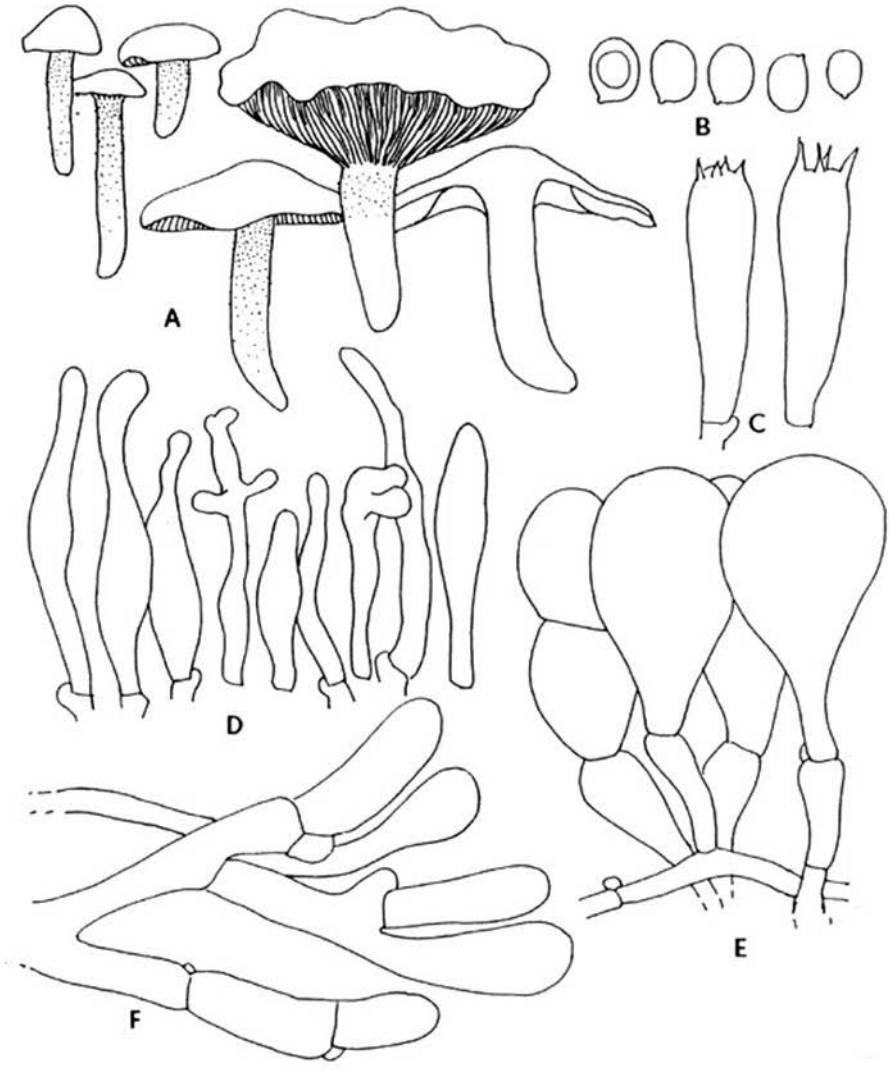

Fig. 1. *Dermoloma cystidiatum*. A. basidiocarps (×0.7); B. spores; C. basidia; D. cheilocystidia; E. pileipellis; F. caulocystidia (Figs. B–F, × 1400).

20–60 × 3–15 mm, equal or slightly tapering to the base, terete or slightly compressed solid, whitish, greyish brown pruinose to subsquamulose, more densely pruinose towards the apex, without distinct basal mycelium. Context thick, greyish, brittle. Odour not distinctive, taste farinaceous. Spore print white.

Spores 3.5–5.5(–6.0) × 3.0–4.0(–4.5) µm, Q = (1.15–)1.2–1.5(–1.55), broadly ellipsoid to ellipsoid, thin-walled, smooth, hyaline, in Melzer violet (amyloid). Basidia (15–)20–29 × 4–6.5 µm, slenderly clavate, 4-spored, sterigmata up to 4 µm long. Lamella edge sterile, made up of densely packed cheilocystidia, 17–36 × 2.5–5.5 µm, versiform: subcylindrical, clavate or slenderly lageniform, often forked or with some large, rounded excrescences. Pleurocystidia absent. Hymenophoral trama subregular; hyphae 1.5–15 µm wide, thin-walled, hyaline, inamyloid. Pileipellis a unistratous to pluristratous hymeniderm, made up of erect, branched hyphae with swollen, pyriform, sphaero-pedunculate to subglobose terminal cells, 8–45 × 6–18 µm with slightly thickened, smooth, brownish walls; subterminal cells mostly slightly inflated, with slightly thickened, brownish wall. Hypodermial hyphae often with faint, hyaline, spiral incrustrations. Pileitrama interwoven, hyphae 1.5–15 µm wide, hyaline. Stipitipellis a cutis, made up of repent hyphae, 2–8 µm wide, with hyaline or pale brown incrusted walls, producing dense clusters of caulocystidia or recurved hyphal tips with swollen apices. Caulocystidia 10–50 × 7–18 µm, mostly clavate, also cylindrical, fusiform, subglobose or constricted, often with a slightly thickened, brown wall. Clamp-connections present in all tissues.

Terrestrial, solitary or in small groups, in overgrazed, poor grassland with scattered rubber trees (*Hevea brasiliensis* (H. B. & K.) Muell.-Arg.).

Collections examined. INDIA: Kerala State, Calicut University Campus, 19 June 1995, *P. Manimohan M627a* (WBS); 20 June 1995, *P. Manimohan M627b* (WBS); 28 June 1995, *P. Manimohan M627c* (holotype WBS); 3 July 1995, *P. Manimohan M627d* (WBS); 1 July 1997, *P. Manimohan M627e* (Herb. Manimohan); 8 July 1997, *K.M. Leelavathy M627f* (Herb. Manimohan); 10 July 1997, *P. Manimohan M699* (Herb. Manimohan).

This fungus is a typical representative of the genus *Dermoloma*, characterized, among other things, by a hymeniderm with parietal, brownish pigment and small, hyaline spores. It differs from all species described so far in the consistently sterile edge of the lamellae, lined by cheilocystidia. Furthermore, the grey staining of bruised lamellae has not been reported for any other species. In view of the amyloid spores, *D. cystidiatum* belongs in section *Atrobrunnea* (Singer, 1975). It is rather similar to *D. scotodes* (B. & Br.) Pegler, described from Sri Lanka, but that species further differs in having an almost white pileus margin, slightly larger and more elongated spores (5.2–6.5 × 3.2–3.7 µm) and a white (instead of grey-brown) flocculose stipe (Pegler, 1986). Spore size and pileus colour are more similar to *D. atrobrunneum* (Dennis) Sing. from Central America, but that species differs also in having a grey-brown stipe with dark brown fibrils (Pegler, 1983). *Dermoloma cystidiatum* is also related to the European species *D. josserandii* Dennis & P. D. Orton, in particular to var. *phaeopodium* (P. D. Orton) Arnolds with a dark brown pileus. Differences are, next to the presence of cheilocystidia and the staining of the lamellae on bruising, the presence of grey-brown (instead of white) dots on the stipe and slightly smaller spores in *D. cystidiatum* (Arnolds, 1993). A grey-brown dotted stipe has been described so far only from *D. cuneifolium* (Fr.: Fr.) M. Bon var. *punctipes* Arnolds, a taxon with inamyloid spores (Arnolds, 1992).

Dermoloma cystidiatum has been collected repeatedly in great quantities on the type locality. The habit and size of sporocarps showed a remarkable variability, even within this single population. A similar variation was reported by Arnolds (1992) for *D. cuneifolium* in western Europe.

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BOOKS RECEIVED BY THE RIJKSHERBARIUM LIBRARY

A.E. Bessette, A.R. Bessette & D.W. Fischer. *Mushrooms of Northeastern North America.* (Syracuse University Press. The Eurospan Group, 3 Henrietta Str., London WC2E 8LU. 1997.) ISBN 0-8156-2707-6 (hardcover), 0-8156-0388-6 (paperback). Pp. 584, 1 text-fig., many colour photographs. Price: hardcover UK £ 51.95, paperback UK £ 23.95.

The mycoflora of the northeastern part of North America is introduced in this overview of representatives of all groups of fungi, except microfungi. The area which is covered reaches from North Carolina in the south east to Kansas in the south west and Manitoba in the north west; the Atlantic Ocean is the eastern border. This book is the first attempt to make a unified survey of this area, many parts of which still await study. The book is very much an overview, as only 1500 species are described and keyed out, and of these 600 are described more fully and illustrated with colour photographs. Unfortunately, a 'rationale' for the choices made, either in the selection of the 1500, or the 600 species to treat more fully, is not given.

Fungi have been divided into 22 major groups, represented by colour illustrations of representatives from each group, while the species descriptions constitute the main part of the book, with genera arranged in alphabetical order within groups. Briefer descriptions of the non-depicted species are included within the keys. The keys themselves are not dichotomous and as many as nine alternatives are given on occasion. The user may have to work through every alternative before concluding that a fungus is not keyed out at all. In some keys one of the first steps requires knowledge that is not visible on the fruit-body itself. Several species-rich genera, e.g. *Cortinarius*, *Inocybe*, and *Russula*, lack keys entirely and are represented by only a few of the more common and distinctive species. Photographs are arranged according to the major groups and follow the treatment of the group. While small (8 or 7 per page), the quality is in most cases good. Examples of the less felicitous ones are *Squamanita umbonata* and *Strobilurus conigenoides*.

A minor point of criticism concerns the naming of authors. It looks as if a computer program has changed every 'ex' into a colon, regardless of its meaning, so strange citations are the result (e.g. *Laccaria nobilis* Mueller: Smith instead of 'Smith in Mueller'; *Pucciniastrum potentillae* Komarov: Jaczewski, Komarov, and Tranzsche; *Xylaria polymorpha* (Persoon: Mérat) Greville where the correct form is '(Persoon: Fries) Greville'). The same kind of computer abuse is probably the cause of mis-spellings of authors' names, e.g. 'Bonorden' instead of 'Bon', and 'Venturi' where 'Ventenat' is the author.

Very short introductions to mycophagy, microscopy and chemical reagents, a glossary, lists of mycological literature and guide books, and indices, both to common and Latin names, complete the work. The language is informal and the use of technical terms has been reduced to a minimum. But despite this, the book will be difficult to use. This is caused first of all by the structure of the keys, which form the most important part of the book. The lay-out of the keys, which is very quiet and pleasant on first view, becomes very monotonous without visual points of reference, and further hampers easy usage. In short, this book is neither a field guide, nor a flora, and it demonstrates that good keys are difficult to make.

A. Bidaud, P. Moënne-Loccoz & P. Reumaux. *Atlas des Cortinaires. Les Cortinaires Hinnuloides. Hors-série No. 1.* (Éditions Fédération Mycologique Dauphiné-Savoie, 70 rue Édison, F-69330 Meyzieu, France. 1997.) Pp. 157, 42 text-figs., 34 col. pls. Price: FF 350.00.

The genus *Cortinarius* has the reputation of being the most difficult and species-rich of all Agaricales genera. A team of French *Cortinarius* specialists has set out to tackle the genus, to provide keys to its species, with descriptions and crayon drawings for all of them. Their work is presented in the series 'Atlas des cortinaires', of which 9 volumes have appeared so far. The present volume is the first to be published 'outside' the main series and gives an overview of section *Hinnulei* in subgenus *Telamonia*, a notoriously difficult group of brown mushrooms. The book starts with a one-page philosophical introduction and an additional half-page of quotation. There mycology is defined as "un contenant contradictoire en devenir transfini" and it is asserted that the "contradictoire et le contradictoire seul" is what allows mycology to make sense. Perhaps this is why as many as 40 new species, four new varieties, and three new formae are presented. Keys are given to the infrasectional en-tities, many of which are also described as new (even stirpes are given Latin descriptions), and to the species. The user of the keys will be hampered by lack of explanation of used terms, and by the fact that in keys to stirpes characters are said to be present in the more typical members of the group. The presentation is an historical overview, followed by commentaries in which species descriptions are embedded and illustrated with black and white line drawings. Unfortunately the quality of these drawings is very poor in comparison to the excellent colour crayon drawings at the end of the book. As an illustration of French cortinariology, particularly as expressed in the works of Henry, this is an important work, though whether in practice it can be used to determine hinnuloid *Cortinarius* species is seriously to be doubted.

H. Clémençon. *Anatomie der Hymenomyceten.* (Kommissionsverlag, F. Flück-Wirth, Internationale Buchhandlung für Botanik und Naturwissenschaften, CH-9053 Teufen, Switzerland. 1997.) ISBN 3-7150-0040-6. Pp. 996, 842 text-figs. Price: SFR 80.00.

The publication of this extremely thorough monograph on the morphology and anatomy of the Hymenomycetes is undoubtedly a milestone in mycology. In the introduction the author writes that modern molecular biology, biochemistry and genetics have led to an enormous revaluation of biology, but that simultaneously a deplorable tendency has developed to neglect or even suppress research on the morphological diversity of organisms and that this book is written for those who still believe that the knowledge and the study of the total organism is essential for biology. With some understatement the author calls this book of nearly 1000 pages a modest attempt to upgrade the appreciation of organismal biology.

There are ten chapters: 1. General biology of Hymenomycetes (10 pp.); 2. The hyphae of the Hymenomycetes (cytology of the vegetative mycelium; modified hyphae) (99 pp.); 3. The mycelium (e.g. mycelial growth, hyphal fusions, differentiations, rhizomorphs, mycorrhiza, etc.) (115 pp.); 4. Bulbils, sclerotia and pseudosclerotia (65 pp.); 5. Mitospores (69 pp.); 6. Basidia and basidiospores (149 pp.); 7. Cystidia, pseudocystidia and hyphidia (83 pp.); 8. Basidiomes (fruit-body types, phylogenetic hypotheses, hyphal systems, pigmentation, etc.) (128 pp.); 9. Carpogenesis (a new set of concepts and terms is introduced) (174 pp., a book in itself); 10. Lichenized Hymenomycetes and Hymenomycetes parasitic on algae (20 pp.).

Each chapter is preceded by historical notes and is profusely illustrated. Throughout the book the author proves his great knowledge of the concerning literature, a fact also demonstrated by the bibliography of 44 pages.

It is to be regretted that this fundamental book has not been published in English, by far the most widely used language in natural sciences. Fortunately there is a long English summary at the end of the book and all captions are in German and English.

Undoubtedly this major publication will be a reference book for decades to come for all who are working with Hymenomycetes or teaching mycology.

P.W. Crous. *Mycosphaerella spp. and their anamorphs associated with leaf spot diseases of Eucalyptus.* (Mycologia Memoir No. 21, APS Press, The American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. 1998.) ISBN 0-89054-190-6. Pp. 170, 140 text-figs., 4 tables. Price: US$ 52.00 (in USA $ 42.00).

More than 450 species of *Eucalyptus* are currently recognized. Many of these trees were initially planted in botanical gardens and arboreta, and distributed through these to other parts of the world. Plantings of fast-growing eucalypts dominate the landscape in many parts of the world. *Mycosphaerella* leaf blotch disease is a serious epidemic, pathogenic threat to these plantations. Disease symptoms vary from early leaf abscission to general leaf spotting and even stem cankers. The dothideaceous genus *Mycosphaerella*, with more than 1800 species published, is one of the largest ascomycete genera known. Many species are pathogenic to leaves and stems of different host plants. In this book 57 species of *Mycosphaerella* and their anamorphs, associated with eucalypts, are treated with full descriptions and illustrations of microscopic details of ascospores, asci, conidia, and conidiogenous cells. Six new species of *Mycosphaerella* are presented and also several anamorph species are described as new. Keys to both teleomorphs and anamorphs are presented. The hypothesis that *Mycosphaerella* is heterogeneous, is tested, using multiple correspondence analysis (MCA) of 18 *Mycosphaerella* species with known anamorphs, testing 27 sets of multistate characters. Clustering of taxa obtained with MCA showed several distinct clusters, supporting the supposed heterogeneity of *Mycosphaerella*. The clusters found correspond to the various anamorph states, suggesting that this is indicative of various groups (genera?) within *Mycosphaerella*. Various proposals for the separation of genera, subgenera, and sections within *Mycosphaerella* are discussed. A new coelomycetous genus, *Xenostigmina*, is proposed.

This is a valuable contribution to the taxonomy and pathology of *Mycosphaerella*.

D.E. Desjardin & E. Horak. *Marasmius and Gloiocephala in the South Pacific region: Papua New Guinea, New Caledonia, and New Zealand taxa.* (In: Taxonomic monographs of Agaricales II. Eds. O. Petrini, L.E. Petrini & E. Horak.) (Bibliotheca mycologica 168, J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung, Johannesstr. 3A, D-70176 Stuttgart. 1997.) ISBN 3-443-59070-5. Pp. 152, 22 text-figs. Price: DM 80.00.

D.E. Desjardin and E. Horak give in two parts an overview of the marasmioid taxa in New Guinea, New Caledonia, and New Zealand, based on the collections made by the second author, and the type collections of the species described from this region. The first part

focuses on the tropical regions (New Guinea and New Caledonia), whereas New Zealand is treated in the second part. Thirty-five taxa are reported from either New Guinea or New Caledonia, of which twelve are described as new. A slightly lower number of taxa is described from New Zealand, 32 in total, of which eleven are new. All taxa are fully described and depicted. This is certainly a very welcome addition to our knowledge of marasmioid fungi and a good base for further research and exploration.

H. Dörfelt & H. Heklau. *Die Geschichte der Mykologie*. (Einhorn Verlag, Postfach 1280, D-73502 Schwäbisch Gmünd, Germany. 1998.) ISBN 3-927654-44-2. Pp. 573, 177 text-figs., 38 tables, numerous portraits of mycologists. Price: DM 258.00.

Apart from a short introduction explaining, among other things, the complicated system of degrees and titles at German universities, this voluminous book consists of four parts. About half the book treats the history of mycology from antiquity till about 1990 in several chapters. Great similarity with the history of botany till the 18th century is shown. In all periods of time the interest of botanists for fungi is discussed in logical coherence with other developments in botany and other sciences. All chapters are easily readable and full of interesting details. Special attention has been paid to the first use of certain terms and to the interpretation of fungi depicted in old herbals and floras. This information is clearly and concisely presented in tables.

The second part consists of 358 short biographies of mycologists and botanists with mycological interest. Along with many references to existing historical literature, the authors have added results of their own research, especially concerning German mycologists of the 20th century. In this respect it becomes evident that several mycologists from other countries of this period are missing. Part of the biographies are accompanied by a portrait. The third part is a tabular survey from 5000 B.C. to 1993, comparing political and social events with important developments in the history of mycology and related sciences. Great attention has been paid to supply the documentation with historical and biographical annotations. There are 55 pages of references and indices to persons, organisms, and subjects.

This book presents the most complete history of mycology as yet in a single volume. For the price of the book the quality of the illustrations could have been better.

M.B. Ellis & J.P. Ellis. *Microfungi on landplants. An identification handbook. New enlarged edition*. (The Richmond Publishing Co. Ltd., P.O. Box 963, Slough SL2 3RS, UK. 1997.) ISBN 085546-246-9 (hardcover), 085546-245-0 (paperback). Pp. x + 868, 2208 black-and-white figs. in 213 pls. Price: hardcover UK £ 60.00, paperback UK £ 40.00, postage UK £ 5.00.

This long-awaited new edition of 'Microfungi on landplants' is, as the cover indicates, an enlarged edition. This means that it is a copy of the first edition, with an additional 36 pages where corrections and 142 descriptions of fungi, not included in the previous edition, are presented. An asterisk in the margin of the original text indicates an addition or correction, which can be found in the supplement. In addition to the original 203 plates seven extra plates are included, picturing the additional fungi. The original plates are fortunately this time better printed.

The book, which only treats smaller fungi (strangely – but maybe wisely – enough, no definition is given of the term Microfungi), is organized according to hostplant, in a number of categories: the plurivorous wood and bark fungi, plurivorous leaf-litter fungi, fungi specific to trees, shrubs and woody climbers, plurivorous fungi on herbaceous plants, fungi specific to various herbaceous plants, plurivorous fungi on grasses, fungi specific to grasses, fungi on rushes, sedges, bur-reeds and reed-maces, fungi on ferns, horsetails and club-mosses, and fungi parasitic on rusts and powdery mildews. In the plurivorous categories a key is given to the genera of fungi, then the species in alphabetical order according to the genus, and in cases with several species per genus a key to the species. In the other categories everything is organized according to the hostplant, in alphabetical order. Not only some knowledge of plant names is required, the user is also supposed to be able to distinguish between different classes of fungi: within the categories plurivorous fungi, first a division is made into Discomycetes, other Ascomycetes, Hyphomycetes, Coelomycetes, and, if appropriate Uredinales and Ustilaginales. This system is continued within the other categories per hostplant. Within these classes the fungi are treated alphabetically according to genus. With the category fungi specific to trees etc., first the fungi on leaves are given, then those on fruits or seeds and finally the ones on wood and bark.

The keys and descriptions in the book are rather simple and short, and mostly lead without much difficulties to a name. Although this is the power of the book, it is in many cases insufficient for reliable identifications and additional, specialised literature should be consulted. Unfortunately the names of the fungi, which were in the original edition already sometimes out of date, have not been changed in the new edition.

Although more than 3500 species of microfungi are treated, the book is far from complete. Not surprising, since so little is in fact yet known about microfungi. The appearance of the first edition has popularized the study of small fungi enormously, but was therefore quickly sold out. It is gratifying that the book has become available again, although the extra value for those who already have the first edition is limited.

G. Guzmán. *Los nombres de los hongos y lo relacionado con ellos en América Latina. Introducción a la etnomicobiota y micología aplicada de la región. Sinonimia vulgar y científica.* (Instituto de Ecología, A.C., Apartado Postal 63, Xalapa, Veracruz, México. 1997.) ISBN 968-786306-4. Pp. xx + 356, 28 text-figs., 23 photographs. Price: US$ 30.00 (softcover), US$ 50.00 (hardcover).

This book presents a first detailed checklist for Latin American fungal names. More than 5500 common names, representing or related to approximately 1750 species of fungi, are listed in alphabetical order. About 3400 names are exclusive to Mexico. Most of the common names are in Spanish, or for Brazil in Portuguese, and in many cases also in Indian languages. There are about 2000 names of edible fungi, 250 of halluçinogenic, 300 of poisonous, 900 of phytopathogenic fungi, and many of medical, chemical, pharmaceutical, or biotechnological application. Of these common names the scientific equivalents are given, together with graphic symbols classifying the properties and applications of the fungi described. For each name the country or state (for Mexico) of origin is indicated. The information presented is based on many publications, as well as on notes by the author, collected during numerous field trips in Mexico, Central and South America during a period of more than 42 years, often with the help of specialists from the region.

J. Heilmann-Clausen, A. Verbeken & J. Vesterholt. *The genus Lactarius. (Fungi of Northern Europe – Vol. 2.)* (Svampetryk, DK-8381 Mundelstrup. 1998.) Pp. 287, numerous coloured plates and text figs. Price: DKK 250.00.

The second volume in this series is dedicated to the genus *Lactarius*. The introductory chapters give an extensive account of the macroscopical and microscopical characters of the genus, the infrageneric classification, ecology and food value of the genus. The keys to the species are followed by detailed species descriptions supplemented by at least one coloured photo and line drawings of spores, cystidia and pileipellis. These generally are of good to excellent quality. Data on geographical distribution and a long list of references complete the book. It is a very attractive book, the first of its kind for the genus in many years, that certainly will find its way to professional and amateur mycologists. Unfortunately, the authors introduce a new, rather confusing terminology for pileipellis types. Regretfully they did not discuss these new terms in a broader mycological circle before introducing them, thus causing confusion. The keys lay too much stress on ecology, particularly the host tree, which will cause difficulties for the user. The most serious problem within this book is probably formed by the rather unequal species concepts used by the three authors, varying from rather narrow (*L. trivialis* versus *L. utilis*; *L. vietus* versus *L. syringinus*) to far too broad (*L. fulvissimus*, *L. rubrocinctus*). Also similar nomenclatoral problems lead to different solutions as is shown by introducing new species names for *L. cremor* and retaining the doubtful name *L. rubrocinctus* at the same time. It is also rather risky to synonymize Northamerican taxa with European ones without knowing the real variation and geographical distribution of the taxa involved (*L. duplicatus* versus *L. lapponicus*).

J. Keller. *Atlas de Basidiomycètes vus aux microscopes électroniques.* (Union des Sociétés Suisses de Mycologie. Sold by Flück-Wirth, CH-9053 Teufen, Switzerland. 1997.) Pp. 173, 14 text-figs., 324 plates with 1658 SEM- and TEM-graphs. Price: FRS 95.00.

The text of this book is in French with rather extensive summaries of conclusions in German and English. The first aim of the author was to present a work, as complete as possible, on the ultrastructure of the spore walls of Aphyllophorales. For the sake of completeness, studies of a certain number of Heterobasidiomycetes, Boletales, Agaricales, and Russulales have been added. In 324 plates of very high quality on glossy paper four to six figures are presented with ultrastructural details. Scanning electron micrographs generally show small basidiomata, basidia, basidiospores, cystidia, hyphae, and crystals. Transmission electron micrographs show details of thin sections of basidiospores, spore walls, parentosomes, apiculi, and spore ornamentation. For the description of basidiospore wall layers and structures Clémençon's terminology is followed. To understand the structure of mature basidiospore walls it was often necessary to study the ontogeny of the different wall layers. In general, for each family a description and discussion are given of ultrastructural details of the spore wall, the basidiospores, the basidium, and other structures, like apophyses, dolipores, hyphae, and cystidia. This atlas is indispensable for those interested in the structure or relationship of basidiomycetes.

M. Magnes. *Weltmonographie der Triblidiaceae.* (Bibliotheca mycologica 165, J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung, Johannesstr. 3A, D-70176 Stuttgart. 1997.) ISBN 3-443-59067-5. Pp. 177, 48 text-figs., 2 plates. Price: DM 96.00.

This thesis is a world-wide taxonomic revision of the ascomycete family Triblidiaceae of the order Rhytismatales. This family was proposed by Rehm (1888) with two genera, and strongly extended to eleven genera by von Höhnel (1918, 1924). More recently the Triblidiaceae were anew defined by Hawksworth & Sherwood (1982) with *Triblidium* and *Pseudographis*, and extended by Eriksson (1992) with *Huangshania*. These three genera are also included in the present study. The family is characterized by the hemiangiocarpic fruitbodies, the presence of both paraphyses and paraphysoids, and its ascus structure. A more profound account of these characters in this and related families of the Rhytismatales is missing. Efforts to obtain cultures of *Triblidium* species were not successful, since the ascospores failed to germinate. The author recognizes and describes four species of *Triblidium*, and two species each in *Pseudographis* and *Huangshania*. About half the book is devoted to genera and species excluded from the Triblidiaceae. Most of these taxa are also presented with full descriptions and drawings of microscopic details. A key is included to representatives of the Triblidiaceae and species that could be kept for these with a hemiangiocarpic or pseudohemiangiocarpic development and growing on bark. It is an important contribution to an up to now poorly known family of ascomycetes.

J.-M. Moncalvo & L. Ryvarden. *A nomenclatural study of the Ganodermataceae Donk.* (Synopsis Fungorum 11, Fugiflora, P.O. Box 95, Blindern, N-0314 Oslo, Norway. 1997.) ISBN 82-90724-18-7. Pp. 114. Price: unknown.

The major part of this booklet consists of a list of 386 species epithets, considered at one time or another to be related to one of the genera of the Ganodermataceae (Aphyllophorales, Basidiomycotina). Of each name its place of publication, typification, and nomenclatural status are given. The names accepted in the Ganodermataceae are discussed and referred to one of the 'groups' corresponding with the eight genera distinguished by the authors. New combinations have been omitted purposely. Eventual modern descriptions based on the study of authentic material are specially mentioned. In a 'taxonomic and geographic summary' the names are listed according to these taxonomic 'groups' and the main geographic regions of the world.

M. Moser & W. Jülich. *Farbatlas der Basidiomyceten. Lief. 14.* (Gustav Fischer Verlag, Wollgrasweg 49, 70599 Stuttgart. 1996.) ISBN 3-437-25506-X. Pp. 36, 77 col. pls. Price: unknown.

This fourteenth issue of the loose-leaf atlas of European basidiomycetes contains photographs of species belonging to the following genera in the Agaricales: *Agaricus, Amanita, Camarophyllus, Clitocybe, Conocybe, Coprinus, Cortinarius, Cystoderma, Entoloma, Galerina, Hebeloma, Hohenbuehelia, Hydropus, Hygrophorus, Hypholoma, Inocybe, Lepiota, Macrolepiota, Marasmiellus, Marasmius, Melanoleuca, Naucoria, Omphalina, Psilocybe, Ripartites, Stropharia, Tectella, Tricholoma, Tubaria*, and *Volvariella*. The genera *Conocybe, Coprinus, Entoloma*, and *Tricholoma* are with twelve or more species represented. Genus descriptions of *Campanella, Macrolepiota, Ripartites*, and *Tectella* are given. As in other issues of this series the quality of the photographs and the state of the depicted mushrooms are very variable.

M. Moser & W. Jülich. *Farbatlas der Basidiomyceten. Lief. 15.* (Gustav Fischer Verlag, Wollgrasweg 49, 70599 Stuttgart. 1997.) ISBN 3-437-25506-1. Pp. 200, 150 col. pls. Price: DM 98.00.

The fifteenth issue of this loose-leaf atlas contains photographs of species belonging to the following genera: *Faerberia* and *Pleurotus* (Polyporales), *Boletus*, *Suillus*, and *Xerocomus* (Boletales), *Clitocybe*, *Conocybe*, *Cortinarius*, *Crepidotus*, *Entoloma*, *Hebeloma*, *Hygrophorus*, *Hypsizygus*, *Inocybe*, *Leucocoprinus*, *Leucopaxillus*, *Macrocystidia*, *Mycena*, *Mythicomyces*, *Phaeogalera*, *Pholiotina*, *Psathyrella*, *Pseudoomphalina*, and *Tricholoma* (Agaricales). Genus descriptions of *Faerberia*, *Arrhenia*, *Haasiella*, *Hypsizygus*, *Mythicomyces*, *Ossicaulis*, and *Rickenella* are provided. Photographs of many rarely depicted species are included, and the quality of the plates varies from moderate to excellent.

M. Núñez & L. Ryvarden. *The genus Aleurodiscus (Basidiomycotina).* (Synopsis Fungorum 12, Fugiflora, P.O. Box 95, Blindern, N-0314 Oslo, Norway. 1997.) ISBN 82-90724-19-5. Pp. 164. Price: unknown.

In this small book a synopsis is given of the genus *Aleurodiscus* (including *Acanthobasidium*, *Acanthophysellum*, *Acanthophysium*, *Aleurobotrys*, *Aleurocystidiellum*, and *Gloeosoma*). The taxonomic arrangement, important character states, and ecology are briefly discussed. Illustrations elucidate the most important terms, though a glossary is not provided. A synoptic key and a dichotomous key to the species are given. It is unfortunate that geographic characters are used as important steps in the dichotomous key, as little is known about the distribution areas of the species, and quite a few species have been recorded from widely separated parts of the earth. A second problem with the keys is the choice between dendrohyphidia and acanthophyses, elements which both may have widely branched apices. All 71 species referred to *Aleurodiscus* are described, and illustrated with black-and-white drawings. The book does not claim to be a monograph because, in most cases, the descriptions have been based on the type collection only, though sometimes on fresh specimens collected by the authors. Six out of the 71 species are described as new. The book is completed with a list of species names which have been referred to the genus. Despite shortcomings and typographical errors this book is a useful guide to an interesting group of fungi and can form the basis for more detailed research.

M.E. Palm & I.H. Chapela (Eds.). *Mycology in sustainable development: expanding concepts, vanishing borders.* (Parkway Publisher, Inc., Boone, North Carolina, USA. 1997.) Pp. 306. Price: unknown.

The book is a compilation of papers presented during a workshop with the same title held in San Diego, California, August 1995. After an introduction by the editors, the book contains four contributions on Mushroom as Non-timber Forest Products, including the Pine Mushroom Industry in Canada, and Matsutake harvesting in the United States, and four contributions on the Inventory and Monitoring of Fungal Biodiversity in the USA and Mexico. Four contributions are devoted to environmentally friendly technologies, including the use of mycorrhizae and fungal biocontrol in Ecosystem Sustainability. The final chapter deals with diversification of markets and novel fungal products.

D. Puntillo. *I licheni di Calabria.* (Monografie XXII, Museo Regionale di Scienze Naturali, Via Giolitti 36, 100123 Torino, Italy. 1996.) ISBN 88-86041-17-9. Pp. 229, 4 text-figs., 42 plates with 8 colour photographs each, 100 distribution maps. Price: L 120,000 + postage.

Of the about 10,000 collections of lichens and lichenicolous fungi in the herbarium of the University of Calabria (CLU), c. 8,000 are collected in Calabria. This book presents an annotated alphabetical list of 856 species and subspecific taxa of lichens recorded from Calabria. A single species, *Arthonia calabrella*, proved to be new for science, 19 are recorded for the first time from Italy and 164 are new from Calabria. For each taxon the collections are cited for the different provinces of the region and comments are given on taxonomic variability, geographic distribution, and growing conditions. Macroscopic details of many species are presented in 335 excellent colour photographs. From a special study on the phytogeographic structure of the Calabrian lichenflora, it appears that most of the 13 phytoclimatologic groups distinguished for Italy are represented in the region, showing that this lichenflora presents a great biodiversity.

S. Raidl. *Studien zur Ontogenie an Rhizomorphen von Ektomykorrhizen.* (Bibliotheca mycologica 169, J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung, Johannesstr. 3A, D-70176 Stuttgart. 1997.) ISBN 3-443-59071-3. Pp. 184, 84 text-figs. Price: DM 90.00.

In this thesis 19 species of higher basidiomycetes, forming ectomycorrhizae in culture with seedlings of coniferous trees, have been investigated. Standard descriptions of the rhizomorphs are given, considering the structure, development, and eventual interaction with pollen. Each description and chapter ends with a discussion, while there are also a special chapter with discussions and a recapitulation of discussions. In a special root chamber system the mycelial growth has been followed in vivo. Of each species under study all steps of mycelial ontogeny are depicted in detailed drawings. Three types of rhizomorphal systems can be distinguished, differing in structure and extension. The four species of *Suillis* studied showed exactly the same structure and development of their rhizomorphs. Characters playing an important role in the ecology of ectomycorrhizae are the extension of the rhizomorphal system, the ability to form ring-shaped structures and hyphal fans, the frequencies of backward oriented branches and substrate adhesion hyphae, and the tendency to form vessel-like hyphae with frequently dissolved septa. This is a valuable enlargement of our knowledge about the ontogeny of ectomycorrhizae. The editors should have considered the great number of partly blank pages and the duplication of a large part of the chapter on the collections examined.

A.Y. Rossman, R.E. Tulloss, T.E. O'Dell & R.G. Thorn. *Protocols for an all taxa biodiversity inventory of fungi in a Costa Rican conservation area.* (Parkway Publ., Inc., P.O. Box 3678, Boone, NC 28607, USA. 1998.) ISBN 1-887905-05-7. Pp. xviii + 195, 4 text-figs., 4 tables. Price: US$ 35.00.

This book is a report of a workshop, which was organized in order to develop protocols for a possible all taxa biodiversity inventory of fungi (ATBI) in the Area de Conservación Guanacaste in Costa Rica. The workshop session was held in 1995, with participation of 25 mycologists from ten different countries, all expert in a different field of mycology. The

120,000 hectares large reserve has a varied vegetation and elevation, with biotopes varying from mangrove vegetation to dry forest, and includes rain forest and cloud forest at an altitude of 1200–1500 m. The number of fungi expected to occur in the selected area was estimated at about 50,000 species. Up to now, not much is known about the mycoflora in the region, therefore a great impact was expected for mycological studies in Costa Rica and adjacent regions.

The book consists of some theoretical chapters in which the backgrounds and terminology of this pilot project are given, together with the goals, management and time frame of the research. The other chapters deal with sampling protocols, as there are procedures for collecting all different classes of fungi and how to handle them, protocols for isolation and culturing fungi, sampling protocols for fungi associated with living plants or other fungi, woody substrate, aquatic substrates, and animals. The last chapter contains useful references. The project was planned to last seven years, of which the first two would be in the form of a pilot project. A large sum of money would be involved for this ambitious and unique project. Sadly enough the project has stopped now due to economical and political circumstances. What remains is this book with protocols for an inventory of all kinds of fungi, surely a useful contribution to the planning of any kind of such an all taxa inventory anywhere in the world.

R. Watling & E. Turnbull. *British Fungus Flora Agarics and Boleti. Vol. 8. Cantharellaceae, Gomphaceae and amyloid-spored and xeruloid members of Tricholomataceae (excl. Mycena).* (Print and Publications Section, Royal Botanic Garden Edinburgh. 1998.) Pp. 189, 134 text-figs. Price: UK £ 12.50.

This volume of the well-known flora contains two rather unrelated groups of mushrooms: the Cantharellaceae and Gomphaceae with four genera, and part of the Tricholomataceae with 17 genera (amyloid-spored) and 14 genera, respectively (xeruloid taxa). It is stressed in the introduction that several of the genera are still poorly known and in need of further revision. This applies particularly for the genera *Melanoleuca* and *Hemimycena*. Also the status of the xeruloid genera as a natural group is a matter of discussion. The flora follows closely the concept of the preceding volumes. The keys are not always very clear, and do not in all respects correspond with the descriptions of the species. Not all species are represented with figures. These figures are of varying quality.

Z. L. Yang. *Die Amanita-Arten von Südwestchina.* (Bibliotheca mycologica 170, J. Cramer in der Gebrüder Borntraeger Verlagsbuchhandlung, Johannesstr. 3A, D-70176 Stuttgart. 1997.) ISBN 3-443-59072-X. Pp. 240, 175 text-figs. Price: DM 110.00.

We are relatively well informed about the macromycetes of Japan, but about those of the vast territories of China we still know relatively little. In the present monograph 47 species of *Amanita* from southwestern China are treated, nine of which are new and 15 others had not been recorded from China before. The descriptions are very detailed and the line drawings exquisite and highly informative. The author accepts section *Caesarea* as distinct from section *Vaginatae* and proposes to transfer the *A. citrina*-group from section *Phalloideae* to section *Validae*. There are keys to the infrageneric taxa and to the species of each section. An impressively long list of references is added. Let us hope that more of such excellent monographs will follow.

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