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NOTES ON BOLETE TAXONOMY—II

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(With 11 Text-figures)

Newly discovered mycorrhizal relationships of boletes with Sapotaceae and Nyctaginaceae in the Neotropics are discussed. The eight neotropical species of *Phylloporus* are keyed out and three described. *Fistulinella* Henn. is transferred to the Strobilomycetaceae. *Phylloporus manausensis* Sing. and *P.* sect. *Manausenses* Sing., *P. leucomycelinus* Sing., *Xerocomus amazonicus* Sing., *X. radicicola* Sing. & Araujo, *Tylopilus arenarius* Sing., *T. potamogeton* Sing., *T.* sect. *Potamogetones* Sing. sect. nov., *Fistulinella campinaranae* Sing. and *Porphyrellus rionegrensis* Sing. & Araujo. are new taxa.

Recent field and laboratory studies have been carried out on boletes (Boletaceae and Strobilomycetaceae) on both fresh and formalin material. Some of the results, as far as they refer to thus far unpublished data or lead to new combinations or new taxa have been found to be of general interest in bolete taxonomy and are discussed in the following series of notes as a continuation of the notes published in the first series (Singer, 1973b).

1. Mycorrhizal relationships

Recent studies on ectomycorrhiza in the neotropics (Amazonas, Brazil) have shown that the ectomycorrhizal fungi of the white sand stands of the hylaea (campina and campinarana vegetation) are ectotroph dominated forest communities. Careful ecological and root anatomy studies have revealed that short roots with mantle and Hartig net can be traced to carpophores of mycorrhizal fungi, including aside from boletes also *Lactarius* (two species), *Amanita* (two species) and *Cantharellus*. The trees belong in the Leguminosae (*Aldina* and perhaps other genera), Rubiaceae (*Psychotria barbiflora*) and Sapotaceae (*Glycoxylon inophyllum*), possibly also some species in the Sapindaceae, but only the mycorrhizae of *Aldina* and *Glycoxylon* can be considered as certainly obligatorily ectomycorrhizal.

The cicatrizing ectomycorrhiza (Singer & Morello, 1960) is the only one which very rarely and sporadically occurs in the primary terra firme forest (which covers most of Amazonia) which has been characterized as practically anectotrophic. On the other hand, the secondary and root-damaged type of hylaea – wherever the natural and complex ecosystem of the hylaea has been disturbed – is known to be

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relatively rich in ectomycorrhiza (cicatrizing mycorrhiza) but only the ectotrophs of the montane rain forest and the subtropical forests of South America and one ectotroph of tropical Asia (*Pinus/Suillus*) had been studied thoroughly. The Amazonian ectotrophs are *Neea* spec. (Nyctaginaceae[1]) with *Amanita* sp. (three species), possibly also *Psychotria* sp., Sapindaceae sp., Leguminosae sp. on one hand and *Russula* sp. and *R. puiggarii* as well as *Phylloporus manausensis* on the other.

The varzea forests had thus far been considered ectomycorrhiza-free. The first hint as to the possibility of ectomycorrhizal symbiosis in inundable forests of Amazonia had been reported by Singer (1961) who observed *Inocybe matrisdei* Sing. with unidentified trees in Amazonian Bolivia but ectomycorrhiza was only suggested by the identity of the fungus, not by direct observation. Singer & Prance and I. Araujo have now collected in varzea *Tylopilus potamogeton* which is evidently ectomycorrhizal with legums.

The bolete species involved are new and shall be described below.

2. The genus Phylloporus in the Neotropics

KEY TO THE TROPICAL AND SUBTROPICAL SPECIES IN THE WESTERN HEMISPHERE.

1. Entire carpophore green, not blackening; cystidia numerous, chestnut colored inside; spores 8.5–10.7×4–5.5 µm. . . . . 1. *P. viridis*, p. 423
1. Carpophores differently colored; if pileus olive-green at first, lamellae (pores) not green and context blackening.
   2. Bluing species (context or at least fresh lamellae bluing on bruising). Ectomycorrhizal species (with angiosperms and conifers), occurring in the Gulf area.
      3. Spores 8.5–11.7×4–5, few up to 12.3×5.5 µm; basidia up to 11 µm broad. 2. *P. bellus*, p. 423
      3. Spores 10.5–15×4.5–5.8 µm; basidia up to 14.5 µm broad. 3. *P. foliiporus*, p. 424
   2. Context or lamellae not bluing.
      4. Pileus and stipe red or reddish. Mycorrhizal with *Quercus*. 4. *P. purpurellus*, p. 424
      4. Pileus and stipe not red.
         5. Context blackening (not reddening before blackening); lamellae not yellow; spore print not olive or olive-brown but 'marron glacé' to 'sandal wood' or 14 H 8, sometimes reaching 'Vandyke brown' to 'Cochin' (Maerz & Paul). Mostly lignicolous. Amazonas region. . . . . 5. *P. manausensis*, p. 425
         5. Context not blackening; lamellae yellow to yellow brown or olive brown; spore print with an olive tinge; NH_3 and NH_4OH strongly, deeply and persistently bluing on fresh pileus surface. Mostly terricolous and mycorrhizal. Only subtropical and tropical-montane species.
            6. Basal mycelium white or whitish.
               7. Pileus 'Rembrandt' to dark olive with 'casserole' margin (Maerz & Paul); lamellae light chrome yellow; spores 4.5–5 µm broad. *Alnus* mycorrhiza. 6. *P. caballeroi*, p. 426
               7. Pileus 'casserole', often with paler center between 'rose beige' and 'Papyrus' (Maerz & Paul); lamellae soon yellowish brown with an olive shade; spores 3.3–4.8 µm broad. *Fagus* mycorrhiza (not tropical?). 7. *P. leucomycelinus*, p. 426
            6. Basal mycelium yellow. Mostly *Quercus* mycorrhiza. 8. *P. rhodoxanthus*, ssp. *rhodoxanthus*, p. 428

[1] This family had also, independently, been indicated as ectomycorrhizal by J.-P. Fiard and by D. Janos (personal communication).

1. PHYLLOPORUS VIRIDIS (Berk.) Sing.

Paxillus viridis Berk. *in* Hooker's London J. Bot. **8**: 133. 1856. — *Phylloporus viridis* (Berk.) Sing. *in* Nova Hedwigia **7**: 123. 1964.

If the green color indicated by Berkeley from notes of the collector were the consequence of bluing — a possibility we have to keep in mind – this species would key out with *P. bellus* which would become a synonym of *P. viridis*. The yellow contents of the cystidia may have been darkening during over 100 years of conservation. In spite of intensive search the species has not been recollected in Amazonia.

2. PHYLLOPORUS BELLUS (Mass.) Corner—Fig. 1

Flammula bella Mass. *in* Kew Bull. for 1914: 74. 1914. — *Phylloporus bellus* (Mass.) Corner *in* Nova Hedwigia **20**: 798. 1970.

Pileus deep bay, granular fibrillose to villous, under a lens with small deeper fibrillose-scaly tufts on paler brownish ground, very densely so, so that the surface appears smooth or subsmooth macroscopically, eventually subtomentose and slightly paler, convex then concave, 10 mm broad (but said to reach 60 mm diam.). — Lamellae bright yellow, bluing when bruised, rather narrow to medium broad, subdistant to distant, not anastomosing near the stipe but often forked at base, decurrent. Spore print brown-olive. — Stipe red-brown, slightly paler than pileus, glabrous to subglabrous macroscopically but very finely scurfy under a lens, subequal but often widened at apex 12 × 1.3 mm (but reaching larger size in the type); basal mycelium white or whitish yellow. — Context whitish yellow, unchanging or indistinctly bluing in parts, fleshy, inodorous.

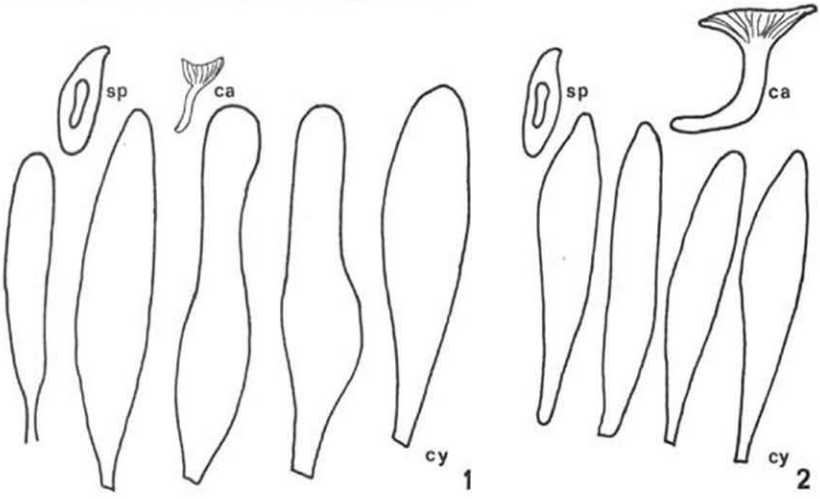


Fig. 1. *Phylloporus bellus*. — ca. Carpophore, × 3/4. — sp. Spore, × 1500. — cy. Cystidia, × 750.

Fig. 2. *Phylloporus purpurellus*. — ca. Carpophore, × 3/4. — sp. Spore, × 1500. — cy. Cystidia, × 750.

Spores 8.5–11.7(–12.3) × 4–5(–5.5) µm, golden olive to greenish melleous, smooth, fusoid, with suprahilar depression. — Hymenium: Basidia 30–38(–40) × 8–10.5(–11) µm, 4-spored, hyaline to yellowish (ammonia mounts), fading to pale argillaceous, pigment intracellular, dissolved. Cystidia 33–77(–98) × 9–18(–20) µm, projecting 25–30 µm, fusoid, ventricose or utriform, not incrusted but internally pigmented like the basidia. — Hyphae hyaline, without clamp connections; hymenophoral trama bilateral of the Phylloporus-subtype. — Cortical layers: Epicutis of pileus a trichodermium of rather broad hyphal cells with rounded ends. Surface of pileus with subhymeniform layer of dermatocystidia in bunches, these either clavate or or like the hymenial cystidia; a similar structure on stipe.

HABITAT.—Solitary in oak woods.

MATERIAL STUDIED.—MEXICO: Oaxaca, San Agostín, Sierra Mazateca, 10 VII 1969, *Singer B 8428* (F). — INDONESIA: Tjibodas, *Hoehnel* ('Zwergexemplare' von *P. bogoriensis* Hoehn., FH).

I believe that *P. bellus* var. *cyanescens* Corner (at least the large-spored collection l.c. p. 799) is *P. foliiporus* (Murr.) Sing. (see below). My Mexican collection appears to be a small carpophore of *P. bellus* var. *bellus* (as described by Corner) and of equal size as Hoehnel's material which shows no trace of blackening.

3. **Phylloporus foliiporus** (Murrill) Sing., *comb. nov.*

Gomphidius foliiporus Murrill *in* Mycologia **35**: 452. 1943. — *Phylloporus rhodoxanthus* var. *foliiporus* (Murrill) Sing. *in* Farlowia **2**: 432. 1945.
Phylloporus bellus var. *cyanescens* Corner *in* Nova Hedwigia **20**: 799. 1940 (*pro parte?*).

This species was described in detail (Singer 1945: 432, pl. 1, 11–12).

4. PHYLLOPORUS PURPURELLUS Sing.—Fig. 2

Phylloporus purpurellus Sing. *in* Sydowia Beih. **7**: 100. 1973.

This species was described in detail l.c.

5. **Phylloporus manausensis** Sing., *sp. nov.* —Fig. 3

Pileo subolivaceo dein flavo vel rufescente; hymenophoro favoloideo et lamellari, griseolo, nigricante; sporis in cumulo vegeto violaceobrunneo. Stipite griseolo, nigricante, carne nigricante. Sporis 8.5–11.2 × 4.2–5.5 µm; cystidia usque ad 89 × 13 µm, tenui- vel crasse tunicatis. Ad truncos arborum ascendens, in silva secundaria tropicali Amazoniae. Typus: *Singer B 9790* (F).

Pileus dusky olive yellow or olive ('syrup', 'old Bronze', 'citrine', 'willow'), on margin often green ('metallic green', 'Quaker green'), often more yellow ('aureoline') on margin, later becoming 'colonial yellow' or the whole pileus orange-rufescent ('feuille morte', 'terracotta') or ferruginous, unshining, velutinous, eventually often becoming granose or granulose, neither hygrophanous nor viscid, rarely or exceptionally subviscid after strong rains, hemispherical or pulvinate, eventually mostly becoming irregularly applanate, neither umbilicate nor umbonate, with at first somewhat incurved, rather acute smooth margin, 7–62 mm broad. — Hymenophore between favoloid and lamellate most frequently partly the former partly the

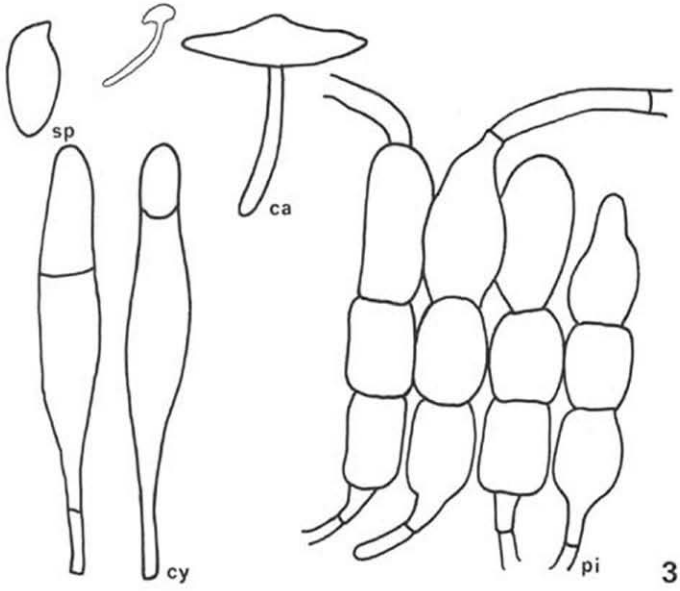


Fig. 3. *Phylloporus manausensis.* — ca. Carpophores, ×3/4. — sp. Spore, ×1500. — cy Cystidia, ×750. — pi. Cortical layer of pileus, × 750.

latter, the anastomoses not necessarily more numerous near margin or near stipe, where present reaching down to the edges of the lamellae or only about half depth of hymenophore, and forming mostly radially extended or boletinoid pentagonal or hexagonal pores 0.8×0.5 to 4×2.7 mm, these not discolorous and the whole hymenophore never yellow or olive brown but 'polar bear', 'ivory', 10 B 3, (M&P) or frequently more grayish ('Longchamps'), blackening when touched, medium broad (deep), later becoming broad to very broad (reaching up to 10 mm), the lamellae medium distant to distant, decurrent. Spore print 'sandal wood' to 'leather brown' or 'marron glacé', or 14 H 8, in very thick layer 'Vandyke brown' to 'Cochin', i.e. never with an olive hue even when quite fresh, but always more or less fawn color to bay. — Stipe 'Ivory' to 'beige soirée' in upper, 'bracken' to 'teak wood' in lower part, only when quite young and fresh 'Manila' above and 'camels hair' below, mostly becoming 'almond', more rarely bright yellow (all colors according to Maerz & Paul, lst Ed.), blackening all over when touched, often also in age, glabrous or subglabrous, not viscid, naked, central, more rarely somewhat eccentric, solid, sometimes at first somewhat tapering upwards, otherwise equal or subequal, eventually sometimes tapering downwards, rarely with abruptly widening base, 26–62×2–5 mm; basal mycelium whitish. — Context mellcous (reaching 'burnt, yellowstone') or somewhat paler, but neither white nor bright yellow nor reddish, never bluing and not reddening before strongly and consistently blackening when bruised or cut, always quite soft-fleshy in pileus and somewhat fragile, eventually becoming slightly tougher and elastic in stipe. Odor none. Taste mild or submild (occasionally very slightly acid or astringent).

Spores 8.5–11.2×4.2–5.5 μm, oblong, smooth, mellcous, with suprahilar depression. — Hymenium: Basidia 34–38×9–10.8 μm, clavate, hyaline, 4-spored. Cystidia

rather numerous on pores and edges of lamellae, 76–89 × 9–13 μm, ventricose to subampullacious or subcylindrical with broadly rounded tip and mostly long-effilate melleous pedicel, with thin to partially thick hyaline to pale melleous wall (0.3–2.5 μm thick), covered by a resinous, sepia-colored continuous incrusting layer which covers the apex like a hood or the middle like a girdle. — Hyphae not or only slightly gelatinizing, without clamp connections, thinwalled, hyaline, but some brownish elements here and there, especially in hymenophoral trama which is bilateral of Phylloporus-subtype; brownish hyphae often connecting with cystidia; mediostratum consisting of axially arranged multiseptate hyphae 2.5–7.7 μm broad, not more pigmented than lateral stratum which consists of divergent but subparallel to parallel hyphae touching each other, never strongly recurved or imbedded in gelatinous mass, 2.5–10.5 μm broad. — Cortical layers: Epicutis of pileus a trichodermial palisade of erect chains of short hyphal cells about 16–18 × 13–16 μm, with sepia intraparietal pigment, with rather thin or firm wall; the terminal cells 25–40 × 13–17 μm, ellipsoid to ampullaceous; above this some applicate hyphae running horizontally and likewise with intraparietal pigment and rather thin wall, 5–9 μm broad, rising from cells which erupt from and often surpass the general level of the trichodermial palisade, this layer becoming rather disorganized and ruptured in old specimens. Hypodermium of smaller hyphal cells, more irregularly arranged than epicutis, about 6–8 μm broad – a relatively shallow layer.

Chemical color reactions: NH_3 and NH_4OH on surface of pileus negative, or very slowly slightly darkening reaching e.g. 16 C 10 (M&P). — KOH on pileus brownish. — Formalin on context of pileus 'Cordovan' (M&P). — Phenol on context of pileus black.

HABITAT.—On earth or humus or most frequently directly on wood around the standing tree trunks of secondary tropical rain forest or ascending on these up to 20 cm from the ground, singly or in small groups. Known hosts: *Neea*, Palmae, Euphorbiaceae. Ectomycorrhizal relationship not demonstrated.

MATERIAL STUDIED.—BRAZIL: Manaus, VIII 1977, *Singer B 10587* (INPA), *B 9790* (typus, F), and ten additional collections (INPA).

6. PHYLLOPORUS CABALLEROI Sing.—Fig. 4

Phylloporus caballeroi Sing. *in* Sydowia Beih. **7**: 101. 1973.

This has been fully described l.c.

7. **Phylloporus leucomycelinus** (Sing.) ex Sing., *sp. nov.*—Fig. 5.

Phylloporus rhodoxanthus ssp. *leucomycelinus* Sing., ined.

Macroscopice characteribus *P. rhodoxanthi* gaudens — mycelio basali albido excepto; sporis 11–12.5 × 3.5–4.5 μm; cystidiis haud incrustatis, hyalinis, ampullaceis. Ad terram sub Fago grandifolia. Typus: *Singer N 7674* (F).

Pileus deep red brown (near 'casserole' M&P), often with bleached zone (between 'rose beige' and 'papyrus') at center, unshining, subvelutinous, sometimes soon becoming densely rivulose-cracked, dry, pulvinate to convex, 28–34 mm broad. — Lamellae brownish yellow to yellow-brown with eventually an olive tinge, close or subclose, rather broad with only here and there an occasional cross-vein, mainly not intervenose and not anastomosing near stipe, waxy-soft and rather thick above, decurrent. Spore print olive-brown. — Stipe concolorous-paler above, with concolorous punctation on much paler ground giving the overall impression of 'cocoa' to 'wild honey' (M&P), pallid near base, central, solid, tapering downwards

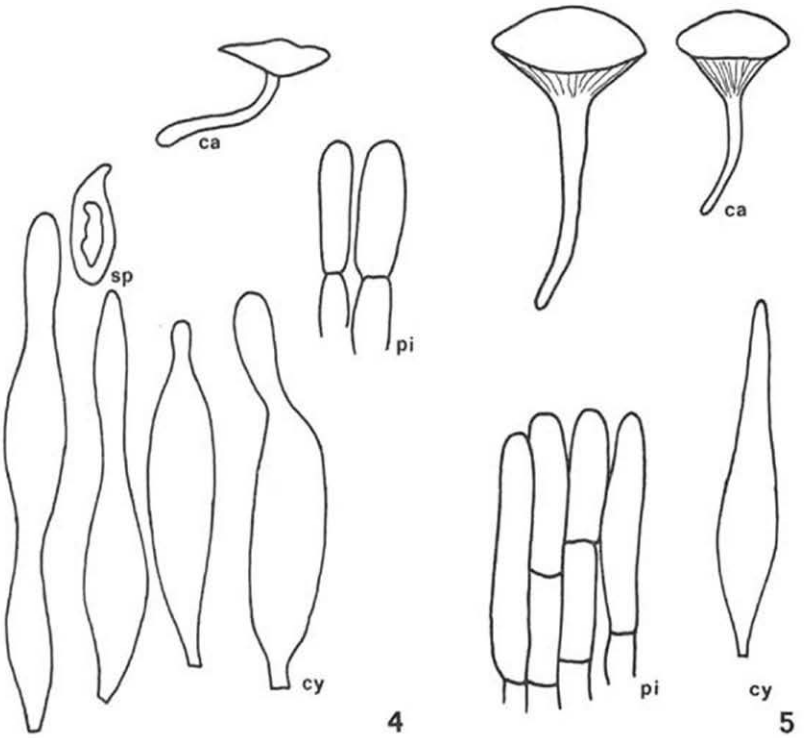


Fig. 4. *Phylloporus caballeroi*. — ca. Carpophore, ×3/4. — sp. Spore, ×1500. — cy. Cystidia, ×750. — pi. Fragment of cortical layer of pileus, ×750.

Fig. 5. *Phylloporus leucomycelinus*. — ca. Carpophores, ×3/4. — cy. Cystidium, ×750. — pi. Cortical layer of pileus, ×750.

27–45×3–5 mm; basal mycelium whitish. — Context at first buffy white all over but often developing a bright yellow zone in the lower part of the pileus and the upper part of the stipe, reddish cinnamon immediately underneath the cuticle, whitish in the base of the stipe, unchanging when bruised or cut; odor nil or slight, agreeable. Taste mild.

Spores 10–12.5(–13.5)×3.3–4.5(—4.8) µm, (11–12.5×3.5–4.5 µm in type) fusoid, melleous, smooth, with suprahilar depression. — Hymenium: Basidia 20–25×6–7 µm, ventricose, 4-spored (in type). Cystidia 50–71×(6)–11–12 µm, ampullaceous, more rarely cylindric-fusoid, hyaline, not incrusted. — Hyphae of hymenophoral trama in bilateral arrangement of Phylloporus-subtype, melleous-hyaline, scarcely subgelatinous; hyphae broad without clamp connections. — Cortical layers: Epicutis of pileus a trichodermial palisade, melleous, of chains of hyphal cells which are melleous, without incrustation, cylindrical or subcylindrical and parallel with each other, the end-cells 18–50×6–8 µm, more rarely swollen (to 16.5 µm), broadly rounded.

Chemical color reactions: NH_3 and NH_4OH giving a strong greenish blue reaction immediately, on the pileus surface as well as the stipe.

Habitat.—On the ground in deciduous woods, under *Fagus grandifolia* in North America.

MATERIAL STUDIED.—U. S.A.: Michigan, Warren Woods, 23 VII 1973. *Ponce de León*, comm. *Singer N 7674* (typus, F).

It is not fully certain that this fungus enters the tropical zone since the material received from Oaxaca, Mexico, under beech and oak is doubtful. Additional material from Chocorua, New Hampshire, has been observed and conserved (FH) previously. It seems to occur also in Canada (FH).

This species is closely related to *P. rhodoxanthus* (Schwein.) Bres. and to the Asiatic species *P. sulcatus* (Pat.) E. J. Gilb. and *P. orientalis* var. *brevisporus* Corner. *P. sulcatus* differs by the conspicuous ribs running down the upper half of the stipe continuing the lamellae and the basal mycelium tending to yellow. These characters would make *P. sulcatus* a synonym of *P. rhodoxanthus* (Schwein.) Bres. which has similar decurrent ribs in many or most specimens. In a Chinese (Yünnan) specimen (FH) the spores are 12.5–14 × 4–4.5 μm in; *P. sulcatus*, type, 11–12.8 × 4.5–5(6) μm; in the American type of *P. rhodoxanthus* 10.5–14.3 × 4–5.5 μm. It appears doubtful whether these forms can be distinguished by spore sizes alone. The intraspecific taxonomy of the *P. rhodoxanthus-sulcatus* complex should be studied more carefully before its various elements can be recognized as independent species. However, the white-mycelial form, described above is certainly specifically different. *P. orientalis* differs from it in bluing context.

8. PHYLLOPORUS RHODOXANTHUS (Schw.) Bres. subsp. RHODOXANTHUS

This species has often been described adequately and needs no further redescription. Its occurrence in the tropics (Mexico, Veracruz) is established by a specimen mixed in with the type of *Naucoria mexicana* Murr. (NY) (a *Phaeomarasmius*).

All temperate and neotropical species investigated thus far, with the single exception of *P. manausensis* have olive to olive-brown spore print, and give the characteristic deep blue ammonia reaction on the pileus. The type species of the genus should therefore with the majority of the species be included in the section *Phylloporus* while *P. manausensis* becomes the type of the section *Manausenses*:

Manausenses Sing. *sect. nov.*

Pileo ammoniaci ope haud caerulescente; sporis in massa purpureo-cervinis. Mycelio vix (obligatim?) ectomycorrhizico. Typus: *P. manausensis* Sing.

It is possible that *P. viridis*, not studied fresh, might belong to the same section. It is also possible that *P. phaeosporus* Corner, for which spore print and chemical data are likewise unknown, may belong in section *Manausenses*. In this latter species the lamellae are described as golden yellow and the spores under the microscope as characteristically 'rich dark brown' (Corner). If it were not for this species, the absence of yellow, brown or olive colors in the lamellae might also be characteristic for the new section. From the color of the lamellae as painted (Corner 1970, pl. 4A) one might also assume that *P. cingulatus* Corner belongs in sect. *Manausenses*.

3. New species of Xerocomus and Tylopilus

Xerocomus amazonicus Sing., *sp., nov.*—Fig. 6.

Pileo sordide ochreo ammoniaci ope caerulescente, tomentoso, haud viscido, tubulis luteis, immutabilibus, mediocribus, stipite sursum brunneolo-vinoso, deorsum vinoso-pallido, ad apicem grosse reticulato, ceterum subtomentoso; carne flavida, sub cute rubido-cinnamomea, immutabili. Sporis 11–15 (22) × 3.5–4.8 (6) μm. Cystidiis inconspicuis; cheilocystidiis majoribus quam cystidia; epicute e trichodermio palisadico efformata sine incrustatione. Ad basin arborum in silva pluviali arenosa. Typus: *Singer & I. Araújo B 10360* (INPA).

Pileus light ocher-beige (11 C 4 to 11 D 5), at center between 'blush' and 'cork', at margin 'blush' (M&P), tomentose, not even subviscid, smooth, convex, obtuse, sometimes slightly applanate in the center, about 25 mm broad. — Hymenophore tubulose, tubes yellow, rather long in the middle (i.e. ventricose), pores concolorous, unchanging on pressure, angular, 0.5–1 mm wide, mostly 0.5–0.8 mm wide, at stipe radially stretched-elongated and lamellar, sinuate-depressed, but not deeply so. — Stipe in upper part brownish vinous ('Cordova, castellon') and here concolorously coarsely reticulated, in the lower two thirds vinous-pallid and finely tomentose or subtomentose but with occasional brownish vinose streaks, smooth, solid, equal, 57 × 6 mm; basal mycelium bright yellow (5 L 1/2) — Context light yellow but under cuticle and in stipe cinnamon, reddish brown and in circumference of base of stipe bright yellow, unchanging when bruised or cut, fleshy. Odor none. Taste mild.

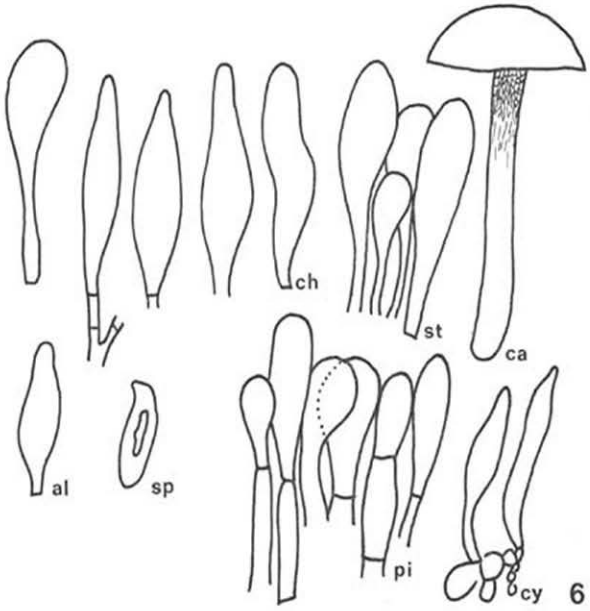


Fig. 6. *Xerocomus amazonicus.* — ca. Carpophore, × 3/4. — ch. Cheilocystidia, × 750. — al. Allocyst, × 750. — st. Covering of stipe, × 750. — pi. Cortical layer of pileus, × 750. — cy. Cystidia of hymenium, × 750.

Spores 11–15–(22) × 3.5–4.8–(6) µm, mostly 11–13.5 × 4–4.5 µm, smooth, melleous, fusoid, more rarely irregularly or regularly cylindrical, without truncation or pore at the distal end but with suprahilar depression or applanation, inamyloid. — Hymenium: Basidia 25–34 × 8–9.5 µm, 4-spored, basal septum without clamp. Cystidia and cystidioles 24–36 × 5–6 µm, fusoid or subcylindrical, obtuse-rounded or with obtuse mucro, thin-walled, little or not projecting, inconspicuous, hyaline; cystidioles rooting at the level of the basidia, cystidia deeper. Cheilocystidia differentiated and occurring at pores and their immediate neighbourhood, 26–49 × 7–11 µm, versiform, mostly fusoid, more rarely cylindrical-clavate or cylindrical-subcapitate, some almost ampullaceous, always rounded-obtuse above, hyaline, thin- or firm-walled, numerous, but not making the edge heteromorphous. — Hyphae hyaline or subhyaline (NH_4OH, KOH), thin-walled, scarcely gelatinized, without clamp connections, inamyloid. Hymenophoral trama bilateral of Phylloporus-type; hyphae of lateral and mediostratum little or scarcely differentiated, 4–13 µm broad, much less irregularly shaped and arranged than in pileus-trama. Subhymenium irregularly subcellular; cells 4.5–7.5 µm in diameter. — Cortical layers: Epicutis of pileus a trichodermial palisade, palest ochraceous stramineous (NH_4OH) with intraparietal pigment, not incrusted, elements thin- to firm-walled; terminal cells cystidiform, these forming a sybhymeniform layer, 26–29 × 13.5–15.5 µm or 32–34 × 7–11 µm, cylindrical, ventricose, clavate or subvesiculose, with broadly rounded tip. Reticulation of stipe beset with fascicles or hymeniform stretches of dermatocystidia and occasionally single dermatocystidia, these 18–49 × 6–12.5 µm, mostly clavate, more rarely fusoid, with rounded tip, thin-walled. — Basal mycelium with hyphae 3–12 µm broad, without clamp connections; occasional allocysts about 30 × 8 µm, thin-walled, these, as the hyphae yellowish-hyaline (KOH), inamyloid.

Chemical color reactions: NH_4OH on surface of pileus immediately and persistently greenish blue. — KOH on surface of pileus fuliginous-chocolate with blue margins.

Habitat.—In campinarana vegetation at base of a dicotyledonous tree in detritus, near Leguminosae, Sapotaceae and Rubiaceae.

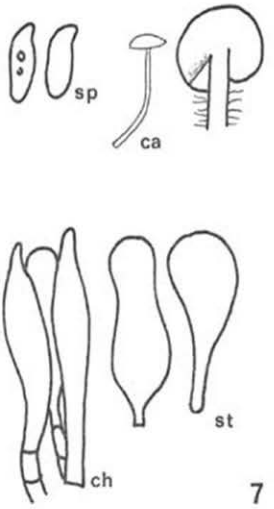
MATERIAL STUDIED.—BRAZIL: 60 km N. of Manaus, *R. Singer & I. Araujo B 10360*, 20 XII 1977, (typus, INPA).

This species belongs in section *Pseudophyllopori* where it is easily separated by its colors. Like all known representatives of this section, this species is ectomycorrhizal.

Xerocomus radicicola Sing. & Araujo, *sp. nov.*—Fig. 7

Pileo subolivaceo-fusco, 10 mm lato; poris gyrosis, luteis, inaequalibus; stipite eburneo, pubescente, dein glabrescente, levi, tenui, radicelligeno; mycelio clare flavido. Sporis 6–8 × 3–4 µm, cystidiis et cheilocystidiis 24–40 × 7–8 µm, ventricoso-mucronatis vel fusoideis. Ad radices arborum dicotyledonearum in silva inundabili pluviali Brasiliae. Typus: *I. Araujo 916* (INPA).

Pileus subolivaceous-fuscous, then fuscous (A 3 D Locquin), subtomentose, convex, about 10 mm broad — Hymenophore tubulose, tubes deep lemon yellow (A 7 h, Locquin) becoming reddish brown (A 2 d, Locquin), maroon when dried, relatively long, ventricose, depressed around the stipe; pores concolorous with tubes, strongly gyrose, often compound (at uneven level), angular and varying from subisodiametric to elongated and even curved, relatively wide. — Stipe ivory colored (F 7 h, Locquin), at first distinctly pubescent under a lens but glabrescent, subglabrous macroscopically, slightly tapering upwards when mature, 22–24 × 0.7–1.5 mm; basal mycelium light yellow; veil none in mature carpophores. — Context rather



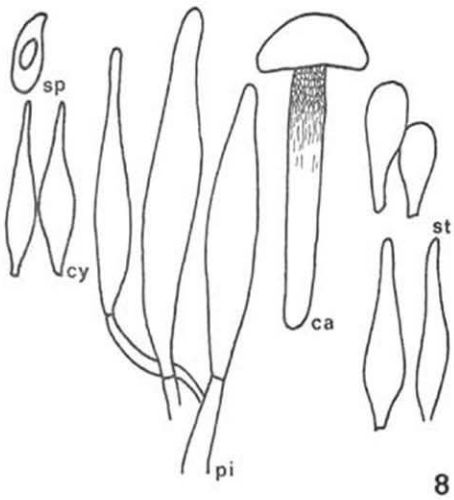


Fig. 7. *Xerocomus radicicola*. — ca. Carpophore, ×3/4. — pr. Primordium, ×25. — sp. Spores, ×1500. — ch. Cheilocystidia, ×750. — st. Elements of covering of stipe, ×750.

Fig. 8. *Tylopilus arenarius*. — ca. Carpophore, ×3/4. — sp. Spore, ×1500. — ca. Cystidia, ×750. — pi. Terminal cells of covering of pileus, ×750. — st. Elements of covering of stipe, ×750.

thin, fleshy, not discolored when bruised, no specific odor noticed. — Development: In smallest carpophore (0.4 mm) primordial hymenium still covered by silky filaments between margin of pileus and apex of stipe, with margin still touching the stipe on one side.

Spores 6–8×3–4 μm, most frequently 6.5–7×3–3.5 μm, oblong to cylindrical, smooth, inamyloid. — Hymenium: Basidia 17×6.5 μm, 4-spored. Cystidia 24–33×7–8 μm, ventricose, ventricose-submucronate or utriform, rounded at tip, thin-walled, not incrusted, hyaline. Cheilocystidia as end cells of mediostratum hyphae above a cylindrical 4–5–(9) μm broad mother cell, about 40 μm long and 7–8 μm broad, fusoid or fusoid-mucronate, few subcylindrical, obtuse; thin-walled, subhyaline, inamyloid. — Hyphae subhyaline, inamyloid, thin-walled, without clamp connections, scarcely gelatinized, irregularly arranged. Hymenophoral trama bilateral of Phylloporus subtype, subhyaline; mediostratum with hyphae slightly firmer-walled and axially arranged than those of the lateral stratum, all about 3–4.3 μm broad. — Cortical layers: Epicutis of pileus a trichodermium of rather loosely arranged interwoven hyphae which soon become matted down in uppermost layer, hyaline to melleous, mostly finely granular inside, 3–8 μm broad. Hypodermium poorly differentiated; incrusting pigment absent. Covering of stipe consisting of dermatocystidia, these 33–38×13–15 μm, short, ventricose-clavate to utriform, or about 100×9 μm, cylindrical and apically attenuated but obtuse. All covering layers vaguely to distinctly gelatinizing in KOH medium.

HABITAT.—On living, creeping rootlets over rotten wood in varzea vegetation of tropical rain forest, apparently parasitic, in Amazonia.

MATERIAL STUDIED.—BRAZIL: Amazonas, Rio Negro, at the Tupuruguarai forest along the river, 17 I 1978, *I. Araujo 916* (typus; INPA).

We consider this small bolete as belonging to section *Brasilienses* Sing. where it is unique because of its colors and its apparent parasitism on rootlets.

Tylopilus arenarius Sing., *sp. nov.*—Fig. 8

Pileo albo, leniter lilacino-tincto, levi, poris parvis, albidis, stipite anguste subventricoso, apice subtiliter lilaceo-reticulato, deorsum minutissime pustuloso sed levi, carne alba, fractu leniter subardosiaca. Sporis (6)–8–11 × 3–3.5 μm, subhyalinis, cum basidiis cystidiisque intus granulis pseudoamyloideis repletis. Ammoniaci ope omnibus superficiebus caerulescentibus. Sub Leguminosis Sapotaceisque in Amazonia. Typus: *Singer B 10590* (INPA).

Pileus white or whitish with slight lilac (55 H 1, M&P) flush especially near margin but this bleaching to dirty white or becoming pale tawny in age and on drying, not viscid, subglabrous to subvelutinous or subtomentose, with at first almost involute margin, smooth, convex, obtuse, about 22–23 mm broad. — Hymenophore tubulose, tubes white or whitish then dirty pinkish, medium long, depressed around stipe; pores concolorous, unchanging on pressure or becoming sordid livid when touched, forming an uneven surface because of their position at different levels, round, three to a millimeter. — Stipe finely lilac (55 H 1, M&P) reticulate on white ground in the upper third, smooth and 53 H 3 (M&P) in the lower two thirds, there minutely pustulate-scurfy when seen under a lens, solid, slightly narrowly ventricose, 30–33 × 7–9 mm, at apex and base about 5–7 mm broad. Basal mycelium white or whitish, soft-cottony. — Context white, slightly slate color to livid when bruised or cut, fleshy-soft in pileus and stipe. Odor none. Taste mild.

Spores (6)–8–11 × 3–3.5 μm, oblong to subfusoid, smooth, with thin, inamyloid wall, but often with minute pseudoamyloid granules inside. — Hymenium: Basidia (16)–22–27 × (6)–8.5 μm, with four up to 7 μm long sterigmata; basidioles often with finely granular pseudoamyloid contents. Cystidia 26–27 × 5–10 μm, with thin inamyloid wall, fusoid to ampullaceous with narrow subobtuse to subacute 2.3–3 μm broad neck, some with pseudoamyloid granulation. — Hyphae inamyloid but some with a fine pseudoamyloid granulation, without clamp connections, thin-walled, in pileus more or less radially, in stipe more or less longitudinally arranged. Hymenophoral trama bilateral of Boletus-subtype; mediostratum not gelatinized, hyaline to pale melleous, of interwoven to subparallel hyphae 2–3 μm broad; lateral stratum broad, strongly gelatinized although hyphae relatively close, strongly curved outwards at first, hyaline or subhyaline and 4.4–8 μm broad, intermixed with some hyaline to pale melleous, flexuous, thin-filamentose hyphae 1–2 μm broad. — Cortical layers: Epicutis of pileus a trichodermium which ends in cystidiform elongated cells, these 40–96 × 6–13 μm, narrowly ventricose to fusoid or ampullaceous, thin-walled, mostly hyaline, with subobtuse or obtuse tip, thin-walled hyphae below somewhat melleous to subhyaline but without incrusting pigment, not gelatinized or scarcely so. Hypodermium a cutis of pale melleous-ochraceous (NH_4OH) to subhyaline hyphae. On veins of reticulation of stipe a hymeniform layer consisting of dermatocystidia (much like hymenial cystidia) and numerous basidiomorphous cells (dermatopseudoparaphyses or dermatobasidia) 15–29 × 6.5–10 μm.

Chemical color reactions: NH_4OH and KOH on all surfaces giving a strong blue reaction (much like that of *Phylloporus* sect. *Phylloporus* and *Xerocomus* sect. *Pseudophyllopori*).

HABITAT.—On humus in campinarana vegetation over white sand and under *Glycoxylon* and Leguminosae, solitary, in Amazonia.

MATERIAL STUDIED.—BRAZIL: Amazonas, Estrada Manaus-Caracaraí, km 45, 3 II 1978, *Singer B 10590* (typus; INPA), & 28 II 1978, *Singer B 10734* (INPA); material parasitized by a *Hypomyces*.

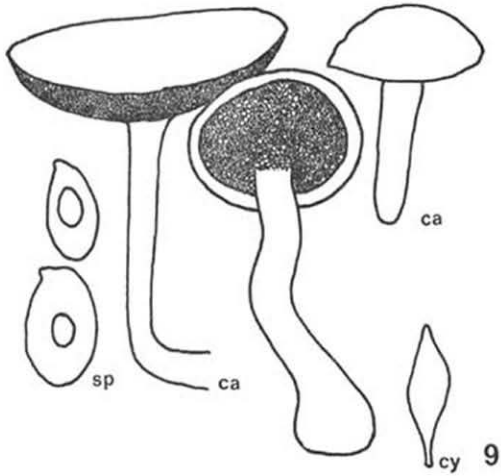


Fig. 9. *Tylopilus potamogeton.* — ca. Carpophores, ×3/4. — sp. Spores, ×1500. — cy. Cystidium, ×750.

Tylopilus potamogeton Sing., *sp. nov.*—Fig. 9.

Pileo brunneo, tomentoso glabrescente, levi; tubulis et poris (0.5–1 mm diam.) nec non carne immutabilibus; stipite cinnamomeo vel umbrino, interdum pallescente, subcylindraceo. Sporis 9.5–12×6.5–8 μm; cystidiis hyalinis. Probe ripam fluminum in silva inundabili et ad arenam albam Amazoniae. Typus: *Singer B 10351* (INPA).

Pileus at first a bright ochraceous brown (near Dennis' illustration of *Lepiota multicolor*), later paler reaching 'clove' or 'Conga' (M&P), at margin tending to cinnamon or Locquin A 2 d, at first evenly tomentose or velutinous, dry, later minutely fibrillose to subglabrous starting from margin inwards, convex, then often with slightly depressed center, 27–36 mm broad. — Hymenophore tubulose, whitish, then pale to light flesh-pink or orangy pink ('sandust', to 'blush' M&P; X 6 h Locquin) deeply depressed-sinuate around stipe but in the middle about 10 mm long and ventricose; pores concolorous with the tubes, rather small to medium (0.5–1 mm wide, about 6 per 1 cm), slightly irregular but scarcely elongated, exuding watery droplets when young and fresh. — Stipe 'cinnamon' then fuscous to umber ('Conga', M&P; X 1 d Locquin), paler or sordid pallid below, sometimes somewhat pallescent in age, densely fibrillose-tomentose, strongly hirsute-tomentose at base, glabrescent above base (at least macroscopically and at least in parts, under a lens remaining finely tomentose), smooth, solid, often twisted, cylindrical or slightly widened at apex or at base, otherwise subequal, 33–75×4.5–16 mm. — Context white, unchanging. Odor none. Taste bitter.

Spores 9.5–12×6.5–8 μm, characteristically ellipsoid to short fusoid, with the inner side sometimes less convex, to slightly concave, i.e. almost bean-shaped, with smooth, homogeneous, firm to slightly thickened (wall 0.4–0.7 μm thick) hyaline wall with mostly a slight fulvous reflex on the inner side (KOH or NH_4OH mounts), with, more rarely without an incomplete to complete germ pore and wall mostly at least thinned at distal end but not truncate. — Hymenium: Basidia 25×7 μm, 4-spored. Cystidia on edges and sides 28–29×5.7–7 μm, fusoid and

often mucronate, hyaline, thin-walled. — Hyphae hyaline, inamyloid, without clamp connections. Hymenophoral trama bilateral of Boletus-subtype; mediostratum somewhat interwoven with hyphae pale melleous ocher from intraparietal pigment, 3–4 μm broad, running axially; hyphae of lateral stratum strongly curved outwards, gelatinized, hyaline, 5–6 μm broad; hyphae of pileus trama interwoven, hyaline, 4–7 μm broad. — Cortical layers: Epicutis of pileus – a trichodermium with superficial terminal hyphae tending to be brown and narrow (1.5–5 μm) whereas in hypodermium they are paler or hyaline and not depressed to form a false cutis, here 2.5–7 μm broad; trichodermium between brown hyphae of surface and hypodermium made up of hyphae which are at first stramineous to brown (from intraparietal pigment and thin fugacious punctate incrustation). Covering of stipe consisting of a similar trichodermium.

Chemical color reactions: KOH on old pileus darker reaching 'leafmold' M&P. — NH_4OH on pileus and stipe darker brown. — Phenol on context negative. — HNO_3 on cuticle of pileus fire orange, on context orangy pallid. — Formalin on context of stipe livid-pallid or negative (white).

HABITAT.—On somewhat sandy soil in inundable varzea or on white sand soils in gallery forest and campinas near river, under dicotyledonous trees, solitary or in small groups, fruiting in early rainy season (December to early March), forming ectomycorrhiza with leguminous trees.

MATERIAL STUDIED.—BRAZIL, Amazonas: Ponta Negra, 18 XII 1977, *Singer & Prance B 10351* (typus; INPA); Rio Negro at 20 km downstream from São Gabriel das Cachoeiras, 20 I 1978, *I. Araujo 938* (INPA); Rio Solimões 4 km off Estrada à Manacapurú, 5 III 1978, *Anderson & Smith*, comm. *Singer B 10788* (INPA).

This species differs from others in the remarkably broad spores. In view of this character combined with the characteristic covering of the stipe and the bitter taste, this species should enter a new section of *Tylopilus*: **Potamogetones** Sing., *sect. nov.*

Sporis 6 μm latis; stipite tomentoso; carne alba immutabili, amara. Typus: *T. potamogeton* Sing.

4. The taxonomic position of the genus Fistulinella.

The genus *Fistulinella* was based on *F. staudtii* Henn. from Africa. The type of this genus is not, as was generally assumed (Gúzman 1974), lost but has been rediscovered and restudied (Singer 1973). I agree with Horak (1968) and Guzman (1974) who consider *Ixechinus* Heim identical with *Fistulinella*. I have shown that all pickled material of boletes has separable ('individual') tubes if the lateral stratum swells up to push the tubes away from each other and if the mediostratum is sufficiently gelatinized or thin to permit the fluid to dissolve enough of the gelatinous mass and thus sever the few thin-walled hyphae connecting the two sides of the lateral strata. Even while growing, some tubes may slide downwards a fraction of a millimeter in relation to others surrounding them, and thus create an uneven pore level, which emphasizes the false impression of separate individual 'pores' as known in *Fistulina*. However, a section through the tubes of dried *Fistulinella campinaranae* Sing., *F. minor* (Heim) Guzmán, *F. venezuelae* (Sing. & Digilio) Sing. and *F. violaceiporus* (Stevenson) Sing., *comb. ined.*, as studied by me show that the hymenophoral trama, aside from being somewhat more gelatinized, is not different from other corresponding

structures in Boletaceae and Strobilomycetaceae. The 'outer' layer of separated tubes as removed from hymenophores in liquid preparations consists of a naked lateral stratum with free hyphae dangling in the medium.

I have (Singer 1975) inserted *Fistulinella* as a section in *Tylopilus*, but have insisted that this is a temporary and tentative solution, waiting for more studies of fresh material. Such fresh material has been obtained recently from the campinarana vegetation in Brazil. These fresh collections were prepared as dried herbarium material and thus a continuous tube-layer was maintained. This species is considered new and most closely related to *F. mexicana* Guzmán. A fraction of the formalin material on which this latter species, recently published (Guzmán, 1974), was based, was kindly sent to the present author for comparison.

What do the newly discovered species of *Fistulinella* reveal about the position of this genus, its limits, and distribution?

In the first place, it appears that all have numerous characters in common and that their distribution and ecology is totally different from that of *Tylopilus* as well as the smooth-spored species of *Porphyrellus*. *Fistulinella* is tropical, extending to New Zealand, and non-mycorrhizal, whereas *Tylopilus* — although including some tropical species — is predominantly north-temperate and consistently ectomycorrhizal. *Porphyrellus* on the other hand, is, as far as smooth-spored species are concerned, north-temperate but reaching the palaeotropics as well as the *Nothofagus* zone of Australia and New Zealand.

Being non-mycorrhizal and narrow-stemmed, with generally very long spores, these often being pseudoamyloid and/or with apical germ pore, with a spore print in color much like that of *Porphyrellus gracilis*, it becomes obvious that *Fistulinella* is much closer to *Porphyrellus* than to *Tylopilus*. It differs nevertheless by the spores which are smooth and by the strong gelatinization not only of the hymenophoral trama but also of the surface layers, at least of the pileus, and the relatively slender stipe.

If we now exclude all species of *Porphyrellus* which agree in their characteristics with *Fistulinella*, we have to transfer the subsection *Viscidini* and with it the type of section *Pseudotylopili* Sing. to *Fistulinella* and transfer the subsection *Niveini* to section *Graciles* of *Porphyrellus*.

The genus *Fistulinella* will then be placed side by side with *Porphyrellus* in the Strobilomycetaceae, and will contain the following species:

F. staudtii Henn.; *F. minor* (Heim) Guzmán, *F. major* (Heim) Guzmán, **F. campinaranae** Sing. *sp. nov.*, *F. mexicana* Guzmán; **F. viscida** (McNabb) Sing., *comb. nov.*[1]; **F. venezuelae** (Sing. & Digilio) Sing., *comb. nov.*[2], and obviously also *Boletellus violaceiporus* Stevenson (type revised).

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[1] Basionym: *Porphyrellus viscidus* McNabb *in* New Zealand J. Bot. **5**: 547. 1967.
[2] Basionym: *Tylopilus venezuelae* Sing. & Digilio *in* Lilloa **30**: 163. 1960.

Fistulinella campinaranae Sing., *sp. nov.*—Fig. 10.

Pileo albo, partim subbrunnescente, 23–29 mm lato; poris duobus vel tribus per millimetrum; stipite albo, lubricoviscido, evolvato, levi, glabro. Sporis 11.5–16.5×4–6 μm, pseudoamyloideis, poro germinativo destitutis; cystidiis ventricoso-fusoideis. Ad truncos emortuos in Brasilia amazonica. Typus: *Singer B 10109* (INPA).

Pileus pallid white with brown ('broncho' or 'brown sugar' M&P) areas, dried 'olive wood' to 'bark', viscid-sticky, slightly lubricous, smooth, glabrous, with non-projecting margin, convex, neither depressed nor umbonate, 23–29 mm broad. — Hymenophore tubulose, tubes whitish, becoming 'sandust' to 4 B 9 (M&P) from spores, 3–5 mm long, free at stipe; pores concolorous, reaching different levels but never separating in fresh or dried material, small (2–3 per mm), round. — Stipe white, somewhat lubricous-viscid, glabrous, naked, smooth, solid, equal, up to 60 mm long, about 3 mm broad. — Context white, unchanging, fleshy-soft and somewhat subgelatinous. Odor none Taste mild.

Spores 11.5–16.5×4–6 μm, fusoid, smooth, subhyaline to ocher melleous but never quite hyaline (unless very young), with pseudoamyloid, homogeneous wall, without germ pore, with elongated oil drop, usually with suprahilar depression. — Hymenium: Basidia 31–36.5×4.8–10.4 μm, (1)–2–4-spored, clavate. Cystidia about 52–15 μm, ventricose fusoid, obtuse, hyaline, thin-walled. — Hyphae filamentous, hyaline, thin-walled, without clamp connections, inamyloid. Hymenophoral trama bilateral of Boletus-subtype; mediostratum hyaline, either reduced to just one axial tier of relatively broad (3–7.5 μm) hyphae or entirely gelatinized and then little different from lateral stratum where, however, hyphae widely spaced, 2–4 μm broad and distinctly recurved. Hyphae of stipe trama only subparallel; rind hyphae thin-filamentous, hyphae of core more like those of mediostratum. Hyphae of pileus trama strongly interwoven, with hyphal cells rather variable in size and shape, subgelatinous. — Cortical layer: Epicutis of pileus – an ixotrichodermium, consisting of elongated hyphae 3.4–7.3 μm, broad gradually narrower towards terminal member, broadly rounded at tip, hyaline or subhyaline in ammonia, somewhat gelatinized.

HABITAT.—In campinarana vegetation on rotting wood, mostly stumps of dicotyledonous trees, solitary or in small groups, fruiting early and late in rainy season.

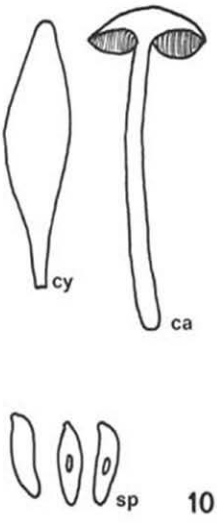
MATERIAL STUDIED —BRAZIL: Amazonas, Estrada Manaus-Caracaraí, km 45, 18 VII 1977, *Singer B 10109* (typus; INPA). Several times recollected at same place.

This species differs from *F. mexicana* in having larger spores without germ pore and more distinctly pseudoamyloid (which may, however, result from the manner of conservation) and the absence of the volva-like 'vaina transparente y muy gelatinosa' described and illustrated by Guzmán (1974).

5. A second Porphyrellus in South America

Porphyrellus rionegrensis I. Sing. & Araujo, *sp. nov.*—Fig. 11.

Pileo pallide salmoneo, badio-squamoso; tubulis sordide pallideque salmoneis, poris 1–2 mm latis; stipite brunneo, aequali, pertenui, nudo. Sporis (14.5)–15–17.7×7–9 μm, minute punctato-verruculosis. Cystidiis voluminosis (11–18 μm latis). Inter radices foliaque putrescentia sub *Diospyro* in silva inundabili. Typus: *I. Araujo 937* (INPA).



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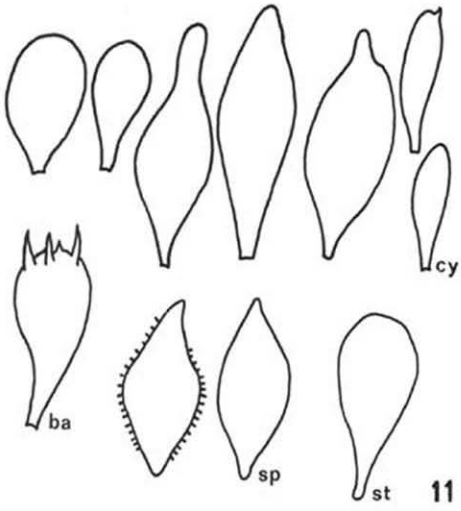

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Fig. 10. *Fistulinella campinaranae*. — ca. Carpophore, ×1. — cy. Cystidium, ×750. — sp. Spores, ×825.

Fig. 11. *Porphyrellus rionegrensis*. — cy. Cystidia, ×750. — cl. Cystidioles, ×750. — ba. Basidium, ×750. — sp. Spores, ×1500. — st. Element of covering of stipe, ×750.

Pileus reddish brown (A d 2 Locquin) scaly-areolate on pale orangy salmon (F 6 h) ground, convex, eventually concave, 18–43 mm broad. — Hymenophore tubular, tubes dirty pale salmon (P 5 h Locquin), depressed around stipe; pores concolorous, somewhat irregular, round or angular, 1–2 mm wide when dried, i.e. relatively very wide. Spore print not obtained. — Stipe brown (A 3 e Locquin), dried becoming light yellowish, glabrous, smooth, but ± dotted-punctate, solid, very slightly and gradually tapering upwards, 34–54 × 1.2–2.7 mm; veil none. — Context pallid. Odor none.

Spores (14.5)–15–17.7×7–9 μm, mostly 15.5–16.5×7–8 μm, fusoid, more rarely cylindrical or almost rhombic, with suprahilar depression, light melleous in KOH, with short rod-like ornamentation, verruculose-punctate, with ornamentation projecting about 0.6–0.8 μm but extreme apex and base of spore smooth or subsmooth, without germ pore or callus. — Hymenium: Basidia 31–43×12.5–17 μm, with four 7 μm long sterigmata Cystidioles 19–26×7–8.5 μm, narrowly ventricose, sometimes with apical eccentric appendage, hyaline, without visible contents. Cystidia 11–52×11–18 μm, ventricose, ventricose-mucronate or ampullaceous, thin-walled, hyaline, 'empty'. — Hyphae inamyloid without clamp connections. Hymenophoral trama bilateral of Boletus-subtype; mediostratum axially arranged, of interwoven hyphae, yellow: lateral stratum hyaline, consisting of strongly recurved hyphae imbedded in gelatinous mass. — Cortical layers: Epicutis of pileus consisting of a trichodermium overlaid by a few repent hyphae 1.5–2.5 μm wide; terminal cells of trichodermium ampullaceous or clavate to utriform 27–35×6–9 μm, often chrome yellow incrusted, below 3–6 μm wide; hypodermium a cutis of brownish ocher hyphae. Covering of stipe: dots formed by chrome yellow incrustations (KOH) over dense layer of dermatocystidia and dermatocystidioles corresponding in size and

shape to respective sterile cells of the hymenium, rising from cutis of 2–6 μm broad, subparallel hyphae.

HABITAT.—Among creeping rootlets and foliage under trees, especially *Diospyrus* sp. (Ebenaceae), rising from earth in inundable forest.

MATERIAL STUDIED.—BRAZIL, Amazonas, Rio Negro, 20 km downstream from São Gabriel das Cachoeiras, 20 I 1978, *I. Araujo 937* (typus; INPA).

This is the second species of this genus discovered in South America. The first known representative of *Porphyrellus* was *P. festivus* Sing.

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PLEUROFLAMMULA

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(With 10 Text-Figures)

Ten species of Pleuroflammula Sing. (three of which are new: P. praestans, P. overeemii, P. simulans) are described and illustrated and their taxonomy and geographical distribution are discussed.

Contrary to Romagnesi's opinion (1977) on micro-genera the few known species of *Pleuroflammula* represent a well defined natural group of agarics which deserves the status of a good and distinct genus (Singer, 1946).

In the field the experienced collector only can distinguish *Crepidotus* from *Pleuroflammula*. Both genera form rather small conchate fruit-bodies which are attached either laterally-dorsally or by an eccentric or lateral and inconspicuous stipe to organic debris (mostly rotten wood and/or bark of dicotyledonous plants). Using a hand lens the attentive observer, studying a species of *Pleuroflammula*, in many cases will discover that most of these fungi bear persistent veil remnants along the margin of the pileus and/or on the stipe. The presence of the veil is an important morphological and therefore taxonomical character to seperate *Pleuroflammula* from the gymnocarpous species of *Crepidotus*.

Furthermore most taxa of *Pleuroflammula* have deep yellow to golden brown or brown coloured carpophores and the context tastes bitter. The spore print is of a deep rust brown colour and thus reminds of spore prints typical for *Gymnopilus*, *Pyrrhoglossum*, *Conocybe* or *Pachylepyrium*.

The spores of *Pleuroflammula* are broadly ovate, smooth, thickwalled, rust brown to yellow-brown and with few exceptions lack the germ pore. In general the hyaline cheilocystidia are clavate, rarely cylindrical or tapering towards the apex and bear no crystals. The basidia are found to be 4-spored, rarely 2-spored (*P. ragazziana*). When pieces of fresh or dried carpophores are mounted in 3% KOH the yellow encrusting pigment immediately dissolves in the solution. The chemical structure of the pigment is unknown.

All characters mentioned before put *Pleuroflammula* distinctly apart from taxa such as *Crepidotus*, *Melanotus*, *Pyrrhoglossum* or laterally inserted species of *Naucoria* (*Simocybe*) or *Phaeomarasmius*. To our knowledge there is — except *Pachylepyrium* — also no other described genus of centrally stipitate agarics or boletes known yet which might be considered as closely related to *Pleuroflammula*.

Based on the hitherto reported records *Pleuroflammula* spreads from the tropical/subtropical belt to temperate zones in both Hemispheres. The area of distribution

of several taxa can go over large geographic distances (e.g. *P. flammea* of *P. ragazziana*). Other species appear to be restricted to rather small geographic regions like *P. puberula* (California), *P. overeemii* (Java) or *P. croceo-sanguinea* and *P. majuscula* (Chile) (Singer 1978: 63).

Despite the poor ecological data available at present it seems that the majority of species require for their developement climatic conditions which are dominated by high rain fall, i.e. the water-soaked evergreen forests on the West-coast of New Zealand and Chile, the moss- and cloud-forests of Papua New Guinea or the monsoon forests of Ceylon and Java. However, much more detailed data are necessary to get more information not only about the ecology proper of the species but also about their horizontal and vertical distribution. Under these circumstances it appears to the critical reader unlikely that *P. overeemii* or *P. simulans* is just restricted to Java or Papua New Guinea respectively. Due to our lack of knowledge about the mycoflora in South-East-Asia the two taxa are recorded not more than once despite the fact that their habitat occurs over hundreds of miles in that part of the world.

Material and references have been received from several herbaria (BO, F, FH, K, NY, PC, S and SGO) and I must acknowledge the assistance of their curators who supported my work in various ways.

If not otherwise stated the magnification of the figures are: carpophores (natural size), spores (×2000), basidia and cystidia (×1000), cuticle (vertical section, ×500).

KEY TO SPECIES OF PLEUROFLAMMULA

1a. Pileus scaly, squamulose or squarrulose, margin often floccose-crenate to appendiculate from veil remnants (false veil); stipe squamulose below submembranaceous or peronate anulus (compare also *P. simulans*); spores deep rust brown (KOH), germ pore absent. 2

b. Pileus glabrous, minutely fibrillose or tomentose, conspicuous squamules and veil remnants absent; spores yellowish, brown or rust brown 6

2a. Cheilocystidia 25–55 × 2–6,5 µm, effiliate, subventricose at base, tapering towards obtuse apex or cylindrical; pileus –20 mm, yellow to golden yellow, margin distinctly appendiculate-crenate; lamellae pale yellow turning brown, deep brick red in dried specimens; stipe eccentric or lateral, concolorous with pileus; spores 7,5–10 × 4,5–6,5 µm; on rotting branches and logs in broad-leaved forests; Chile (type), Argentina
1. *P. croceo-sanguinea*, p. 441

b. Cheilocystidia clavate or subcylindrical-capitate. 3

3a. Pleurocystidia absent; pileus –30 mm, yellow, with orange to ferrugineous scales, margin dentate; stipe eccentric, lateral or absent, –6 × –1,5 mm, yellow; annulus membranaceous or fibrillose; spores 6,5–8(–8,5) × 5–6 µm; cheilocystidia 25–65 × 4–6 µm; on rotting decaying wood; Eastern USA (type), Mexico, Colombia, ? Brazil 2. *P. flammea*, p. 441

b. Pleurocystidia (20–40 × 5–8 µm) lageniform to fusoid-subcapitate (reminding of chrysocystidia) 4

4a. Pileus –15 mm, pale yellow covered with ferruginous scales, margin dentate from whitish veil remnants; stipe –4 × —1 mm, eccentric to lateral, white to ochraceous; distinct annulus absent in mature carpophores; spores 8–10(–10,5) × 5,5–7 µm; basidia 2-spored; cheilocystidia 6–7 µm at apex, clavate; on rotten wood (*Tilia*, *Eucalyptus*); East Africa (Somalia, type; Kenya), South Africa, Tristan da Cunha, Azores, Portugal, Ireland
3. *P. ragazziana*, p. 443

b. Pileus yellow, covered with concolorous squamules 5

5a. Pileus –30 mm, deep yellow or yellow-brown, margin dentate; stipe –10×–2 mm, eccentric to lateral, concolorous with pileus, annulus membranaceous, spores 7–9,5× 5–6 μm; basidia 4-spored; cheilocystidia 25–50×4–8 μm (at apex), often in fascicles; on rotten plant material (*Cordyline*, *Neopanax*, *Pseudopanax*); New Zealand 4. *P. praestans*, p. 445

b. Pileus –16 mm, pale yellow or ochraceous, with orange appressed squamules; stipe –2×–1 mm, eccentric, concolorous with pileus; annulus not distinct; base floccose; spores (7–)7,5–9×5–6 μm; cheilocystidia 15–30×5–10 μm, clavate; on rotten organic material; Ceylon, ? Colombia . . . . . 5. *P. flavo-marginata*, p. 445

6a. Spores yellowish to brown (KOH) 7

b. Spores deep rust brown 9

7a. Spores lacking germ pore, 6–8,5×5–5,5 μm; cheilocystidia 25–40×5–6 μm; pileus –5 mm, brown; lamellae brown, edge albofimbriate; stipe –2×–1 mm, lateral, brown; on rotten wood; Java . . . . . 6. *P. overeemii*, p. 446

b. Spores with germ pore (compare also *P. simulans*) 8

8a. Pileus –6(–15) mm, yellow; stipe lateral or absent, concolorous with pileus; spores 6,5–8×4,5–5,5 μm, ovate to sublentiform; cheilocystidia polymorphous, subcylindrical to ventricose or appendiculate; on rotten wood; Guadeloupe (type), ? Eastern USA 7. *P. dussii*, p. 447

b. Pileus –10 mm, brown; stipe –4 mm long, eccentric to lateral, brown; spores 6–8,5× 4,5–5,5 μm, often phaseoliform; cheilocystidia 30–55×2–5 μm, fusoid-capitate or cylindrical-capitate; on decaying wood; Western USA (S. California) . 8. *P. puberula*, p. 447

9a. Spores 6,5–8×4,5–5 μm, with germ pore, often phaseoliform; cheilocystidia 20–35× 4–7 μm, fusoid-capitate; pileus –28 mm, yellow; stipe –16×–3,5 mm, eccentric, yellow; on rotten wood; Chile. . . . . 9. *P. majuscula*, p. 449

b. Spores 7–8,5×5–5,5 μm, germ pore absent, ovate; cheilocystidia 40–90×3–4 μm, cylindrical or tapering towards obtuse apex, occasionally branched; pileus –25 mm, golden brown; stipe –5×–2 mm, eccentric to lateral, concolorous with pileus, cortina ring-like; on rotten branches of broad-leaved trees or stems of bamboo; Papua New Guinea . . . . . 10. *P. simulans*, p. 449

1. PLEUROFLAMMULA CROCEO-SANGUINEA (Mont.) Sing.—Fig. 1 A—G.

Agaricus croceo-sanguineus Mont. apud Gay *in* Hist. Fis. Pol. Chile **7**: 339. 1849 (basionym). — *Pleuroflammula croceo-sanguinea* (Mont.) Sing. *in* Beih. Nova Hedwigia **29**: 283. 1969.

ILLUSTRATIONS.—Montagne apud Gay (1849: pl. 7 fig. 4).

HABITAT.—On rotten branches and logs of broad-leaved trees (*Nothofagus dombeyi* and *N. obliqua* are known host plants). Chile (type), Argentina, Ecuador (?, see Patouillard & Lagerheim 1895: 205).

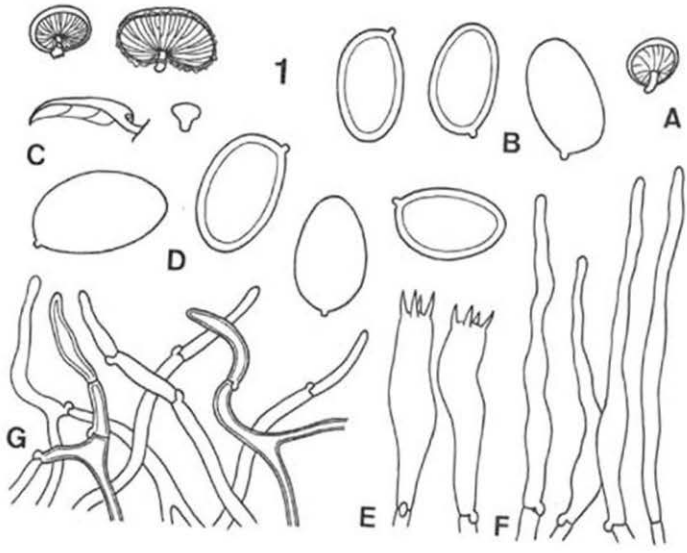
MATERIAL EXAMINED.—CHILE: Valdivia, bois de Roble, 1839, *Gay* (holotype, PC); Valdivia, Cuenta Sta. Elvira, 8 Apr. 1975, *Horak* 75/244 (ZT).

Our material corresponds well with the type collection (from the same locality) and with Singer's description. For more information consult Singer (1969).

According to Singer (1978: 63) *P. croceo-sanquinea* ss. Pat. & Lagerh. (1895: 205) is conspecific with *P. flavo-marginata* (B. & C.) originally described from Ceylon (see p. 445).

2. PLEUROFLAMMULA FLAMMEA (Murrill) Sing.—Fig. 2 A—F.

Crepidotus flammeus Murrill *in* North American Fl. **10**: 153. 1914 (basionym). — *Pleuroflammula flammea* (Murrill) Sing. *in* Mycologia **38**: 522. 1946.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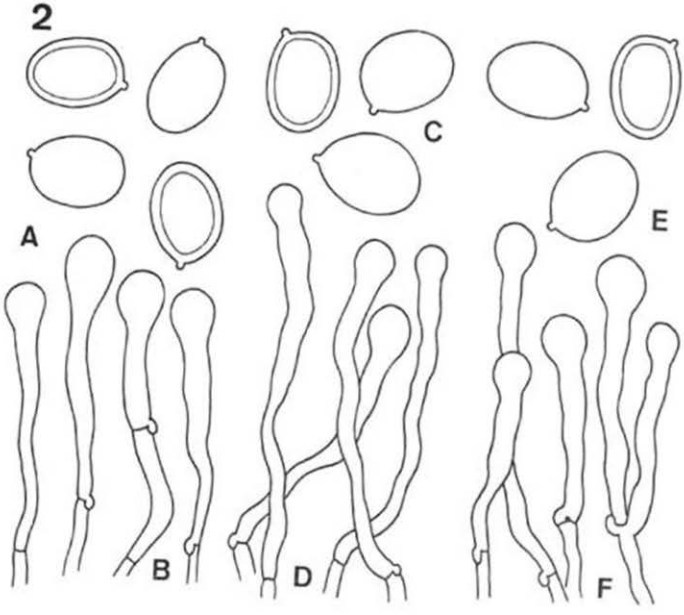
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Pleuroflammula chocoruensis Sing. *in* Lilloa **13**: 59. 1947.
Pleuroflammula squarrulosa Sing. *in* Beih. Nova Hedwigia **7**: 86. 1973.

HABITAT.—On rotten branches and dead logs of deciduous trees. East-Coast of USA (from New Hampshire to Florida), Colombia.

MATERIAL EXAMINED.—U. S. A.: Virginia, Crabbottom, 17–21 July, *Murrill 221* (holotype, NY); Blackburg, 27 July–3 Aug. 1904, *Murrill 325* (NY). — Connecticut: Redding,. 17 July 1902, *Earle 472* (NY). — Tennessee: Unaka Springs, 18–24 Aug. 1904, *Murrill* (NY). — Florida: Brodgon Hammock, Dade Co., 19 June 1915, *Small & Dossier 6074* (NY). — New Hampshire: Chocorua, Sept. 1905, *Krieger 194* (holotype of *P. chocoruensis* Sing., FH). — COLOMBIA: Cali, Cerro Horqueta, 2 May 1968, *Singer B 6915* (holotype of *P. squarrulosa* Sing., F).

Upon examining the collections mentioned above there can be no doubt that the area of distribution of *P. flammea* — a common fungus along the East-Coast of the USA — spreads also across the Carribean to Colombia. All characters found on the Colombian material are identical with the ones observed on typical *P. flammea*.

3. **Pleuroflammula ragazziana** (Bres.) Horak, *comb. nov.* —Fig.3 A—G.

Crepidotus ragazzianus Bres. *in* Ann. Ist. Bot. Roma **5**: 176. 1892 (basionym).
Crepidotus hibernianus A. Pears. & Dennis *apud* A. Pears. *in* Trans. Brit. Myc. Soc. **32**: 268. 1949. – *Pleuroflammula hiberniana* (A. Pears. & Dennis apud A. Pears. Sing. *in* Sydowia **15**: 70. 1961.
Pleuroflammula flammea (Murrill) ss. Sing. *in* Res. Norw. scient. Exp. Tristan da Cunha **37–38**: 17. 1955.
Crepidotus austroafricanus Pilát *in* Trans. Brit. myc. Soc. **33**: 237. 1950. — *Pleuroflammula austroafricana* (Pilát) Reid *in* Contr. Bolus Herb. **7**: 115. 1975.
Pleuroflammula flavomarginata (B. & Br.) Sing. ss. Pegl. *in* Kew Bull. Add. Ser. **6**: 485. 1977.
ILLUSTRATIONS.—Bresadola (1933. Iconogr. mycol.: pl. 1248 fig. 2; Pearson (1949: 268); Reid (1975: pl. 17A); Pegler (1977: fig. 104, 3a–d).

HABITAT.—On rotten wood and bark of broad-leaves trees (*Eucalyptus* in Portugal; *Tilia* in Ireland). East Africa (Somalia, type; Kenya), South Africa, Tristan da Cunha, Azores, Portugal, Ireland.

MATERIAL EXAMINED.—EAST AFRICA: Ghambia, Ragazzi (holotype, S). — PORTUGAL: March 1902, *Torrend 764* (herb. Bresadola, S). — IRELAND: Killarney, Muckross Park, 29 Aug. 1946, *Pearson & Dennis* (holotype of *Crepidotus hibernianus*, K).

The most distinctive characters of this (in Europe probably introduced) fungus are: small ferrugineous scales on the surface of the pileus, inconspicuous white veil remnants on the stipe, relatively large spores, 2-spored basidia and short clavate

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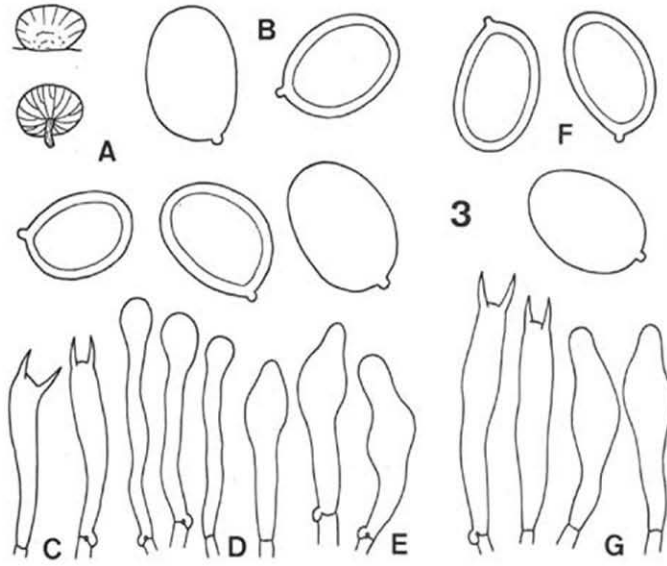
Fig. 1. *Pleuroflammula croceo-sanguinea*. — A, B. From type of *P. croceo-sanguinea*. — A. Carpophore (sec. Mont. apud Gay). — B. Spores. — C–G. *From Horak 75/244*. — C. Carpophores. — D. Spores. — E. Basidia. — F. Cheilocystidia. — G. Cuticle.
Fig. 2. *Pleuroflammula flammea*. — A, B. From type of *P. flammea*. — A. Spores. — B. Cheilocystidia. — C, D. From type of *P. squarrulosa*. — C. Spores. — D. Cheilocystidia. — E, F. From type of *P. chocoruensis*. — E. Spores. — F. Cheilocystidia.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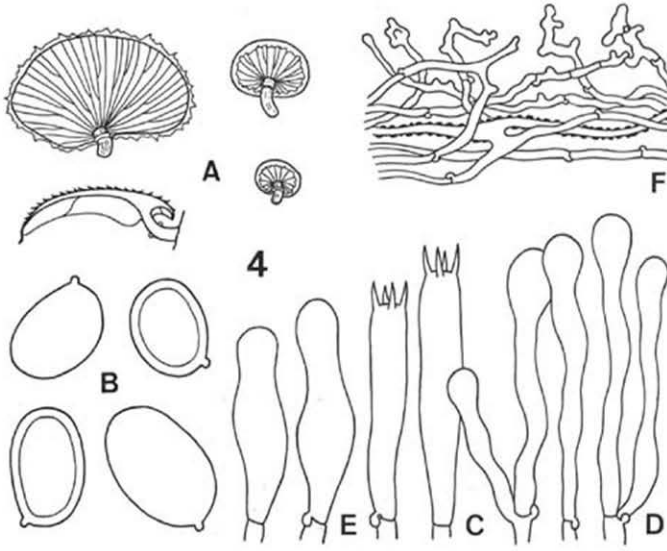
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cheilocystidia. Recently Pegler (1977: 485) and Dennis, Reid & Spooner (1977: 88) reported on the occurrence of this conspicuous fungus in Kenya and the Azores (as '*P. hibernica*'!) respectively.

4. **Pleuroflammula praestans** Horak, *sp. nov.*—Fig. 4 A—F.

Pileo –30 mm lato, reniformi vel conchiformi, convexo, aureo vel aureobrunneo, squamuloso, marginem versus dentato-appendiculato, sicco. Lamellis ex adnato emarginatis, luteoaureis dein luteoferrugineis, serratis, luteomarginatis. Stipite —10/—2 mm, excentrico vel laterali, cylindrico, pileo concolori, annulo membranaceo peronatoque instructo, basim versus floccoso. Odore nullo. Sapore amaro. Sporis 7–9,5 × 5–6 μm, ovatis, levibus, crasse-tunicatis, ferrugineis. Cheilocystidiis 25–50 × 4–8 μm, clavatis. Ad frustulos lignosos. Novazelandia. Holotypus: *PDD 27133*.

Pileus –30 mm diam., orbicular when young becoming reniform to conchiform, convex, with margin inrolled but dentate or appendiculate from veil remnants, yellow to deep yellow or yellow-brown, densely covered with minute fibrillose concolorous squamules, dry, estriate, not hygrophanous. Lamellae adnate to emarginate, ventricose, crowded, yellow-brown turning mustard brown or ferrugineous; edge serrate, concolorous or yellow. Stipe –10 × –2 mm, eccentric or lateral, always well developed, cylindrical, concolorous with pileus, with veil forming membranaceous persistent ring, towards apex glabrous to pruinose, towards base floccose-fibrillose, solid, dry, single in groups. Odour not distinctive. Taste bitter. Context yellow-brown, not gelatinized, Spore print yellow-brown to rust brown.

Spores 7–9,5 × 5–6 μm, ovate to ellipsoid, smooth, thick-walled, rust brown; germ pore absent. Basidia 25–36 × 6–7 μm, 4-spored. Cheilocystidia 25–50 × 4–8 μm, slender, clavate or cylindricalsubcapitate, thin-walled, with yellow-brown plasmatic pigment, often in fascicles, forming sterile edge on lamellae. Pleurocystidia 25–35 × 6–8 μm, fusoid-subcapitate, thin-walled, with yellow-brown plasmatic pigment, scattered. Cuticle a cutis of subregular interwoven cylindrical hyphae, terminal cells irregularely branched to corallioid (like *Marasmiellus*), membranes not gelatinized, encrusted with yellow-brown (KOH) pigment. Clamp connections present.

HABITAT.—On rotten leaves and branches of *Cordyline indivisa* (Agavaceae), *Neopanax arboreum* (Araliaceae) and *Pseudopanax crassifolium* (Araliaceae). New Zealand.

MATERIAL EXAMINED.—NEW ZEALAND: North Island, Mt. Egmont National Park, Stratford Lodge, 12 June 1968, *Horak* (holotype *PDD 27133*; isotype *ZT 68/534*); South Island, Westcoast, S. of Ahaura, 14 March 1968, *Horak 68/172* (ZT).

5. PLEUROFLAMMULA FLAVO-MARGINATA (B. & Br.) Sing.—Fig. 5 A—C.

Crepidotus flavo-marginatus B. & Br. *in* J. Linn. Soc. **11**: 546. 1871 (basionym). — *Pleuroflammula flavo-marginata* B. & Br.) Sing. *in* Sydowia **6**: 349. 1952.

? *Lentinus emerici* Berk. ined. (in sched., K). See Singer *in* Sydowia **15**: 143. 1961.

Fig. 3. *Pleuroflammula ragazziana*. — A–E. From type of *P. ragazziana*. — A. Carpophores. — B. Spores. — C. Basidia. — D. Cheilocystidia. — E. Pleurocystidia. — F, G. From type of *P. hiberniana*. — F. Spores. — G. Basidia and cheilocystidia.

Fig. 4. *Pleuroflammula praestans*. — A–F. From type of *P. praestans*. — A. Carpophores. — B. Spores. — C. Basidia. — D. Cheilocystidia. — E. Pleurocystidia. — F. Cuticle.

Agaricus croceo-sanguineus Mont. ss. Pat. & Lagerh. *in* Bull. Soc. myc. France **11**: 205. 1895 (fide Singer, 1978: 63).

ILLUSTRATIONS.—Pilát (1950: 222).

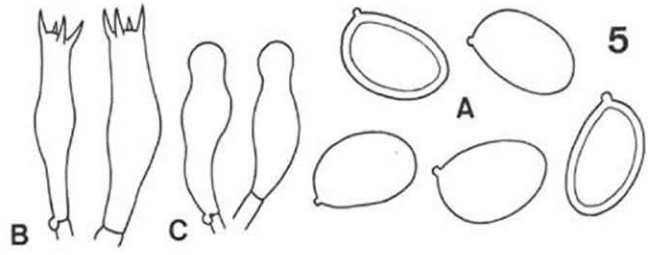
HABITAT.—On rotten wood. Ceylon, ? India, ? Colombia (fide Singer, 1978: 63).

MATERIAL EXAMINED.—CEYLON: Ceylon, *Thwaites 392* (holotype; K).

Fresh collections of this conspicuous fungus are needed to get detailed information concerning both microscopical and macroscopical data. The type collection in K is in rather poor condition.

6. **Pleuroflammula overeemii** Horak, *sp. nov.*—Fig. 6 A—D.

Pileo –5 mm lato, minuto, spathulato vel conchiformi, convexo, glabro, brunneo veo ochraceobrunneo, sicco. Lamellis ex adnato emarginatis, distantibus, brunneis, serratis. Stipite –2/–1 mm, laterali, cylindrico, brunneo, glabro. Sporis 6–8,5/5–5,5 μm, ovato-ellipsoideis, levibus, crasse-tunicatis, luteis. Cheilocystidiis 25–40/5–6 μm, clavatis. Ad lignum putridum. Java. Holotypus! *BO 259*.



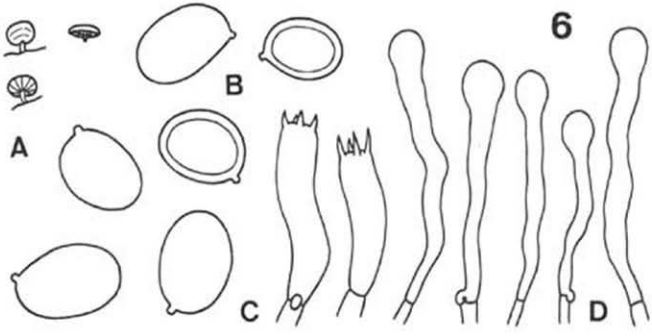


Fig. 5. *Pleuroflammula flavo-marginata*. — A–C. From type of *P. flavo-marginata*. — A. Spores. — B. Basidia. — C. Pleurocystidia.

Fig. 6. *Pleuroflammula overeemii*. — A–D. From type of *P. overeemii*. — A. Carpophores. — B. Spores. — C. Basidia. — D. Cheilocystidia.

Pileus–5 mm diam., at first spathulate becoming conchiform or reniform, margin inrolled, convex later plane; brown to ochraceous brown, dry, glabrous, estriate, not hygrophanous, veil remnants absent. Lamellae adnate to emarginate, distant, ventricose; brown to ochre brown, edge serrate, albofimbriate. Stipe –2×–1 mm, lateral, cylindrical; concolorous with pileus, covered with white fibrils, veil forming neither ring nor cortina, dry, solid, single in groups. Odour and taste unknown. Context brown, not gelatinized. Spore print brown. Spores 6–8,5×5–5,5 µm, ovate (to ellipsoid), smooth, brown, thick-walled, germ pore absent. Basidia 18–22×5–6 µm, 4-spored. Cheilocystidia 25–40×5–6 µm, slender, clavate to subcapitate, with yellow plasmatic pigment. Cuticle a cutis of cylindrical hyphae, encrusted with brown pigment, Clamp connections present.

HABITAT.—On rotten wood. Indonesia (Java).

MATERIAL EXAMINED.—INDONESIA: Java, Bogor, Botanical Garden, May 1921, *v. Overeem 259* (holotype; BO).

Pleuroflammula overeemii is well characterized by its small sized carpophores, lack of veil remnants and rather small spores.

7. PLEUROFLAMMULA DUSSII (Pat.) Sing. apud Sing. & Smith—Fig. 7 A—B.

Crepidotus dussii Pat. *in* Bull. Soc. myc. France **18**: 173. 1902 (basionym). — *Pleuroflammula dussii* (Pat.) Sing. apud Sing. & Smith *in* Mycologia **38**: 521. 1946.

ILLUSTRATIONS.—Horak (1968: 479).

HABITAT.—On rotten wood and bark. Guadeloupe (type), U.S.A. (see Singer, 1946: l.c.).

MATERIAL EXAMINED.—GUADELOUPE: Bois de Bains-Jaunes, *Duss* (holotype; FH).

Pleuroflammula dussii represents the type species of the genus *Pleuroflammula*. Because of its morphological characters, however, this fungus takes a rather isolated position among the hitherto known species within that genus. To our opinion observations on fresh material might reveal that *P. dussii* is better accomodated in the genus *Melanotus* (Horak 1977).

A full description and additional data about *P. dussii* are found in Singer & Smith (1946), Hesler & Smith (1965) and Horak (1968).

8. PLEUROFLAMMULA PUBERULA (Peck) Sing.—Fig. 8 A—C.

Crepidotus puberulus Peck *in* Bull. Torrey bot. Club **25**: 324. 1898 (basionym). — *Pleuroflammula puberula* (Peck) Sing. *in* Lilloa **13**: 85. 1947.

Original diagnosis (Peck, 1898):

'Pileus 6–10 mm, thin, reniform or suborbicular, nearly plane, minutely pubescent, brown; lamellae rather broad ventricose, rustybrown when mature, whitish on edge; stem short, 2–4 mm long, equal, curved, lateral or eccentric, brown, with thin suborbicular patch of white mycelium at base; spores subelliptical, 9–10×5–6 µm.

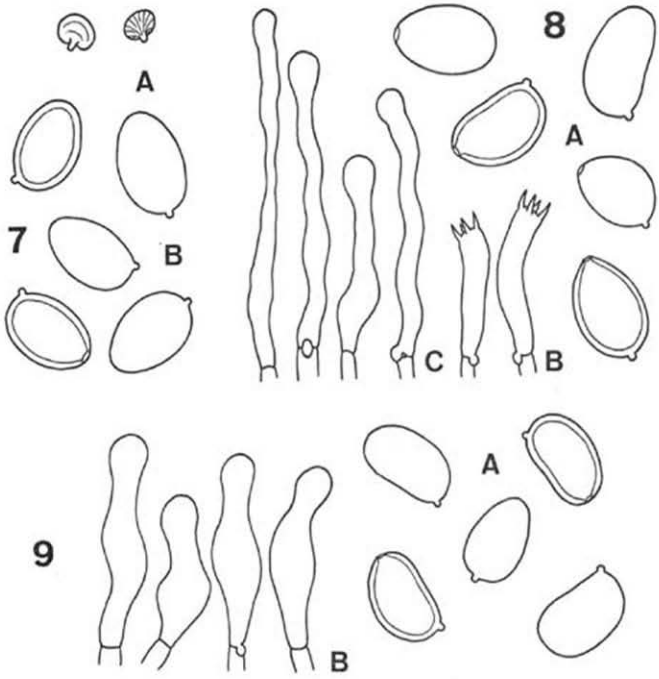


Fig. 7. *Pleuroflammula dussii*. — A, B. From type of *P. dussii*. — A. Carpophores. — B. Spores.
Fig. 8. *Pleuroflammula puberula*. — A–C. From type of *P. puberula*. — A. Spores. — B. Basidia. — C. Cheilocystidia.
Fig. 9. *Pleuroflammula majuscula*. — A, B. From type of *P. majuscula*. — A. Spores. — B. Pleurocystidia.

Observations on the type-material:

Spores 6–8,5 × 4,5–5,5 μm, ovate to phaseoliform, smooth, thick-walled, pale yellow-brown, with distinct narrow germ pore. Basidia 15–20 × 4–5 μm, 4-spored. Cheilocystidia 30–55 × 2–5 μm, fusoid-capitate or cylindrical-capitate, with membrane occasionally thick-walled towards base, hyaline or with yellow-brown plasmatic pigment. Pleurocystidia absent. Cuticle?. Clamp connections present.

HABITAT.—On decaying wood. U.S.A. (S. California).

MATERIAL EXAMINED.—U. S. A.: South California, Compton, 18 March 1897, *McClatchie 1338* (holotype; NY).

The spores of *P. puberula* bear a narrow but distinct germ pore. In *Pleuroflammula* as far as known this distinctive character has been observed only in two taxa and both of them occur along the Pacific Coast in North America and South America.

9. PLEUROFLAMMULA MAJUSCULA Sing.—Fig. 9 A–B.

Pleuroflammula majuscula Singer *in* Beih. Nova Hedwigia **29**: 282. 1969.

For macroscopical description see Singer (1969: l.c.).

Spores 6,5–8×4,5–5,5 μm, ovate to ellipsoid, often phaseoliform, smooth, with thick-walled membrane, ochraceous to rust brown; germ pore narrow but distinct. Basidia 18–25×5–7 μm, 4-spored. Cheilocystidia 20–35×4–7 μm, polymorphous, cylindrical-capitate or fusoid-lageniform, with yellow plasmatic pigment. Pleurocystidia absent. Cuticle a cutis of cylindrical not gelatinized hyphae, encrusted with yellow-brown pigment. Clamp connections present.

HABITAT.—On rotten log. Chile.

MATERIAL EXAMINED.—CHILE: Valdivia, Hueycolla, 4 May 1967, *Singer M 6729* (holotype; SGO).

Pleuroflammula majuscula appears to be a rather rare fungus in Chile and it is known only from the type locality. *P. puberula* — from South California — is its closest relative among the taxa studied in this contribution.

10. **Pleuroflammula simulans** Horak, *sp. nov.*—Fig. 10 A—E.

Pileo –25 mm lato, conchiformi vel reniformi, convexo, ad marginem dentato-appendiculato, aureobrunneo, velutino. Lamellis ex adnato emarginatis, luteis dein sinapicoloribus, alboserratis. Stipite –5×–2 mm, laterali, cylindrico, pileo concolori, anulo imperfecto instructo, fibrilloso. Sporis 7–8,5×5–5,5 μm, ovatis, levibus, crasse-tunicatis, ferrugineis, aporis. Cheilocystidiis 40–90×3–4 μm, cylindraceis. Ad ramos putridos. Nova Guinea. Holotypus: *ZT* 72/6.

Pileus –25 mm diam., conchiform to reniform, with margin incurved and dentate-appendiculate, convex; golden yellow to yellow-brown; velutinous to felty, estriate, dry, conspicuous veil remnants absent. Lamellae adnate to emarginate, at first deep yellow (like *Gymnopilus*) changing to yellow-brown, mustard brown or ochraceous-brown; edge whitish, serrate. Stipe –5×–2 mm, lateral, cylindrical, concolorous with pileus, longitudinally fibrillose, dry, solid, with incomplete, fibrillose to submembranaceous, subpersistent annulus; single in groups. Odour and taste not distinctive. Context yellow-brown. Spore print brown with ferruginous tint.

Spores 7–8,5×5–5,5 μm, ovate, smooth, thick-walled, rust brown; germ pore absent. Basidia 20–27×5–7 μm, 4-spored. Cheilocystidia 40–90×3–4 μm, cylindrical or tapering towards obtuse apex, hyaline or with yellow-brown plasmatic pigment, forming sterile edge. Pleurocystidia absent. Cuticle a cutis of subregular cylindrical hyphae (4–10 μm diam.), membranes not gelatinized, yellow-brown plasmatic and encrusting pigment. Clamp connections numerous.

HABITAT.—On rotten branches of broad-leaved trees and stems of *Nastus* sp. (Bambusaceae). Papua New Guinea.

MATERIAL EXAMINED.—PAPUA NEW GUINEA: Eastern Highlands, Goroka, Daulo Pass, 5 Jan. 1972, *Horak 72/6* (holotype; ZT).

The cheilocystidia (shape, size) and the spores of *P. simulans* are reminescent of those observed in *P. croceo-sanguinea*. However, the Chilean fungus is well seperated by its conspicuous veil remnants and the deep brick red coloured lamellae.

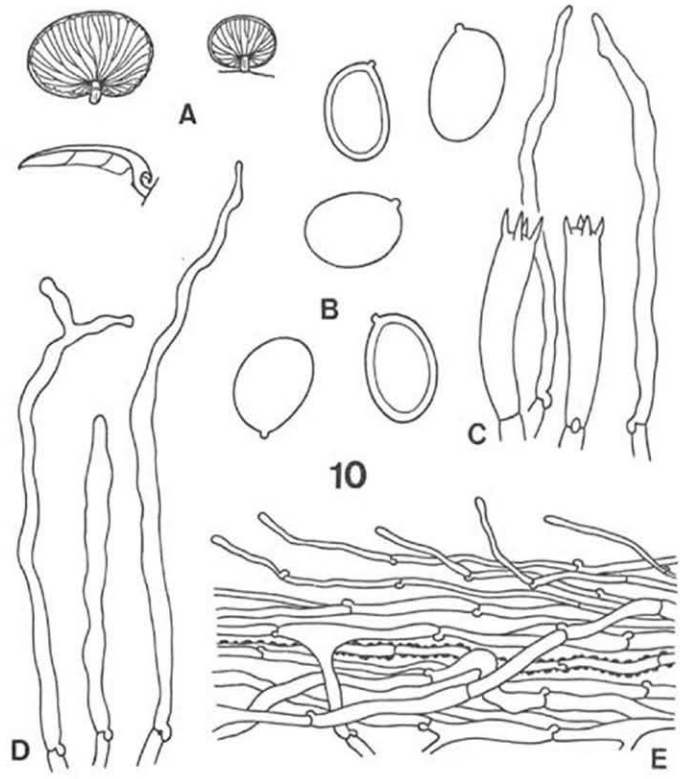


Fig. 10. *Pleuroflammula simulans*. — A–E. From type of *P. simulans*. — A. Carpophores. — B. Spores. — C. Basidia. — D. Cheilocystidia. — E. Cuticle.

DOUBTFUL SPECIES

Pleuroflammula fluminensis Singer *in* Beih. Sydowia **7**: 86. 1973.

Despite efforts no type material was located in NY, FH and F.

Zusammenfassung

Zehn Arten von *Pleuroflammula* Singer (1946) [davon 3 neue: *P. praestans*, *P. overeemii*, *P. simulans*] werden beschrieben, abgebildet und bezüglich Taxonomie und geographischer Verbreitung diskutiert.

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ON SOME APHYLLOPHORALES FROM AUSTRALIA

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(With 13 Text-figures)

A collection of Aphyllophorales from Australia and Tasmania has been studied. Fifteen species have been identified and the following new taxa are described: *Amaurohydnum flavidum* gen. et spec. nov., *Amauromyces pallidus* gen. et spec. nov., *Hyphoderma cinnamomeum*, *Lindtneria pellicularis*, *Resinicium luteum* spp. nov. The new combination *Radulodon calcareus* (Cooke & Massee) is proposed.

The Aphyllophorales of Australia are far from being well known. The main source of information, of course, is the monograph of Cunningham (1963) who studied many collections from Australia although he dealt more in particular with the species of New Zealand. In a series of interesting papers Reid (1955–1963) described and figured many basidiomycetes, the greater part of which are Aphyllophorales. Mention should further be made of the important publication by Talbot who paid special attention to the more inconspicuous species of that group. Valuable information is also found in the other literature cited at the end of the paper but which is not mainly devoted to the species of Australia.

If, however, all information available is put together and the question is asked how much is actually known about Australian Aphyllophorales, then the astonishing gaps in our knowledge become evident. The obvious reason is the deplorable lack of collections from Australia, which makes it practically impossible to judge the number of indigenous species. Only very few people have been interested in the said group of fungi and the main work has still to be done, so that every additional collection of Aphyllophorales from Australia is most welcome. It was therefore with great interest that I looked into part of the Aphyllophorales recently collected there by Maas Geesteranus. Although on a private visit he managed to bring back many interesting species, a number of which are dealt with in this paper. In the collector's opinion his output can by no means be considered to be representative since the collecting was done in only a few restricted areas and during a dry spring following a winter which, according to local people, had also been exceptionally dry.

Some of the species mentioned are probably typical of a dry climate (e.g. *Radulodon calcareus*), whereas others like *Lindtneria pellicularis* certainly grew under microclimate conditions with a higher relative humidity. All specimens were very well preserved, which greatly facilitated the microscopic analysis of hyphal structures.

In order to allow a better comparison of the size of the microscopical characters, all structures are shown with the same magnification.

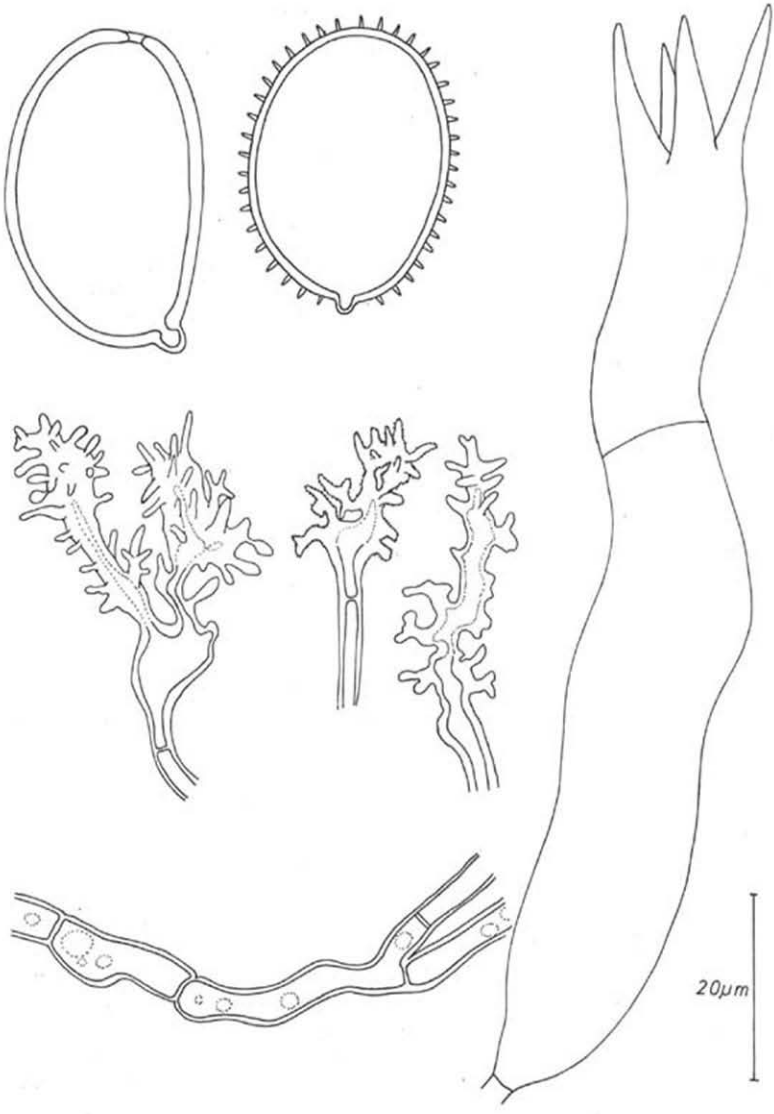


Fig. 1. *Aleurodiscus sparsus* — *Maas Geesteranus 15548*: spores, basidium, acanthophyses, basal hyphae.

ALEURODISCUS SPARSUS (Berk.) Höhn. & Litsch.—Fig. 1

Stereum sparsum Berk. *in* J. Linn. Soc., Bot. **14**: 72. 1873. — *Aleurodiscus sparsus* (Berk.) Höhn. & Litsch. *in* Sber. K. Akad. Wiss. Wien Math.-Nat. Kl. **116**: 809. 1907.

Basidiocarp annual, resupinate, effused, several cm large, membranaceous, closely adnate, separable in small pieces; context homogeneous; hymenial surface white, even, slightly to strongly cracked when dry; margin white, indistinct, determinate, narrow, somewhat pruinose; rhizomorphs and hyphal strands lacking.

Hyphal system monomitic. Hyphae hyaline, flexuous-cylindrical, 3–4 μm wide and rather thin-walled in subhymenium (0.2–0.4 μm), 3–6 μm in diam. and somewhat thick-walled (0.6 μm) in trama, clamps always lacking, contents with yellow oil guttules. Acanthophyses present, abundant, of hymenial to subhymenial origin, hyaline, 30–80 μm long, thick-walled, in basal part smooth, in upper part often branched and with irregular, spine-like outgrowths the surface of which often appears granulose; basal clamp lacking; contents homogeneous; not protruding; some weakly amyloid. Basidia hyaline, broadly cylindrical to somewhat clavate when mature, 60–110 × 13–20 μm, thin-walled, smooth; basal clamp lacking; contents homogeneous; with four, large, subulate sterigmata (c. 15 × 5 μm). Spores hyaline, broadly ellipsoid, with large, relatively thin-walled apiculus, 24–30 × 16–20 μm, thick-walled (1–1.5 μm), spiny in Melzer (smooth in KOH and lactophenol), contents oily, becoming yellow in Melzer, strongly amyloid, not dextrinoid or cyanophilous.

REACTIONS.—Spores strongly, some acanthophyses weakly amyloid, no other part of basidiocarp being amyloid, dextrinoid or cyanophilous.

SUBSTRATE.—In Australia found on wood of Eucalyptus.

DISTRIBUTION.—Australia, New Zealand.

SPECIMEN STUDIED.—AUSTRALIA: Victoria, Warburton, Mt Donna Buang, ±1000 m alt., 2 Nov. 1977, *R. A. Maas Geesteranus 15548* (L).

The spores are smooth in KOH and show an apical porus; sometimes also the apiculus dissolves, which creates a second porus at this place.

Amaurohydnum Jülich, *gen. nov.*

Fructificatio resupinata, effusa, circa 200 μm crassa, adnata, membranacea, pallide colorata. Systema hypharum monomiticum. Hyphae hyalinae, cylindraceae vel torulosae, distinctae vel indistinctae, fibulatae, circa 2–4 μm latae. Basidia distincte clavata, parva, fibulata, tetraspora. Sporae hyalinae, tenui-tunicatae, laeves, parvae, inamyloideae. Typus: *Amaurohydnum flavidum* Jülich.

Etymology: ἀμαυρός — inconspicuous; hydnum.

Basidiocarp annual, resupinate, effused, about 200 μm thick, adnate, membranaceous, pale coloured. Hyphal system monomitic. Hyphae hyaline, cylindrical to torulose, distinct to indistinct, about 2–4 μm wide, with clamps. Basidia distinctly clavate, small, 4-spored, with a basal clamp. Spores hyaline, thin-walled, smooth, small, inamyloid.

SCOPE.—Monotypic.

Amaurohydnum flavidum Jülich, *sp. nov.*

Fructificatio resupinata, effusa, usque ad 20 cm longa, ad 200 μm crassa, membranacea, adnata, ochracea vel flavida, minute hydnoidea; margo alba. Systema hypharum monomiticum. Hyphae hyalinae, cylindricae vel torulosae, 1.5–3.5 μm diametro, tenui-tunicatae vel

basales paulo incrassate-tunicatae, laeves, fibulatae. Cystidia desunt. Basidia hyalina, distincte clavata, 12–14×5.3–5.8 μm, fibulata, tetraspora, sterigmata circa 2.5×0.8 μm. Sporae hyalinae, ellipsoideae, 3.8–4.2×2.4–2.6 μm, tenui-tunicatae, laeves, inamyloideae. Habitat: in ligno Eucalypti. Typus: Australia, Victoria, Warburton, Mt Donna Buang, ±1000 m alt., 2.XI. 1977, *R. A. Maas Geesteranus 15549* (L).

Basidiocarp annual, resupinate, effused, up to 20 cm large, up to 200 μm thick (except the teeth), membranaceous, adnate, separable in small pieces; context homogeneous; hymenial surface ochraceous to yellow, minutely hydnoid, strongly cracked when dry; margin white, indeterminate, thinning out; rhizomorphs and hyphal strands lacking.

Hyphal system monomitic. Hyphae hyaline, cylindrical to torulose, densely arranged, branching from or near clamps, 2–3 μm wide and thin-walled in subhymenium, slightly thick-walled and 1.5–3.5 μm diam. in trama, smooth; clamps present; contents homogeneous. Cystidia lacking. Basidia hyaline, distinctly clavate, 12–14×5.3–5.8 μm, smooth, thin-walled, with clamp, with homogeneous contents, with four subulate sterigmata (c. 2.5×0.8 μm). Spores hyaline, ellipsoid, with small apiculus, 3.8–4.2×2.4–2.6 μm, thin-walled, smooth, with homogeneous contents, inamyloid.

SUBSTRATE.—On wood of *Eucalyptus*.

DISTRIBUTION.—Australia.

SPECIMEN STUDIED.—AUSTRALIA, Victoria, Warburton, Mt Donna Buang, ±1000 m alt., 2 Nov. 1977, *R. A. Maas Geesteranus 15549* (L).

Amauromyces Jülich, *gen. nov.*

Fructificatio resupinata, effusa, adnata, tenuis, crustata, ceracea, pallide colorata. Systema hypharum monomiticum. Hyphae hyalinae, basales incrassate tunicatae, latae (5–10 μm), fibulatae, parietibus in KOH crescentibus vel solventibus. Cystidia hyalina, incrassate tunicata, fibulata. Basidia hyalina, circa 10–20 μm longa, clavate vel flexuoso-cylindracea, tetraspora, fibulata. Sporae hyalinae, tenui-tunicatae, laeves, ellipsoideae, parvae, inamyloideae. Typus: *Amauromyces pallidus* Jülich.

Etymology: ἀμαυρός — inconspicuous, μυκης — fungus.

Basidiocarp resupinate, effused, adnate, thin, crust-like, ceraceous; hymenial surface pale coloured.

Hyphal system monomitic. Hyphae hyaline, thin-walled in subhymenium, thick-walled and very wide (5–10 μm) in trama, with clamps at all primary septa; wall of basal hyphae swelling and partly dissolving in KOH. Cystidia hyaline, thick-walled, smooth, clamped. Basidia hyaline, about 10–20 μm long, clavate to flexuous-cylindrical, 4-spored, with clamp. Spores hyaline, thin-walled, smooth, ellipsoid, small, inamyloid.

SCOPE.—Up to now monotypic.

The genus is characterized by its very broad and thick-walled basal hyphae, which remind one of *Phanerochaete*. Contrary to that genus clamps are developed at all primary septa. The wall of the basal hyphae swells and dissolves partly in KOH. The basidia are rather small.

Amauromyces pallidus Jülich, *sp. nov.*—Figs. 2, 3a

Fructificatio resupinata, effusa, 30–80 μm crassa, circa 10 cm lata, ceracea, valde adnata, laevis. Systema hypharum monomiticum. Hyphae hyalinae, cylindraceae vel paulo torulosae,

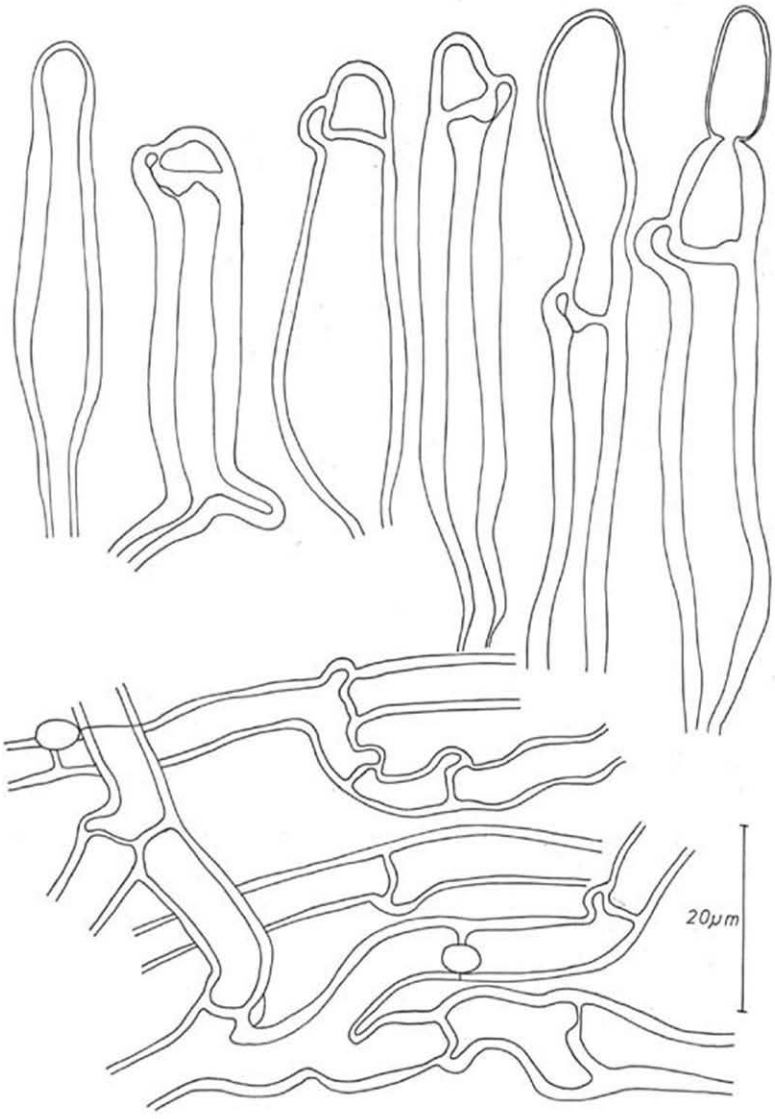


Fig. 2. *Amauromyces pallidus*. — Type: cystidia (above), basal hyphae (below).

fibulatae, basales latae (5–10 μm), parietibus in KOH crescentibus vel solventibus. Cystidia (lamprocystidia) hyalina, plus minusve cylindracea vel clavata, crasse-tunicata, saepe cum septo fibulato in regione apicis, Basidia hyalina, clavata vel flexuoso-cylindracea, tenui- vel incrassate-tunicata, laeves, fibulata, 10–20(–25) × 4.6–5.0 μm. Sporae hyalinae, late ellipsoideae, tenui-tunicatae, laeves, parvae, 3.5–4 × 2.2–2.4 μm, inamyloideae. Habitat: in ligno Eucalypti. Typus: Australia, Victoria, Mt Bride, S. of Warburton, 3.XI.1977, *R. A. Maas Geesteranus 15550* (L).

Basidiocarp annual, resupinate, effused, about 10 cm large, 30–80 μm thick, ceraceous, closely adnate; context homogeneous; hymenial surface pale greyish, even, not cracked when dry; margin concolorous, indistinct, thinning out; rhizomorphs or hyphal strands lacking.

Hyphal system monomitic. Hyphae hyaline, cylindrical to somewhat torulose, indistinct in subhymenium, densely interwoven in trama, branching from or opposite to clamps, 4–6 μm wide and thin- to slightly thick-walled in subhymenium, 5–8(–10) μm in diam. and thick-walled in trama, smooth; clamps always present, although sometimes difficult to observe; contents homogeneous; walls of basal hyphae strongly swelling (and partly dissolving) in 5–10% KOH, yellow in Melzer. Cystidia (lamprocystidia) present, abundant, of subhymenial origin, mostly cylindrical to clavate, often 2-celled with rather small apical cell delimited by clamped septum, 40–80 × 10–12–16 μm, thick-walled (1–4 μm), smooth (i.e. without crystals) or apical part somewhat scaly; basal clamp probably present; contents homogeneous, in 2-celled stages the plasma often concentrated in the apical cell; protruding up to 30 μm;

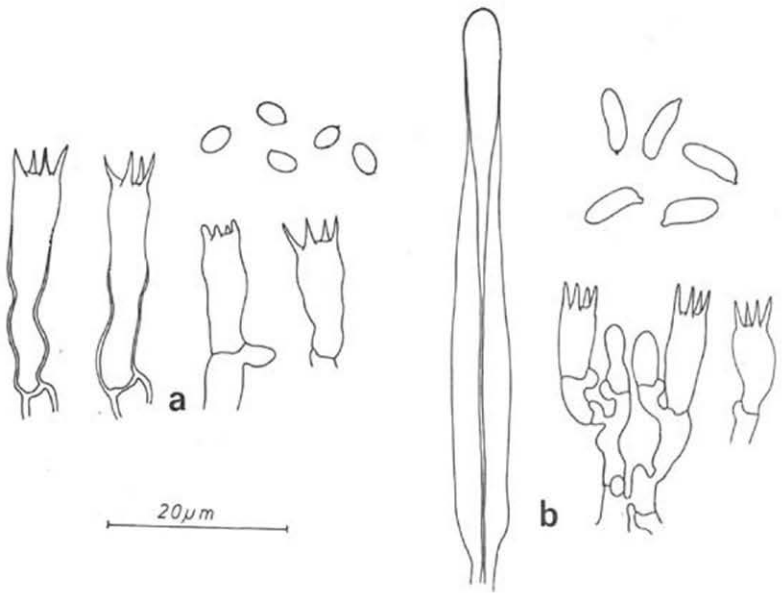


Fig. 3a. *Amauromyces pallidus*. — Type: basidia, spores.
Fig 3b. *Tubulicrinis glebulosus*. — *Maas Geesteranus 15542*: lyocystidium, basidia, spores.

no reaction in Melzer or with cotton blue. Basidia hyaline, clavate or flexuous-cylindrical, 10–20(–25) × 4.6–5.0 μm, in upper part thin-walled, in basal part often somewhat thick-walled, smooth; clamp present; contents homogeneous, with four, subulate sterigmata (c. 4 × 0.8–1 μm). Spores hyaline, broadly ellipsoid, with small apiculus, 3.5–4 × 2.2–2.4 μm, not glued together, thin-walled, smooth, with homogeneous contents, neither amyloid, nor dextrinoid or cyanophilous.

REACTIONS.—No part of basidiocarp amyloid, dextrinoid, or cyanophilous.

SUBSTRATE.—Saprophytic on wood of *Eucalyptus*.

DISTRIBUTION.—Australia.

SPECIMEN STUDIED.—AUSTRALIA, Victoria, Mt Bride, S. of Warburton, 3 Nov. 1977, *R. A. Maas Geesteranus 15550* (type;L).

The basal hyphae immediately begin to swell in 5–10% KOH, some parts (especially near the clamps) of the hyphal walls becoming almost invisible after several minutes. The swelling of the wall of the lamprocystidia is less conspicuous and only conspicuous after about 30 minutes.

The fungus of the type collection partly overgrows a *Botryobasidium* spec. (probably *B. botryosum*) with similar basal hyphae, which differ in being clampless and strongly cyanophilous.

BOTRYOBASIDIUM BOTRYOSUM (Bres.) J. Erikss.—Fig. 4

Botryobasidium botryosum J. Erikss. *in* Symb. bot. Upsal. **16** (1): 53. 1958.

Basidiocarp annual, resupinate, effused, several cm large, c. 150 μm thick, hypochnoid, adnate, easily separable; context homogeneous; hymenial surface greyish or greyish ochraceous, even, not cracked when dry; margin whitish, indistinct, thinning out; rhizomorphs or hyphal strands lacking.

Hyphal system monomitic. Hyphae hyaline, cylindrical, loosely arranged, 5–7 μm wide and thin-walled in subhymenium, 5–10 μm in diam, and thick-walled (0.4–1.6 μm) in trama; clamps always lacking; contents homogeneous; walls yellow in Melzer, distinctly cyanophilous in cotton blue. Cystidia lacking. Basidia hyaline, broadly cylindrical to somewhat clavate when mature, more or less ellipsoid when young, 10–15 × 7.5–9 μm, thin-walled, smooth, a basal clamp lacking; contents homogeneous; with six subulate sterigmata. Spores hyaline, fusiform or navicular, with distinct apiculus, 8–10 × 3.5–4 μm, not glued together, thin-walled, smooth, contents guttulate, not amyloid or dextrinoid, slightly cyanophilous.

REACTIONS.—Walls of hyphae and basidia distinctly (spore wall weakly) cyanophilous, but no part of basidiocarp amyloid or dextrinoid.

SUBSTRATE.—In Australia collected on wood of *Eucalyptus*.

DISTRIBUTION.—Temperate regions, Australia.

SPECIMENS STUDIED.—AUSTRALIA: Victoria, Warburton, Mt Donna Buang, ±1000 m, 2 Nov. 1977, *R. A. Maas Geesteranus 15546* (L.) — Victoria, Gippsland, Morwell, Morwell National Park, 22 Nov. 1977, *R. A. Maas Geesteranus 15566* (L).

The species delimitation is not quite clear in *Botryobasidium*. The Australian specimens deviate from European material in having somewhat smaller spores and basidia.

This species is not mentioned in Cunningham.

BOTRYOBASIDIUM OBTUSISPORUM J. Erikss.—Fig. 5

Botryobasidium obtusisporum J. Erikss. *in* Symb. bot. Upsal. **16** (1): 57. 1958.

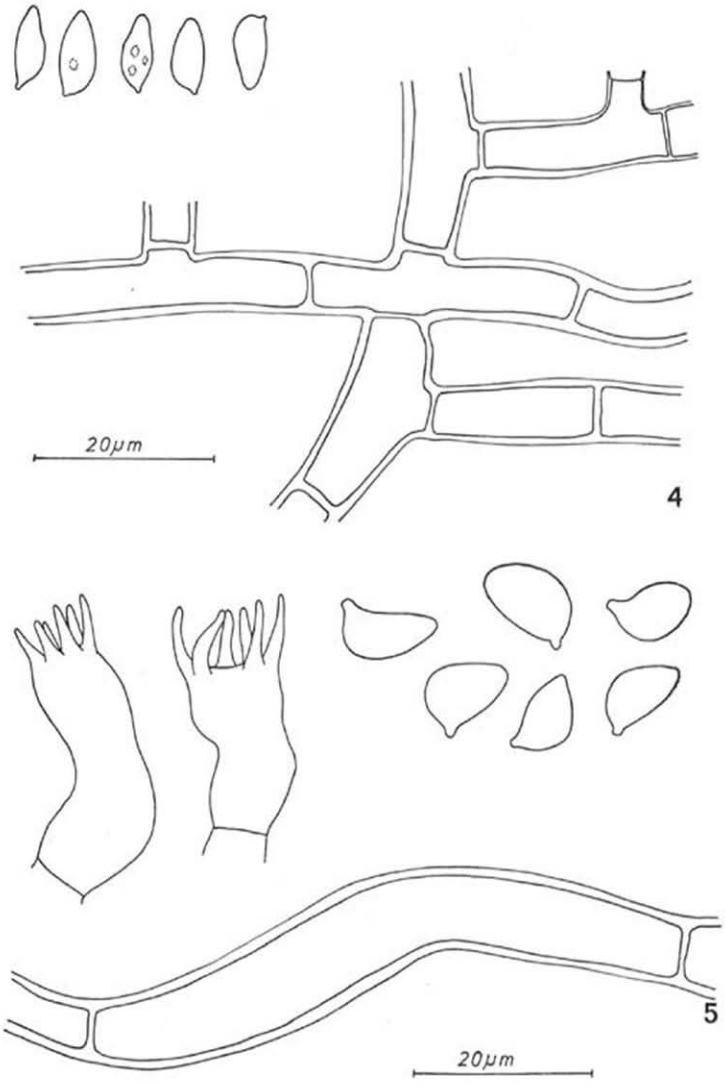


Fig. 4. *Botryobasidium botryosum*. — *Maas Geesteranus 15546*: spores, basal hyphae.

Fig. 5. *Botryobasidium obtusisporum*. — *Maas Geesteranus 15539*: basidia, spores, basal hypha.

Basidiocarp annual, resupinate, effused, several cm large, 150–200 μm thick, hypochnoid, adnate, easily separable; context homogeneous; hymenial surface ochraceous, even, not cracked when dry; margin whitish, indistinct, thinning out; rhizomorphs and hyphal strands lacking.

Hyphal system monomitic. Hyphae hyaline (subhymenium) to yellow (trama), cylindrical, loosely arranged, branching at right angles, 5–8 μm wide and thin-walled in subhymenium, 8–10 μm in diam. and thick-walled (0.4–0.8 μm) in trama, smooth; clamps always lacking; contents homogeneous; walls becoming yellow in Melzer. Cystidia lacking. Basidia hyaline, broadly cylindrical when mature, ellipsoid when young, 20–28×9–10 μm, thin-walled, smooth, clamp lacking, with six subulate sterigmata. Spores hyaline, obliquely ovoid, with large apiculus, 9–11×4.5–6 μm, not glued together, thin-walled, smooth, with homogeneous contents, neither amyloid, nor dextrinoid or cyanophilous.

SUBSTRATE.—In Australia collected on wood of *Eucalyptus*.

DISTRIBUTION.—Europe (type collection), Australia.

SPECIMEN STUDIED.—AUSTRALIA: Victoria, Dom Dom Saddle, ±500 m alt., 7 Nov. 1977, *R. A. Maas Geesteranus 15539* (L).

The spores are slightly wider (4.5–6 μm) than those of the type collection (3.5–5 μm), otherwise there seems to be no difference.

Not mentioned in Cunningham.

CORTICIUM TULASNELLOIDEUM Höhn. & Litsch. —Fig.6

Corticium tulasnelloideum Höhn. & Litsch. *in* Sber. K. Akad. Wiss. Math.-nat. Kl. Wien **117**: 1118. 1908.

SPECIMENS STUDIED.—AUSTRALIA: Victoria, Hurstbridge (Melbourne), on underside of fallen *Eucalyptus* branch, 15 Nov. 1977. *R. A. Maas Geesteranus 15557* (L). — TASMANIA: Launceston, Punch Bowl Reserve, on underside of fallen *Eucalyptus* branch, 13 Nov. 1977, *R. A. Maas Geesteranus 15563* (L).

This species is easily recognized by its small, warted spores, small basidia, clamped hyphae, and the greyish-cream coloured hymenial surface. It is known from Europe, North America, Australia, and New Zealand. Its systematic position is still unclear: according to its spores it should be placed in *Trechispora*, but it forms pleurobasidia, a character separating it from most species of *Trechispora*.

Hyphoderma cinnamomeum Jülich, *sp. nov.*—Fig. 7

Fructificatio resupinata, effusa, molle membranacea, adnata, hymenio cinnamomeo, laeve vel minute odontioideo. Systema hypharum monomiticum. Hyphae hyalinae, cylindraceae, incrassate tunicatae, fibulatae, 4–5 μm latae. Leptocystidia hyalina, tenui-tunicata, subulata, 25–40×4–6 μm. Basidia suburniformia, tetraspora, 18–25×4.0–5.5 μm. Sporae hyalinae, late ellipsoideae, laeves, tenui-tunicatae, 5.5–5.8×3.8–4.0 μm, inamyloideae, Habitat: in ligno Eucalypti. Typus: Australia, Tasmania, Launceston, Punch Bowl Reserve, 13.XI.1977, *R. A. Maas Geesteranus 15561* (L).

Basidiocarp annual, resupinate, effused, about 10 cm large, soft-membranaceous, adnate, separable in small pieces; context homogeneous; hymenial surface cinnamon, even to slightly odontioid (lens!), not cracked when dry; margin pale yellowish-cinnamon, indistinct; rhizomorphs and hyphal strands lacking.

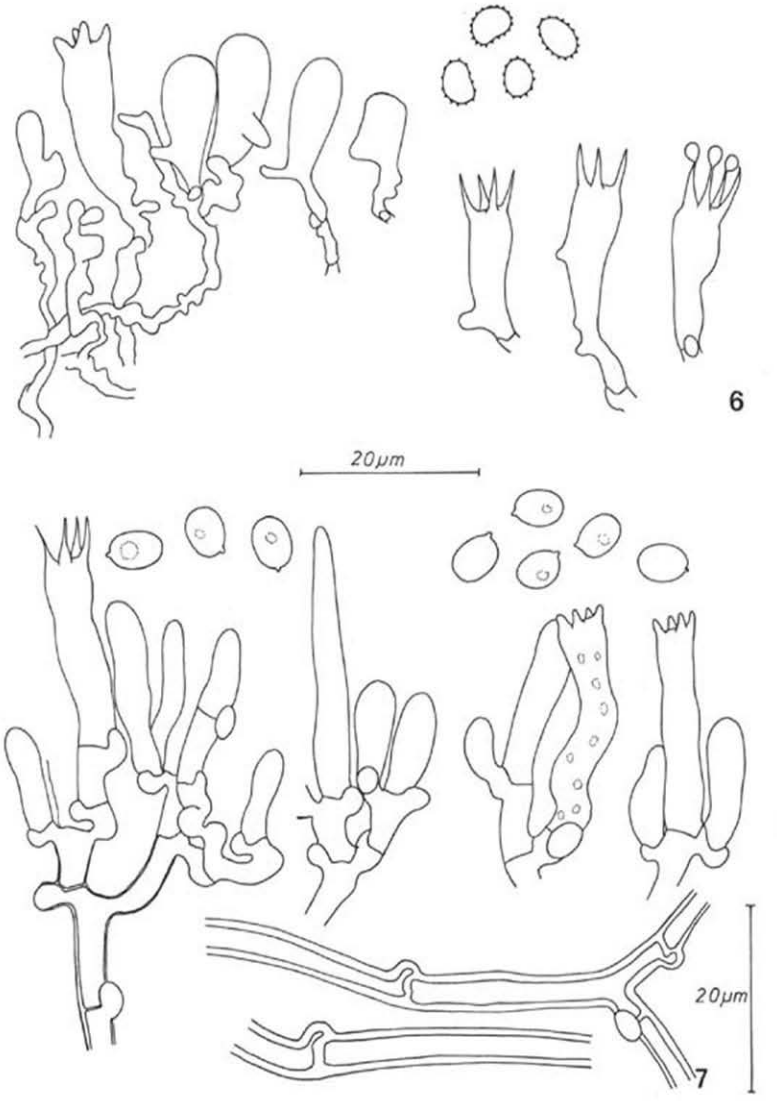


Fig. 6. *Corticium tulasnelloideum.* — *Maas Geesteranus 15557*: basidia, spores.

Fig. 7. *Hyphoderma cinnamomeum.* — Type: leptocystidium, basidia, spores, basal hyphae.

Hyphal system monomitic. Hyphae hyaline, cylindrical, loosely arranged in subhymenium and trama, branching from or opposite to clamps, 4–5 μm in diam., thin- to slightly thick-walled in subhymenium (0.2–0.4 μm), thick-walled in trama (0.5–1.0 μm), smooth; clamps always present; contents homogeneous. Cystidia (leptocystidia) abundant, hyaline, of hymenial origin, subulate, 25–40×4–6 μm, thin-walled, smooth; clamp present; contents homogeneous; protruding up to 15 μm. Basidia hyaline, clavate to suburniform when mature, clavate when young, 18–25×4.0–5.5 μm, thin-walled, smooth; clamp present; contents homogeneous; with four, subulate sterigmata (4–4.8×1–1.2 μm). Spores hyaline, broadly ellipsoid, with small apiculus, 5.5–5.8×3.8–4.0 μm, not glued together, thin-walled, smooth, neither amyloid, nor dextrinoid or cyanophilous.

REACTIONS.—No part of basidiocarp amyloid, dextrinoid or cyanophilous.

SUBSTRATE.—Saprophytic on wood of *Eucalyptus* spec.

DISTRIBUTION.—Tasmania.

SPECIMEN STUDIED.—AUSTRALIA, Tasmania, Launceston, Punch Bowl Reserve, 13 Nov. 1977, *R. A. Maas Geesteranus 15561* (type; L).

The species differs from other species of *Hyphoderma* in the colour of the basidiocarp and the rather small spores. The basal hyphae are distinct and somewhat thick-walled like those of *Hyphoderma setigerum* (Fr.) Donk, the generic type of *Hyphoderma*. The mycelium on or in the wood is yellow and reminds one of **Hyphoderma flagellatum** (Cunn.) Jülich, *comb. nov.* (basionym: *Corticium flagellatum* Cunn. 1963, The Thelephoraceae of Australia and New Zealand, p. 52), a species described from New Zealand, differing in microscopical characters.

Lindtneria pellicularis Jülich, *sp. nov.*—Fig. 8

Fructificatio resupinata, effusa, tenuis (c. 50 μm), pellicularis, laevis, pallide ochracea, rhizomorphis tenuissimis (cum 5–10 hyphae). Systema hypharum monomiticum. Hyphae hyalinae, tenui-tunicatae, fibulatae, 5–6 μm latae. Cystidia desunt. Basidia hyalina, clavata, guttulis cyanophilis, 28–32×8–9 μm, tetraspora. Sporae hyalinae, globosae, apiculis distinctis, incrassate-tunicatae (0.4 μm), 5–5.6 μm diametro, dense aculeatae, valde cyanophilae (praecipue aculei). Habitat: in ligno Eucalypti. Typus: Australia, Victoria, Mt Bride, S. of Warburton, 3.XI.1977, *R. A. Maas Geesteranus 15551* (L).

Basidiocarp annual, resupinate, effused, several cm large, c. 50 μm thick, pellicular, very loosely adnate, separable, context homogeneous; hymenial surface cream-coloured to ochraceous, even, not cracked when dry; margin whitish, indistinct, thinning out, hyphal strands present, white, very thin, composed of 5–10 hyphae.

Hyphal system monomitic. Hyphae hyaline, cylindrical, loosely arranged in subhymenium and trama, branching from or opposite to the clamps, 5–6 μm in diam., thin-walled throughout, smooth, clamps always present, contents homogeneous. Cystidia lacking. Basidia hyaline, clavate when mature and young, 28–32×8–9 μm, thin-walled, smooth; basal clamp present; contents with oily material, part of which stains distinctly blue in cotton blue. Spores hyaline, globose, with prominent apiculus, 5–5.6 μm in diam., somewhat thick-walled (0.4 μm), densely covered with short and thin spines, contents with oil guttules, neither amyloid nor dextrinoid but strongly cyanophilous.

REACTIONS.—Walls of hyphae and basidia yellow in Melzer, spore wall pale brown; the greater part of the 'oil' guttules in basidia and spore wall is distinctly cyanophilous; not other parts of the basidiocarp are amyloid, dextrinoid, or cyanophilous.

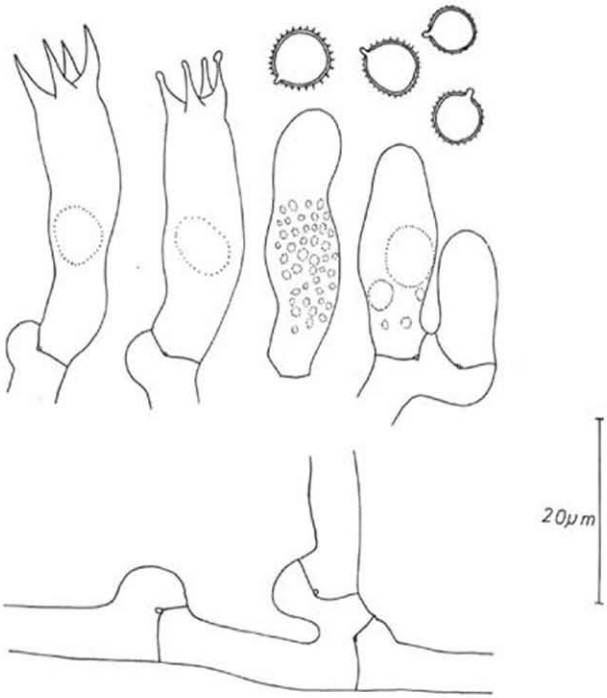


Fig. 8. *Lindtneria pellicularis*. — Type: basidia, spores, basal hyphae.

SUBSTRATE.—Saprophytic on wood of fallen *Eucalyptus*.
DISTRIBUTION.—Australia.
SPECIMEN STUDIED.—AUSTRALIA, Victoria, Mt Bride, S. of Warburton, 3 Nov. 1977, *R. A. Maas Geesteranus 15551* (type; L).

The genus *Lindtneria* has recently been emended by Jülich (1977) to include not only poroid species but also such with a smooth hymenophore. The genus is characterized by its aculeate and strongly cyanophilous spores, the reaction to cotton blue of the guttules in the basidial contents and the mostly soft-membranaceous (pellicular only in *L. pellicularis*) basidiocarp. The genus now comprises five species, three in the northern hemisphere, one in Africa, and now one from Australia. The species may be distinguished as follows:

1a. Hymenial surface smooth 2
b. Hymenial surface poroid 3
2a. Basidiocarp pellicular, with thin hyphal strands; spores globose, 5–5.6 µm in diam.; basidia 28–32 µm long; Australia . . . . . *L. pellicularis* Jülich
b. Basidiocarp membranaceous, hyphal strands lacking; spores ellipsoid, 7–9 × 5.5–6.5 µm; basidia 35–55 × 6–12 µm; Europe . . . . . *L. leucobryophila* (Henn.) Jülich

3a. Spines on spore surface in wing-like crests; Africa . . . . . *L. pterospora* Reid
b. Spines on spore surface separated (except for the hilum region) 4
4a. Spores globose, 6–8 μm in diam.; basidia 25–35×9–12 μm; Europe, North America *L. trachyspora* (Bourd. & Galz.) Pilát
b. Spores ellipsoid, 6–9×5–6 μm; basidia 25–40×8–11 μm; Russia . . . *L. flava* Parm.

Meruliopsis corium (Fr.) Ginns

Meruliopsis corium Ginns *in* Can. J. Bot. **54**: 126. 1976.

Specimen studied.—Australia: Tasmania, Launceston, Punch Bowl Reserve, on the underside of a fallen *Eucalyptus* branch, 13 Nov. 1977, *R. A. Maas Geesteranus 15556* (L).

This is the most common merulioid fungus growing in temperate to tropical areas. The basidiocarp may be completely resupinate, but is mostly distinctly reflexed. Contrary to many other merulioid fungi the folds remain even after drying. The hymenial surface is cream-coloured or of an orange to medium brown colour. In striking contrast to the colour of the hymenium is the pure white trama. The species is recognized microscopically by its distinct, rather wide, clampless hyphae and the ellipsoid, adaxially slightly depressed and inamyloid spores. This species has often been collected in New Zealand, seldom in Australia.

Peniophora crustosa Cooke—Fig. 9

Peniophora crustosa Cooke *in* Grevillea **8**: 56. 1879.

Basidiocarp annual, effused up to 10 cm, about 500 μm thick, adnate, ceraceous; context homogeneous or layered; margin determinate; rhizomorphs or hyphal strands lacking; hymenial surface even, pruinose under a lens, whitish to greyish to pale brownish.

Hyphal system monomitic. Hyphae 2–3 μm wide and thin-walled in subhymenium, 2–4 μm in diam. and somewhat thick-walled (0.5–0.8 μm) in trama, more or less cylindrical, branching near septa; clamps lacking; contents homogeneous; with many loosely arranged crystals in trama. Cystidia (lamprocystidia) numerous, of subhymenial origin, thick-walled, heavily incrusted, 40–60×8–14 μm, enclosed or protruding up to 25 μm. Basidia hyaline, narrowly clavate when mature, flexuous-cylindrical when young, thin-walled, (16–)20–25×4–5 μm; clamp lacking; contents homogeneous; with (2–)4 subulate sterigmata (4–4.5×0.8 μm, in two-spored basidia c. 8×1.4 μm). Spores hyaline, ellipsoid, at adaxial side slightly curved, thin-walled, smooth, 6–7.2×2.8–3.4 μm, with small apiculus, with homogeneous contents, neither amyloid, nor dextrinoid or cyanophilous.

Substrate.—In Australia found on wood of *Eucalyptus*.

Specimen studied.—Australia: Victoria, Dom Dom Saddle, ±500 m alt., 7 Nov. 1977, *R. A. Maas Geesteranus 15541* (L).

This species is known from New Zealand (type locality) and Australia and seems to be not rare. It is a typical member of the genus *Peniophora* sensu stricto with its dense hyphal context, heavily incrusted lamprocystidia and narrowly ellipsoid spores.

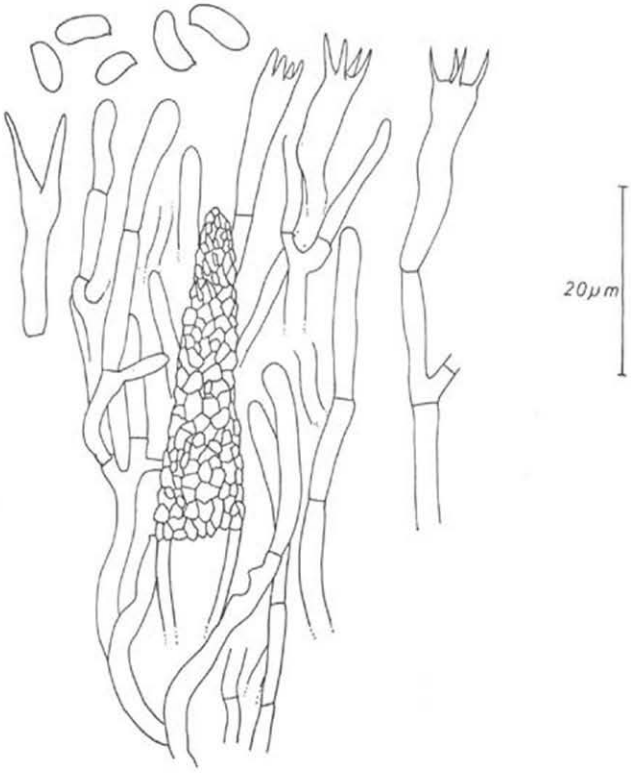


Fig. 9. *Peniophora crustosa.* — *Maas Geesteranus 15541*: lamprocystidium, basidia, spores.

Radulodon calcareus (Cooke & Mass.) Jülich, *comb. nov.*—Fig. 10

Hydnum calcareum Cooke & Massee *in* Grevillea **21**: 38. 1892 (basionym).

Basidiocarp annual, resupinate, effused, 15 cm large, 100–200 µm thick (except for the spines), membranaceous, adnate; context homogeneous; hymenial surface greyish, hydnoid, with conical, up to 2 mm long spines; surface of basidiocarp cracked when dry; margin white, determinate; rhizomorphs or hyphal strands lacking.

Hyphal system monomitic. Hyphae hyaline, more or less cylindrical, loosely arranged in subiculum, densely interwoven but distinct in trama, branching from or opposite to clamps, 3–4 µm in diam., thin-walled in subhymenium, thin- to somewhat thick-walled in trama of spines, smooth; clamps present at all septa; contents homogeneous. Leptocystidia (or gloeocystidia) present, abundant also in the sterile parts of spines, of hymenial origin, hyaline, more or less clavate, in younger parts of hymenium with lateral projections, 50–80 × 8–10 µm, thin-walled, smooth, with clamp always present, with homogeneous contents, enclosed or protruding

up to 20 μm; no reaction in Melzer or with cotton blue. Basidia hyaline, clavate when mature and young, 18–20 × 5–5.5 μm, thin-walled, smooth; clamp always present; contents homogeneous; with four, subulate sterigmata (c. 3.2 × 1 μm). Spores hyaline, broadly ellipsoid, with small apiculus, 4.8–6 × 3.2–4 μm, not glued together, thin-walled, smooth, with homogeneous contents or seldom with some guttules, neither amyloid, nor dextrinoid or cyanophilous.

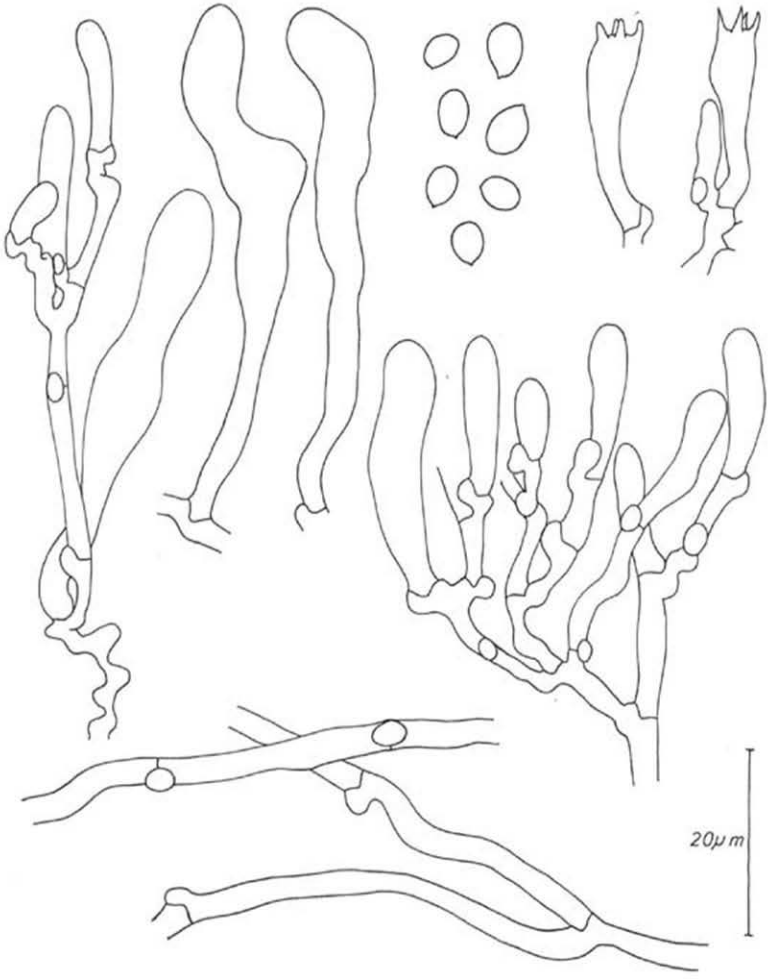


Fig. 10. *Radulodon calcareus*. — *Maas Geesteranus 15552*: gloeocystidia, basidia, spores, basal hyphae.

REACTIONS.—No part of the basidiocarp is amyloid, dextrinoid, or cyanophilous.
SUBSTRATE.—Saprophytic on bark of *Eucalyptus* species.
DISTRIBUTION.—Australia, New Zealand.
SPECIMEN STUDIED.—AUSTRALIA: Victoria, Mt Bride, S. of Warburton, 3 Nov. 1977, *R. A. Maas Geesteranus 15552* (L).

The spores of this species are thin-walled and broadly ellipsoid, whereas other species of *Radulodon* have globose to subglobose and slightly thick-walled spores. The gloeocystidia are very similar to those of *R. erikssonii*.

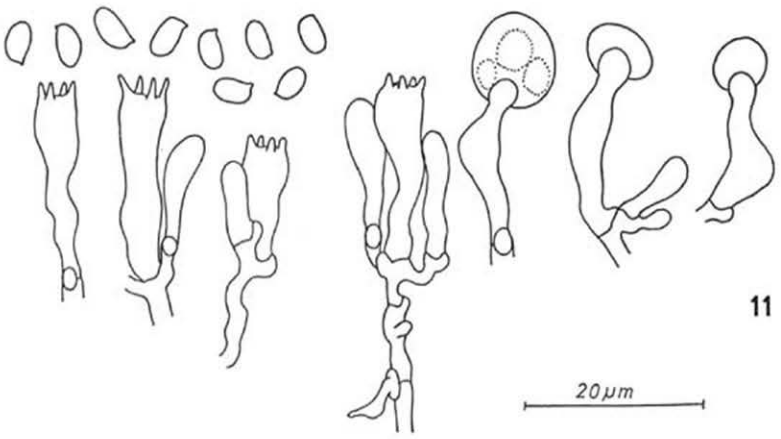
Resinicium luteum Jülich, *sp. nov.*—Fig. 11

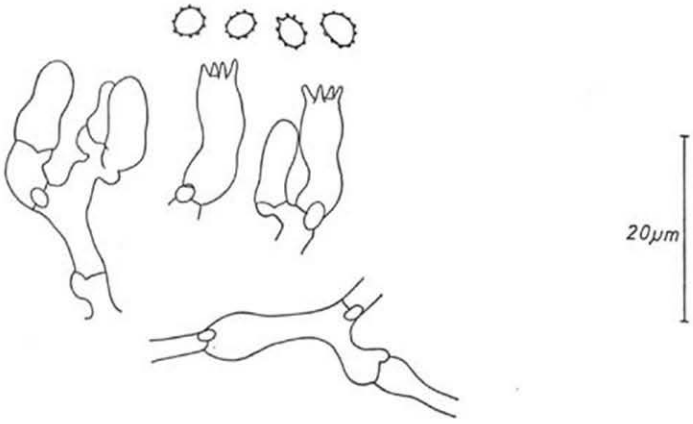
Fructificatio resupinata, effusa, 50–100 μm crassa, membranacea, adnata, flavida, minute odontioidea. Systema hypharum monomiticum. Hyphae hyalinae, cylindraceae vel saepe torulosae, tenui-tunicatae, 1.5–3 μm latae, fibulatae. Cystidia adsunt, tenui-tunicata, clavata, 15–20×4–6 μm, cum capite oleifero (usque ad 9 μm in diametro), fibulata. Basidia hyalina, clavata, 12–20×4–5 μm, tenui-tunicata, fibulata, tetraspora. Sporae hyalinae, late ellipsoideae, 4.4–5.0×2.4–2.5 μm, tenui-tunicatae, laeves, inamyloideae. Habitat: in ligno Eucalypti in silva. Typus: Australia, Victoria, Gippsland, Morwell, Morwell National Park, 22.XI.1977, *R. A. Maas Geesteranus 15572* (L).

Basidiocarp annual, resupinate, effused, several cm large, 50–100 μm thick, soft-membranaceous, loosely adnate, separable; context homogeneous; hymenial surface yellow, not cracked when dry, odontioid; the teeth conical, c. 80–150 μm long; margin whitish, thinning out; rhizomorphs or hyphal strands lacking.
Hyphal system monomitic. Hyphae hyaline, cylindrical to mostly torulose, loosely or densely arranged in subhymenium, densely arranged in trama, branching from or opposite to clamps, 1.5–3.0 μm in diam., thin-walled, smooth; clamps present at all septa; contents homogeneous. Cystidia present, abundant, especially on spines, hyaline, clavate, 15–20×4–6 μm, with globose cap up to 9 μm in diam., thin-walled, smooth, with clamp, protruding up to 15 μm; cap filled with large oil guttules; plasma of cystidial body homogeneous. Basidia hyaline, clavate when mature, flexuous cylindrical to narrowly clavate when young, 12–20×4–5 μm, thin-walled, smooth; clamp present; contents homogeneous; with four subulate sterigmata. Spores hyaline, broadly ellipsoid, at adaxial side straight, with small apiculus, 4.4–5.0×2.4–2.5 μm, not glued together, thin-walled, smooth, with homogeneous contents, neither amyloid, nor dextrinoid or cyanophilous.
REACTION.—No part of basidiocarp amyloid, dextrinoid, or cyanophilous.
SUBSTRATE.—Saprophytic on very rotten wood of *Eucalyptus* species.
DISTRIBUTION.—Known only from Australia.
SPECIMENS STUDIED.—AUSTRALIA, Victoria, Gippsland, Morwell, Morwell National Park., 22 Nov. 1977, *R. A. Maas Geesteranus 15572* (type; L).

The genus *Resinicium* is well characterized by its clavate basidia together with the peculiar cystidia, the cap-like apical part of which is filled with large guttules of oily material. The type species, *R. bicolor*, very common in the northern hemisphere, has also been reported from India and New Zealand. The genus *Resinicium* comprises now four species which can be distinguished as follows:

1a. Hymenial surface even; cystidia rather small, 2–4 μm wide (the cap up to 6 μm); spores 4–5×2–3 μm; northern hemisphere . . . . . *R. furfuraceum* (Bres.) Parm.
b. Hymenial surface odontioid to hydnoid 2





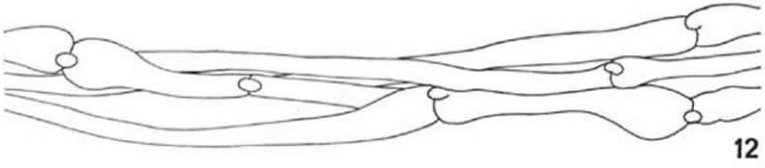


Fig. 11. *Resinicium luteum.* — Type: spores, basidia, cystidia.

Fig. 12. *Trechispora farinacea.* — *Maas Geesteranus 15540*: basidia, spores, hyphal strands.

2a. Hymenial surface distinctly hydnoid; cystidia 3–5 μm wide (the cap up to 9 μm); spores allantoid, 4–7 × 1.5–2 μm; North America . . . *R. chiriahuaense* Gilberts. & Budington
b. Hymenial surface odontioid; spores shorter and broader 3
3a. Hymenial surface whitish to pale cream-coloured; two kinds of cystidia: (*i*) clavate, with oil-filled cap up to 12 μm in diam., (*ii*) small and clavate, with an apical tuft of crystals; spores 4–6 × 2.5–3 μm; northern hemisphere, India, New Zealand *R. bicolor* (Fr.) Parm.
b. Hymenial surface yellow; one type of cystidia: clavate, 4–6 μm wide, with oil-filled cap up to 9 μm in diam.; spores 4.4–5 × 2.4–2.5 μm; Australia . . . . . *R. luteum* Jülich

TRECHISPORA FARINACEA (Pers. ex Fr.) Liberta—Fig. 12

Trechispora farinacea Liberta *in* Taxon **15**: 318, 1966.

Basidiocarp annual, resupinate, effused, several cm large, c. 100 μm thick (except for spines), soft-membranaceous, adnate, easily separable; context homogeneous; hymenial surface ochraceous, even to distinctly hydnoid, with soft, narrowly conical or flattened teeth (up to 2 mm long), not cracked when dry; margin whitish, indistinct, thinning out; rhizomorphs or hyphal strands sometimes present, especially in substrate.

Hyphal system monomitic. Hyphae hyaline, cylindrical, often with ampulliform swellings near septa, in trama often torulose, densely arranged in subhymenium and trama, branching from or near clamps, thin-walled throughout, 3–6 μm in diam. in subhymenium, 1.6–6 μm in diam. in trama; surface smooth; clamps present at all septa; contents homogeneous. Cystidia lacking. Basidia hyaline, clavate to suburniform, some distinctly urniform when mature, clavate when young, 10–16 × 4.5–5 μm, thin-walled, smooth; clamp present; contents homogeneous; with four subulate sterigmata (c. 5.6 × 0.6 μm). Spores hyaline, broadly ellipsoid, with small apiculus, 3.5–4 × 2.8–3.0 μm, not glued together, slightly thick-walled, densely warted, with homogeneous contents, neither amyloid, nor dextrinoid, not or only weakly cyanophilous.

SUBSTRATE.—Saprophytic on all kinds of plant material, in Australia collected on wood of *Eucalyptus*.

DISTRIBUTION.—Known from Europe, North America, Russia, southern parts of South America, West Indies, and West Australia. Not mentioned in Cunningham.

SPECIMENS STUDIED.—AUSTRALIA: Victoria, Dom Dom Saddle, ±500 m alt., 7 Nov. 1977, *R. A. Maas Geesteranus 15540* (L). — Victoria, Gippsland, Bulga National Park, NW of Yarram, 24 Nov. 1977, *R. A. Maas Geesteranus 15573* (L).

TUBULICRINIS GLEBULOSUS (Bres.) Donk—Fig. 3b

Corticium glebulosa Bres., Fungi trident. **2**: 61. 1898. — *Tubulicrinis glebulosus* (Bres.) Donk *in* Fungus **26**: 14. 1956.

Tubulicrinis gracillimus (Ell. & Ev.) G. H. Cunningham, Thelephoraceae of Australia and New Zealand: 141. 1963.

Basidiocarp annual, resupinate, effused, several cm large, c. 100 μm thick, membranaceous, closely adnate; context homogeneous; hymenial surface yellow-ochraceous, even, hairy under a lens owing to long, protruding cystidia, not cracked when dry; margin whitish, indistinct, arachnoid; rhizomorphs or hyphal strands lacking.

Hyphal system monomitic. Hyphae hyaline, cylindrical to mostly torulose, compactly arranged in subhymenium and trama, branching from or near clamps,

2–4 μm in diam., thin-walled in subhymenium, thin- to slightly thick-walled in trama, smooth; clamps present at all septa; contents homogeneous. Cystidia (lyocystidia) present, abundant, of tramal origin, hyaline, cylindrical, 50–120 × 5.5–9 μm, at basal part very thick-walled (up to 3 μm), leaving only a capillary lumen gradually expanding towards thin-walled apex, smooth; clamp probably present; contents homogeneous; protruding, not or only very slightly amyloid; (except outer and inner membrane) rapidly dissolving in 5–10% KOH. Basidia hyaline, clavate when mature and young, 10–14 × 4.5–5 μm, thin-walled, smooth; clamp present; contents homogeneous; with four subulate sterigmata (4–5.5 × 0.7–0.8 μm). Spores hyaline, cylindrical to slightly allantoid, with distinct apiculus, 6–7 × 1.8–2.2 μm, not glued together, thin-walled, smooth, with homogeneous contents, neither amyloid, nor dextrinoid or cyanophilous.

REACTIONS.—Cystidia dissolving in 5–10% KOH; no part of basidiocarp amyloid, dextrinoid, or cyanophilous.

SUBSTRATE.—In Australia found on wood of *Eucalyptus*.

DISTRIBUTION.—Europe, North America, South Africa, Australia, New Zealand.

SPECIMEN STUDIED.—AUSTRALIA: Victoria, Warburton, Mt Donna Buang, ±1000 m alt., 2 Nov. 1977, *R. A. Maas Geesteranus 15542* (L).

Cunningham cites eleven specimens from New Zealand, two from Australia. In the list of substrates he does not mention wood of *Eucalyptus*. The species seems to be widely distributed in temperate and perhaps subtropical areas of both the northern and southern hemisphere.

XYLOBOLUS ILLUDENS (Berk.) Boidin—Fig. 13

Xylobolus illudens Boidin *in* Revue Mycol. **23**: 341. 1958.

SPECIMENS STUDIED.—AUSTRALIA: Victoria, Warburton, Mt Donna Buang, on wood of fallen *Eucalyptus*, ±1000 m alt., 2 Nov. 1977, *R. A. Maas Geesteranus 15543*, *15544* (L).

The species can be distinguished from other species of *Stereum* and *Xylobolus* by the effuso-reflexed (seldom resupinate and then only in young stages) basidiocarps, dimitic hyphal system, yellow hyphae, presence of acanthophyses and at the same time absence of gloeocystidia and/or vesicles in the trama, and strongly amyloid spores. The basidiocarp is more or less brown and resembles a *Hymenochaete*; the hymenial surface is greyish to violaceous.

The well developed specimen depicted by Cunningham shows (apart from some clavate hyphal endings) two distinct elements in the hymenium, viz. acanthophyses and basidia. In young specimens, however, the hymenium appears to be built up only of acanthophyses, the basidia being formed at a much later stage. In an intermediate stage as depicted here acanthophyses are found, the apical part of which has grown out to form (2–)4 sterigmata and the same number of spores. Thus the thin-walled apical part of a basidium is found to surmount a thick-walled, spiny acanthophyse. This phenomenon of such sterile hymenial structures like acanthophyses or dendrophyses growing out in young specimens to form basidia and spores is also known in some species of *Aleurodiscus* and *Pulcherricium caeruleum* (Jülich 1974).

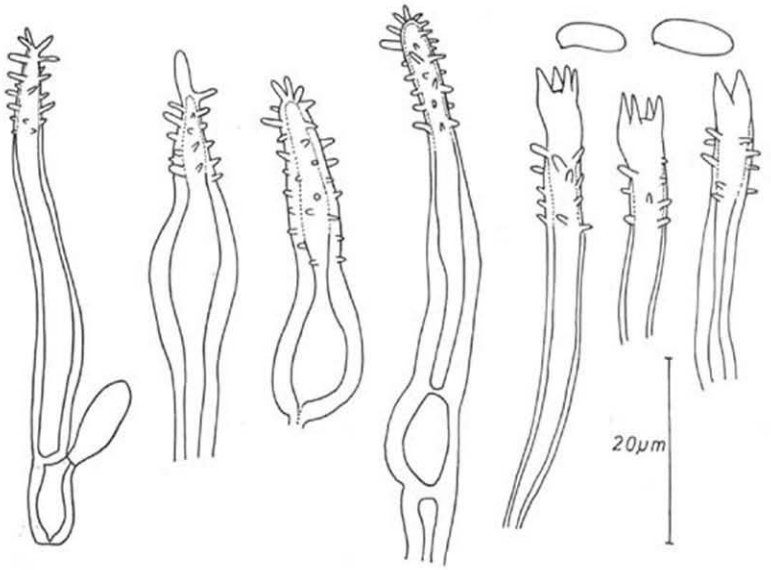


Fig. 13. *Xylobolus illudens*. — *Maas Geesteranus 15544*: acanthophyses, basidia, spores.

This then seems to be the normal development: first a hymenium made up only of acanthophyses, some of which later grow out apically to form basidia, and in fully mature specimens many basidia, all thin-walled throughout and originating from side-branches of the hyphae or acanthophyses.

The type locality of *X. illudens* is Swan River, West Australia. It has been collected many times in Australia, Tasmania, and New Zealand.

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NOTES ON INOCYBE

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(With 31 Text-figures)

Inocybe similis Bres. sensu Kühner is not conspecific with *I. similis* Bres. Both taxa are redescribed here; the former as a new species. An emended description is given of *Inocybe halophila* Heim.

Inocybe brunneotomentosa Huijsm., *sp. nov.*—Figs. 1-9

Name misapplied to the present species. — *Inocybe similis* Bres. sensu Kühner *apud* Kühner & Romagnesi, Fl. anal. 221, fig. 332. 1953; *in* Bull. Soc. Natur. Oyonnax **9**, Suppl.: 14, figs. 1, 2 and 4c. 1955; sensu J. Stangl *in* Z. Pilzk. **37**: 22. 1971 and col. ill. *s.n.*; sensu Moser *in* Gams, Kl. Kryptog Fl. II b/2, 2. Aufl.: 157. 1955 & 3. Aufl.: 246. 1967.

Pileo 15–40 mm, campanulato vel plano-convexo, tomento primo pallide brunneo-alutaceo dein gradatim fuscescenti obtecto, mox – centro excluso – in pannulis partim evanescentibus diruto, de hac re fundo denudato, glabro, alutaceo, radialiter fibrilloso exhibenti. Lamellis mediocriter confertis, paulo adnexis, ventricosis, primo juventute albis, mox ocraceis, dein cinnamomeo-brunneis; acie albida, fimbriata. Stipite 25–35 × 2.5–5 mm, subaequali, apice solum pulverulento-pruinoso, primo deorsum sordide alutaceo, mox e basi sursum sordide cano-brunneo suffuso, sed apice albido remanenti. Carne pilei tenui, albida, stipitis superficie pallidiore; odore spermatico. Sporis 6.3–9.6 × 4.3–5.8 μm, late ellipsoideis vel ellipsoideis. Basidiis 25–28 × 7.5–8.2 μm, 4-sporis. Cystidiis lamellarum 34–56 × 10–20 μm, claviformibus vel fusiformibus. Cystidiolis praesentia dubiosa. Pileipelle crassitudine fere 40 μm, e hyphis 4–10 μm latis, pariete flavotincto. Tomento e hyphis singularibus fasciculisque laxe intertextis, 5–14(–18) μm latis, pariete flavobrunneo, pigmento extraparietali granuliformi (juventute), postea maculiformi. Stipitipelle apice solum extremo cystidiis typicis gerenti. Subcaespitosa in locis humosis in deciduis (sub quercubus, fagis, carpinis). Typus: '*H. S. C. Huijsman*, 22 VIII 1953, Vorden, Gelderland, The Netherlands (L)'.

Pileus 15–40 mm, when still closed with incurved margin and whitish veil extending from margin to upper part of stem, soon expanding, campanulate to plano-convex, distinctly umbonate, at first pale alutaceous-brown and tomentose, but with tomentum except at centre soon breaking up into patches and rags, tending to exfoliate, thus showing the ochraceous-alutaceous, smooth underlying layer (pileipellis) with age more and more contrasting with remaining patches of strongly darkening tomentum (velum universale?). Gills moderately crowded, slightly adnexed to sinuato-adnexed, convex, 3.5 mm broad or less, white in the very beginning, becoming ochraceous, then cinnamon brown; edge minutely fimbriate, whitish. Stem 25–35 × 2.5–5 mm, equal or slightly thickened downwards, solid, pulverulento-pruinose at whitish top, elsewhere dirty alutaceous, becoming dirty grey-brown from base upwards but remaining pale at top. Flesh thin, whitish in cap, in stem paler than surface of stem; smell spermatic.

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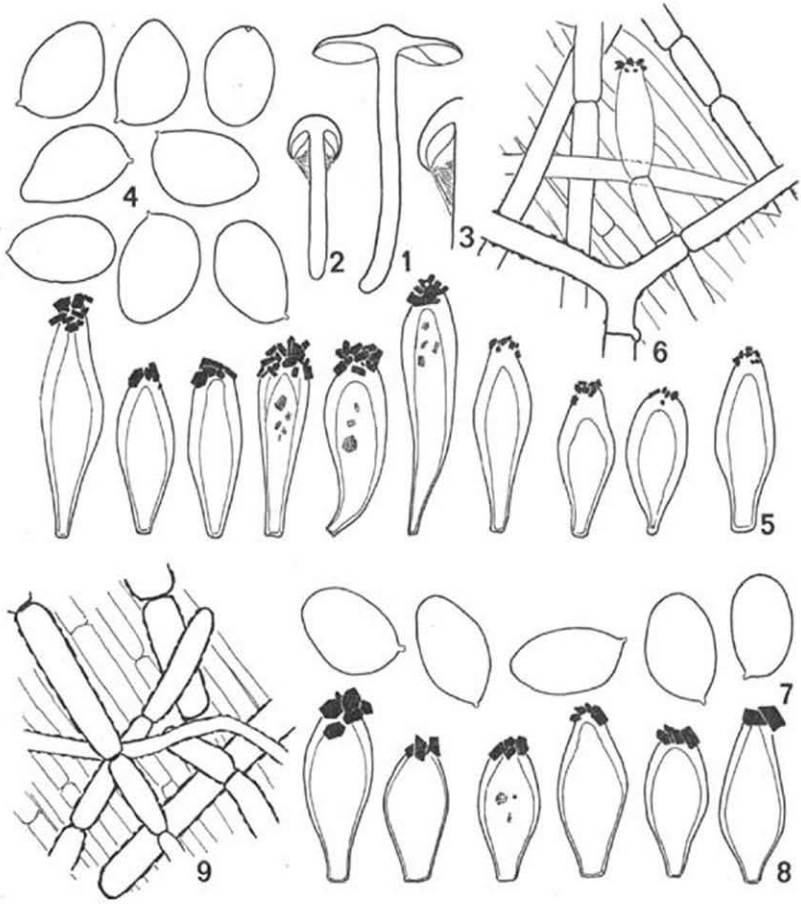
Spores 6.9–9.6 × 4.3–5.8 μm, broadly ellipsoid to ellipsoid, sometimes inaequilateral from side view. Basidia 25–28 × 7.5 × 8.2 μm, mostly 4-spored. Cystidia of gills claviform to fusiform, thick-walled, yellowish, crested; pleurocystidia 34–50 × 10–18 μm; cheilocystidia on an average slightly longer, but exceptionally depassing a length of 56 μm. Cystidioles if present, unfrequent. Tomentum half-way cap made up of loosely interwoven, 5–10(–14) μm wide hyphae and of bundles of hyphae;



Figs. 1–9. *Inocybe brunneotomentosa*. — 1. Median section, expanded fruitbody (× 1). — 2. Idem, closed fruitbody (× 1.5). — 3. Part of 2 (higher magn.). — 4. Spores (× 2000). — 5. Cystidia: at the left 6 cheilocystidia; the two longer ones are exceptional; at the right 4 pleurocystidia (× 600). — 6. Surface of cap, about half-way radius (× 400). — 7. Spores (× 2000). — 8. Cystidia (× 600). — 9. The same as 6 in an older specimen. (Figs. 1–6 from type; Figs. 7–9 from *Stangl 366*).

hyphal cells with yellowish brown walls and granules of an extraparietal brown pigment seemingly confluent into maculiform patches with age. Pileipellis half-way cap about 40 μm thick, consisting of closely pressed, parallel, 4–10 μm wide hyphae with yellowish walls; transition into paler flesh of cap rather abrupt. Stipitipellis only at extreme apex with typical cystidia, these soon downward passing into a narrow zone of rudimentary cystidia passing in their turn into ordinary end-cells of emerging hyphae. Clamp-connections present.

HABITAT.—In small groups on humus of deciduous trees (*Quercus, Fagus, Carpinus*).

COLLECTIONS EXAMINED.—NETHERLANDS: prov. Gelderland, Linde near Vorden, 22 Aug. 1953. *H. S. C. Huijsman* (holotype; L); prov. Zuid-Holland, Wassenaar, estate 'Hartekamp', 5 May 1957, *C. Bas 1265* (L); GERMANY, Bavaria: Augsburg, Siebentisch Park, 8–10 Aug. 1966, *J. Stangl* (M); Augsburg, Siebentisch Strasse, 22 Sept. 1966, *J. Stangl* (M).

When Kühner (1953: 224) attributed specimens of the present species to *Inocybe similis* Bres., he apparently underestimated the exactness of Bresadola's spore-measurements (Bres.: 10–15×6.5–8.5 μm; Kühn.: (5.7–)6–8.7(–10)×(4.2–)4.5–5(–5.5) μm). Moreover the spores are said to be reniform by Bresadola (1908: 161), whereas those drawn by Kühner (1955, 18) are rather broadly ellipsoid.

Examination of the type of *I. similis* Bres. proves that Bresadola's measurements are correct, so that *I. similis* Bres. sensu Kühn., moreover differing from *I. similis* Bres. in many other respects, is in need of another name. As I have been unable to find an adequate description in literature, the specific epithet '*brunneotomentosa*', referring to the brown tomentum of the cap, is introduced for it here.

It is not impossible that the layer provisionally indicated as 'tomentum' in the diagnosis is a suprapellis, but the possibility that it represents a veil should certainly not be excluded. Facts pointing to the second possibility are:

I. The suprapellis in cystidiate species of *Inocybe* is essentially constituted of radial hyphae; rests of the universal veil on the cap on the contrary are generally made up of interwoven or entangled hyphae, like here.

II. A careful examination revealed that the tomentum on the cap and the cortina at the margin of the cap form a continuum, so that they seem to belong to one peripheral layer, i.e. the universal veil.

III. If the tomentum would represent a suprapellis it is strange that, even in young fruitbodies, no rudiments of a typical universal veil could be found. In most species of *Inocybe* the presence of some remnants of the veil over the cap, in the form of undifferentiated, thin-walled and colourless hyphae, can be observed, at least in still closed specimens.

So the possibility cannot be excluded that the primitive universal veil, in *Inocybe* ordinarily destroyed in an early primordial stage by hyphae emanating from the pileipellis, persists in *I. brunneotomentosa*. Future collections and above all embryological investigations are needed for confirmation or rejection of this hypothesis. Unfortunately *I. brunneotomentosa* is a rare and inconspicuous species.

There is some variation in the shape of the spores. In collections of Kühner (Q=1.47) and myself (Q=1.47) they are broadly ellipsoid; in that of Bas (Q=1.61) and those of Stangl (Q=1.55) they are simply ellipsoid. (Q=length-breadth ratio).

It will not escape attention that in Fig. 6, showing the surface of the cap at a

magnification of 400×, a cystidium is drawn. Actually the presence of cystidia in the circumdiscal zone of the pileus is not rare in cystidiate species of *Inocybe*. I suspect that these pileocystidia are little known because the examination of the superficial layers of the cap is much neglected in this genus. Perhaps their presence is a response of the cap to a stimulus exerted on it when it is piercing the soil.

Inocybe brunneotomentosa can only be confused with *I. tenebrosa* Quél. (=*I. atripes* Atk.)[1] But there the nature of the pilcipellis is not aberrant. Moreover the stipe of *I. tenebrosa* is covered with cystidia from top to base. Kühner stated that in *I. similis* sensu Kühn. the extreme base of the stem is sometimes slightly roseate to vinaceous. Neither Stangl (1971: 22), nor Bas, nor myself were able to repeat this observation, which possibly induced Hennig (1967: 202) to synonymize *I. similis* sensu Kühn. with *I. atripes*. It is a well-known fact that the tomentum at the base of the stem of *I. tenebrosa* often shows a reddish tint persisting in herbarium-specimens.

INOCYBE SIMILIS Bres.—Figs. 10–22

Inocybe similis Bres. *in* Ann. mycol. **3**: 161. 1908.

MISAPPLICATIONS. — *Inocybe similis* sensu Kühner *apud* Kühner & Romagnesi, Fl. anal. 221. 1953 and *in* Bull. Soc. Nat. Oyonnax **9**, suppl. (Compl. Fl. anal. 5): 14. 1955, and sensu J. Stangl *in* Z. Pilzk. **37**: 22. 1971 (=*I. brunneotomentosa*); sensu Hennig in Michael-Hennig, Handb. Pilzfr. **4**: 202. 1967 (=*I. haemacta*, spor. excl.).

ILLUSTRATION. — Bres., Iconogr. mycol.: pl. 730 fig. 2. 1931.

Cap 20–35 mm, conico-campanulate to campanulate-convex, broadly umbonate, with incurved or abruptly deflexed margin, coarsely radially fibrillose, with concentric rows of laterally confluent, quadrangular, fringed squamulae around ± canescent, smooth to fissurate centre, with from centre outwards squamulae more and more separate, but often squamulae little developed, unicolorous cinnamon brown, with flesh nowhere showing, with a circle of greyish velar remnants on margin and, particularly in young specimens, with numerous greyish patches of same origin elsewhere. Gills moderately crowded, 37–44, with 1–2 tiers of short gills, adnexed to emarginate-adnexed, rather broad, from ochraceous to cinnamon brown; edge fimbriate, whitish. Stem 20–50×2.5–5 mm, cylindrical, equal, but subbulbous at base, submarginate, pruinoso-pulverulent at apex, with fading pruinosity downward to half-way length, faintly streaked with whitish fibrils on lower half, paler than the cap, brownish in median zone, occasionally slightly darkening with age, but apex and base remaining whitish. Flesh whitish. Smell not noted, probably insignificant.

Spores 10–15.8×6.3–8 μm, in lateral view mostly subphaseoliform with distinct,

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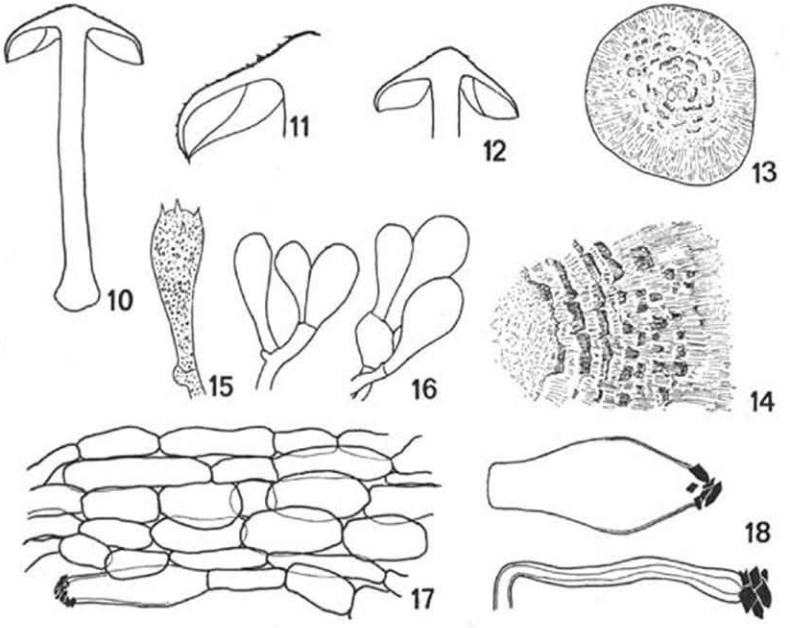
[1] To my mind Quélet's description (1885: 279) and especially his figure of *I. tenebrosa* (1885: 279; pl. 8, fig. 8) can hardly be misinterpreted. *I. tenebrosa* Quél. (1885) and *I. atripes* Atk. (1918) are synonyms. In 1931 the name *I. tenebrosa* became obsolete when Heim (1931: 162) lodged Quélet's species with its stipe 'bistre-noirâtre ou olivâtre' and its cap 'finement excorié, grivelé' (=speckled like a song thrush) in his sect. *Dulcamarae*, solely because Quélet described the spores as 'pruniformes ou en forme de rein'. At present one knows that there are also cystidiate *Inocybe*, not belonging to sect. *Dulcamarae* sensu Heim, that have reniform spores. Atkinson (1918: 211) did not take up the name *I. tenebrosa* for his *I. atripes* 'as it (*atripes*) differs in the velvety [read: cystidiate] non-striate stem' and as he had 'no knowledge of the cystidia in *I. tenebrosa*'.

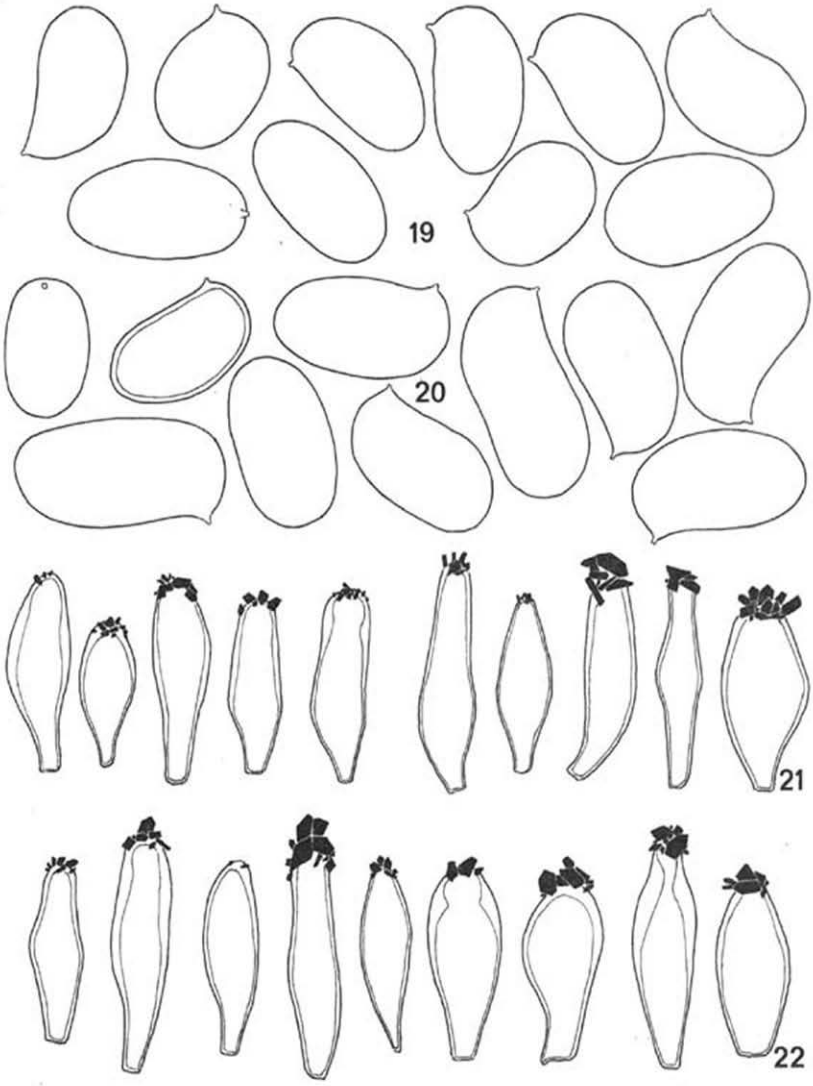
often extensive, supra-apicular concavity, in face view subcylindrical, subtruncate at both ends. Basidia 33–42 × 10–12 μm, 4-spored. Cystidia moderately thick-walled, pale yellowish; pleurocystidia 40–62 × 11–18 μm, mostly subfusiform to subcylindrical, cheilocystidia similar but on an average slightly more ventricose, 36–60 × 14–22 μm, sometimes subclaviform; cystidioles obpiriform, optically empty, numerous. Pileipellis consisting of two rather indistinct layers: a suprapellis of 5–12 μm wide hyphae interspersed with intercellular brown granules; cells rather thick-walled, 20–200 × 5–12 μm, with rounded ends, with brown parietal pigment and dispersed granules of extraparietal pigment; 'subpellis' made up of slightly narrower and less pigmented hyphae, rather abruptly passing into flesh. Remnants of universal veil on cap, up to 35 μm thick at centre of cap, consisting of laxly interwoven, thin-walled, hyaline or poorly pigmented 3–7 μm wide hyphae. Caulocystidia typical and in crowded tufts at apex of stem, downwards rapidly scarcer, half-way stem still scattered but often rudimentary (Fig. 18), practically lacking from lower half of stem. Clamp-connections present.

HABITAT.—On humid sandy to loamy soil with scanty herbaceous vegetation.

COLLECTIONS EXAMINED.—ITALY, Desert near Trient, May 1900, *G. Bresadola* (holotype; S); NETHERLANDS, prov. Gelderland, loam-pit near Buren, 9 Aug. 1971, *J. de Kleuwer* (L).



Figs. 10–18. *Inocybe similis*. — 10. Median section of fruitbody (× 1). — 11. Idem of part of cap (× 2). — 12. Idem of another cap (× 1). — 13. Aspect of surface of cap (× 1). — 14. Part of 13 magnified. — 15. Fresh basidium (× 600). — 16. Cystidioles (× 600). — 17. Surface of cap about half-way radius (× 400). — 18. Caulocystidia (× 600). (Fig. 17 from type; all other Figs. from *de Kleuwer 9 VIII 1971*.)



Figs. 19–22. *Inocybe similis*. — 19, 20. Spores (×2000). — 21. Cystidia: at the left five pleurocystidia; at the right five cheilocystidia (×600). — 22. Idem, but at the left four cheilocystidia. (Figs. 19, 22 from type; Figs. 20, 21 from *de Kleuwer 9 VIII 1971*.)

Among the middle-sized cystidiate species of *Inocybe*, *I. similis* is perhaps unique in having at the same time large spores with the average length notably exceeding 10 μm, and a spore shape that can best be described with the terms reniform or phaseoliform. In fact the spores have an extensive supra-apicular depression.

Still another character demands our attention. In the majority of species of *Inocybe* with superficial squamules on the cap, these are essentially triangular. This is brought about by a tendency to converge of the radial fibrils, thus forming pointed squamules. Later on these may detach themselves from the surface of the cap at their tips and sides in consequence of growth tensions in the cap. In *I. similis*, however, the squamules on the cap have in principle a quadrangular shape, because the hyphae have no tendency to converge. Here the shape of the squamules is mainly determined by parallel radial hyphae. In the circumdiscal zone the squamules are usually sidewards connected, forming concentric rows or bands.

In *I. similis* the formation of superficial squamules by the suprapellis does not affect the only slightly paler subpellis, so that the squamules hardly stand out against this underlying layer and are easily overlooked when the cap is cursorily examined. Sometimes, however, squamulae are virtually lacking.

Inocybe similis is fully characterized by large and phaseoliform spores in combination with cystidia that only exceptionally have a distinct neck, ± quadrangular squamulae on the cap and a somewhat bulbous stem that is not cystidiate on its lower half.

Macroscopically *I. similis* can easily be confused with old specimens of *I. halophila* emend. which may grow in the same habitat; in the loam-pit near Buren they occur both.

INOCYBE HALOPHILA Heim *emend.* Huijsm.—Figs. 23–31

Inocybe halophila Heim, Genre *Inocybe*: 242. 1931.

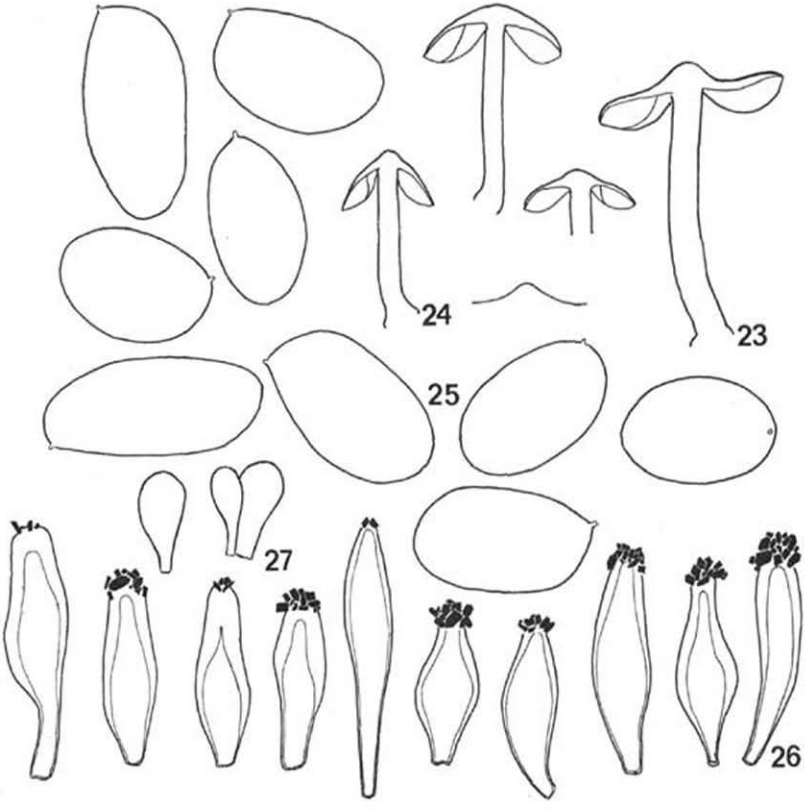
Inocybe vulpinella Bruylants *in* Bull. trimest. Soc. mycol. Fr. **85**: 341. '1969' [1970].

MISAPPLICATIONS. — *Inocybe halophila* sensu Pearson *in* Trans. Br. mycol. Soc. **26**: 45. 1943 (? I. lacera); sensu Kühner apud Kühner & Romagnesi, Fl. anal. 224. 1953 (*et auct. post. plur.*; ? *I. lacera*); *Inocybe lacera* var. *halophila* sensu O. Andersson *in* Bot. Notiser **2** (2) Suppl.: 27. 1950 (? *I. lacera*).

SELECTED ILLUSTRATION. — R. Heim, Genre *Inocybe*: pl. 17 fig. 2. 1931.

Cap 10–32(–40) mm, at first hemispherical to conical, expanding to convex or campanulate-convex, mostly with broad and obtuse umbo, finally rarely with upturned margin, more or less roughly radially fibrillose, often squamulose, at centre sometimes with a tomentose canescence, smooth or more or less rimulose, at limb with disseminated appressed greyish patches of universal veil, sordid ochraceous brown, fulvous brown or becoming rather dark brown, especially at centre, when young and fresh mostly with orange tinge sometimes persisting for a long time. Gills not crowded, rather broad, lanceolate, attenuate-adnexed to nearly free, clay brown to brown; edge whitish. Stem 15–40(—60) × 3–6 mm, subequal, solid, with a subbulbous, submarginate base, distinctly pulverulent-pruinose from top to bulb when young but in old specimens pruinosity less conspicuous in lower 2/3 to 4/5 of length, sparsely streaked with appressed fibrils, sordid whitish at top, at middle zone first like top but with orange or pinkish tint and later gradually invaded by colour of cap but remaining paler, white at base. Flesh whitish in cap and bulb, in stem colour of surface but paler. Smell faint or absent.

Spores 10–18×6.5–9.3 μm but in some collections hardly longer than 14.5 μm; ellipsoid to elongate-ellipsoid or subcylindrical, with an orange tinged endospore of varying thickness. Basidia 29–35×12–17 μm, normally 4-spored but often many 2-spored. Cystidia on gills mostly thick-walled, yellow and copiously crested, variously shaped; pleurocystidia 40–66×12.5–25 μm, fusiform, broadly fusiform, sublageniform with a short and very broad neck, etc.; cheilocystidia 32–68×15–25 μm, like pleurocystidia but on an average more ventricose; paracystidia frequent, clavate. Pileipellis made up of two distinct layers: suprapellis built up of radially arranged 7–28 μm wide hyphae consisting of rows of rather thick-walled cells with a yellowish brown parietal pigment, abundantly banded with belts of a slightly darker extraparietal pigment (most conspicuous at low magnification, e.g. 200×),



Figs. 23–27. *Inocybe halophila*. — 23. Median sections of fruitbodies (×1). — 24. Idem of young fruitbody (×2). — 25. Spores (×2000). — 26. Cystidia: at the left five pleurocystidia; at the right five cheilocystidia (×600). — 27. Cystidioles (×600). (Figs. 23, 25–27 from *Tjallingii 16 VI 1975*; Fig. 24 from *Daams 25 VI 1972*.)

subpellis about 40 μm thick, constituted of radially disposed up to c. 12 μm wide, less pigmented hyphae not constricted at septa. Stipitipellis with a smaller or greater number of salmon coloured lacticiferous hyphae, but intensity of salmon colour widely varying in specimens from different origin; caulocystidia resembling cheilocystidia, mostly in bundles, present from top to bulb of stem but downwards decreasing in number, just above bulb however still isolated ones with thick walls and crested apex. Clamp-connections present.

HABITAT.—On calcareous sandy or loamy soil.

COLLECTIONS EXAMINED.—NETHERLANDS: prov. Friesland, Isl. of Terschelling, Kroonpolders, 28 July 1958, *C. Bas 1495* (L); prov. Gelderland, Buren, loam-pit, 11 Aug. 1972, *J. de Kleuver* (L); IJsselmeerpolders, Oostelijk Flevoland, Roggebotzand, 16 June 1975, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers* (L); prov. Noord-Holland, Nederhorst den Berg, 25 June 1972, *J. Daams* (L); prov. Zuid-Holland, Rockanje, near little lake in dunes, 22 Sept. 1957, *A. F. M. Reijnders* (L); Oostvoorne, humid valley behind outer dunes, 11 Nov. 1957, *C. Bas & H. S. C. Huijsman* (L); Oostvoorne, outer dunes, 4 Nov. 1958, *C. Bas 1670* (L); Oostvoorne, bank of Tenellaplas, 6 Nov. 1958, *C. Bas 1688* (L); Oostvoorne, dunes, 11 Aug. 1972, *J. de Kleuver* (L); Oostvoorne, Kruininger Gors, humid sandy plain, 19 Oct. 1972, *H. S. C. Huijsman* (L).

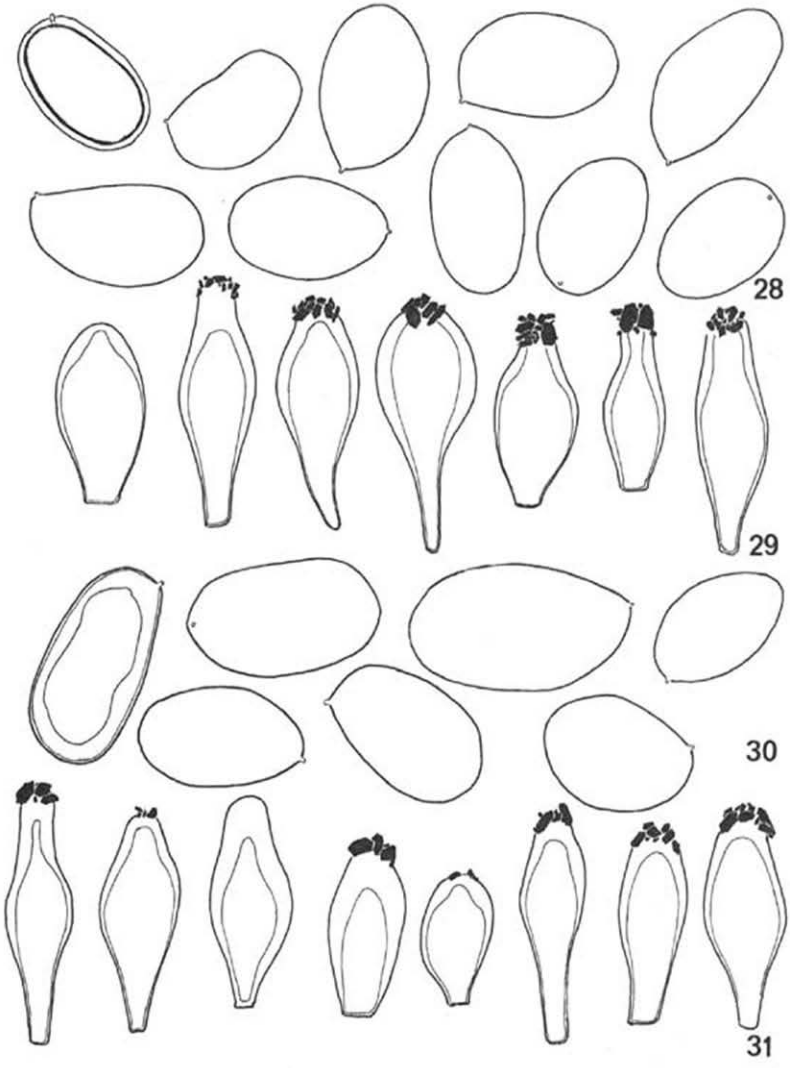
SWEDEN: Upland, north of Rånäs, on unused railroad-track, 16 Aug. 1975, *N. Suber & H. S. C. Huijsman.*

Inocybe halophila Heim has given rise to much confusion, because the original description covers certainly two, perhaps even three species. Unfortunately no type is extant. However, as the coloured illustration accompanying the original description is an excellent representation of a predominantly coastal *Inocybe* well-known to me and several Netherlands' and Belgian mycologists, I deem it wise to designate as a lectotype of *Inocybe halophila* Heim plate 17 figure 2 in Heim's monograph 'Le genre *Inocybe*', with exclusion of parts of the description and of the text-figures.

Heim's description of the macroscopical characters could partly bear upon a species unknown to me with greenish flesh in the cap. The microscopical characters in his description refer for a great part to a taxon in the *I. lacera*-complex. The young Heim must have mixed up a number of collections of this taxon with collections of *I. halophila* sensu stricto. Thus it is not surprising that he put *I. halophila* in his stirps Lacera.

In Heim's plate the special colours of young fruitbodies are excellently reproduced. The caps show a mixture of brown and orange and the middle part of the stem is flushed with a pinkish tint. Furthermore the shape of the young caps, the bulbous base encrusted with sand, the habitat and the majority of the other macroscopical characters point undoubtedly to the species I found so many times on the coastal dunes, especially between 1932 and 1940, when I lived on the Island of Walcheren. At that time I had more than once the occasion to compare fresh and young fruitbodies with Heim's pictures.

Heim's description of the stipe 'd'abord couvert d'une pruine blanc rosé, persistante au sommet' might suggest that the pruina is only persistent at the top. This is not the case. Microscopically the stem is from the top down to the bulb covered with yellow to salmon coloured cystidioles and cystidia. In young fruitbodies this is already evident with a hand-lens; in older ones, however, it often occurs that the



Figs. 28–31. *Inocybe halophila*. — 28. Spores (×2000). — 29. Cystidia: at the left four pleurocystidia; at the right three cheilocystidia (×600). — 30. Spores (×2000). — 31. Cystidia: at the left four pleurocystidia; at the right four cheilocystidia (×600). (Figs. 28, 29 from *Daams 25 VI 1972*; Figs. 30, 31 from *Suber & Huijsman 16 VIII 1975*.)

pruina seems limited to the top, but then microscopical examination reveals the contrary.

Neither Dr. Bas nor myself ever observed any greenish colour in the flesh of the cap. This seems surprising since after Heim several authors mentioned this colour. It must however be stressed that all of them also attributed to *I. halophila* narrow spores, up to 6 or 6.5 μm broad, while the spores of *I. halophila* emend. are much broader. Also Bruylants (1970: 340) did not mention greenish flesh in her description of the same species under the name *I. vulpinella* Bruylants. It must be emphasized that Bruylants subordinated Netherlands' collections of *I. halophila* emend. under her *I. vulpinella*. From her point of view this was fully correct, as *I. halophila* Heim emend. and *I. vulpinella* are certainly conspecific. In this connection it is significant that Heim's coloured illustration of his *I. halophila* does not show a trace of green.

The greater part of the spore-measurements for *I. halophila* given by Heim in his monograph (p. 245) seem to apply to *I. lacera*, but not those under 'd', which on the contrary fully agree with *I. halophila* emend.

I think that the proposed lectotypification, fully in accordance with the rules of nomenclature (Art. 70), clarifies the existing muddle around *I. halophila*. The possibility to select a satisfactory lectotype out of the discordant elements in the protologue is here amply extant. It would be unwise and contrary to Heim's intention to select *I. lacera*, a species that was not in need of a name then, and that is not typical for coastal habitats.

When Bruylants (1970: 344) rejected the name *I. halophila* Heim for the species she described as new under the name *I. vulpinella*, she did not try to disentangle the different elements in Heim's description, but merely stressed the characters in that description apparently referring to the *I. lacera*-component. She did not, however, lecto-typify *I. halophila* in that sense.

In the outer coastal dunes and the humid valleys in between, particularly on the islands, *I. halophila* is far from rare in the Netherlands. It ventures also, though rarely, into the inland at localities where soil and vegetation remind of the coastal dunes. But I do not know of any locality farther from the coast than about 60 km. It must be said that at most of the inland localities, but not at all, *I. halophila* has to be considered an adventive, brought there with coastal sand used for heightening the level of the soil.

Inocybe halophila is very variable in two respects, namely in the colour of the cap and in the length of its spores. When comparing descriptions accompanying the dried samples, one encounters a wide range of brown tones such as orange-brown, fulvous, marroon, umber, sienna and even potato-coloured. The colour of the cap partly depends on the varying number of salmon coloured lacticifers in the flesh, partly on the varying degree in which the cap is covered with remnants of the universal veil, and in part also on the quantity of brown pigment of the hyphae of the suprapellis, which are richly banded by an extraparietal pigment, in a zebra-like manner.

In some specimens the spores scarcely exceed a length of 14.5 μm, in many others a great number of them reach or even surpass a length of 18 μm. Fruitbodies pro-

ducing many large spores have a high percentage of 2-spored basidia. Very large spores tend to a quadrangular form.

Under oil-immersion a most uncommon character of the spores comes to the light, viz. an orange coloured endosporium, in most spores equally thin, but in some extremely thickened and irregularly shaped (see the left spore in Fig. 30). In such spores the coloured endosporium is neatly marked off from the colourless interior.

It is highly probable that the dubiously marginate bulb, which remains white when the flesh of the stem has become distinctly coloured, will prove to be truly marginate in primordia. Therefore I think that *I. halophila*, with its cystidiate stem and its tendency to exhibit orange hues, might be placed next to *I. godeyi*.

The most striking characters immediately separating *I. halophila* from *I. similis* are the stipe, cystidiate downward to the bulb, and the shape of the spores, subellipsoid to subcylindrical and absolutely without an extensive supra-apicular depression.

Unfortunately the coloured plate published by Miss Bruylants under the name *I. vulpinella* does not give a good idea of *I. halophila* emend. Among other things, the colours are aberrant and rather different from those in the colour code of Séguy she refers to in the description.

Because of the great variability of the spores and the cystidia, I have outlined these of three different collections.

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HEBELOMINA MICROSPORA HUIJSM.* AND REFLEXIONS ON HEBELOMINA R. MAIRE AS A GENUS

H. S. C. Huijsman

*Rijksherbarium, Leiden***

(With one Text-figure)

The name *Hebelomina microspora* is validated*. It is supposed that the genera *Hebeloma* (Fr.) Kumm. and *Hebelomina* R. Maire differ in their essential characters only in that 'layer IV' of the spore wall of *Hebeloma*, as defined by Besson & Bruchet, is rudimentary in *Hebelomina*. For the time being it is proposed that they be considered as two separate genera.

Hebelomina microspora Huijsm., *sp. nov.*—Fig. 1

Hebelomina microspora Huijsman, *nom. nud.*, *in* Revue Mycol. **11**: 31. 1946. (No Latin diagnosis.)

Pileo 20–40(–50) mm, primo hemispherico-convexo, margine involuto, velo fugaci cum stipite apice conjuncto, orbiculari, mox expanso, saepe obtuse ac late umbonato; aetate margine inflexo, undato-sublobato vel irregulari, raro ab initio margine cum eodem sociorum concreto; interdum primitus veli reliquis minutis sparse obtecto, subfragili, haud hygrophano, centro viscidulo, principio albo, demum pallide alutaceo-ochraceo, saepe plus minusve incarnato immixto, nonnunquam cum scrobiculis dispersis diam. 1–4 mm concoloribus sed magis pilei superficie saturatis ornato. Lamellis mediocriter confertis, attenuato-adnatis vel subemarginatis, denique subdecurrentibus, usque ad 4–4.5 mm latis, albis dein pileo concoloribus; acie integra. Stipite e ramulo *Pinus* orto, 35–45 × 3–12 mm, centrali vel subexcentrico, primo vulgo verticali, postea ascendenti vel decumbenti, subaequali vel deorsum dilatato, cortice satis duro, medulla spongiosa farcto, aetate striato vel subsulcato, apice vix pulverulento, fibrillis veli mox evanescentibus, albido. Carne haud crassa, alba; odore primo iodoformi reminiscenti (sec. Smits), dein subnullo; sapore amarissimo.

Sporis in cumulo pertenui albis, in herbario — multis annis post, sub micr. — stramineis 6.5–7.8 × 4.2–4.6 μm, amygdaliformibus, levibus, crassotunicatis, distincte dextrinoideis. Basidiis ± 29 × 6.5 μm, granulis carminophilis carentibus, 4-sporigeris. Pilis marginum lamellarum 30–40 × 6–9 μm, inferne inflatis, superne leviter dilatatis. Trama lamellarum regulari. Pileipelle indistincter bistrata: suprapelle ± 25 μm crassa, e hyphis confertis repentibus perangustis, membrana gelificata, extructa; subpelle e hyphis crassioribus, haud gelificatis, in hyphis intermixtis carnis gradatim transeuntibus. Stipitipelle ad apicem solo nonnulis hyphis emergentibus praedita. Fibulis frequentibus.

Habitatio et distributio: gregatim ad ramulos dejectos *Pinus silvestris* in silva mixta prope Rijssen, provincia Overijssel, Neerlandia. Loco typico tantum reperta, 24.X.1943; *W. J. Reuwecamp & W. F. Smits* (Typus; L).

* The reader is referred to the note added in proof on p. 489.

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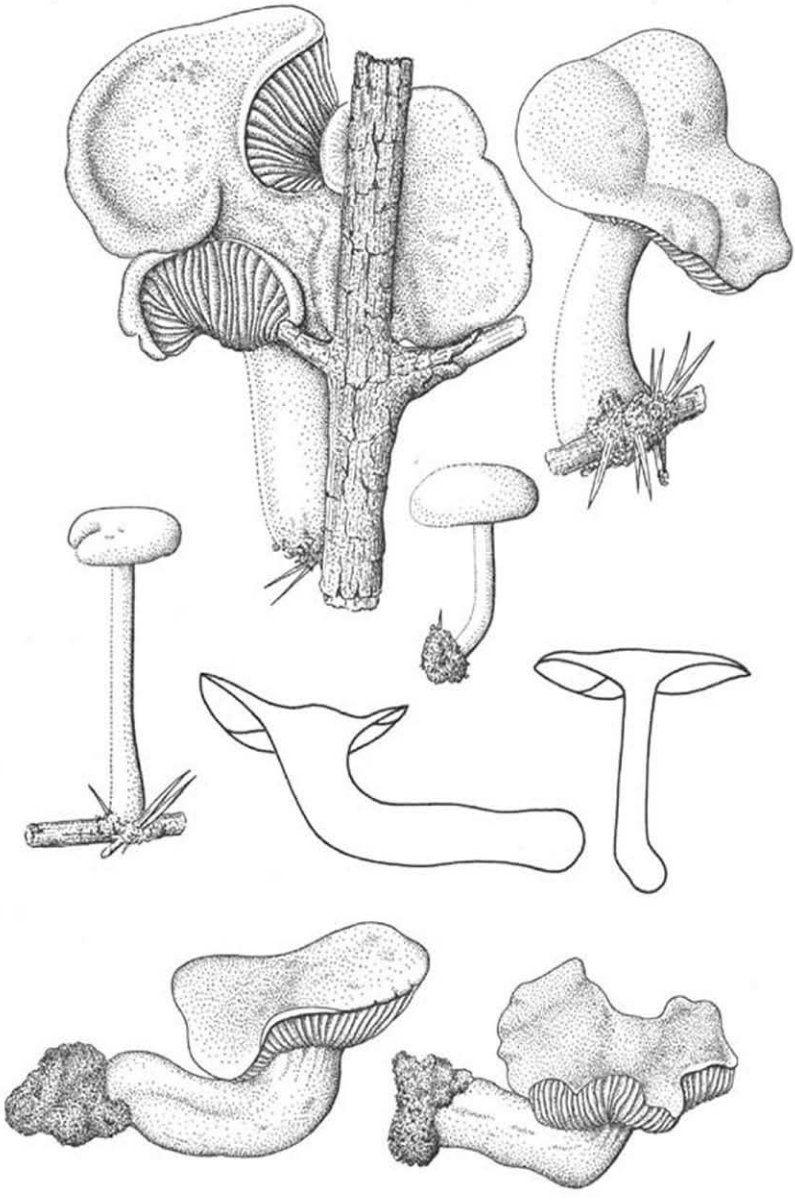

Fig. 1. *Hebelomina microspora*. — Fruit-bodies of type (× 1).

Hebelomina microspora would seem to be a very rare species; as far as I know, it has not been gathered beyond the type-locality, which was destroyed shortly after 1945, when a new quarter of Rijssen was built. To make things worse, a few years after the war the originally very rich type material was unearthed in a very poor condition, badly moth-eaten and mouldy. Nevertheless the crucial characters of this curious species could be checked.

Prof. R. Kühner and prof. R. Singer (1962: 581; 1975: 580) kindly examined fragments of the type and both of them declared that the Dutch fungus belonged to a genus of which until then they had never seen a representative. They agreed that the species be placed in the monotypic genus *Hebelomina* R. Maire (1935), found only once in North Africa. Though the type of the type species of the genus seems to have been lost, the generic and especially the very detailed and impeccable specific diagnosis of Maire (the two in Latin) give an excellent picture of *Hebelomina domardiana* R. Maire.

In the accompanying French text, Maire characterized *H. domardiana* as follows: '...un champignon très remarquable, ayant l'aspect extérieur d'un *Tricholoma*, mais qui est, en réalité, un *Hebeloma* à spores incolores.' And a little farther '...*Hebelomina* est aux *Hebeloma* ce que le genre *Cortinellus* est aux *Cortinarius*.'

With the remark in the species-diagnosis: 'Sporae in cumulo tenui albae; in cumulo crassae non visae', Maire evidently envisaged the possibility that, like in so many 'Leucosporae', the spores in a thick spore-print might prove to be not quite white. The same could apply to *H. microspora*, of which I suspect that the spores in a layer of sufficient thickness might prove to be not entirely without colour.

Before comparing *H. microspora* with possibly allied taxa, the following should be pointed out. In the plate of my former paper on *Hebelomina* (1946) I designated as III two fusiform 'pleurocystidia' scarcely surmounting the top-level of the basidia. A re-examination many years ago showed that this level on the face of the lamellae is not topped by any formation except sterigmata and spores. Thus the formations indicated and described as pleurocystidia must have been incidental.

Hebelomina microspora is similar to species of *Hebeloma* in having an ixocutis, a corresponding pattern of colours of the cap, the same structure of the lamellae — further provided with only marginal hairs, morphologically falling within the range of variability of those of *Hebeloma* —, the bitter taste of the flesh and the amygdaliform shape of the spores of so many representatives of *Hebeloma*, the thick spore walls, etc.

It differs from *Hebeloma* in the white or very pale spores, which are smooth (observed with a light-microscope), in the cyanophilous and dextrinoid wall and, curiously, in its lignicolous habitat. Mr. W. F. Smits stressed that the type-locality was strewn with branches of different kinds of trees, but that only branches of *Pinus* were affected. So *H. microspora* seems to be pinicolous or, perhaps, bound to wood of conifers only.

Hebelomina microspora has in common with *H. domardiana* that both of them can be defined as 'un *Hebeloma* à spores incolores' (Maire). It differs essentially from *H.*

domardiana in that only young spores of the African species have a dextrinoid wall, in the dimensions of the spores (*H. microspora*: 6.5–7.8×4.2–4.6 μm; *H. domardiana*: 11–15×8 μm), consequently also in those of the basidia, and again in the habitat (*H. domardiana:* 'in quercetis suberis').

Hebelomina domardiana and *H. microspora* have so many characters in common with the species of *Hebeloma* that a close relationship with that genus cannot be denied.

To enrich insight in the architecture of the spore wall within the genus *Hebeloma*, Besson & Bruchet (1973: 264–275) investigated exhaustively, with the most advanced techniques at present available, the constituting layers of this wall.

In broad outlines, they found five different layers which they indicated from inside outwards by the Roman figures I–V. The concentric layers I–III are perfectly smooth. The important layer IV, enveloping layer III, produces the spore ornamentation and bears the spore pigments. It is covered by the thin layer V, distinguishable with an ordinary microscope in such species of *Hebeloma* as have a relatively high spore ornamentation.

Mature and sound spores of *Hebeloma* are acyanophilous and not dextrinoid. This alters as soon as a spore is broken or damaged. Then an intermediate zone of the wall — indicated by Besson & Bruchet as layer III (+an outer zone of II) — proves to be coloured after treatment with a solution of cotton blue in lactic acid and, at the same time, proves to be dextrinoid. Evidently in intact and mature spores there is a barrier, preventing cotton blue and iodium from entering into III. In broken spores however these substances can enter through the plane of breakage and probably, still more easily, via I (and the inner layers of II). As layer V seems to be of little importance here, the barrier must be formed by the thick and pigmented layer IV. For a better understanding it might be useful to refer to plate III (figs. 1 and 3) of the article of the French authors mentioned.

If from a spore of *Hebeloma* we could take away layer IV without causing damage to the other layers, very likely: (*i*) this spore would be colourless (IV being the layer containing the pigments), (*ii*) the spore wall would be fully smooth (I ignore the irrelevant possibility that layer V might have become folded), and (*iii*) layer III would be immediately accessible to cotton blue and to iodium (the 'barrier' having been removed). I think our hypothetical spore would differ little from a spore of *Hebelomina*. That this reasoning is not only illusory may be illustrated by the following.

Examination of the spores of *H. microspora* in chloral-hydrate after a treatment with a watery solution of cresyl blue reveals that the greater part of the thickness of the wall is occupied by a metachromatic zone. Externally this zone is delimited by a dark blue line, internally by a faint blue-coloured line, mostly difficult to observe.

The same picture is obtained with rather young spores of *Hebeloma sinapizans* (or some other allied species) where layer IV is not yet distinctly developed and which have undergone the same treatment. Once more the well-known picture is shown in the 'kernel' of a mature spore which has slipped out of its warty and pigmented shell (=layer IV) after the cover-glass has been forcibly tapped.

Therefore morphologically, in its essential characters, it appears that all the differences between *Hebeloma* and *Hebelomina* (spore colour, wartiness of spores, accessibility to cotton blue and iodium) can be reduced to a single one, namely to a rudimentary 'layer IV' in *Hebelomina*.

In this connection and without much being attached to the fact it is nevertheless curious that the spores of *H. microspora* are just a little smaller than the smallest ones in *Hebeloma*, whose measurements are borrowed from Bruchet (1970).

I trust that the above results, obtained with limited means, will prove to be an approach to the actual facts.

From a phylogenetic standpoint we know nothing at all about the nature of the mutual relations of the two genera. It may be that the existing species of *Hebelomina* are the last representatives of a dying 'tribe', living a languishing life in their last niches. But the possibility that the same mutation took place repeatedly in different species of *Hebeloma*, can better not be excluded.

So, for the present, I deem it wise not to propose a unification of the two closely allied genera.

I am very grateful to the late Mrs. E. Helmer van Maanen, Ph. D., for the correction of the English text and to all those who have contributed to the accomplishment of this publication.

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Note added in proof

Just when the present paper came into print, my attention was drawn to an article by Alessio & Nonis (1977) with a description of an agaric under the validly published name *Hebelomina microspora*. Unfortunately that species seems to be quite different from the *H. microspora* described in this paper.

Macroscopically the italian species has the habit of some umbonate *Inocybe* rather than that of a *Hebeloma*. The colour of the cap seems to be too dark and, in older specimens, too red (in the original '*H. microspora*' this varies from pure white to about pink-buff as in Séguy 199), and the stem has almost the same colour as the cap (in the original species – as in many Hebelomata – remaining practically white).

According to Alessio & Nonis, from a microscopic point of view, the spores are

identified as amyloid (whereas in my species they are pseudoamyloid) and the edge of the gills is set with large cystidia, measuring 40–80(–100) × 9–16 μm.

Since as a result of the publication of Alessio & Nonis the name *Hebelomina microspora* Huijsm., validated in the proceeding text, has become a later homonym. I propose the following name change:

Hebelomina neerlandica Huijsm., *nom. nov.*

Basionym: *Hebelomina microspora* Huijsm. (see p. 485) non *H. microspora* Alessio & Nonis, *in* Micol. ital. **6** (3): 15. 1977.

ADDITIONAL REFERENCE

ALESSIO, C. L. & NONIS, U (1977). Una specie quasi sconosciuta: *Hebelomina microspora* Huijsman. *In* Micol. ital. **6** (3): 15–19, pl. 18.

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NOTES ON HYDNUMS—XI

R. A. Maas Geesteranus
Oegstgeest

(With 11 Text-figures)

Some of the species and names of hydnoid fungi treated in Furukawa's work are discussed. *Hydnum albidum* is recorded in Europe for the first time. Further finds of some interesting species are reported. *Auriscalpium barbatum* (Western Australia) and *Steccherinum peruvianum* (Peru) are described as new species. A key to the species of *Auriscalpium* is given.

For the preparation of the present paper material has been received on loan or for incorporation in the 'Rijksherbarium' from the herbaria at Baton Rouge (LSUM), Bergen (BG), Graz (GZU), Helsinki (H), München (M), Oulu (OULU), and Perth (UWA), as well as from the correspondents A. Nyffenegger (Belp, Switzerland), L. Riousset (Maillane, France), and E. Schild (Brienz, Switzerland). To all these I wish to express my best thanks. Acknowledgment is also made to the Director of the 'Rijksherbarium' for providing working facilities.

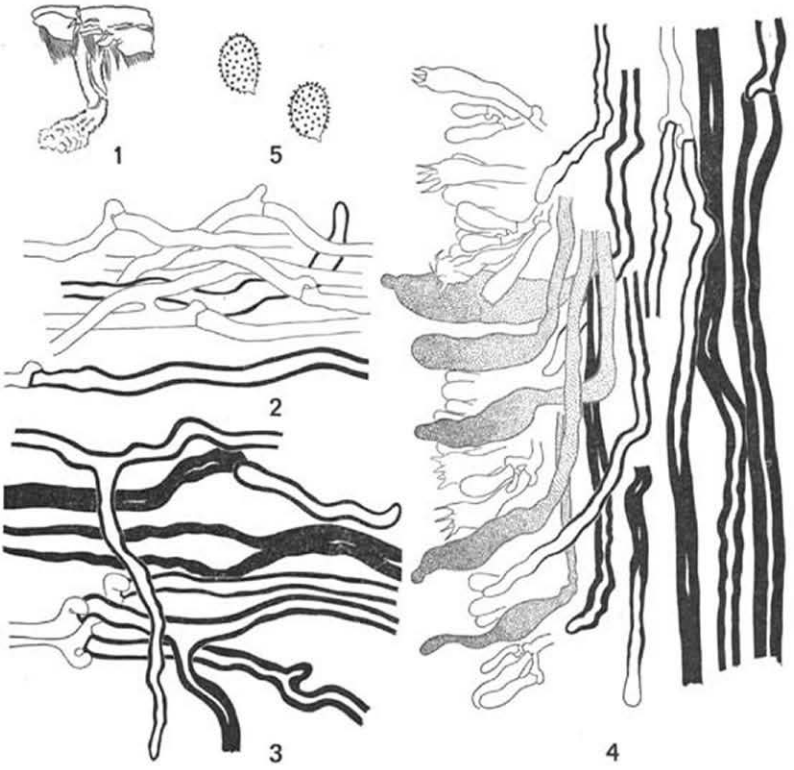
AURISCALPIACEAE

Auriscalpium barbatum Maas G., *sp. nov.*[1]—Figs. 1-5

Basidioma solitarium. Pileus circa 20 mm diam., orbicularis, plano-convexus vel centro paulum depressus, laevis vel radiatim subrugulosus, maxima ex parte glaber, margine vero processibus multis minutis praeditus, subtiliter radiatim striatus, nitidulus, rufo-umbrinus, in sicco margine incurvato, crenulato vel in aculeos producto. Stipes circa 15×3–5 mm, centralis, solidus, inferne curvatus, sursum dilatus, hispidus praecipue basin versus, fulvus, subiculo lanoso concolori exortus. Aculei usque ad 7 mm longi, decurrentes, conferti, subulati, cinerei, apice sordide incarnati. Caro circa 0.5 mm crassa, modice mollis, brunnea, et supra et infra linea tenuissima fusca delimitata, dimitica, e hyphis generatoriis skeletalibusque formata, paucis hyphis oleiferis immixtis. Hyphae generatoriae 2–3.6 μm latae, haud inflatae, tenuiter tunicatae, ramosae, interdum anastomosantes, septatae, fibulatae. Hyphae skeletales 2–8 μm latae, crasse tunicatae vel solidae, nonnullae etiam generatoriarum modo ramosae et fibulatae. Basidia 22–25×5.5–7 μm, clavata, fibulata, 4-spora, sterigmatibus usque ad 4.5 μm longis praedita. Sporae 5.8–6.3×3.8–4.7 μm, ellipsoideae, adaxialiter paulum applanatae, spinulosae (spinulis sat robustis), incolores, amyloideae, apiculo obliquo munitae. Gloeocystidia apice 7–11.5 μm lata, numerosa, e hymenio prolata, variantia sed vulgo fusiformia, tenuiter tunicata.

Holotypus: *UWA 2149*, pars in L.

[1] Etymology: *barbatus*, bearded; referring to the long spines which give the pileus a bearded appearance.



Figs. 1–5. *Auriscalpium barbatum* (Holotype). — 1. Habit sketch of basidiome put together from various broken parts. — 2. Detail of context close under upper surface of pileus and about 1.5 mm back from margin, showing scarcity of skeletal hyphae. — 3. Detail of context at lower surface of pileus near insertion of a spine, also about 1.5 mm back from margin, showing abundance of skeletal hyphae (most generative hyphae omitted). — 4. Detail of spine, showing basidia, gloeocystidia, and skeletal hyphae. — 5. Two spores. (Fig. 1, ×1; Figs. 2–4, ×700; Figs. 5, ×1400.)

Basidiome solitary. Pileus c. 20 mm across, orbicular, plano-convex or with somewhat depressed centre, smooth to somewhat radiately rugulose, glabrous for the greater part but with many minute excrescences near margin, with delicate radiating striations, slightly shiny, dark brown with some reddish shade; margin incurved (in dry condition), crenulate or running out into spines. Stipe c. 15 × 3–5 mm, central, solid, curved below, widening upwards, hispid particularly towards base, fulvous, springing from a woolly, concolorous, sand-incrusted subiculum. Spines up to 7 mm long, decurrent, crowded, subulate, ash grey with horny, dingy flesh-coloured tips. Context c. 0.5 mm thick in pileus, fairly soft, brown, bounded both above and below by a very thin, dark brown to black line.

Context of pileus dimitic (but see remarks), made up of generative, some oleiferous, and skeletal hyphae, Generative hyphae 2–3.6 μm wide, not inflated, thin-walled, branched, sometimes anastomosing, septate, with clamp connections. Skeletal hyphae 2–8 μm wide, thick-walled to solid, not infrequently mixed with or passing

into equally thick-walled sclerified generative hyphae which are branched, septate' and clamped. Context of spines similar, generative hyphae somewhat narrower (up to 2.7 μm wide), oleiferous hyphae more conspicuous, skeletal hyphae confined to core of spine. Both oleiferous hyphae and skeletals curving outwards terminally, the former to produce gloeocystidia, the latter to reach or penetrate the subhymenial region but never protruding beyond the basidia. Basidia 22–25 × 5.5–7 μm, clavate, clamped, 4-spored, with sterigmata up to 4.5 μm long. Spores 5.8–6.3 × 3.8–4.7 μm, pip-shaped, conspicuously spinulose, colourless, amyloid, with oblique apiculus. Gloeocystidia 7–11.5 μm wide, numerous, protruding, variously shaped but usually fusiform, thin-walled.

Holotype.—AUSTRALIA: Western Australia. Fitzgerald River National Park (between Albany and Esperance), on the track leading to West Mount Barren, 16 Aug. 1977, *R. N. Hilton*, 'growing from fragments of sparse humus embedded in sandy earth ... in open, not woodland, country', with small trees of *Eucalyptus tetragona* nearby (*UWA 2149*, fragment in L).

The type consists of a single specimen which, most unfortunately, was badly broken in transport. As a result, the habit sketch (Fig. 1) must be regarded as an approximation.

No information is available on the colour of the context in young, fresh specimens, which to my mind is an important character, but this may be deduced from the colour of the context of similarly constructed *A. umbella* Maas G. (1971: 17). Unlike *A. vulgare* S. F. Gray (Maas Geesteranus, 1963: 427), *A. umbella* is a species with soft-fleshed pileus, without thick-walled hyphal elements (with their high refractive power), the context of which is known to be brownish already when fresh, and drying even browner. It is perhaps permissible to assume that the context of equally soft-fleshed *A. barbatum*, which is brown now, likewise was tinged brownish when fresh and young, and never had the whiteness of *A. vulgare*.

Reverting to my 1963 publication quoted above, special attention may be drawn to the striking resemblance between *A. vulgare* and *A. barbatum* in the hyphal structure of their spines. I have little doubt, therefore, that these two species are more closely related mutually than to any other species of the genus, in spite of obvious differences.

Since the genus appears to grow larger a key is provided to facilitate identification of the species.

KEY TO THE SPECIES OF AURISCALPIUM

1. Context of pileus tough. Skeletal hyphae (and/or sclerified generative hyphae) abundant, also near upper surface of pileus.
   2. Pileus umbilicate to cyathiform, sparingly pilose to glabrous (eastern China): *A. fimbriato-incisum*
   2. Pileus plano-convex, villose with a few scattered bristle-like hairs or densely hispid, glabrescent only in old age (Northern Hemisphere): . . . . . *A. vulgare*
1. Context of pileus fairly soft. Skeletal hyphae (and/or sclerified generative hyphae) absent or present only near lower surface of pileus.
   3. Spores 3.5–4.7 μm broad. Not growing on mosses.
      4. Growing on wood or fallen branches. Spines without or with rare skeletal hyphae (South America): . . . . . *A. villipes*
      4. Springing from a subiculum 'embedded in sandy earth'. Spines with abundant skeletal hyphae in core (Western Australia): . . . . . *A. barbatum*
   3. Spores 4.9–5.6 μm broad. Base of stipe attached to mosses (New Zealand): *A. umbella*

HERICIACEAE

DENTIPELLIS MACRODON (Pers. ex. Fr.) Furukawa

This is a recombination proposed by Furukawa (1974: 53), but he seemed to have been unaware of the following. Donk (1962: 233) stated that he had been unable to locate authentic material of *Hydnum macrodon*. He suggested (p. 234) that the name be rejected as a nomen dubium. He further discussed the interpretations as given to *H. macrodon* by L. W. Miller and by Lundell. According to Donk, *H. macrodon* sensu L. W. Mill. represents *Dentipellis separans* (Peck) Donk (p. 235), while *H. macrodon* sensu Lundell is *Dentipellis fragilis* (Pers. ex Fr.) Donk (p. 233).

Strictly speaking, Furukawa's recombination, being based on a nomen dubium, is a nomen dubium, too. Very probably, however, his description agrees with one of the two more modern conceptions. Thus, his material will prove to be identical with either *Dentipellis fragilis* or *D. separans*. I am not at the moment prepared to say which, as this would entail a thorough re-examination of Peck's type.

HYDNACEAE

In discussing the taxonomic relationships of some genera of hydnoid fungi, Furukawa (1974: 7) selected the development of tramal tissue in the spines of the hymenophore and the sterile tip of the spine as the most important features to define the family Hydnaceae. To him this kind of spine constituted 'the spine in its real sense'. In order to preclude any ambiguity he repeated (p. 8) that 'tramal structure in the spine, and sterile at the apices [represent] absolute character of the Hydnaceae...'. He found that spines of this kind occur in such diverse genera as *Basidioradulum*, *Dentipellis*, *Mycoacia*, and *Odontia*. This led him to place these taxa indiscriminately under the Hydnaceae irrespective of differences in the consistency of the context, the hyphal make-up, the shape of the basidia, amyloidity of the spores, and presence or absence of cystidia.

HYDNUM ALBIDUM Peck

Hydnum albidum Peck *in* Bull. N.Y. St. Mus. **2**: 10. 1887; *in* Rep. N.Y. St. Mus. nat. Hist. **51**: 310, pl. 56 figs. 1–7. 1898; *in* Mem. N.Y. St. Mus. **4**: 175, pl. 67 figs. 1–7. 1900. — *Dentinum albidum* (Peck) Snell *in* Mycologia **37**: 51. 1945. — *Hydnum repandum* f. *albidum* (Peck) Nikolajeva *in* Fl. Pl. crypt. URSS **6** (Fungi) 2: 306. 1961.

MISAPPLIED.—*Hydnum repandum* var. *albidum* (Peck) Bres., Icon. mycol. **21**: text to Pl. 1045. 1932.

Basidiome similar in habit to *H. repandum*. Pileus c. 65 mm across, plano-convex, minutely velutinous, milk white to gypsum white, flavescent, margin obtuse to acute in places. Stipe c. 50 × 14–20 mm, central, crooked and incrassate below, felted, concolorous with pileus, staining ochraceous yellow where bruised (spots turning more brownish after some time), with rounded base. Spines about as long as those in *H. repandum* but much more crowded and more slender, more or less decurrent,

concolorous with pileus, somewhat flavescent with age. Context not zoned, soft and fragile (as in *H. repandum*), milk white. Odour agreeable, somewhat spicy. Taste reminiscent of *H. repandum* but weaker, not acrid. (Macroscopic description based on notes provided by Mr. E. Schild.)

Context of pileus (badly dried, hence hyphae very hard to distinguish separately) monomitic, made up of generative hyphae, some of which were seen to be 18 μm wide, inflating, thin-walled, clamped. Basidia 36–40 × 5.5–7 μm, cylindrical-clavate, clamped, 5–6-spored, with sterigmata 4.5–5.5 μm long. Spores 4.5–5.2 × 2.9–3.6 μm, pip-shaped, smooth, colourless, with oblique apiculus 0.9 μm long.

COLLECTION EXAMINED.—SWITZERLAND: Canton Bern, Belp, near Hunzikenbrücke, 13 Sept. 1977, *A. Nyffenegger*, among moss in riverine wood with *Picea* bordering the River Aare (Herb. E. Schild and L).

This find is the first record of the species in Europe, but the epithet '*albidum*' is not new in European mycological literature.

Fries (1815: 139) once mentioned a pale form of *Hydnum repandum* which he called f. *albidum* but never referred to again.

Cejp (1928: 82) described a *Hydnum repandum* var. *albidum* which, however, had no connection with Peck's species, since it was based on a different type.

Bresadola (1932, see above) made the recombination *H. repandum* var. *albidum* (Peck) Bres. but misapplied the name, for the spore sizes he gave clearly indicate the association of his variety with *H. repandum*.

If it were not for Mr. Schild's vigilance, the present material might have gone unnoticed. Now that *H. albidum* is known to occur in Europe, it may be useful for mycologists on this continent to point out the three main features by which the species can be told from *H. repandum*. In *H. albidum* the entire basidiome is of a conspicuous whiteness, the spines are very much crowded and more slender than in *H. repandum*, while its spores are smaller and narrower.

STECCHERINACEAE

STECCHERINUM CILIOLATUM (Berk. & Curt.) Gilb. & Bud.

Maas Geesteranus, 1974: 506.

Furukawa (1974: 13), in describing this species under the name *Odontia ciliolata*, did not mention the skeletal hyphae and apparently failed to notice that the thick-walled cystidia are nothing but the terminal ends of skeletal hyphae.

STECCHERINUM FIMBRIATUM (Pers. ex Fr.) John Erikss.

Maas Geesteranus, 1974: 509.

Hyphal analysis has become commonplace in the study of Aphyllophorales, but full advantage can be obtained only if the operation includes a little more than the rendering of a few meaningless fragments of hyphae. Furukawa (1974: 13) stated that '...*O. fimbriata* has a monomitic hyphal system...', but renewed observation may show him that his statement is in need of correction.

Steccherinum peruvianum Maas G., *sp. nov.*—Figs. 6-11

Basidiomata plus minusve coalita. Pileus usque ad 22 mm antice productus, 8 mm latus, initio cylindraceus vel subulatus, deinde flabelliformis, postice angustior, incurvatus, plano-convexus vel subconfragosus, minute radiatim rugulosus, margine minute fibrilloso-velutinus, alio loco potius lanosus vel lanoso-hirsutus, zonis tomento coacto laevioribus variegatus, pallide sordideque ochraceus, lineis concentricis obscuris destitutus, basi lanoso-hirsutus, fere fulvo-ochraceus. Aculei 0.5–0.8 mm longi, 0.1–0.2 mm lati, longe decurrentes, pilei basin versus convallati, conferti, subulati, teretes vel applanati, recti, vulgo simplices, sordide carnei, albo-pruinosi, apice puberuli. Caro usque ad 2 mm crassa, conspicue duplex, inferne concentrice zonata, pallide ochracea, e hyphis generatoriis skeletalibusque formata. Hyphae generatoriae 1.8–3.6 μm latae, haud inflatae, tenuiter tunicatae, ramosae, septatae, fibulis praeditae. Hyphae skeletales 2.7–6.3 μm latae, crasse tunicatae vel fere solidae. Basidia 12.5–13.5 × 4.7 μm, magna ex parte immatura, clavata, fibulata, 4-spora. Sporae 3.6–4.5 × 2.2–2.7 μm, ellipsoideae, adaxialiter applanatae, laeves, hyalinae, apiculo obliquo munitae. Cystidia 2.7–4.5 μm lata, aculeorum apicem versus sat numerosa, hymenium haud vel paulo superantia, cylindracea vel apicem versus angustiora, apice vero obtusa, rarius incrustata.

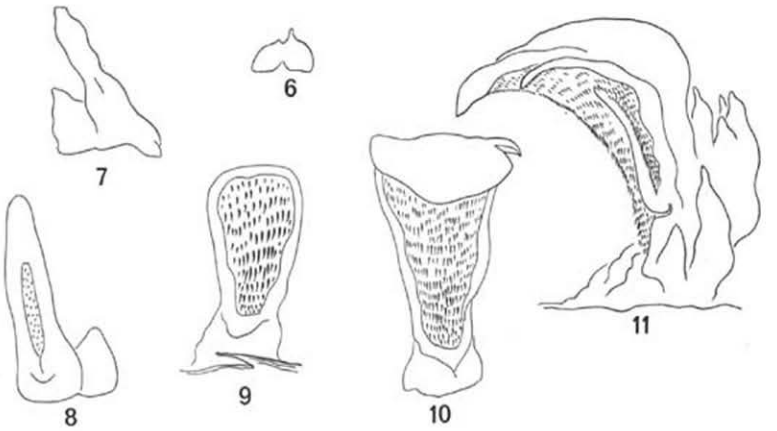
Holotypus: *Lowy 484 P* (L).

Collection consisting of five groups of more or less coalesced basidiomes, all very probably springing from the same mycelium. Pileus up to 22 mm radius and 8 mm wide, wider by confluence, at first cylindrical to subulate, then widening and becoming flabelliform, tapering towards base, incurved (from drying), plano-convex to uneven, finely radiately rugulose (also caused by drying?), finely fibrillose-velutinous at margin, more woolly or woolly-hirsute farther back, with alternating zones of a matted surface caused by collapse of tomentum, fairly pale dingy ochraceous, not zoned with concentric darker lines; margin entire to somewhat scalloped. Base short, woolly-hirsute, somewhat warmer ochraceous. Spines 0.5–0.8 mm long, 0.1–0.2 mm broad, decurrent far down, separated from base by raised rim which tends to disappear with age, crowded, subulate, terete to flattened, straight, usually simple, dingy flesh colour, whitish-pruinose, puberulous at tip. Context up to 2 mm thick, conspicuously duplex, the firmer lower part concentrically zoned, pale ochraceous.

Context dimitic, consisting of generative and skeletal hyphae; sclerified generative hyphae locally also present. Generative hyphae 1.8–3.6 μm wide, not inflating, thin-walled (but thick-walled sclerified hyphae), branched, septate, with clamp connections. Skeletal hyphae 2.7–6.3 μm wide, thick-walled or, the narrower ones, almost solid. Context of spines similar. Basidia 12.5–13.5 × 4.7 μm (the majority immature), clavate, clamped, 4-spored. Spores 3.6–4.5 × 2.2–2.7 μm, pip-shaped, smooth, colourless, with small oblique apiculus. Cystidia 2.7–4.5 μm wide, all of tramal origin, more numerous towards tip of spine, not or little protruding, cylindrical or tapering terminally, with obtuse apex, more rarely with clavately widened tip, the majority smooth, only very few near tip of spine scantily incrusted.

HOLOTYPE.—PERU: 'vicinity of Quistococha fish hatchery, about 20 km from Iquitos, Dpto. Loreto', 26 Oct. 1958. *B. Lowy* (L).

The type of this species presents several characters which at first sight reminded me of *Steccherinum peckii* Banker. These are (*i*) the fairly slender, flabelliform pilei, (*ii*) the raised rim separating the spine-bearing area from the base, (*iii*) the woolly-hirsute base of the basidiome, (*iv*) the rarity of incrusted cystidia and their occurrence near the tip of the spine, and (*v*) the size of the spores. On the other hand, there are several differences which cannot be ignored. In *S. peruvianum* (*i*) the pileus is devoid of concentric, darker lines, (*ii*) the base is not elongated to form a slender stipe, while



Figs. 6–11. *Steccherinum peruvianum* (Holotype). Successive stages in the development of basidiome and spine-bearing area (all figs., ×3).

the context of the pileus is (*iii*) conspicuously duplex, (*iv*) thicker than in *S. peckii* but (*v*) at the same time, and probably owing to the presence of fewer sclerified hyphae, not so hard and rigid as in that species. Because of this quality of the context the pilei of *S. peckii* never changed on drying, remaining perfectly straight, whereas those of *S. peruvianum* are curved inwards.

STECCHERINUM RENIFORME (Berk. & Curt.) Banker

Maas Geesteranus, 1974a: 524.

COLLECTIONS EXAMINED.—U. S. A., Ohio: Preble Co., Big Woods area, Hueston's Woods State Park, 12 July 1973, *W. B. & V. G. Cooke 47706*, on *Fagus grandifolia* (L); Hocking Co., The Gulf, Cedar Falls to Pold Man's Cave, 16 Nov. 1975. *W. B. & V. G. Cooke 51858*, on rotten wood (L); Highland Co., Fort Hill State Memorial, 3 Aug. 1976. *W. B. & V. G. Cooke 52361*, on hardwood (L).

THELEPHORACEAE

HYDNELLUM FERRUGIPES Coker

Maas Geesteranus, 1976: 280.

COLLECTIONS EXAMINED.—AUSTRIA: Steiermark, Graz, Ragnitztal near Schweinberg, 24 Sept. 1975, *J. Riedl* (GZU, part in L). — FINLAND: Uusima, Tammisaari, Tvärminne, Sandträsk, 13 Aug. 1937. *E. Häyrén*, in pine forest (H, part in L); Tuusula, Nummenkylä, 9 Sept. 1943, *E. Häyrén*, among moss in spruce forest (H); Etelä-Karjala, Kotka, Mussalo, 10 Aug. 1953. *A. Ulvinen* (OULU); Etelä-Häme, Loppi, Salo, Sorsamo, 13 Sept. 1970, *P. Alanko 16276*, in pine heath forest (H); Padasjoki, Vesijako Nat. Park, 3 Sept. 1971, *P. Alanko 18584* (H); Tammela, Mustiala, 2 Aug. 1866, *P. A. Karsten*, in pinastreto ('*Hydnum intermedium* n. sp.', H); Etelä-Savo, Taipalsaari, Karhunpää, 28 Aug. 1965, *O. Vitikainen*, sparse in dry pine heath (H); Pohjois-Häme, Toivakka,

Huikko, about 1.5 km NE of public school, 28 Aug. 1974, *E. Kankainen*, in pine heath forest (OULU); Pohjois-Savo, Suonenjoki, Harjakangas, Maassa, 28 Aug. 1966, *K. Takala* (OULU); Keski-Pohjanmaa, Haapavesi, crossing of road to Korkattivuori hill, 5 Aug. 1966. *M. Ohenoja*, abundant among *Pleurozium* in dryish pine forest (OULU); Haapavesi, Micluskylä, Kiikankallio, 15 Aug. 1970, *P. Koskela*, among mosses (OULU); Kainuu, Vaala, Maanamansalo, 7 Aug. 1977, *V. Hakulinen*, in dry pine forest rich in lichens + *H. ferrugineum* (OULU); Pohjois-Pohjanmaa, Haukipudas, Viitajärvi, Rönkölänkangas, 27 Aug. 1967, *T. Ulvinen*, in pine forest on mossy ground rich in litter (OULU); Kemijärvi, Juujärvi, Suorsavaara, 4 Aug. 1974, *P. Koskela*, fairly abundant in dry heath forest (OULU); Lumijoki, E of road to cemetery, 18 Aug. 1972, *K. Lehtosaari*, dryish pine heath of *Empetrum-Vaccinium vitis-idaea* type (OULU); Oulu, Sanginsuu, E bank of Sanginjoki river, 11 Oct. 1970, *T. Ulvinen*, in pine forest (OULU); Pudasjärvi, Aittojärvi, NW side of lake, 26 Aug. 1967, *T. Ulvinen*, in dry pine heath forest (OULU); Rovaniemi rural comm., Pahtaja, Tavivaara, 24 Aug. 1976, *E. Ohenoja & al.* (OULU); Rovaniemi rural comm., Kumpukivalo, 1 km S of Lammasuoma, 11 Aug. 1977, *K. Virtanen*, old HMT-spruce forest on gentle slope facing S, ca. 300 m alt. (OULU); Rovaniemi rural comm., Marrasjärvi, Uurtamo, W side of pond called Pieni Härklinlampi, 16 Aug. 1977, *E Uurtamo*, in dry EMT pine heath forest (OULU); Ylitornio, SE slope of Aavasaksa hill, 5 Sept 1973, *T. Ulvinen*, among mosses and litter in EMT forest (OULU); Kuusamo, Kuusamo, Oivanki, Rantalahti 1 km W, 7 Aug. 1966, *T. Ahti 22806*, in pine forest with lichen undergrowth (H); Kuusamo, Oulanka Nat. Park, Haaralammenkangas, path to Taivalköngäs falls, 21 Aug. 1974, *T. Ulvinen*, locally abundant in dry heath forest on sandy ground (OULU); Posio, Pernu, Kurtankaltio, N of Koivuköngäs falls of Kurttajoki river, 19 Aug. 1977, *T. Ulvinen*, abundant in sandy pine forest rich in lichens (OULU); Taivalkoski, Kylmälä, W side of Moskavaara hill, 23 Sept. 1972, *E. & M. Ohenoja*, in VMT forest on slope (OULU). — NORWAY: Hordaland, Lindas, Isdalstø, 18 Sept. 1976, *A. Berthelsen*, in spruce forest (BG, part in L).

The surprising number of new localities now on record for the present species would seem to indicate that *H. ferrugipes* is less rare in Europe than originally thought and suggests that, perhaps, at least some collections in the past may have been mistaken for the very similar and much commoner *Hydnellum caeruleum* (Hornem. ex Pers.) P. Karst.

The regular occurrence of both *H. caeruleum* and *H. ferrugipes* in Finland may well offer an opportunity for starting detailed field studies in order to see whether there exist ecological differences between the two species. Cultural tests, moreover, should answer the question what significance if any must be attributed in certain cases to the presence or absence of clamps.

The gathering from Mustiala listed above and provisionally named 'Hydnum intermedium' by Karsten is most probably the oldest collection of the species in existence. A possible reason why the Finnish mycologist refrained from publishing this name is his apparent difficulty in distinguishing between 'H. intermedium' and the species then known to him as *Hydnum compactum* Pers. ex Fr. (a synonym of *Hydnellum caeruleum*). In Karsten's herbarium there is material collected 6 Sept. 1867, one year after the first find, and also named 'H. medium' but with the addition of 'Hydn. compactum?', clearly expressing his doubt.

HYDNELLUM TARDUM Maas G.

Maas Geesteranus, 1975: 54, 98.

COLLECTION EXAMINED.—FRANCE: 'Savoyer Alpen, Bozel sous Glaigetan, 19 Sept. 1971, *A. Bresinsky 71/93e & R. Kühner*', obviously in coniferous wood (M).

SARCODON GLAUCOPUS Maas G. & Nannf.

Maas Geesteranus, 1975: 64, 105.

COLLECTION EXAMINED.—FINLAND: Etelä-Karjala, Vehkalahti, Pyhältö, 22 Aug. 1972, *Lars Fagerström*, woodland of *Pinus* with lichen undergrowth on sandy soil W of Kettumäki (H).

SARCODON LEPIDUS Maas G.

Maas Geesteranus, 1975: 65, 105.

COLLECTIONS EXAMINED.—ITALY: Prov. Treviso, Montello, Sept. 1976, 25 Sept. 1977, *F. Dal Savio & E. Schild*, under a *Corylus avellana* bush growing under *Castanea vesca* (L).

SARCODON REGALIS Maas G.

Maas Geesteranus, 1975: 67, 106.

COLLECTIONS EXAMINED.—FRANCE: Dép. Bouches-du-Rhône, St-Rémy, Bois de [illegible], 28 Oct. 1976, *L. Riousset*, under *Quercus ilex* (L). — SWITZERLAND: Canton Bern, Brienz, Schwanden, Sportplatz, 18 Aug. and 14 Oct. 1976, *E. Schild & W. Wäfler*, in mixed wood of *Corylus* and *Picea* (L).

GENERA INCERTAE SEDIS

CLIMACODON PULCHERRIMUS (Berk. & Curt.) Nikol.

Maas Geesteranus, 1971: 138.

COLLECTION EXAMINED.—TURKEY: Bolu, Koru Motel (Loc. 313), 30 Aug. 1972, Finnish Bot. Exp. to West-Central Asia 1972, *M. Korhonen 1212*, on rotten wood in mixed forest of *Fagus* and *Abies*, 860 m alt. (H, fragment in L).

After a report had been published on the lignicolous macrofungi collected in Turkey by the recent Finnish Botanical Expedition to West-Central Asia (Niemelä & Uotila, 1977), the above material was sent to me for identification. The interest of this collection lies in the remarkable fact that (*i*) oleiferous hyphae in the pileus are very rare and (*ii*) all specimens prove to be devoid of gloeocystidia, even near the base of the spines. I have noticed this phenomenon before (Maas Geesteranus, 1971: 140) but never regarded it as anything more than an anomaly of rare occurrence. If, however, the lack of gloeocystidia proves to be a consistent feature of an entire collection, and possibly may happen more often, it is time to emend my key to the genera (1971: 13–14). The change concerns couplet 13 (on p. 14) which now should read:

13. Spores smooth.
    14. Generative hyphae in the spines as well as basidia lacking clamps: . . . *Climacodon*
    14. Generative hyphae in the spines as well as basidia with clamps: . . . . . *Hydnum*

MYCOLEPTODON LICENTII Pilát

A disturbing error crept into a previous publication (Maas Geesteranus, 1974b). The passage on p. 495 beginning with *Mycoleptodon licentii* Pilát must be deleted, since this species is a synonym of *Mycorrhaphium adustum*, not of *M. stereoides*.

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A NEW SPECIES OF TALAROMYCES AND A DISCUSSION OF SOME RECENTLY DESCRIBED TAXA

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(with one Text-figure)

A new species of *Talaromyces* C. R. Benjamin, *T. assiutensis*, is described and illustrated. It was isolated from Egyptian soil amended with crushed buffalo hooves and incubated for five months at 35 °C. *T. assiutensis* is characterized by white to pale yellow ascomata, small, smooth-walled to finely roughened ascospores and short biverticillate conidiophores. The taxa of *Talaromyces* published after 1972 are briefly discussed.

Among some strains sent to the Centraalbureau voor Schimmelcultures for identification, an hitherto undescribed taxon of *Talaromyces* C. R. Benjamin was encountered. The following new species is proposed to accomodate it.

Talaromyces assiutensis Samson & Abdel-Fattah, *sp. nov.*—Fig. 1.

Stat. Conid. **Penicillium assiutense** Samson & Abdel-Fattah, *sp. nov.*

Coloniae in agaro farina maydis confecto celeriter crescunt, post 14 dies 33 °C 7 cm diam., in strato basilari coacto copiosa ascomata alba vel dilute flava ferentes. Status conidialis plerumque parcus vel absens, in coloniis vetustis nonnumquam stratum virescens format. Exsudatum incoloratum nonnumquam adest; odor abest. Reversum cremeum vel dilute flavum. Ascomata 10 diebus 33 °C maturantia, mollia, saepe mycelio laxo obtecta, nonnumquam confluentia, alba, nonnumquam dilute flava, globosa vel subglobosa, 250–500 μm diam.; hyphis laxe intricatis involuta; e hyphis regulariter acervatis oriuntur. Asci catenulati, globosi vel ellipsoidei, 7–10 × 5.5–7 μm, evanescentes, 8-spori. Ascosporae ellipsoideae, 3.0–3.5 × 2.0–2.5 μm, hyalinae, leves vel minute asperulatae. Conidiophora plerumque ex hyphis aeriis surgentia, erecta, hyalina, levia; stipites 25–40 × 2.5–3.0 μm, unum penicillum metularum phialidumque proferunt; metulae plus minusve cylindricae, 3–5 verticillatae, 12–17 × 2.0–3.0 μm; phialides lanceolatae, 2–5 verticillatae, 12–16 × 2.2–3.0 μm. Conidia in catenis intricatis connexa, hyalina, ellipsoidea, levia, 2.2–4.0 × 1.5–2.2 μm. Chlamydosporae absunt. Temperatura optima 33 °C, crescere potest inter 12 et 40 °C.

Typus: *CBS 147.78*, isolatus e terra diluta, ungulis bisonis maceratis admixta, prope Assiut in Aegypto a H. M. Abdel-Fattah, 1977.

Colonies on oatmeal agar growing rapidly, attaining a diameter of 7 cm within 2 weeks at 33 °C, consisting of a basal felt in which numerous white to pale yellow

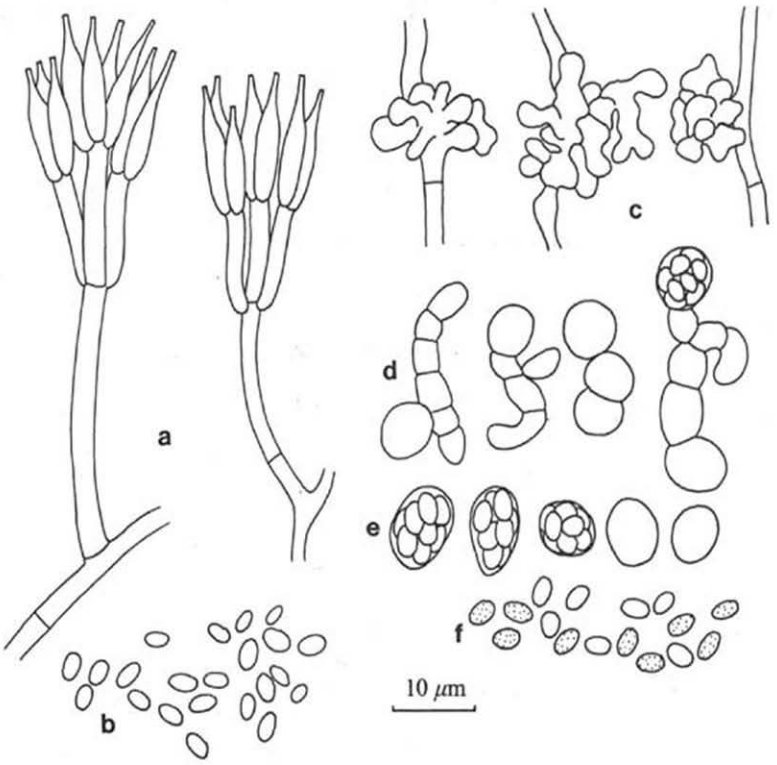

Fig. 1. *Talaromyces assiutensis*. — a. conidiophores. — b. conidia. — c. initials. — d. catenulate asci. — e. asci. — f. ascospores.

ascomata develop; conidial state usually scantily produced or sometimes absent, in 5 weeks old cultures greenish conidial areas may occur when cultures are transferred after 2 weeks from 33 °C to room temperature (about 20 °C). Exudate not produced or sometimes present as colourless drops. Odour absent. Reverse cream to pale yellow. Ascomata ripening within 10 days at 33 °C, non-ostiolate, soft, often bounded by loose cottony mycelial overgrowth, occasionally confluent, white, sometimes pale yellow, globose to suglobose, 250–500 μm in diameter; ascoma wall consisting of loose thin hyphae; ascomata developing from regularly gnarled hyphae. Asci in chains, globose to ellipsoidal, 7–10 × 5.5–7 μm, evanescent, 8-spored. Ascospores ellipsoidal, 3.0–3.5 × 2.0–2.5 μm, hyaline, smooth-walled to finely roughened. Conidiophores hyaline, erect, smooth-walled; stipe 25–40 × 2.5–3.0 μm, bearing one apical whorl of metulae and phialides. Metulae more or less cylindrical, 3 to 5 in a whorl, 12–17 × 2.0–3.0 μm. Phialides lanceolate, in whorls of 2 to 5, 12–16 × 2.2–3.0 μm. Conidia in tangled chains, hyaline, ellipsoidal, smooth-walled, 2.2–4.0 × 1.5–2.2 μm. Chlamydospores not observed.

Colonies on 2% malt extract agar (MEA) growing more slowly than on oatmeal agar with thinner growth and less abundant production of ascomata. In slant

cultures on MEA ascomata with a diameter up to 2000 μm were observed after one month. Conidial state usually better developed than on oatmeal agar. Reverse and basal felt of the colonies yellow to red brown.

Optimum temperature for growth is 33 °C, with a temperature range between 12 and 40 °C. Optimum temperature for ascomata production on oatmeal agar is between 30 and 36 °C.

Type culture *CBS 147.78*, isolated by dilution plating from soil which had been amended with crushed buffalo hooves and incubated for 5 months at 35 °C by H. M. Abdel-Fattah, Assiut, Egypt.

T. assiutensis belongs to the section *Talaromyces* (Stolk & Samson, 1972), but differs from the other members of this section by the white ascomata and the small, smooth-walled to finely roughened ascospores. It resembles *T. trachyspermus* (Shear) Stolk & Samson, but can be distinguished from it by the smooth ascospores, the regularly gnarled ascoma initials and the short biverticillately branched conidiophores. Since the type strain of *T. assiutensis* was isolated from soil with crushed buffalo hooves it was also cultivated on sterilized hairs on plain agar. The strain showed some growth on the hairs, but the hyphae did not penetrate the cortex of the hairs.

DISCUSSION OF SOME RECENTLY DESCRIBED TAXA IN TALAROMYCES

Since the publication of the monograph by Stolk & Samson (1972) some new taxa have been described:

Wright & Loewenbaum in Bertoni & al. (1973) distinguished a new var. *macrocarpus* of *Talaromyces trachyspermus* (Shear) Stolk & Samson for strains which have 500–1500 μm large ascomata. The variety was, however, invalidly published because no type was indicated (Art. 37, Stafleu & al., 1972). The size of the ascomata in the genus *Talaromyces* is an unreliable character since it is depending on age and culture media. The variety *macrocarpus* can therefore regarded as insufficiently distinct from *T. trachyspermus*.

In their notes on Ascomycetes from Ohio, Huang & Schmitt (1975) described seven *Talaromyces* species from soil. They found that *Penicillium ucrainicum* Panasenko (1964) is a *nomen invalidum*, because it was published without indication of a type and regarded it correctly synonymous with *T. flavus* (Klöcker) Stolk & Samson var. *flavus*. They proposed a new name, *Penicillium ohiense* Huang & Schmitt (as '*ohiensis*') for the anamorph of the different species, *T. ucrainicus* Udagawa.

T. galapagensis Samson & Mahoney (1977) isolated from partially sterilized soil of the Galapagos Islands, is a distinct species, characterized by large ascospores ornamented by irregularly disposed warts and ridges.

Ram & Ram (1972) proposed the new combination *Eupenicillium vermiculatum* (Dangeard) Ram & Ram, but did not indicate the location of the basionym *Penicillium vermiculatum* Dangeard. This combination is therefore not validly published according to Art. 33 (Stafleu & al., 1972). The culture studied by these authors was not available for study but their description seems to fit *T. flavus* var. *flavus*.

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MYRIODONTIUM KERATINOPHILUM, GEN. ET SP. NOV.

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(With 2 Text-figures)

The hyphomycete *Myriodontium keratinophilum, gen. et sp. nov.*, is described and illustrated. It was isolated from soil and a preputial swab of a bull. The new taxon is characterized by fertile hyphae consisting of intercalary polyblastic conidiogenous cells and one-celled conidia borne on long denticles. Its relationship to other hyphomycetous genera with solitary blastic conidia is discussed.

In the course of an investigation of the soil mycoflora in Italy a number of fungi were isolated and screened for their antibiotic and antiviral properties. During this work two isolates of an hitherto undescribed hyphomycete were encountered.

Myriodontium Samson & Polonelli, *gen. nov.*

Coloniae albae, floccosae, pulverulentae. Mycelium ramosum, hyalinum, septatum, leve. Hyphae fertiles aeriae, procumbentes, hyalinae, ramosae, leves. Cellulae conidiogenae polyblasticae, integratae, intercalares vel terminales, determinatae, plus minusve cylindricae, undique dense denticulatae; denticuli longi, cylindrici. Conidia solitaria, sicca, continua, hyalina, dacryoidea. Teleomorphosis ignota.
Species typica: *Myriodontium keratinophilum* Samson & Polonelli.

Colonies white, floccose, powdery. Mycelium branched, hyaline, septate, smooth-walled. Fertile aerial hyphae procumbent, hyaline, branched, smooth-walled. Conidiogenous cells polyblastic, integrated, intercalary or terminal, determinate, more or less cylindrical, densely denticulate all over surface; denticles long, cylindrical. Conidia solitary, more or less synchronously formed, dry, one-celled, hyaline dacryoid. Teleomorph not known.
Type species: *Myriodontium keratinophilum* Samson & Polonelli

Myriodontium keratinophilum Samson & Polonelli, *sp. nov.*—Fig. 1

Coloniae in agaro YpSs dicto modice rapide crescunt, post 14 dies 25 °C 6 cm diam. in strato basilari dense coactae, mycelio aerio floccoso albo obtecta, saepe pulvinis mycelialibus sterilibus zonatae. Reversum album; odor abest. Hyphae vegetativae hyalinae, leves, ramosae,

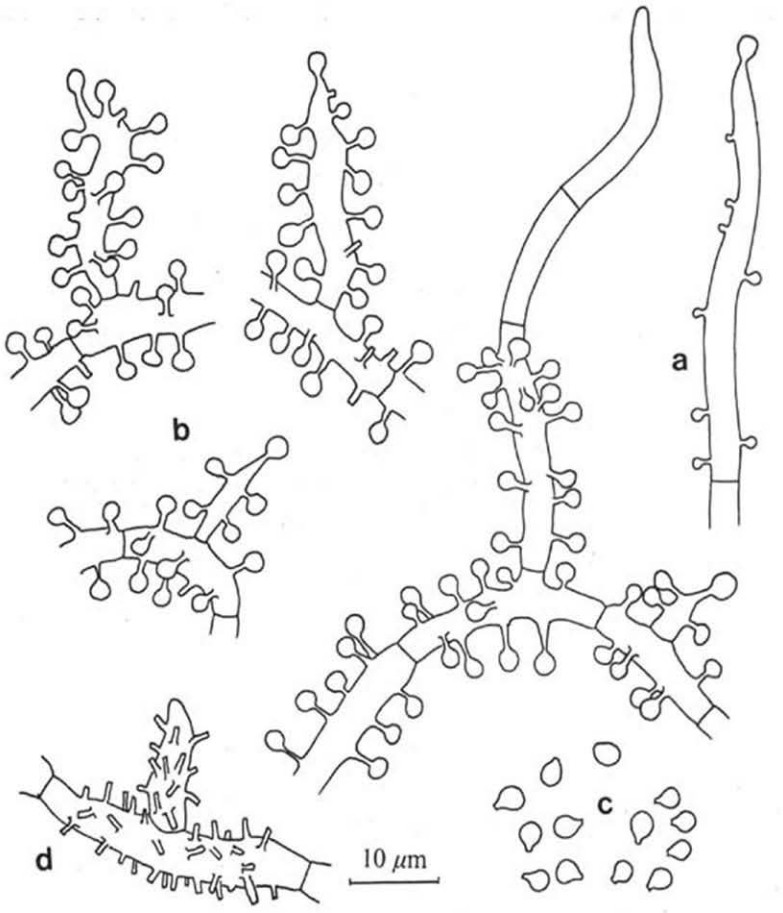

Fig. 1. *Myriodontium keratinophilum.* — a. Young conidial structure. — b. Polyblastic conidiogenous cells with solitary conidia. — c. Conidia. — d. Conidiogenous cells showing long cylindrical denticles after secession of conidia.

septatae, 2.6–6 μm latae; hyphae fertiles similes, ad 4 μm latae. Cellulae conidiogenae polyblasticae, intercalares vel terminales, plus minusve cylindricae, 10–30 × 2.5–5 μm, denticuli undique radiantes, cylindrici, 1.5–3 × 0.5–1.0 μm. Conidia solitaria, plus minusve simul oriunda, sicca, continua, subglobosa ad dacryoidea, hyalina, levia, 2–3 μm diam.

Typus: *CBS 947.73*, isolatus e terra in Horto botanico, Romae in Italia, Junio 1973.

Colonies on YpSs agar growing moderately rapidly, attaining a diameter of 6 cm within 14 days at 25 °C, consisting of a white basal felt, obscured by white, floccose, aerial mycelium, often strongly zonated by white sterile mycelial cushions alter-

nating with sporulating structures, appearing mostly in localized areas. Reverse uncoloured; odour absent. Vegetative hyphae hyaline, smooth-walled, branched, septate, 2.5–6 μm wide. Fertile hyphae hyaline, branched, smooth-walled, 2.5–4 μm wide. Conidiogenous cells polyblastic, integrated, intercalary or terminal, determinate, more or less cylindrical, 10–30 × 2.5–5 μm, denticulate; denticles all over surface, long, cylindrical, 1.5–3 × 0.5–1 μm. Conidia solitary, more or less synchronously formed, dry, subglobose to dacryoid, hyaline, one-celled, smooth-walled, 2–3 μm in diameter.

Colonies on hay-infusion agar growing slowly, attaining a diameter of 5 cm within 14 days at 25 °C, consisting of a thin basal felt with many white mycelial cushions and sporulating structures, usually arranged in a zonated pattern and intermixed with a few aerial hyphae.

Growth on oatmeal agar is similar, but with abundant aerial mycelium and a less zonated pattern.

The fungus grows and sporulates abundantly on hairs. Sporulation on sterilized hairs above Czapek or plain agar occurs after one to two weeks. The hyphae do not penetrate the cortex and growth remains restricted between the scales of the cuticle.

MATERIAL EXAMINED.—*CBS 947.73* (=type culture) and *CBS 948.73*, both isolated from two different soil samples, collected at the Botanical Garden in Rome, Italy, in June 1973. The strains were isolated after inoculation of a soil suspension on Litman's Oxgall agar. — *CBS 949.73*, isolated by Dr. Brigitte Gedek (Munich, FRG) from a preputial swab of a bull. — *IMI 160292* (herbarium specimen), as *Sporothrix* species, isolated from soil, California (USA) by G. F. Orr.

On the basis of the polyblastic conidiogenous cells and the one-celled conidia, *Myriodontium* can be compared with *Trichosporiella* Kamyschko ex W. Gams & Domsch, *Emmonsia* Cif. & Montem., *Myceliophthora* Cost., *Chromelosporium* Corda, *Pulchromyces* Hennebert, *Beniowskia* Rac. and *Ustalaginoidea* Brefeld.

The monotypic genus *Trichosporiella* (type species: *T. cerebriformis* (De Vries & Kleine-Natrop) W. Gams) is distinguished by very slow growing, butyrous colonies with thin, hyaline mycelium growing submerged in the agar. Each conidiogenous cell produces one to few almost sessile conidia, which are borne on short denticles (De Vries & Kleine-Natrop, 1957; Gams & Domsch, 1969; von Arx, 1971). Conidiogenesis in the genera *Emmonsia* and *Myceliophthora* is similar but conidia can also be produced from ampulliform swellings and often form acropetal chains (Van Oorschot, 1977). Colonies are mostly floccose. Conidial structures similar to those in *Trichosporiella* and *Emmonsia* are found in the ascomycete genera *Podosordaria* and *Poronia* (Jong & Rogers, 1969; Morgan-Jones & Hashmi, 1973; Stiers & al., 1973; Furuya & Udagawa, 1977).

Species of the genera *Chromelosporium* and *Pulchromyces* (Hennebert, 1973; Pfister & al., 1974) resemble *Myriodontium*, but have distinct erect, branched conidiophores and broader hyphae. In *Chromelosporium* the conidia are blown out from the conidiogenous cells without denticles.

The genus *Beniowskia* was described by Raciborski (1900) and based on *B. graminis* Rac., a sporodochial fungus growing on leaves of *Panicum nepalense*. On the type specimen (in herb. ZT) no fungal material could be found. Two other species of *Beniowskia*, *B. sphaeroidea* (Kalchbr. & Cooke) Mason and *B. penniseti* Wakef. however, fit Raciborski's generic description and can be regarded as typical representatives.

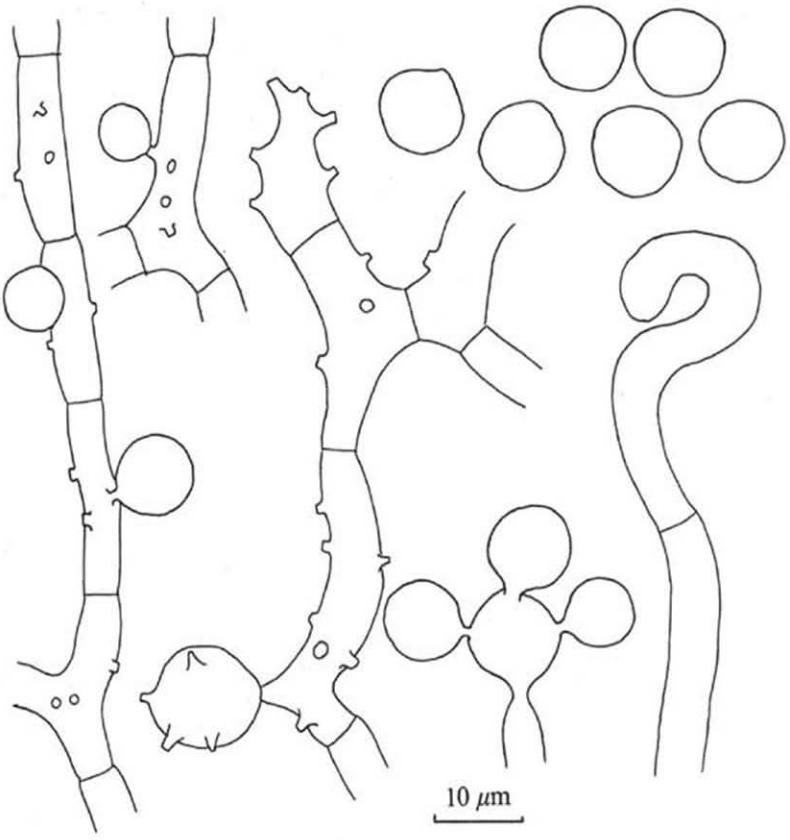

Fig. 2. *Beniowskia sphaeroidea*, conidiogenous structures (Figure drawn from specimens collected by H. Sydow – Fungi Aequatoriense – on *Pennisetum bambusiforme* (Fourn.) Hemsch. and *Lasiacis sorghoidea* (Desv.) Hitch et Chas. in herb. ZT).

In *B. sphaeroidea* (fig. 2) the sporodochia consist of 5–7 μm wide hyphae with conidiogenous cells bearing short denticles. Conidia may also be produced from ampulliform swellings. *B. macrosporus* M. D. Mehrotra (1964) has been cultured on agar media. In the type strain (*CBS 757.74*) good growth and sporulation could be observed. The conidiogenous structures, however, mainly consist of polyblastic proliferating cells, giving rise to acropetal chains of conidia. The formation of solitary conidia from polyblastic, shortly denticulate, cylindrical conidiogenous cells, probably occurs only on the natural substrate.

The species of *Beniowskia* are very similar to those of *Ustilaginoidea* (type species:

U. virens (Cooke) Takahashi). The fructifications also occur on grasses but mostly only on the ovaries of invidual grains which are transformed into large, very dark, olive-green or sometimes orange, velvety masses (Ellis, 1971).

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ARCHITECTURE DE LA PAROI SPORIQUE DES AURISCALPIACÉES ET DES HÉRICIACÉES

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(Avec Planches 50–56)

L'ultrastructure de la paroi sporique de la famille des Auriscalpiacées et de la famille des Hériciacées est étudiée au moyen du microscope électronique. L'architecture des parois sporiques est la même dans les deux familles.

La famille des Auriscalpiacées (Aphyllophorales-Basidiomycètes) a été créée en 1963 par Maas Geesteranus pour les genres *Auriscalpium*, *Gloiodon* et *Lentinellus* auxquels l'auteur hollandais ajouta, par la suite (1976), les genres *Gloeodontia* et *Clavicorona*.

Cette conception de la famille des Auriscalpiacées ne fait pas l'unanimité des mycologues; certains, comme Harrison, (1973) proposent une classification tout autre des Hydnacées et répartissent de manière fort différente les genres mentionnés ci-dessus.

La présence de spores finement ornementées et amyloïdes constitue l'un des critères importants définissant la famille des Auriscalpiacées. Notre recherche a donc tout naturellement porté sur l'observation des parois sporiques (microscopie électronique) afin de savoir s'il y a unité de structure ou non.

Par ailleurs, certains auteurs, en particulier Maas Geesteranus (1976), considèrent la famille des Auriscalpiacées comme très proche de celle des Hériciacées; c'est la raison pour laquelle nous avons complété notre étude par l'observation des spores de quelques espèces appartenant à cette seconde famille.

Matériel

Famille des Auriscalpiacées

Auriscalpium vulgare S. F. Gray, *J. Keller 2173* (NEU)
Gloiodon nigrescens (Petch) Maas G., *J. Boidin 5196* (LY)

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** Address: Rue E. Argand 11, 2000-Neuchâtel, Suisse.

Gloiodon strigosus (Sw. ex Fr.) P. Karst., *J. Boidin 5195* (LY)
Lentinellus cochleatus (Pers. ex Fr.) P. Karst., *A. Capellano 432* et *487* (LY)
Lentinellus flabelliformis (Bolt. ex Fr.) Ito, *H. Clémençon 7624* (LAU)
Lentinellus ursinus (Fr.) Kühn., *A. Capellano 580* (LY)
Gloeodontia discolor (B. & C.) Boidin, *J. Boidin 5559* (LY)
Clavicorona pyxidata (Fr.) Doty, *A. H. Smith s.n.* (MICH)

FAMILLE DES HÉRICIACÉES

Hericium coralloides (Scop. ex Fr.) S. F. Gray, *J. Keller 2159* (NEU)
Hericium erinaceus (Bull. ex Fr.) Pers., *J. Boidin 7568* (LY)
Creolophus cirrhatus (Pers. ex Fr.) P. Karst., *A. Capellano 584* (LY)
Laxitextum bicolor (Pers. ex Fr.) Lentz, *J. Keller 2129* (NEU)
Gloeocystidiellum citrinum (Pers.) Donk, *J. Keller 2004* (NEU)
Gloeocystidiellum contiguum sensu Bourd. & G., dét. Boidin, *J. Boidin 7322* (LY)
Gloeocystidiellum furfuraceum (Bres.) Donk, *J. Keller 2188* (NEU)
Gloeocystidiellum porosum (B. & C.) Donk, *A. Capellano 175* (LY)
Gloeocystidiellum leucoxanthum (Bres.) Boidin, *J. Boidin 7320* (LY)
Dentipellis fragilis (Pers. ex Fr.) Donk, *J. Eriksson 14 IX 1970* (GB)
Steccherícium seriatum (Lloyd) Maas G., *J. Boidin 6968* (LY).

MÉTHODE

Tous les champignons (frais ou secs) ont été fixé au $KMnO_4$ à 1.5% à l'exception de *Steccherícium seriatum* qui a été fixé au glutaraldéhyde. Après déshydratation et inclusion, ils ont été coupés et contrastés par l'acétate d'uranyle et le citrate de plomb (Reynolds, 1963).

DISCUSSION

Dans les deux familles considérées, l'architecture de la paroi sporique présente au maximum de sa complexité 3 strates qui sont l'*épispore*, la *périspore* et l'*ectospore* (de l'intérieur vers l'extérieur).

L'*épispore*, correspondant à la *coriotunica* sensu Clémençon (1970), est d'épaisseur variable, de 30 µm chez *Gloeodontia discolor* (Pl. 52 fig. 1) à 0.2 µm chez *Creolophus cirrhatus* et 0.5 µm chez *Hericium coralloides* (Pl. 53 fig. 2 et Pl. 52 fig. 3). Par ailleurs, elle est toujours opaque aux électrons et très souvent d'une grande homogénéité. Chez *Dentipellis fragilis* (Pl. 56 fig. 2) et *Lentinellus cochleatus* (Pl. 51 fig. 1) en revanche, il est possible de distinguer une répartition inégale des particules opaques; encore peu marquée dans la première espèce, l'inégalité est frappante dans la seconde où l'*épispore* est distinctement stratifiée en une couche externe et une couche interne d'aspect nettement plus granuleux; bien que la structure et la situation interne de cette dernière le suggèrent, il ne nous semble pas opportun d'en faire une *endospore*.

La *périspore* de la plupart des espèces étudiées est une strate claire aux électrons et pourvue d'épaississements en forme de verrues; elle rappelle la structure observée

par l'un de nous (=*trachystratum*, Keller 1976) chez quelques Aphyllophorales. Dans les deux espèces à spores lisses, *Creolophus cirrhatus* (Pl. 53 fig. 2) et *Gloeocystidiellum citrinum* (Pl. 54 fig. 1), la périspore apparaît comme une strate mince et régulière.

L'*ectospore*, enfin, se présente en général comme une très fine pellicule résultant de l'agglomération de particules opaques. Chez *G. citrinum* (Pl. 54 fig. 1) cependant, il est possible de discerner un double feuillet; l'interne, clair aux électrons, correspond à l'*endosporothecium* et l'externe, opaque, à l'*exosporothecium* (Clémençon, 1970).

CONCLUSIONS

La structure de la paroi sporique des Auriscalpiacées présente une grande homogénéité; l'ornementation est due à des expansions de la *périspore* qui, par ailleurs, constitue la strate sensible au réactif de Melzer (amyloïdie).

Chez les Hériciacées, lorsque les spores sont ornementées, l'architecture est identique à celle observée dans la famille précédente. Dans le cas des spores lisses — *Creolophus cirrhatus* (Pl. 53 fig. 2) et *Gloeocystidiellum citrinum* (Pl. 54 fig. 1) — les strates sont les mêmes et seule la périspore diffère par son épaisseur uniforme. Soulignons encore que les spores de *Gloeocystidiellum leucoxanthum* (Pl. 55 fig. 1), considérées jusqu'ici comme lisses, sont en réalité pourvues d'ornements nettement visibles, bien que peu accusés.

En conclusion, l'architecture des parois sporiques est la même dans les deux familles qui, par conséquent, ne peuvent être départagées sur la base de ce caractère. Ce résultat confirme ainsi un peu plus la thèse de Maas Geesteranus selon laquelle les critères sérieux séparant les Auriscalpiacées des Hériciacées sont peu nombreux (bon nombre d'entre eux s'étant même révélés inexacts!) et que 'perhaps it is only a matter of taste whether or not the two families will be merged into one — Auriscalpiaceae.'

SUMMARY

The ultrastructure of the spore wall of the families Auriscalpiaceae and Hericiaceae is studied with a transmission electron microscope. This structure appears to be identical in these families.

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LÉGENDES DES PLANCHES 50–56

EXPLICATION DES ABRÉVIATIONS. — ec, ectospore. — ep, épispore. — p, périspore.
Les traits portés sur les figures correspondent à 0.1 μm.

PLANCHE 50

Fig. 1. *Auriscalpium vulgare.*
Fig. 2. *Gloiodon nigrescens.*
Fig. 3. *Gloiodon strigosus.*

PLANCHE 51

Fig. 1. *Lentinellus cochleatus.* A noter la stratification de l'épispore.
Fig. 2. *Lentinellus flabelliformis.*
Fig. 3. *Lentinellus ursinus.*

PLANCHE 52

Fig. 1. *Gloeodontia discolor.*
Fig. 2. *Clavicorona pyxidata.*
Fig. 3. *Hericium coralloides.*

PLANCHE 53

Fig. 1. *Hericium erinaceus.*
Fig. 2. *Creolophus cirrhatus.*
Fig. 3. *Laxitextum bicolor.*

PLANCHE 54

Fig. 1. *Gloeocystidiellum citrinum.*
Fig. 2. *Gloeocystidiellum contiguum.*
Fig. 3. *Gloeocystidiellum furfuraceum.*

PLANCHE 55

Fig. 1. *Gloeocystidiellum leucoxanthum.*
Fig. 2. *Gloeocystidiellum leucoxanthum.* L'ornementation de la paroi est nettement visible bien que peu marquée (flèches).
Fig. 3. *Gloeocystidiellum porosum.*

PLANCHE 56

Fig. 1. *Dentipellis fragilis.*
Fig. 2. *Dentipellis fragilis.* A remarquer la stratification de l'épispore.
Fig. 3. *Steccherinum seriatum.*

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NOTES AND BRIEF ARTICLES

NEWLY RECORDED IN THE NETHERLANDS—IV
PORIA XANTHA

H. F. VAN DER LAAN

*Arnhem**

PORIA XANTHA (Fr. per Fr.) Cooke.—Fig. 1

Polyporus xanthus Fr. per Fr., Syst. mycol. **1**: 379. 1821. — *Poria xantha* (Fr. per Fr.) Cooke *in* Grevillea **14**: 112. 1886. — *Amyloporia xantha* (Fr. per Fr.) Bond. & Sing. ex Sing. *in* Annls. mycol. **39**: 50. 1941. — *Poria xantha* (Fr. per Fr.) Cooke f. *pachymeris* Jo. Erikss. *in* Svensk bot. Tidskr. **43**: 22. 1949. — For other synonyms see Donk (1974: 164).

Fruit-bodies perennial, resupinate or on vertical surfaces also in the shape of dimidiate, conical pilei, up to 15×10×15 mm, made up of indistinctly stratified tubes. The young, wide lower part of the pilei light yellow to pale orange, the old, narrow upper part greyish and zonate. Fruit-bodies fibrous when young, becoming brittle, then friable or even chalky with age. Margin at first sterile, white, arachnoid, later forming a fertile, well-defined edge. Subiculum white, up to 1(–2) mm thick, strongly amyloid. Tubes up to 5 mm long, with entire edges. Pores about circular, 0.05–0.15 mm in diameter, sometimes elongated to 0.5 mm, 4–9 per mm. Dissepiments 0.05–0.1 mm thick, pseudo-amyloid (colouring golden yellow to reddish brown) or weakly amyloid. Fruit-bodies with distinct lemon odour when fresh according to collectors of specimens from Olst (see below), aromatic according to others; at first mild, then very bitter.

Hyphal system dimitic. Skeletal hyphae abundant, non-septate, thick-walled, rarely branched, flexuous, interwoven, 1.5–5 μm in diameter. In subiculum large diameters prevail, in dissepiments small ones. Generative hyphae scarce, septate, with clamps, thin-walled, 1–2 μm in diameter. Basidia clavate, 11–16(–18) ×3–5 μm. Spores cylindrical, curved, hyaline, smooth, inamyloid, 4–5(–5.5)×1–1.5(–2) μm.

COLLECTIONS EXAMINED.—NETHERLANDS: prov. Utrecht, Lage Vuursche, 29 Oct. 1966, *J. Daams*, on vertical side of *Picea* stump (L); prov. Overijssel, Olst, 'Het Wijnbergen', 16 Nov. 1974 and 26 Nov. 1977, *J. Piepenbroek & G. Piepenbroek-Groters*, on vertical sides and on top of stumps of coniferous trees (L).

The foregoing description is based mainly on the specimens collected near Olst, which are developed much better than those from Lage Vuursche. The pilei of the latter, although numerous (10–15 per cm² in large parts of the surface area) are considerably smaller (measuring about 2×2×2 mm) and, varying in colour from light yellow to greyish orange, they do not show the striking colour contrast of the former. The dissepiments of all the specimens of the Olst collection show a pseudo-

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amyloid reaction, but those from Lage Vuursche sometimes are slightly amyloid and sometimes pseudo-amyloid.

The specimens with the tiny nodose pilei appear to be identical with, or at least very close to the form of *Poria xantha*, which is frequently found in the South of Sweden. It is the one described by Fries and, therefore, represents *P. xantha f. xantha*. The specimens with the much larger, well-developed pilei, agree with the form found, in addition to *f. xantha*, in many other countries of the northern temperate zone. Because it had been given various confusing or incorrect names, J. Eriksson (1949: 22) proposed for it a new one: *f. pachymeris*. This name appears to have been commonly accepted, although Donk (1967: 124; 1974: 165) has pointed out that it was not validly published, because a Latin description was lacking.

Bondarcev & Singer (1941: 50) have placed *Poria xantha*, together with three other species in a new genus: *Amyloporia*. The most important feature distinguishing

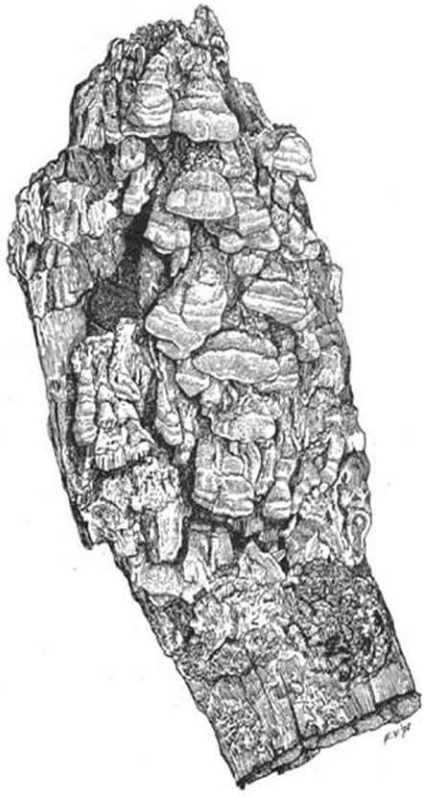

Fig. 1. *Poria xantha* f. *pachymeris*. Fruit-body (×1) of collection from Olst, 1974.

it from *Poria* is the amyloidity of the context of the fruit-bodies. According to Donk, (1967: 67–68), however, this is only true for *P. xantha*. He also doubted (ibid.: 69) whether this feature is sufficient reason for the creation of a new genus. Therefore he preferred to leave the species in the genus *Poria*.

Poria xantha usually grows on coniferous wood, but it has been found also on deciduous trees.

In the northern half of Germany (in the mountains as well as in the lowlands) *P. xantha* has been almost exclusively found as *f. pachymeris* (Jahn 1971: 60), The same applies to Denmark (Christiansen 1960: 347–348). Jahn states (ibid.) that the species is more frequently found in the southern than in the northern half of Germany, but according to Bourdot & Galzin (1928: 675) it is rare in France. Pegler (1973: 38) lists both forms for Great Britain.

The collections described above are the only ones recorded in the Netherlands at the present time.

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NEWLY RECORDED IN THE NETHERLANDS—V
PORIA SERICEO-MOLLIS

H. F. van der Laan

Arnhem, The Netherlands

Poria sericeo-mollis (Romell) Lloyd

Polyporus sericeo-mollis Romell *in* Ark. Bot. **11**: 22. 1911. — *Poria sericeo-mollis* (Romell) Lloyd, Mycol. Writings **4**, Letter No. 40: 6. 1912. — *Strangulidium sericeo-molle* (Romell) Pouz. *in* Ceská Mykol. **21**: 206. 1967. — For other synonyms, see Donk (1974: 163).

Fruitbodies resupinate, effused, up to 10 × 5 cm, readily separable, locally revolute at margin, ± 1 mm thick, white, soft and pliable but tough when fresh, orange-white to greyish orange, sometimes pinkish white and fragile when dry. Subiculum white,

very thin or absent. Margin at first sterile, white, byssoid, about 1 mm wide, later fertile up to well-defined edge. Tubes up to 1 mm long; pores about circular, but irregular or dedaloid on inclined surfaces, 0.2–0.25 mm in diameter, averaging 3–4 per mm; dissepiments about 0.05 mm thick, entire.

Hyphal system monomitic. Hyphae mostly thick-, sometimes thin-walled, 2.5–4 μm in diameter, branched, with clamps, interwoven. Cystidia numerous but unevenly distributed, thin-walled, cylindrical to clavate, (10–)20–30 × (3–)4(–5) μm, heavily encrusted at apex. Incrustations 5–10 μm in diameter, readily soluble in 5% KOH, but not in 10% NH_4OH. Basidia clavate, (7–)10–18 × 4–5 μm, with four 3–4 μm long sterigmata. Spores ellipsoid, flattened on one side, 3.5–4.5 × 2–3 μm, hyaline, smooth, inamyloid.

COLLECTIONS EXAMINED.—NETHERLANDS: prov. Gelderland. Putten, 'Schovenhorst', Pinetum, 29 Oct. 1977, *H. F. van der Laan*, on side of stump of coniferous tree and on log of coniferous wood from other part of pinetum (L).

Poria sericeo-mollis has frequently been confused with other species. According to Donk (1974: 261–262) its author, Romell, failed to distinguish between it and species now known as *Oligoporus rennyi* (B. & Br.) Donk, *Tyromyces ptychogaster* (F. Ludw.) Donk and *Tyromyces floriformis* (Quél. apud Bres.) Bond & S. In addition, Romell did not mention the presence of cystidia, although they are abundant in the type. The failure of several other mycologists to find these, may have caused the confusion with such species as mentioned above, none of which has cystidia. However, because it now has been found that the incrustations at the apex of the cystidia dissolve in KOH, this failure may also have been caused by mounting the material for microscopic examination in this solution. After the incrustations have disappeared the thin-walled cystidia are hard to recognize.

Another striking difference between *P. sericeo-mollis*, as it is conceived today, on the one hand, and *Oligoporus rennyi* as well as *Tyromyces ptychogaster* on the other hand, is the absence of a chlamydosporous state in the former and its presence in the latter two species. Chlamydosporous fruitbodies of *Tyromyces ptychogaster* are more frequently found than are basidiosporous fructifications. In the Netherlands it is a rather rare species. *Oligosporus rennyi*, which as a rule develops both kinds of spores next to each other, has been observed even less frequently in this country. For this reason, it is of interest to note that in October 1975 I found specimens of *T. ptychogaster* with tubes and basidiospores as well as chlamydospores in the Schovenhorst Pinetum, and was subsequently given by Dr. W. Gams the corresponding forms of *Oligoporus rennyi* found in the course of the same foray.

Pouzar (1967: 206) united *P. sericeo-mollis* and *O. rennyi* and transferred them to a new genus, *Strangulidium*, because both have utriform basidia and cyanophilous sporewalls. However, Donk (1974: 236), pending further research, preferred to leave them in the genera *Poria* and *Oligoporus*.

According to Jahn (1971: 58) *P. sericeo-mollis* has been found several times in the mountainous and hilly regions of Westfalia. He presumes that it may also be found in the low lands in the north of Germany, because Christiansen (1960: 360) mentions two finds in Denmark. The species is also listed by Pegler (1973: 38) for Great Britain. *P. sericeo-mollis* had not been recorded before in the Netherlands.

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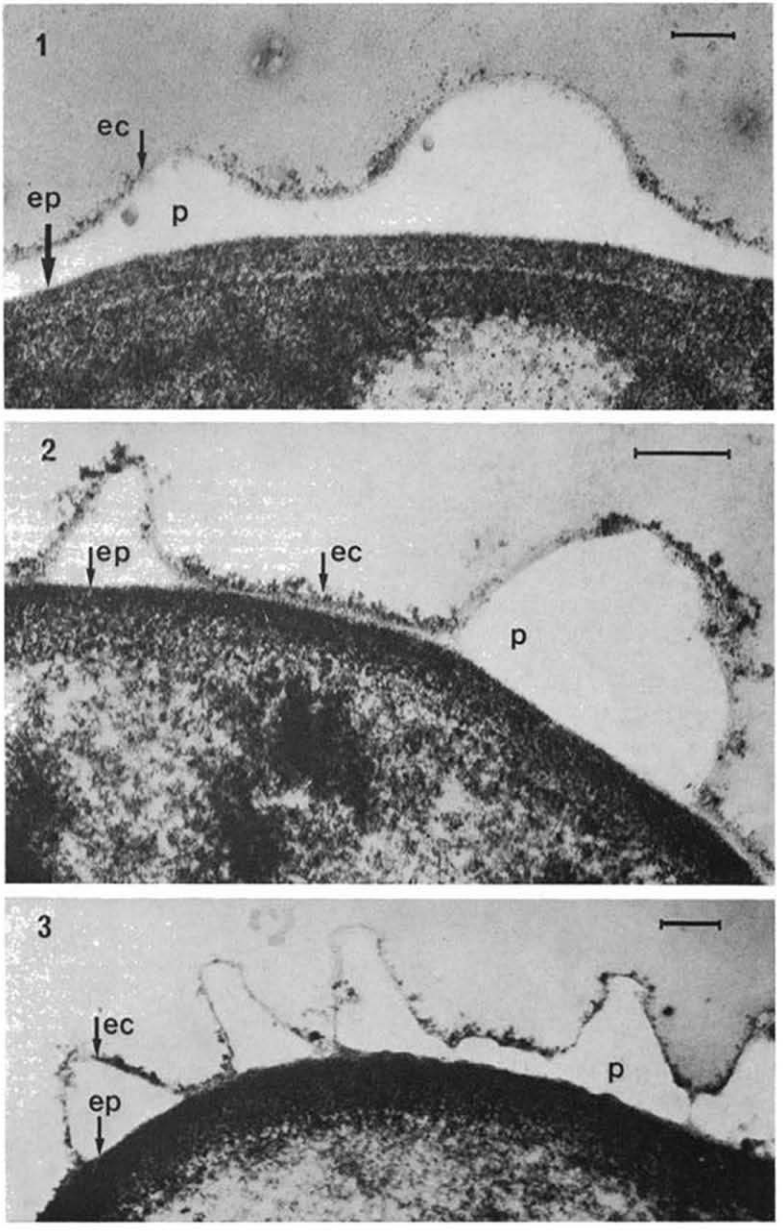
New names are in **bold-face** type. Subdivisions of genera are indicated by the sign §, illustrations by an asterisk (*).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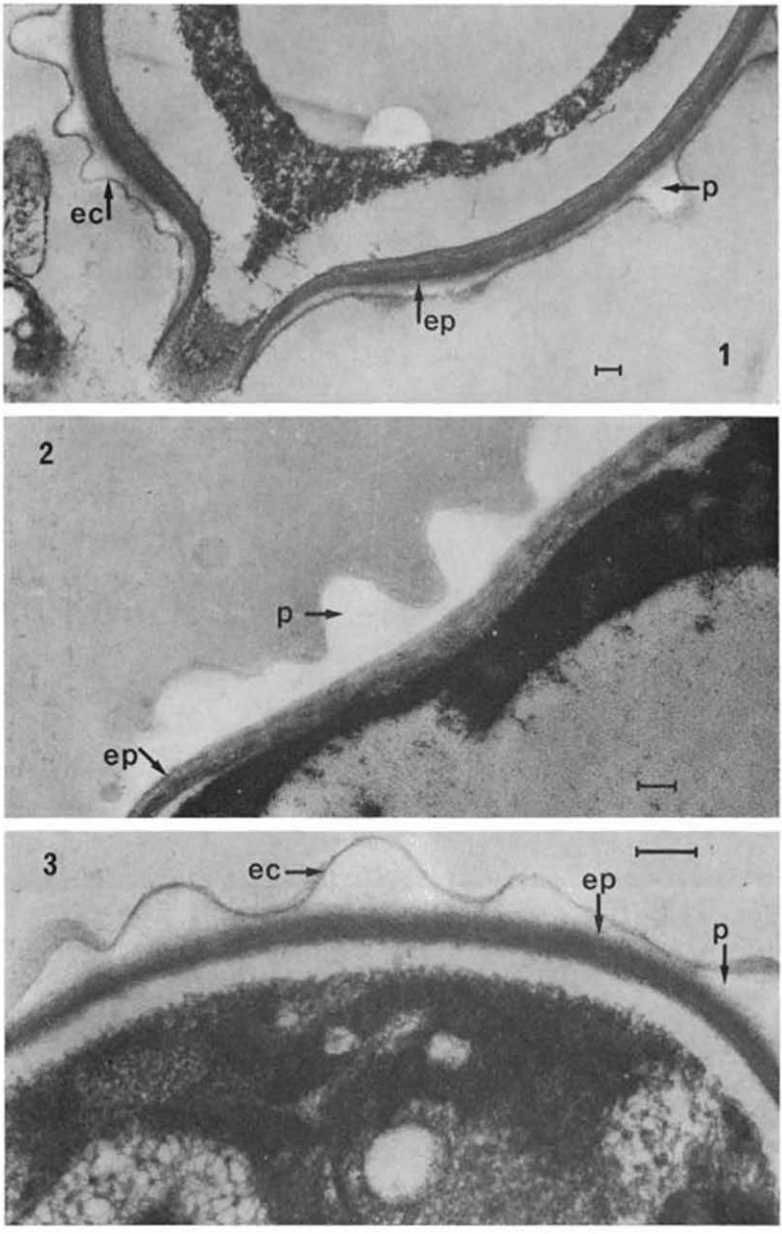
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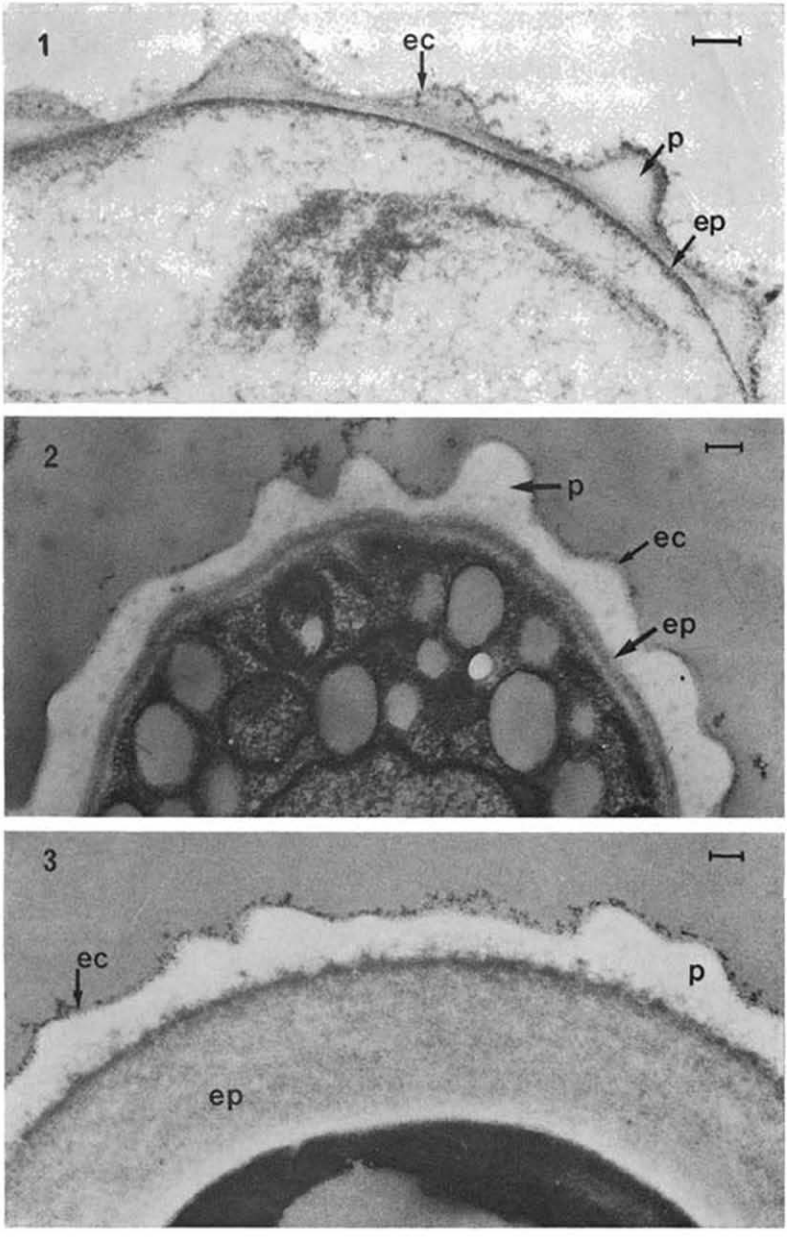
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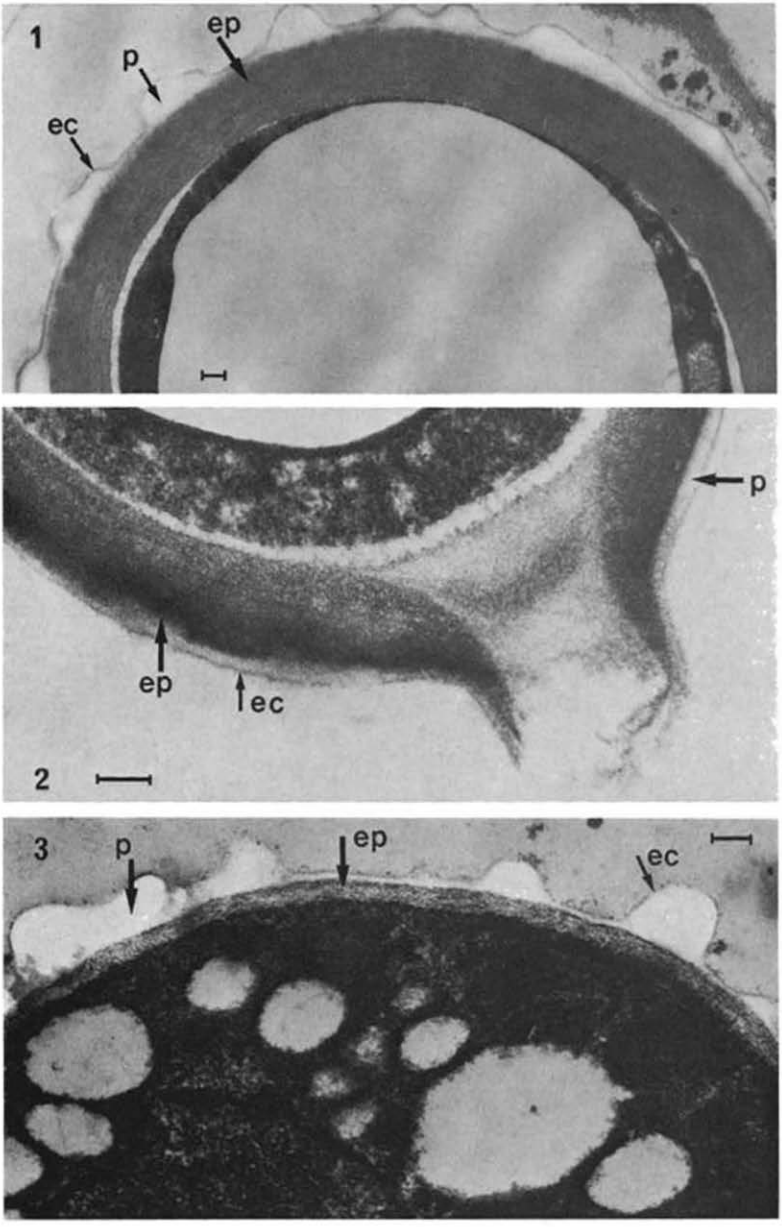
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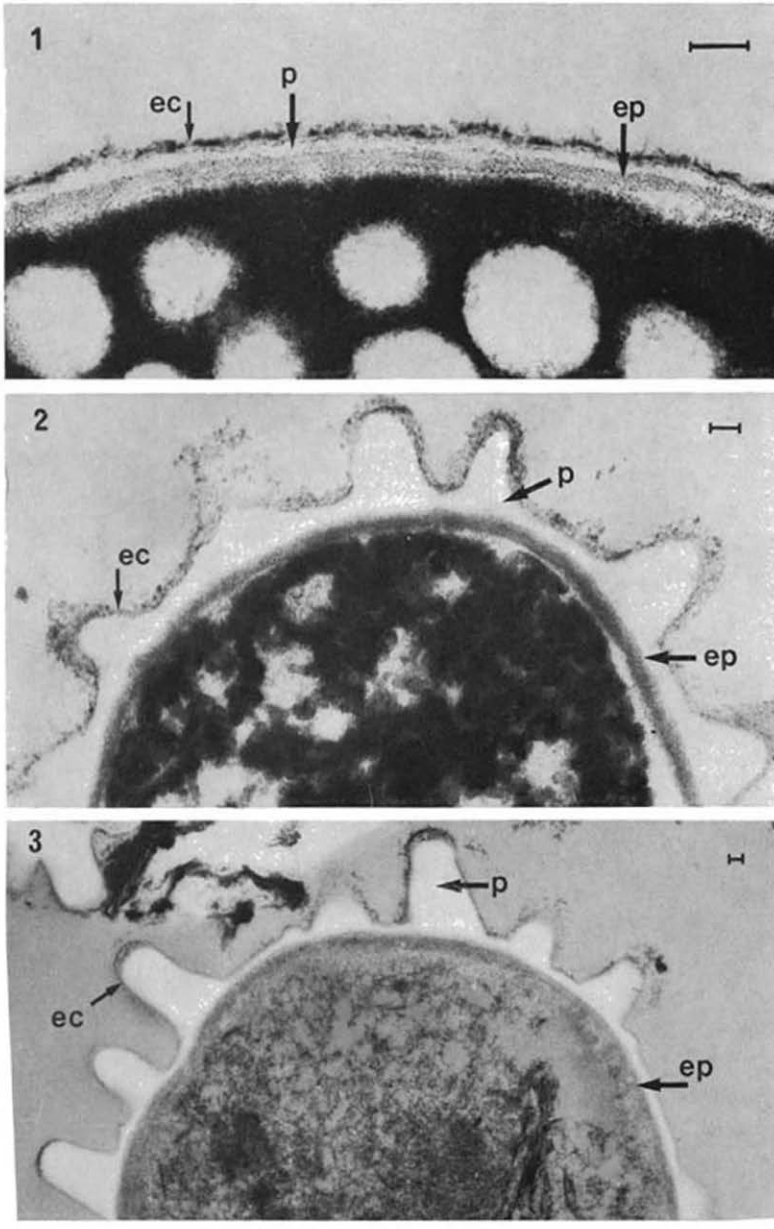
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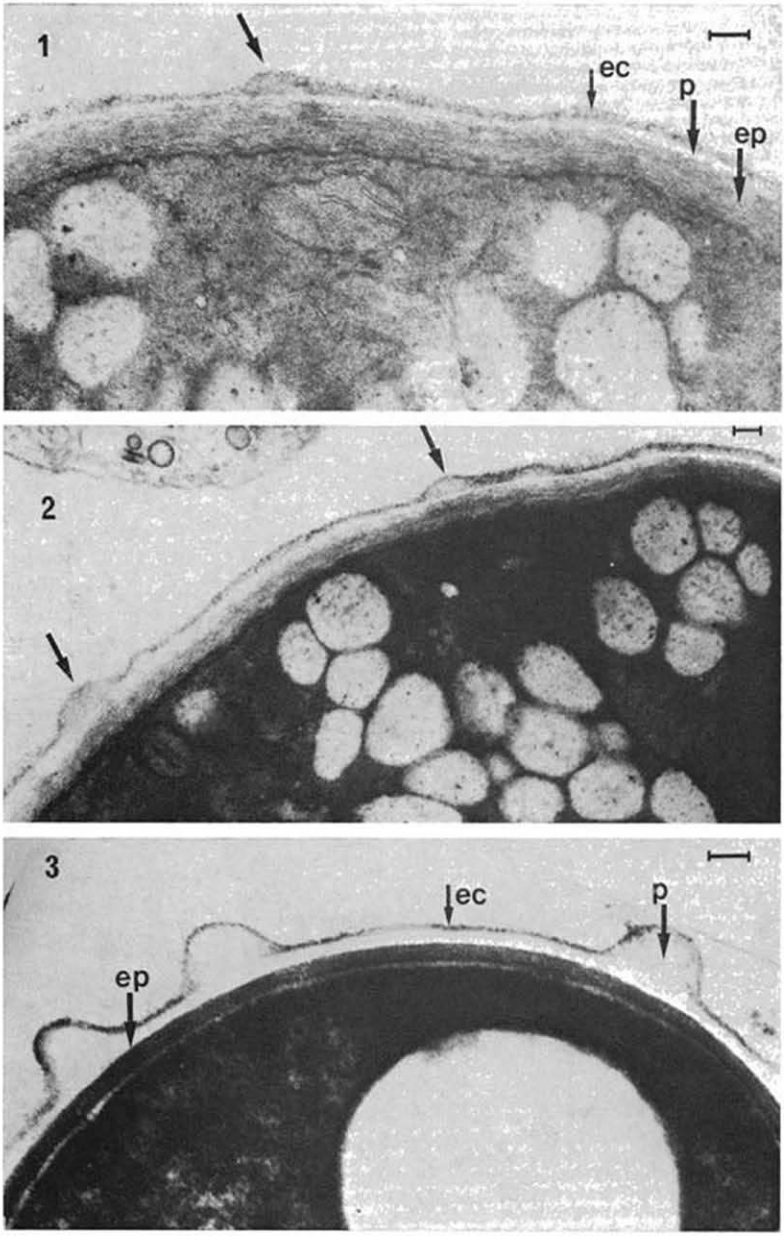
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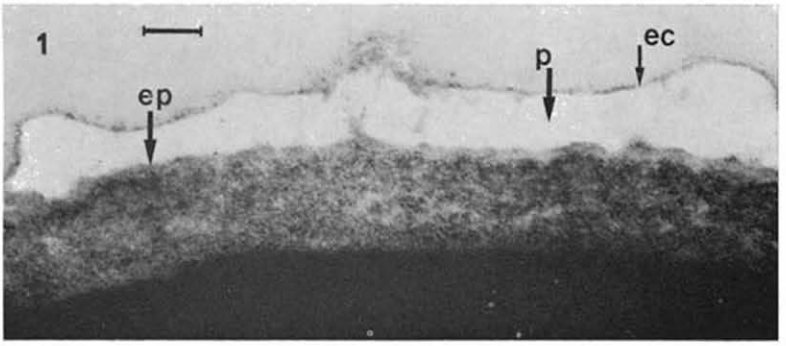
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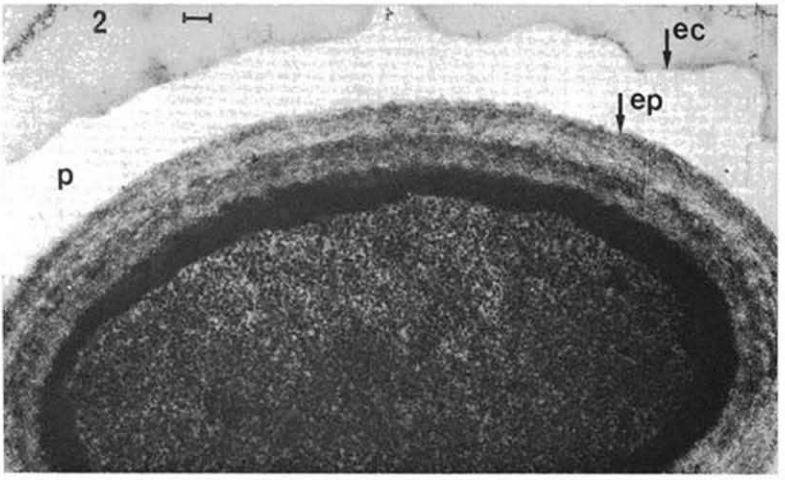
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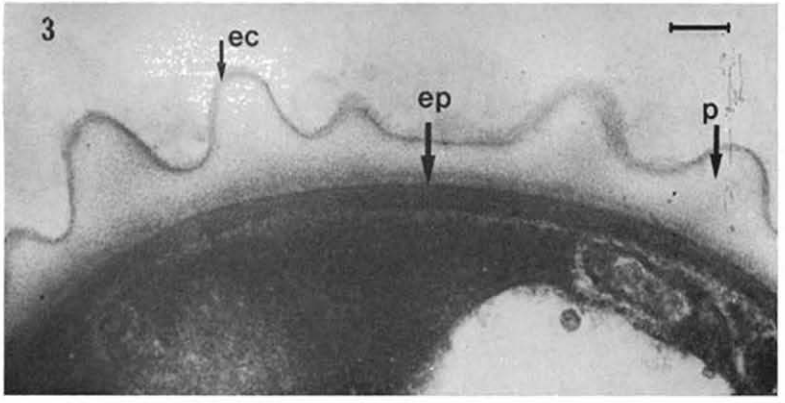
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