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INOCYBE (AGARICALES) IN INDOMALAYA AND AUSTRALASIA

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Twenty-three species of *Inocybe* (Fr.) Fr. (1863; Agaricales) from Indomalaya and Australasia (except New Zealand; compare Horak, *1977*) are keyed out, described, and illustrated. Sixteen species and one form are new. Of the remaining six species the macroscopic and microscopic data (as observed on type material or topotypic collections) are reported and discussed.

This contribution on Indomalayan and Australasian species of *Inocybe* (Fr.) Fr. should be consulted in conjunction with my paper (Horak, *1979*) on species of *Astrosporina* Schroeter (*1889*) collected in the same geographical area.

As pointed out elsewhere, in my concept *Inocybe* and *Astrosporina* are regarded as two independent genera—knowing well, however, that the two units are here and there linked up by intermediate species (compare also *I. casuarinae* Corn. & Horak).

Typical representatives of *Inocybe* are characterised by brown spores of subglobose, ovoid, phaseoliform, amygdaliform, sublimoniform, or cylindrical shape. Under all circumstances the spore membrane is smooth and even, never gibbous or stellate as in *Astrosporina*. A germ pore is always absent but a callus-like pore can be observed in numerous species (Horak, *1968*).

The list of previous publications dealing with Indomalayan and Australian species of *Inocybe* is amazingly short, and not more than about two dozens of names can be found in the literature.

After completing the critical revision of available type material and authentic collections (except the New Zealand species; Horak, *1977*) the number of taxa actually representing *Inocybe* was drastically reduced to four, viz. *Inocybe cutifracta* Petch (Sri Lanka), *I. umbrina* Massee (Singapore), *I. subgeophylla* Hennings (Indonesia), and *I. australiensis* Cleland & Cheel (Australia).

In my opinion the 23 species of *Inocybe* referred to in this review must represent a fraction of the total number of taxa actually occuring in the vast ectotrophic Australasian and Indomalayan forests. Fully aware of the difficulties and the many sources of the already existing confusion concerning the taxonomy of *Inocybe*, only very well documented collections have accordingly been taken into account. With other words: only those species are reported which are distinctly defined by one or several unusual characters. Hence numerous specimens remain unpublished for the time being, despite of excellent field notes, drawings, paintings, and/or photographs. This is true in particular with Indomalayan and Australasian taxa that are closely related to polymorphic or insufficiently known species or sections of *Inocybe* (i.e. aff. *I. fastigiata*, aff. *I. obscura*, etc.). This material must wait until a thorough revision of all interrelated species is carried out.

Probably all species of *Inocybe* (and *Astrosporina*) enter mycorrhiza and therefore these fungi are also of considerable biological importance concerning regeneration, growth, health, and

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distribution of their hostplants. According to present knowledge the species of *Inocybe* described herewith are growing in close association with deciduous trees and shrubs. They belong either to the Fagaceae (*Nothofagus*, *Castanopsis*, *Lithocarpus*), Dipterocarpaceae (*Anisoptera*), Tiliaceae (*Althoffia*), Casuarinaceae (*Casuarina*), or Myrtaceae (*Eucalyptus*). Under these circumstances the study and the knowledge of inocybioid agarics are not only warranted from the scientific point of view but deserve high interest also due to their ecological role in silviculture (reforestation).

In the course of this study most of the Japanese representatives of *Inocybe* (Kobayasi, *1952*) have not been examined, since unfortunately the type material was unavailable. The bulk of information published below was collected by myself in Australasia (Papua New Guinea, 1971–3) and in Indomalaya (Indonesia, 1977). As at other occasions, Professor E. J. H. Corner (Cambridge, U.K.) permitted to make use of the numerous collections of *Inocybe* gathered in Malaysia, Singapore, Sabah, Papua New Guinea, and Solomon Isl. I am greatly indebted to his generous offer which brought welcomed mycological news from hitherto very little explored regions in Indomalaya and Australasia. In addition I wish to thank the curators in ADW, BO, and K for the loan of type specimens and Professor T. Hongo (Otsu, Japan) for exsiccata and literature concerning Japanese species of *Inocybe*. Finally I like to acknowledge both the facilities received at the Forest Research Centre, Bulolo (Papua New Guinea) and the travelling grant obtained from the Swiss Society of Natural Sciences (*1977*) which gave me the opportunity to carry out field work in the Far East.

Type material of the new species is kept in ZT and in the personal herbarium of Prof. Corner.

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

KEY TO THE INDOMALAYAN AND AUSTRALASIAN SPECIES OF INOCYBE

(The New Zealand species are keyed out in Horak, *1977*)

1. Cheilocystidia (pleuro- and caulocystidia if present) thin-walled, crystals absent (except *I. conicoalba*); stipe rarely pruinose (at apex only) 2

1*. Cheilocystidia and/or pleurocystidia and caulocystidia (if present) thick-walled, metuloid, crystals, or resinous incrustation present; stipe often pruinose, at least near apex 10

2. Spores cylindric to subfusoid 3

2* Spores amygdaliform, ovoid, or phaseoliform 4

3. Cheilocystidia clavate to vesiculose, 35–50 × 15–25 μm; spores 8.5–10 × 3.5–4 μ,; pileus – 30 mm, argillaceous to pale brown, umbonate, innately fibrillose; stipe – 30 × – 4 mm, cylindric, whitish, minutely fibrillose; odour absent; on sand in coastal dunes under *Althoffia* (Tiliaceae). Papua New Guinea . . . . 1. *I. althoffiae*, p. 5

3* Cheilocystidia cylindric to subclavate, 65–110 × 5–8 μm; spores 11.5–14 × 4–5 μm; pileus – 45 mm, brown, convex, innately fibrillose; stipe – 35 × – 10 mm, cylindric, pale reddish brown, fibrillose; odour ?; on soil. Australia . . . . 2. *I. arenacolens*, p. 6

4. Pileus lilac or white, surface smooth to innately fibrillose. 5

4*. Pileus neither lilac nor white, surface conspicuously scaly to squamulose or rimose (and splitting towards margin) 6

5. Pileus − 15 mm, white, conic; stipe − 45 × − 2 mm, white, cylindric, base subbulbous, white fibrillose cortina when young; spores 9–10.5 × 5–6 μm, amygdaliform (to sublimoniform); cheilocystidia (and pleurocystidia) 35–50 × 11–18 μm, fusoid, encrusted with crystals; odour spermatic; on soil in forests (*Castanopsis, Lithocarpus*). Papua New Guinea . . . . 3. *I. conicoalba*, p. 7

5*. Pileus − 40 mm, lilac turning brown, umbonate; stipe − 50 × − 5 mm, lilac, cylindric, base clavate, fibrillose; spores 7.5–9.5 × 4.5–5 μm, phaseoliform; cheilocystidia 25–50 × 9–16 μm, clavate; odour spermatic; on soil in (montane) forests. Sabah . . . . 4. *I. ionides*, p. 8

6. Pileus scaly to conspicuously squamulose 7

6*. Pileus rimose to strongly fibrillose (splitting towards margin) 9

7. Context in stipe green-black; pileus − 35 mm, brown, obtusely conic to umbonate; stipe − 100 × − 6 mm, cylindric, brown, green towards base, strongly fibrillose; spores 10–12.5 × 7–8.5 μm, ovoid; cheilocystidia cylindric to subclavate; odour fruity turning unpleasant with age; on soil in forests (*Nothofagus*). Papua New Guinea . . . . 5. *I. umbrinovirens*, p. 9

7*. Context in stipe reddening (upon bruising or exposure) 8

8. Pileus − 20 mm, brown, umbonate; stipe − 45 × − 2.5 mm, cylindric, brown to reddish brown, covered with concolorous recurved fibrils or squamules; spores 6.5–8 × 4–5 μm, ovoid; cheilocystidia cylindric to subfusoid; odour none; on soil in forests (*Castanopsis, Lithocarpus*). Indonesia (Java) . . . . 6. *I. fuscospinulosa*, p. 11

8*. Pileus − 40 mm, convex to campanulate, brown; stipe − 60 × − 6 mm, cylindric, brown, fibrillose-squamulose; spores 9–11.5 × 5–6.5 μm, phaseoliform; cheilocystidia clavate; odour absent or unpleasant; on soil in fagaceous forests (*Nothofagus, Castanopsis, Lithocarpus*). New Zealand (type), Papua New Guinea . . . . 7. *I. latericia*, p. 12

9(6*). Lamellae rather distant; pileus − 30 mm, umbonate to plane, red-brown at disc, brownish grey towards margin; stipe − 40 × − 3 mm, cylindric, base subbulbous, white, covered with concolorous fibrils; spores 8.5–11.5 × 5–5.5 μm, ellipsoid, occasionally subphaseoliform; cheilocystidia clavate; odour ?; on soil. Sri Lanka . . . . 8. *I. cutifracta*, p. 13

9*. Lamellae densely crowded, very narrow; pileus − 50(100) mm, conic becoming umbonate-plane, yellowish to ochraceous brown, darker or subferruginous at disc; stipe − 110 × − 12 mm, cylindric, base often abruptly ending, white to pale yellow-brown, fibrillose to scurfy; spores 6–9 × 4–6 μm, ovoid to subphaseoliform; cheilocystidia clavate to sublageniform; odour absent or unpleasant (like corn or burnt horn); on soil in low-land and montane forests. Singapore (type), Malaysia, Sabah, Papua New Guinea, Solomon Isl. . . . . 9. *I. umbrina*, p. 14

10(1*). Spores subglobose, 5.5–6.5 × 5–5.5 μm; pileus − 50 mm, umbonate to plane, yellow or ochre, fibrillose-rimose, margin appendiculate; lamellae yellow to yellow-brown; stipe − 60 × − 8 mm, cylindric, base subclavate, yellow, fibrillose to silky; context yellow; odour none; on soil in lowland and montane forests. Japan (type), Singapore, Papua New Guinea . 10. *I. sphaerospora*, p. 16

10*. Spores and colour of carpophores different 11

11. Spores sublimoniform to amygdaliform-mucronate (compare also *I. violeipes*) 12

11*. Spores elliptic with few blunt but distinct angles or elliptic-amygdaliform, pip-shaped or subphaseoliform 13

12. Stipe with white, cortinate, persistent annulus, − 50 × − 2 mm, cylindric, base subbulbous, white to pale brown; pileus − 20 mm, campanulate to umbonate, brown, fibrillose, disc subsquamulose; odour fruity or spermatic; spores 7.5–9.5 × 4.5–5.5 μm; cheilocystidia and pleurocystidia fusoid; on soil in forests (*Castanopsis, Lithocarpus*). Papua New Guinea . . . . 11. *I. cingulata*, p. 17

12*. Veil remnants on stipe absent, − 45 × − 2 mm, cylindric, dark brown, strongly fibrillose, base with yellow, strigose hairs; pileus − 25 mm, conspicuously conic to papillate, dark brown, disc covered with coarse, recurved scales, fibrillose towards margin; odour absent; spores 8.5–10 × 6.5–7 μm; cheilocystidia and pleurocystidia subfusoid to lageniform; on soil in montane forests (*Nothofagus*). Papua New Guinea . . . . 12. *I. procera*, p. 18

13. Spores ellipsoid with few, blunt angles, 6.5–9 × 4–5 μm; pileus − 40 mm, campanulate to umbonate, ochre-brown, fibrillose to subsquamulose (at disc); stipe − 80 × − 6.5 mm, cylindric, base subclavate, pale ochraceous, scurfy; odour spermatic; cheilocystidia and pleurocystidia fusoid; on sandy soil under *Casuarina*. Malaysia . . . . 13. *I. casuarinae*, p. 20

13*. Spores elliptic-amygdaliform to pip-shaped or subphaseoliform (compare *I. violaceovelata*) . 14

14. Carpophores white; pileus – 25 mm, campanulate to umbonate-plane, fibrillose, rimose towards margin; stipe – 50 × – 3 mm, cylindric, base subbulbous, smooth (except pruinose apex); odour spermatic; spores 7–8.5 × 4–4.5 μm; cheilocystidia and pleurocystidia fusoid, less than 40 μm long; on soil in forests (*Castanopsis, Lithocarpus*). Indonesia (Java) . . . . 14. *I. olorinata*, p. 21

14*. Carpophores pale brown, brown, or red-brown 15

15. Margin of pileus conspicuously strigose, of stiff, white hairs (composed of long, cylindric, thick-walled hyphae); stipe reddish brown, pruinose all over, cylindric, equal; odour spermatic; cheilocystidia subfusoid, yellow membranes (KOH) up to 4 μm diam. 16

15*. Margin of pileus never strigose; stipe not pruinose over whole length but fibrillose to squamulose 17

16. Pileus – 25 mm, convex, argillaceous-brown; stipe – 40 × – 2.5 mm; spores 6.5–8 × 4–5 μm; on soil in forests (*Nothofagus*). Papua New Guinea . . . . 15. *I. strigiceps*, p. 22

16*. Pileus – 12 mm, convex to plane, pale brown to fuscous; stipe – 15 × – 1 mm; spores 7–9 × 4.5–5.5 μm; on soil (rarely also on rotten wood) in forests (*Nothofagus, Lithocarpus*). Papua New Guinea
16. *I. strigiceps* f. *pygmaea*, p. 24

17. Stipe without conspicuous veil remnants at least in mature specimens 18

17*. Stipe covered with persistent, conspicuous remnants of veil (annulate girdles or coarse longitudinal fibrils); compare also *I. subgeophylla*. 19

18. Pileus – 20 mm, conic to umbonate-expanded, brown, to red-brown, squamulose, fibrillose towards margin; stipe – 45 × – 3 mm, cylindric, base equal or subbulbous, pale brown or pale red-brown, with faint lilac tinge, covered with white appressed fibrils of veil; odour spermatic; spores 7.5–9 × 4–5 μm; cheilocystidia and caulocystidia with hyaline, thin-walled membrane; pleurocystidia fusoid, metuloid; on soil in mountain forest (*Castanopsis, Lithocarpus*). Indonesia (Java)
17. *I. subgeophylla*, p. 25

18*. Pileus – 18 mm, convex to umbonate, brown to dark brown, fibrillose, disc scaly; stipe – 35 mm, cylindric, base occasionally subbulbous, brown, apically pruinose, smooth or fibrillose below, odour spermatic; spores 6.5–8 × 4.5–5 μm; all cystidia fusoid, metuloid; on soil. Australia
18. *I. australiensis*, p. 26

19. Veil remnants white forming numerous, subannulate zones and squarrose scales on stipe; pileus – 12 mm, convex to campanulate, dark brown, densely covered with erect, concolorous scales; lamellae mustard yellow at first; stipe – 25 × – 2 mm, cylindric, pale red-brown, apex pruinose; odour fruity; spores 6–6.5 × 3.5–4 μm; cheilocystidia and pleurocystidia fusoid, membrane yellow (KOH); pileocutis composed of ovoid to subglobose cells; on soil in forests (*Nothofagus*). Papua New Guinea . . . . 19. *I. multicingulata*, p. 27

19*. Veil remnants brown, orange-brown, or lilac 20

20. Veil remnants brown or orange-brown; pileus viscid when moist; odour spermatic; cheilocystidia intermixed with clavate, hyaline and thin-walled cells 21

20*. Veil remnants lilac, forming appressed, persistent zones and belts on stipe 22

21. Pileus – 35 mm, conic to papillate-plane, white to pale yellow, disc and margin covered with conspicuous, fuscous fibrils and patches of veil; stipe – 70 × – 3(–4) mm, cylindric, white, apex pruinose, towards base strongly covered with coarse, fuscous, fibrillose or floccose veil remnants (becoming viscid when moist); spores 7–8.5 × 4.5–5 μm; cheilocystidia clavate to broadly fusoid; on soil in fagaceous, mountain forests (*Nothofagus, Castanopsis*). Papua New Guinea (type), Sabah
20. *I. fuscoperonata*, p. 29

21*. Pileus – 30 mm, convex to expanded with conic umbo, red-brown to orange, fibrillose, strongly squamulose with age; stipe – 40 × – 4 mm, cylindric, pale yellow, towards base with distinct, orange to ochre-brown, subannulate, persistent belts of veil; spores 7.5–8.5 × 4.5–5 μm; cheilocystidia and pleurocystidia lageniform; yellow-brown, plasmatic pigment in cuticular hyphae; on soil in forests (*Nothofagus, Lithocarpus*). Papua New Guinea . . . . 21. *I. zonatipes*, p. 30

22. Pileus – 25 mm, acuto-conic, pale ochre-brown, fibrillose, minutely squamulose over conic papilla; stipe – 40 × – 4 mm, cylindric, subbulbous base white, lilac above; context in stipe lilac; odour none; spores 8.5–11 × 4.5–5.5 μm, occasionally with distinct mucro; cheilocystidia and pleurocystidia

lageniform; on soil in forests (*Castanopsis*). Papua New Guinea . . . 22. *I. violeipes*, p. 31

22* Pileus – 40 mm, umbonate-campanulate, fuscous, minutely squarrose all over; stipe – 55 × – 5 mm, cylindric, base subbulbous, pale brown; odour spermatic; spores 8–9 × 4–4,5 µm; cheilocystidia and pleurocystidia fusoid; on soil in forests (*Lithocarpus*, *Castanopsis*). Papua New Guinea 23. *I. violaceovelata*, p. 32

Inocybe althoffiae Horak, *spec. nov.*—Fig. 1

Pileo – 30 mm, e campanulato plano, umbonato vel subdepresso in centro, argillaceobrunneo, innate fibrilloso. Lamellis emarginatoadnatis, albidis dein argillaceis. Stipite – 30 × – 4 mm, cylindraceo vel subattenuato basim versus, albido, squamis minutis albidisque instructo. Odore nullo. Sporis 8.5–10 × 3.5–4 µm, cylindraceis vel subfusoideis, brunneis. Cheilocystidiis vesiculosis, haud metuloideis. In arena sub *Althoffia*. Nova Guinea. Typus: ZT 72/495.

Pileus 15–30 mm, umbonate to campanulate becoming convex or expanded, umbo in aged specimens absent and centre plane to depressed; argillaceous to pale brown; innately fibrillose, occasionally with small squamules over disc, veil remnants absent, dry. Lamellae crowded, emarginate to adnate; whitish at first, turning argillaceous or pale brown, edge concolorous, even. Stipe 20–30 × 3–4 mm, cylindric or attenuated towards base, rather stout; whitish to pallid; dry, densely covered with white fibrils or minute squamules (over whole length), cortina absent, hollow, single in groups. Context pale brown. Odour and taste not distinctive.

Spores 8.5–10 × 3.5–4 µm, cylindric to subfusoid, brown, smooth, membrane thin-walled, germ pore absent. Basidia 25–28 × 5–6 µm, 4-spored. Cheilocystidia 35–50 × 15–25 µm, clavate to vesiculose, sometimes subfusoid, hyaline, membrane thin-walled, occasionally encrusted with brown pigment, crystals absent. Pleuro- and caulocystidia none. Cuticle a cutis of cylindric hyphae (5–12 µm diam.), encrusted with yellow-brown (KOH) pigment. Clamp connections present.

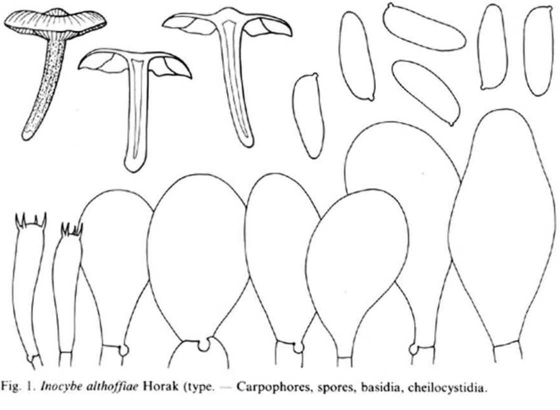

Fig. 1. *Inocybe althoffiae* Horak (type. — Carpophores, spores, basidia, cheilocystidia.

HABITAT.—On sand in coastal dunes under *Althoffia* sp. (Tiliaceae). Papua New Guinea.

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Buso (SE. of Lae), 20.VI.1972, *Horak* (ZT 72/495, holotype).

As the specific epithet implies this *Inocybe* grows under *Althoffia* sp. (Tiliaceae) in coastal dunes of Papua New Guinea. It is well-defined by its particular microscopic characters (cylindrical spores and vesiculose, thin-walled cheilocystidia without crystals) which confirm its membership to sect. *Dulcamarae*.

Inocybe arenacolens (Cleland) Horak, *comb. nov.*—Fig. 2

Naucoria arenacolens Cleland *in* Trans. R. Soc. S. Australia **57:** 193. 1933 (basionym).

Nothing can be added to the macroscopic characters published in the original diagnosis. The type material is in good condition.

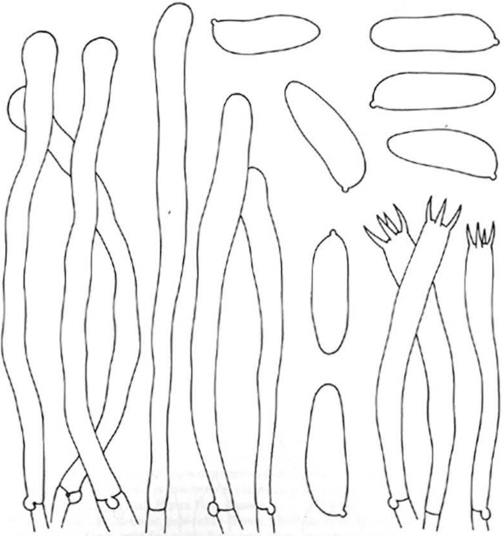

Fig. 2. *Inocybe arenacolens* (Clel.) Horak (type). — Spores, basidia, cheilocystidia.

Spores 11.5–14 × 4–5 μm, cylindric to subfusoid, brown, smooth, membrane thin-walled, germ pore none. Basidia 50–60 × 6–7 μm, 4-spored. Cheilocystidia 65–110 × 5–8 μm, cylindric to subclavate, slender, membrane thin-walled, yellow-brown (KOH) plasmatic pigment present, forming dense seam on edge, crystals absent. Pleuro- and caulocystidia absent. Cuticle a cutis or trichoderm of cylindric hyphae (6–12 μm diam.), both encrusting and plasmatic brown pigment present. Clamp connections numerous.

HABITAT.—On sandy soil. South Australia.

MATERIAL.—AUSTRALIA: South Australia, Encounter Bay, 22.V.1930, Cleland (ADW 12781, holotype of *N. arenacolens* Cleland).

In my opinion the microscopic characters, observed on the rather fragmentary type collection of this Australian agaric, leave no doubt about its generic position. As in the previous species, the spores are conspicuously cylindrical to subfusoid and bear no germ pore or callus. Brown pigment is observed dissolved both in the cylindrical cheilocystidia and in the majority of cuticular hyphae which commonly are also encrusted with a pigment of the same colour. It is assumed that *I. arenacolens* grows in mycorrhizal association with *Eucalyptus* sp.

Inocybe conicoalba Horak, *spec. nov.*—Fig. 3

Pileo –15 mm, conico vel convexo papilla conica instructo, albo dein pallido, fibrilloso. Lamellis adnexoadnatis, argillaceis. Stipite –45 × –2 mm, cylindraceo, ad basim subbulboso, albo, cortina alba et fibrillis albis subzonatis instructo. Odore spermatico. Sporis 9–10.5 × 5–6 μm, amygdaliformibus, brunneis. Cystidiis fusoideis, tenui-tunicatis, incrustatis. Ad terram in silvis fagineis. Nova Guinea. Typus: ZT 73/250.

Pileus 8–15 mm, conic becoming convex with conic or obtuse papilla, campanulate; white (turning pale cinnamon with age); dry, silky to innately fibrillose; margin not striate, covered with white fibrillose veil remnants. Lamellae (L 8–18, –5) crowded, adnate to adnexed, ventricose; pale argillaceous at first turning pale brown, edge white, fimbriate. Stipe 25–45 × 1–2 mm, cylindric, base equal or subbulbous to pestle-shaped; white; dry, glabrous to innately silky, below subpersistent, white, fibrillose cortina with several indistinct, appressed zones of the white veil, fistulose in age, single in groups. Context white. Odour and taste spermatic. Spore print brown.

Spores 9–10.5 × 5–6 μm, amygdaliform (to sublimoniform), apex distinctly mucronate, smooth, brown, membrane thin-walled, germ pore absent. Basidia 20–30 × 7–8 μm, 4-spored. Cheilo- and pleurocystidia 35–50 × 11–18 μm, fusoid to lageniform, membrane thin-walled, hyaline, apex encrusted with crystals. Caulocystidia scattered, cylindric to subfusoid, frequently with irregular, finger-like out-growth, membrane not metuloid, crystals absent. Cuticle a cutis of repent, cylindric hyphae (3–6 μm diam.), membranes not gelatinised, pigment lacking, terminal cells occasionally differentiated and then subcorallioid (cp. caulocystidia). Clamp connections present.

HABITAT.—On soil in forests under *Castanopsis* and *Lithocarpus* (Fagaceae). Papua New Guinea.

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Bulolo, Manki, 1300 m, 21.V.1973, *Horak* (ZT 73/250, holotype); Bulolo, Manki, 1300 m, 14.X.1971, *Horak* (ZT 71/110).

Because of the white colour and the more or less persistent veil remnants on the stipe *Inocybe conicoalba* is reminiscent of a slender *I. geophylla* (Fr.). The species from Papua New Guinea, however, is well separated from the latter taxon, not only by its habitat (under *Castanopsis* and *Lithocarpus*) but also by the unusual, lageniform, thin-walled, and encrusted cheilo- and pleurocystidia.

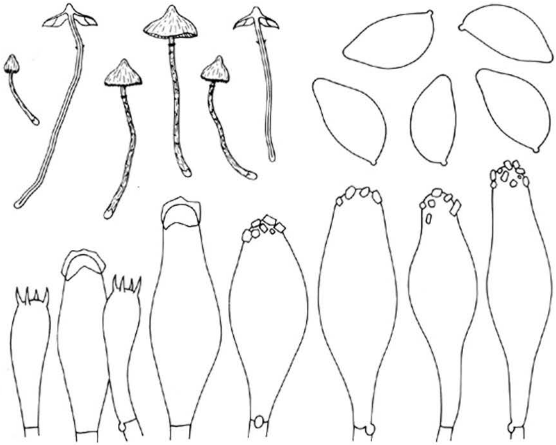

Fig. 3. *Inocybe conicoalba* Horak (type). — Carpophores, spores, basidia, cheilocystidia, pleurocystidia.

Inocybe ionídes Corner & Horak, *spec. nov.*—Fig. 4

Pileo – 40 mm, umbonatoplano, primo violaceo dein fusco, fibrilloso. Lamellis adnexis, lilacinis. Stipite – 50 × – 4 mm, e cylindraceo subclavato, violaceo, glabro. Odore subspermatico. Sporis 7.5–9.5 × 4.5–5 µm, phaseoliformibus, brunneis. Cheilocystidiis clavato-vesiculosis, hyalinis. Ad terram in silvis. Sabah. Typus: ZT 80/175.

Pileus 10–40 mm, convex to plane with conic to umbonate disc; lilac at first turning fuscous with age; smooth at centre, fibrillose towards margin, veil remnants none. Lamellae crowded, adnexed, ventricose; lilac turning pale argillaceous or fawn, edge whitish, fimbriate. Stipe 20–50 × 2–5 mm, base up to 8 mm, cylindric, base clavate; lilac, changing to pale lilac or whitish with age, villous base white; dry, fibrillose, smooth in upper portion, cortina absent. Context lilac. Odour and taste slightly spermatic.

Spores 7.5–9.5 × 4.5–5 µm, phaseoliform, bean-shaped, ovoid in dorsal view, yellow-brown, smooth, membrane thin-walled, germ pore none. Basidia 22–35 × 6–8 µm, 4-spored. Cheilocystidia 25–50 × 9–16 µm, cylindric to clavate, membrane hyaline, thin-walled, crystals absent. Pleuro- and caulocystidia absent. Cuticle a cutis of cylindric hyphae (3–10 µm diam.), yellow (KOH) encrusting and plasmatic pigment present. Clamp connections numerous.

HABITAT.—On soil in forests. Sabah (Mt. Kinabalu).

MATERIAL.—SABAH: Mt. Kinabalu, Mesilau River, 1700 m, 21.IV.1964, *Corner* (ZT 80/175; RSNB 8386, holotype). — Mt. Kinabalu, Mesilau River, 1500 m, 4.IV.1964, *Corner* (ZT 80/174).

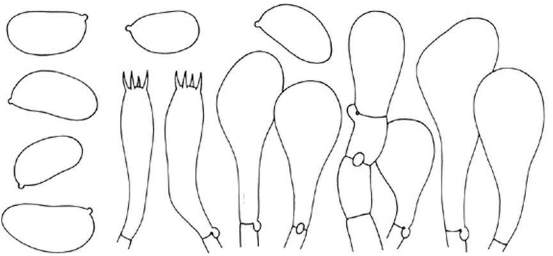

Fig. 4. *Inocybe ionides* Corner & Horak (type). — Spores, basidia, cheilocystidia.

When reading for the first time Prof. Corner's field notes on this lilac *Inocybe*, I never expected that *I. ionides* could belong to those taxa with thin-walled, not encrusted cheilocystidia and absent pleurocystidia ('*Inocybe* leiosporés acystidiés' sensu Kühner & Romagnesi, *1953*). Young carpophores of this species are lilac to violet all over but in aged specimens the colour of the pileus turns to dark brown. *I. ionides* was collected twice in montane forests on the slopes of Mt. Kinabalu, Sabah (Eastern Malaysia) where it probably grows under fagaceous trees.

Inocybe umbrinovirens Horak, *spec. nov.*—Fig. 5

Pileo –35 mm, conicoconvexo vel umbonatoplano, umbrino, grosse squamato. Lamellis adnexis, cinnamomeis vel umbrinis, albofimbriatis. Stipite –100 × –6 mm, cylindraceo, umbrino, basim versus viridi, fibrilloso. Caro viridinigra. Odore gratissimo. Sporis 10–12.5 × 7–8.5 μm, ovoideis, brunneis. Cheilocystidiis cylindraceis. Ad terram in silvis nothofagineis. Nova Guinea. Typus: ZT 72/164.

Pileus 15–35 mm, hemispheric when young soon becoming conico-convex or obtusely umbonate-expanded; cinnamon to umber brown; centre covered with very coarse, often recurved, concolorous scales, conspicouosly fibrillose-rimose towards not striate margin, dry, veil remnants absent. Lamellae (L 20–25, –5) crowded, adnexed, subventricose, up to 7 mm wide; cinnamon to umber brown or chocolate brown, white edge fimbriate-dentate. Stipe 40–100 × 4–6 mm, cylindric, equal, slender; upper portion concolorous with pileus, green towards base; dry, strongly fibrillose, hollow, veil remnants none, single in groups. Context cinnamon or pale red-brown in pileus, green-black towards and at base. Odour strong, pleasant, sweet to fruity, in aged specimens changing to unpleasant, like burnt hair. Taste mild.

Spores 10–12.5 × 7–8.5 μm, ovoid, brown, smooth, membrane thin-walled, germ pore none. Basidia 40–50 × 10–13 μm, 4-spored. Cheilocystidia (terminal cells) 20–45 × 5–13 μm, cylindric to subclavate, forming dense seam on edge, membrane hyaline or yellowish (KOH), yellowish encrusting and/or plasmatic pigment present. Pleuro- and caulocystidia absent. Cuticle a cutis or trichoderm of cylindric hyphae (3–7 μm diam.), membrane encrusted with yellow (KOH) pigment, but yellow plasmatic pigment also represented. Clamp connections numerous.

HABITAT.—On soil in forests under *Nothofagus* (*N. carrii*, *N. grandis*). Papua New Guinea.

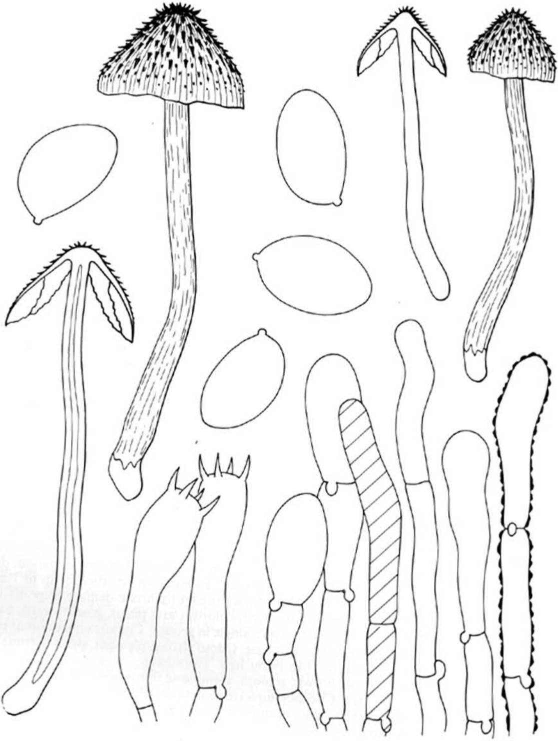

Fig. 5. *Inocybe umbrinovirens* Horak (type). — Carpophores, spores, basidia, cheilocystidia.

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Wau, Mt. Kaindi, 2300 m, 1.III.1972, *Horak* (ZT 72/164, holotype).

The green to black-green colour at the base of the stipe is indicative for this conspicuous Papua New Guinean *Inocybe* which fructifies in montane rain forest under *Nothofagus* spp. Thus *I. umbrinovirens* is immediately recognized as a close ally of both *I. calamistrata* (Fr.)—a common agaric in the northern hemisphere—and *I. calamistratoides* Horak (*1977*) which occurs in association of New Zealand representatives of *Nothofagus* spp. The three taxa, however, are well separated by their distinct microscopical characters.

Inocybe fuscospinulosa Corner & Horak, *spec. nov.*—Fig. 6

Pileo –20 mm, e convexo campanulato, umbrino vel fusco, conspicue spinuloso. Lamellis adnexis, tabacinis. Stipite –45 × –2.5 mm, cylindraceo, pileo concolori vel rubrobrunneo, squamulis recurvatis concoloribus instructo, velo nullo. Caro rufescente. Odore nullo. Sporis 6.5–8 × 4–5 μm, ovatis, brunneis. Cheilocystidiis haud metuloideis, e cylindraceo subfusoideis, hyalinis. Ad terram in silvis fagineis. Indonesia. Typus: ZT 77/205.

Pileus 10–20 mm, convex becoming obtusely umbonate-expanded or campanulate; date brown, umber brown, or fuscous; densely covered with conspicuous (up to 1.5 mm high), spiny, erect squamules; margin not striate, without veil remnants. Lamellae (L 16–20, –7) rather crowded, adnexed, ventricose; umber brown to tobacco brown, lilac tints absent, fimbriate edge paler. Stipe 30–45 × 1.5–2.5 mm, cylindric, equal, slender; concolorous or paler, often with red-brown tinge; fibrillose, here and there with small, fibrillose, occasionally scaly, brown squamules; dry, solid, veil remnants absent, single in groups. Context brown in pileus, reddish brown in stipe, slightly reddening upon exposure or bruising, any green colours absent. Odour and taste not distinctive.

Spores 6.5–8 × 4–5 μm, ovoid, smooth, brown, membrane thin-walled, germ pore absent. Basidia 25–35 × 6–7 μm, 4-spored. Cheilocystidia 25–50 × 5–7 μm, cylindric to subfusoid, membrane thin-walled, hyaline, crystals absent. Pleuro- and caulocystidia none. Cuticle a trichoderm of bundled, cylindric hyphae (5–12 μm diam.), terminal cells often fusoid, encrusted with brown (KOH) pigment. Clamp connections present.

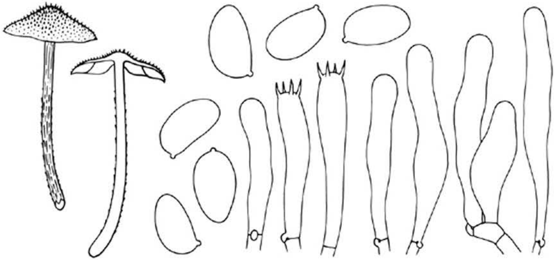

Fig. 6. *Inocybe fuscospinulosa* Corner & Horak (type). — Carpophores, spores, basidia, cheilocystidia.

HABITAT.—On soil in forests dominated by *Castanopsis* spp. and *Lithocarpus* spp. (Fagaceae). Indonesia.

MATERIAL.—INDONESIA: Java, Tjibodas, 1650 m, 16.III.1977, *Horak* (ZT 77/205, holotype); Tjibodas, 1800 m, 11.IV.1972, *Corner* (ZT 79/188; *J-4*).

The context of this brown species with hispid pileus reddens on exposure, and in combination with thin-walled and not encrusted cheilocystidia it is obviously related to *I. cervicolor* (Pers. ex Pers.) Quél. This Javanese species, however, is distinct from other members of sect. *Cervicolores* by its small spores and cheilocystidia of exceptional small size.

INOCYBE LATERICIA Horak—Fig. 7

Inocybe latericia Horak *in* N.Z. J. Bot. **15:** 716. 1977.

The specimens collected in Papua New Guinea (under *Castanopsis acuminatissima* and *Lithocarpus* spp.) agree in all details with the type from New Zealand which grows there in association with *Nothofagus* spp. (Horak, l.c.).

HABITAT.—On soil in forests (associated with Fagaceae). New Zealand (type), Papua New Guinea.

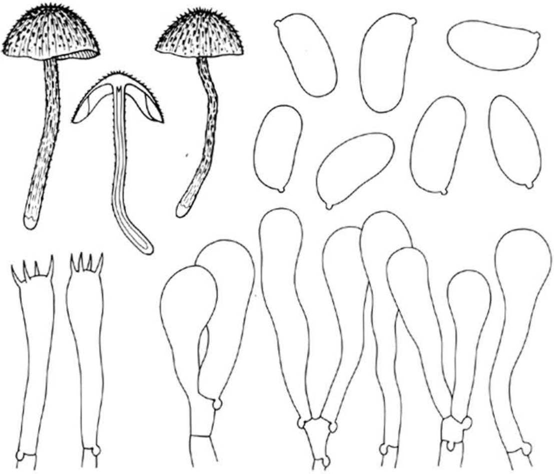

Fig. 7. *Inocybe latericia* Horak (ZT 73/162). — Carpophores, spores, basidia, cheilocystidia.

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Bulolo, Manki, 1300 m, 29.III.1973, *Horak* (ZT 73/129); Bulolo, Manki, 1250 m, 12.IV.1973, *Horak* (ZT 73/162).

The reddening context is the most obvious macroscopic character of this *Inocybe* which also belongs to sect. *Cervicolores*. The base of the stipe becomes also reddish to red-brown in aged specimens. The type collection from New Zealand (under *Nothofagus* spp.; Horak, *1977*) agrees in all essential details with the material gathered in Papua New Guinea (under *Castanopsis* and *Lithocarpus*).

INOCYBE CUTIFRACTA Petch—Fig. 8

Inocybe cutifracta Petch *in* Ann. R. bot. Gdns Peradeniya **6**: 201. 1917.

The type material is in rather bad condition. Nothing can be added to the macroscopic characters (cp. Petch, l.c.).

Spores 8.5–11.5 × 5–5.5 μm, ellipsoid, rarely slightly phaseoliform, brown, smooth, membrane thin-walled, germ pore absent. Basidia not recovered. Cheilocystidia 45–70 × 13–20 μm, clavate, hyaline, membrane thin-walled, crystals none. Pleuro- and caulocystidia absent. Cuticle not recovered. Clamp connections present.

HABITAT.—Not reported.

MATERIAL.—SRI LANKA: Peradeniya, 15.X.1914, *Petch 4176* (K, holotype).

In the original diagnosis *I. cutifracta* Petch is described as an agaric with red-brown, sulcate pileus of about 30 mm in diameter. The stipe (−40 × −3 mm) is densely covered by white fibrils. These macroscopic data indicate that this Ceylonese species of *Inocybe* must be a close relative of the polymorphic *I. fastigiata* (Schaeff. ex Fr.) Quél. This opinion was confirmed by the

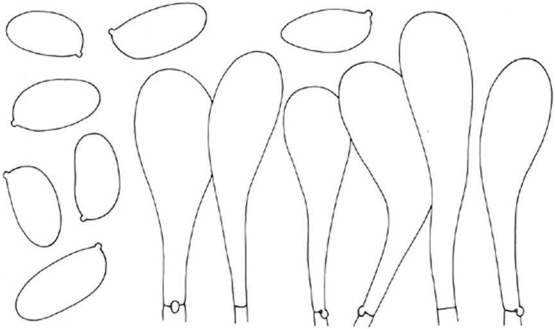

Fig. 8. *Inocybe cutifracta* Petch (type). — Spores, cheilocystidia.

microscopic examination of the fragmentary type material. Van Overeem (*1927*) reports *I. cutifracta* from Indonesia (Java) but this identification remains doubtful since no voucher specimens could be located in BO. Systematically *I. cutifracta* is closely allied to *I. umbrina* Massee. The area of the hitherto known distribution of the latter agaric stretches from Singapore eastwards to the Solomon Isl. It is likely that v. Overeem rather collected the similar *I. umbrina* than the actual *I. cutifracta*.

INOCYBE UMBRINA Massee—Fig. 9

Inocybe umbrina Massee *in* Kew Bull. 1914: 74. 1914; non *Inocybe umbrina* Bresadola, Fung. trident. **1**: 50, tab. 55. 1884 (basionym).[1]

Pileus 20–50(–100) mm, conico-convex becoming expanded-umbonate; at first fawn, pale yellow or ochre, covered with thin coat of white to grey, appressed fibrils (of veil), disc turning ochre-brown, hazel brown, or umber with age; strongly rimose to splitting towards sinuous margin (especially in aged carpophores) but umbo remaining smooth to innately fibrillose; dry, any persistent veil remnants on margin absent. Lamellae (L 18–40, –7) very crowded, narrow; adnexed to nearly free; at first whitish to pale grey-brown becoming cinnamon to brown, edge albo-fimbriate. Stipe –70(–110) × –6(–12) mm, cylindric, equal, occasionally attenuated towards base, often twisted; white or pale yellow, becoming brownish or concolorous with pileus in aged carpophores; dry, strongly fibrillose, apex subpruinose, sometimes with inconspicuous, appressed, fibrillose remnants of white veil, solid, tough, single or cespitose, in groups. Context white to dirty yellowish, firm. Odour strong, unpleasant, reminding of burnt horn.

Spores 6–9 × 4–6 μm, ovoid to subelliptic, brown, smooth, membrane thin-walled, germ pore none. Basidia 20–28 × 7–9 μm, 4-spored. Cheilocystidia 25–70 × 11–20 μm, clavate to vesiculose, membrane hyaline, thin-walled, sometimes with yellow-brown, plasmatic or encrusting pigment. Pleurocystidia none. Caulocystidia like cheilocystidia, scattered. Cuticle a cutis of repent, bundled, cylindric hyphae (4–10 μm diam.), encrusted with brown pigment. Clamp connections numerous.

HABITAT.—On soil in low-land and mountain forest (under *Castanopsis* and *Lithocarpus* in Papua New Guinea). Singapore (type), Malaysia, Sabah, Papua New Guinea, Solomon Isl.

MATERIAL.—SINGAPORE: Singapore, Havelock Road, 21.XI.1913, *Burkill 250* (K, holotype); Botanic Gardens, 29.III.1930, *Corner* (ZT 80/172); Reservoir Jungle, 2.IV.1941, *Corner* (no material preserved. — MALAYSIA: Johore, Sedili River, 3.VIII.1931, *Corner* (ZT 80/173. — SABAH: Mt. Kinabalu, Liwagu River, 1300 m, 29.VIII.1961, *Corner* (ZT 80/167, RSNB 2554); Mt. Kinabalu, Bembangan River, 1700 m, 21.II.1964, *Corner* (ZT 80/171, RSNB 5404); Mt. Kinabalu, Mesilau River, 1500 m, 2.V.1964, *Corner* (ZT 80/168, RSNB 8535 A); same locality, 1700 m, 4.V.1964, *Corner* (ZT 80/169, RSNB 8535 B); same locality, 1700 m, 17.IV.1964, *Corner* (ZT 80/166, RSNB 8321). — PAPUA NEW GUINEA: Morobe district, Lae, Botanic Garden, 25.IX.1960, *Corner* (ZT 79/186); Bulolo, Heads Hump, 1100 m, 18.X.1971, *Horak* (ZT 71/146); same locality, 18.X.1971, *Horak* (ZT 71/147); Madang, 3.X.1969, *Shepherd 406* (CANB 227265). — SOLOMON ISLANDS: Guadalcanal, Tsuva, 7.XI.1965, *Corner* (ZT 880/165, RSS 1744).

Among the species dealt with in this paper *Inocybe umbrina* Mass. has the most wide-spread area of distribution of all. This agaric enters ecto-mycorrhiza with fagaceous trees (predominantely *Castanopsis* and *Lithocarpus*) and to date it is reported both form Indomalaya (Singapore, Malaysia, Sabah) and Australasia (Papua New Guinea, Solomon Isl.). As pointed

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[1] For Bresadola's fungus the new combination **Astrosporina umbrina** (Bres.) Horak is proposed.

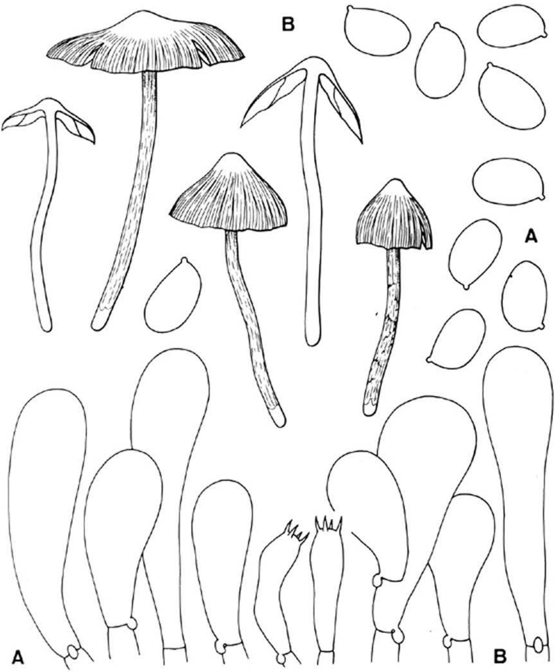

Fig. 9. *Inocybe umbrina* Mass. — A. (type) Spores, cheilocystidia, basidia. — B. (ZT 71/147) Carpophores, spores, cheilocystidia.

out above *I. cutifracta* Petch sensu v. Overeem (*1927*) is probably conspecific with *I. umbrina* adding thus another record (Java) within the present limits of its distribution.

Habit, size, and colour of *I. umbrina* are very similar of those of *Astrosporina angustifolia* Corn. & Horak (Horak, *1979*). In addition the two species occur in Papua New Guinea, Sabah, and Java together in the same biotop, so that microscopic examination is required to separate these closely resembling agarics.

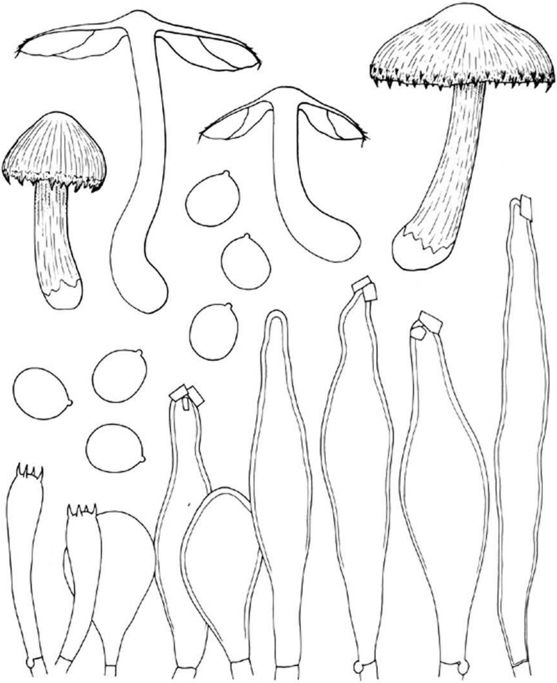

Fig. 10. *Inocybe sphaerospora* Kobayasi (ZT 72/333). — Carpophores, spores, basidia, cheilocystidia, pleurocystidia.

INOCYBE SPHAEROSPORA Y. Kobay.—Fig. 10

Inocybe sphaerospora Y. Kobayasi *in* Nagaoa **2:** 80. 1952.

Pileus 20–50 mm, convex at first becoming obtusely umbonate or campanulate finally expanded and plane; straw yellow, yellow, or pale ochre, pale ochre-brown over disc; innately fibrillose, rimose or splitting towards margin, with concolorous, subpersistent, fibrillose patches of veil along margin, dry. Lamellae (L 18–26, −5) crowded, adnexed to emarginate-adnate, ventricose, up to 8 mm wide; pale yellow to sulphur yellow when young turning pale yellow-brown, edge paler, fimbriate. Stipe 35–60 × 4–8 mm, cylindric to subclavate, base up to 13 mm diam., rather stout; straw yellow, orange towards base; dry, pruinose at apex, silky to fibrillose towards base, cortina absent, solid, single in groups. Context yellow, orange in cortex of stipe. Odour and taste not distinctive.

Spores 5.5–6.5 × 5–5.5 μm, globose to subglobose or ovoid, brown, smooth, membrane thin-walled. Basidia 27–40 × 7–8 μm, 4-spored. Cheilo- and pleurocystidia 40–95 × 15–20 μm, fusoid, often with long neck, membrane metuloid (up to 2 μm diam.), pale yellow-brown (KOH), encrusted with crystals, cystidia on the gill edge proper occasionally clavate to vesiculose. Caulocystidia absent, or not distinctive. Cuticle a cutis of cylindric hyphae (3 – 8 μm diam.), encrusted with yellowish (KOH) pigment. Clamp connections present.

HABITAT.—On soil in forests, under *Castanopsis* and/or *Lithocarpus* (Fagaceae) and *Aisoptera* (Dipterocarpaceae) in Papua New Guina. Japan (type), Singapore, Papua New Guinea.

ILLUSTRATION.—Kobayasi (*1952*: 81).

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Bulolo, Manki, 1400 m, 28.III.1972, *Horak* (ZT 72/333); Markham Valley, Oomsis (W. of Lae), 100 m, 19.VII.1972, *Horak* (ZT 72/533). — SINGAPORE: Botanic Gardens, 17.I.1930, *Corner* (ZT 80/176).

The preceding description is based on specimens from Papua New Guinea. The material from Papua New Guinea and Singapore corresponds in all essential features with the type from Japan (Kobayasi, l.c.; Hongo, *1956*: 28).

Inocybe cingulata Horak, *spec. nov.*—Fig. 11

Pileo – 20 mm, e conico campanulato, argillaceo vel avellano, fibrilloso dein subrimoso, saepe e velo albo marginem versus obtecto. Lamellis adnexis vel adnatis, argillaceis dein tabacinis. Stipite – 50 × – 2 mm, cylindraceo interdum subclavato, pileo concolori, cortina alba persistenter cingulato, infra fibrillis albis dense instructo. Odore ingrato. Sporis 7.5–9.5 × 4.5–5.5 μm, amygdaliformibus, brunneis. Cystidiis fusoideis, metuloideis, incrustatis. Ad terram in silvis fagineis. Nova Guinea. Typus: ZT 72/343.

Pileus 5–20 mm, conico-convex when young becoming campanulate or umbonate-expanded; pale brown to (hazel)brown, in aged specimens with pale ochre-brown tinge at disc; innately fibrillose, subrimose towards not striate margin, centre occasionally subsquamulose in aged carpophores, margin covered with white fibrils from the veil (sometimes with white, subpersistent, attached patches), dry. Lamellae (L 12–20, − 5) crowded, adnexed to adnate, ventricose; greyish, pale argillaceous or cinnamon becoming (tobacco)brown, fimbriate edge white. Stipe 25–50 × 1.5–2 mm, cylindric, base sometimes swollen, slender; white or concolorous with pileus, base often white; dry, with persistent, white, fibrillose ring from cortina, below with conspicuous white, longitudinal, coarse fibrils from the veil; fistulose, single and cespitose, in groups. Context pale brown beneath cuticle of pileus, white in stipe. Odour and taste spermatic, occasionally with fruity or sourish component.

Spores 7.5–9.5 × 4.5–5.5 μm, amygdaliform, distinctly mucronate, in dorsal view often sublimoniform, smooth, brown, membrane thin-walled, germ pore absent. Basidia 20–28 × 7–8 μm, 4-spored. Cheilo-, pleuro- and (scattered) caulocystidia 35–70 × 11–18 μm, fusoid, metuloid (membrane up to 1.5 μm diam.), hyaline to pale brown, apex encrusted with crystals or capped with resinous remnants. Cuticle a cutis of cylindric hyphae (3–8 μm diam.), encrusted with brown (KOH) pigment. Clamp connections present.

HABITAT.—On soil in forests under *Castanopsis acuminatissima* and/or *Lithocarpus* spp. (Fagaceae). Papua New Guinea.

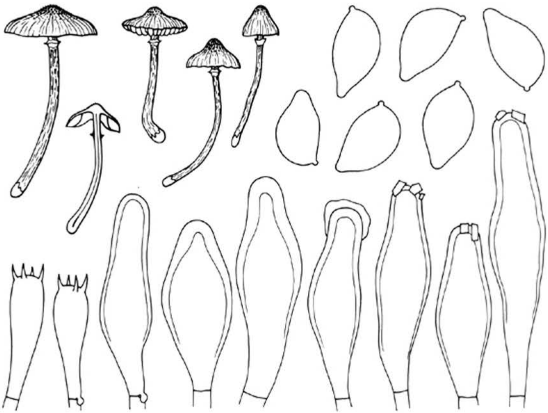

Fig. 11. *Inocybe cingulata* Horak (type). — Carpophores, spores, basidia, cheilocystidia, pleurocystidia.

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Wau, McAdam Memorial Park, 1300 m, 30.III.1972, *Horak* (ZT 72/343, holotype); Bulolo, Manki, 1400 m, 25.X.1971, *Horak* (ZT 71/210); Bulolo, Manki, 1300 m, 31.I.1973, *Horak* (ZT 73/29); Bulolo, Manki, 1300 m, 16.V.1973, *Horak* (ZT 73/229).

This delicate species is well characterised by the white and persistent cortina at the upper portion of the stipe. Its habit and colour are reminiscent of another Papua New Guinean *Inocybe*, viz. *I. conicoalba*. Both species enter ectotrophic mycorrhiza with *Castanopsis-Lithocarpus* and occur side by side in the same habitats. Therefore, having aged carpophores only, the separation between *I. conicoalba* and *I. cingulata* can be difficult in the field. Microscopically, however, these two species are well defined (see key).

Inocybe procera Horak, *spec. nov.*—Fig. 12

Pileo −25 mm, convexo vel subplano, papilla conica conspicuaque instructo, brunneo, subsquarroso, marginem versus rimoso. Lamellis adnexis, argillaceis. Stipite −45 × −2 mm, cylindraceo, pileo concolori, fibrillis concoloribus obtecto. Odore nullo. Sporis 8.5–10 × 6.5–7 μm, amygdaliformibus vel sublimoniformibus. Ad terram in silvis nothofagineis. Nova Guinea. Typus: ZT 73/75.

Pileus 10–25 mm, convex to expanded, always with conspicuous (up to 6 mm high), conic papilla; pale brown to fuscous; papilla covered with coarse but small, brown scales and squamules, fibrillose-rimose towards not striate margin; dry, veil remnants absent. Lamellae (L

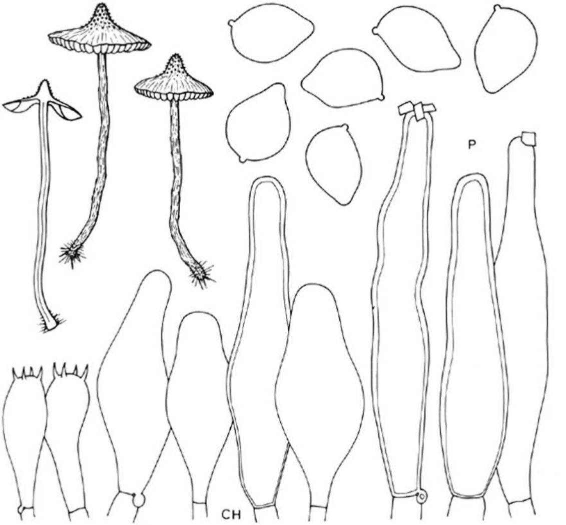

Fig. 12. *Inocybe procera* Horak (type). — Carpophores, spores, basidia, cheilocystidia (CH), pleurocystidia (P).

8–12, – 3) adnexed to emarginate-adnexed, ventricose; cinnamon, argillaceous or pale brown, edge white, fimbriate. Stipe 30–45 × – 2 mm, cylindric, equal, slender; concolorous with pileus; densely covered with coarse, brown fibrils especially towards apex, yellow, strigose hairs at base, cortina remnants absent; dry, fistulose, single in groups. Context brown. Odour and taste not distinctive.

Spores 8.5–10 × 6.5–7 μm, lemon-shaped to amygdaliform, distinctly mucronate, smooth, brown, membrane thin-walled. Basidia 25–30 × 6–7 μm, 4-spored. Cheilo- and pleurocystidia 40–80 × 12–18 μm, cylindric to subfusoid or lageniform, membrane rather thin-walled (up to 1 μm diam.), hyaline, rarely encrusted with crystals. Caulocystidia absent. Cuticle a cutis or trichoderm of bundled, cylindric hyphae (4–8 μm diam.), membrane up to 1 μm diam., encrusted with brown pigment. Clamp connection present on septa.

HABITAT.—On soil in *Nothofagus*-forest (*N. carrii*, *N. grandis*). Papua New Guinea.

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Wau, Mt. Kaindi 2300 m, 18.III.1973, *Horak* (ZT 73/75, holotype).

This species was collected once only in montane rain forests (under *Nothofagus* spp.). It is characterised by several distinct features, viz. prominent, conic and squarrose papilla, yellow strigose hairs at the base of stipe and sublimoniform spores.

Inocybe casuarinae Corner & Horak, *spec. nov.*—Fig. 13

Pileo −40 mm, convexo dein umbonato, ochraceobrunneo, fibrilloso, subsquamuloso ad apicem. Lamellis adnexis, argillaceis. Stipite −80 × −6.5 mm, cylindraceo vel subclavato, cremeo vel subochraceo, apicaliter pruinoso. Odore ingrato. Sporis 6.5–9 × 4–5 µm, ellipsoideo-angulatis, brunneis. Cystidiis metuloideis, fusoideis, incrustatis. In arena sub *Casuarina*. Malaya. Typus: ZT 79/185.

Pileus 15–40 mm, convex becoming campanulate or broadly umbonate and expanded; pale ochraceous, fawn or pale brown; innately fibrillose (especially towards not striate margin), disc smooth in young specimens, becoming subsquamulose with age, dry, veil remnants absent. Lamellae (L 14–21, −5) crowded, adnexed, ventricose; white to pale yellow at first turning fawn or pale brown, white edge fimbriate. Stipe 30–80 × 3–6.5 mm, cylindric or subclavate, stout, firm;

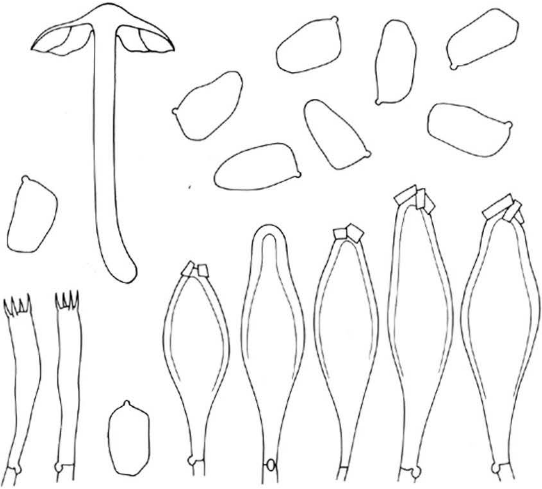

Fig. 13. *Inocybe casuarinae* Corner & Horak (type). — Carpophores, spores, basidia, cheilocystidia, pleurocystidia.

cream to pale ochraceous; pruinose or scurfy near apex, glabrous towards base, dry, solid, thin fibrillose veil remnants are recognized in very young specimens only, single or subcespitose, in groups. Context white to pale yellow. Odour and taste unpleasant, spermatic or like corn.

Spores 6.5–9 × 4–5 μm, in profile with few obtuse angles, subnodulose, occasionally ellipsoid, smooth, brown, membrane thin-walled, germ pore none. Basidia 30–35 × 5–6 μm, 4-spored. Cheilo- and pleurocystidia 40–60 × 15–18 μm, fusoid, metuloid (membrane up to 2 μm diam.), yellow-brown plasmatic pigment present, encrusted with crystals. Caulocystidia 40–70 × 10–18 μm, subclavate, to fusoid, mostly thin-walled, yellow-brown (KOH) pigment present, scattered. Cuticle a cutis of cylindric hyphae (3–10 μm diam.), membranes of subcuticular hyphae with yellow-brown (KOH), encrusting pigment. Clamp connections present.

HABITAT.—On sandy soil (along the coast) under *Casuarina equisetifolia* (Casuarinaceae). Malaysia.

MATERIAL.—MALAYSIA: Johore, Jason Bay, Sedili River, 17.VII.1972, *Corner* (ZT 79/185, holotype); same locality, 15.VI.1934, *Corner* (ZT 80/177).

This striking Malaysian species obviously forms ectotrophic mycorrhiza with *Casuarina equisetifolia*. To date it was unknown that members of the Casuarinaceae enter symbiosis with agarics. In addition *I. casuarinae* is particularely distinguished by its subangular spores. Among all species of *Inocybe* hitherto described from the Far East there is only another taxon having similar spores (*I. ammophila* Matsuda & Hongo, *1956*). Both species grow in sandy soils.

Inocybe olorinata Horak, *spec. nov.*—Fig. 14

Pileo –25 mm, ex hemisphaerico campanulato, albo, fibrilloso-rimoso marginem versus. Lamellis adnato-emarginatis, isabellinis. Stipite –50 × –3 mm, cylindraceo, usque ad 5 mm ad basim, subbulboso, albo, apicaliter pruinoso. Caro alba. Odore ingrato. Sporis 7–8.5 × 4–4.5 μm, subamygdaliformibus, brunneis. Cystidiis fusoideis, metuloideis, incrustatis. Ad terram in silvis fagineis. Indonesia. Typus: ZT 77/98.

Pileus 15–25 mm, hemispheric when young becoming obtusely umbonate-expanded or campanulate; white, centre pale yellowish in aged carpophores; dry, disc smooth, fibrillose-rimose towards splitting margin, veil remnants absent. Lamellae (L 20–26, –5(–7)) crowded, adnexed to emarginate-adnate, ventricose; whitish at first becoming pale cinnamon and finally argillaceous-grey, edge paler, even. Stipe 25–50 × 2–3 mm, upper portion cylindric, base subbulbous (up to 5 mm diam.), slender; white; pruinose at apex, smooth towards base, dry, solid, veil remnants none, single in groups. Context white. Odour and taste strongly spermatic.

Spores 7–8.5 × 4–4.5 μm, subamygdaliform, smooth, brown, membrane thin-walled, germ pore none. Basidia 18–25 × 6–7 μm, 4-spored. Cheilo-, pleuro-, and caulocystidia 25–50 × 9–16 μm, fusoid, metuloid (membrane up to 1.5 μm diam.), hyaline, encrusted with crystals. Cuticle a cutis of cylindric hyphae (4–8 μm diam.), membrane not gelatinised, pigment absent. Clamp connections present.

HABITAT.—On soil in forests under *Castanopsis* spp. and *Lithocarpus* spp. (Fagaceae). Indonesia.

MATERIAL.—INDONESIA: Java, Tjibodas, 1650 m, 14.III.1977, *Horak* (ZT 77/98, holotype).

Young carpophores of *Inocybe olorinata* are completely white and remind therefore *I. geophylla* (Sow. ex Fr.) Kummer or one of its close allies (*I. sambucina* (Fr.) Qúel., *I. pudica* Kühn.). The Javanese species of *Inocybe*, however, differs in significantly smaller spores and

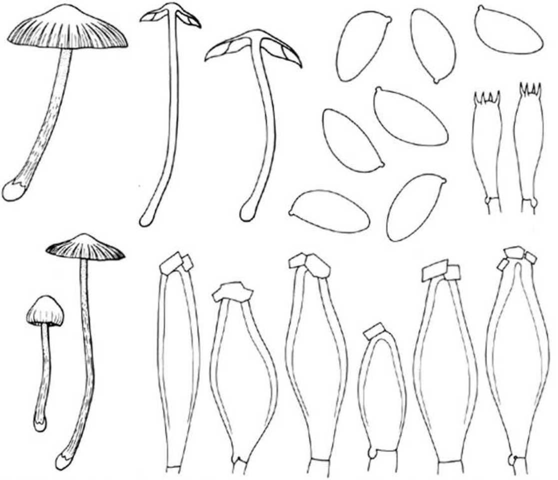

Fig. 14. *Inocybe olorinata* Horak (type). — Carpophores, spores, basidia, cheilocystidia, pleurocystidia.

cystidia. Macroscopically, *I. olorinata* is similar to *Astrosporina alboviscida* Horak (*1979*), firstly described from Papua New Guinea, whose occurrence in Java were feasible.

Inocybe strigiceps Horak, *spec. nov.*—Fig. 15

Pileo – 25 mm, ex hemisphaerico convexo, centro glabro et argillaceo-brunneo, marginem versus crinibus albis strigosissimis persistenter instructo. Lamellis adnexis, ochraceis dein rufo-brunneis. Stipite – 40 × – 2.5 mm, cylindraceo, rufobrunneo, pruinoso. Odore grato. Sporis 6.5–8 × 4–5 μm, amygdaliformibus, brunneis. Cystidiis fusoideis, metuloideis, luteis. Ad terram in silvis nothofagineis. Nova Guinea. Typus: ZT 71/400.

Pileus 10–25 mm, hemispheric to convex later becoming plane; disc argillaceous to pale brown, smooth, towards margin with conspicuous, white, strigose hairs (up to 3 mm long), exceeding margin even in degraded specimens; dry, margin not striate. Lamellae (L 20–26, – 3) crowded, adnate to adnexed, ventricose; ochre to yellow when young turning pale red-brown with age, edge white, fimbriate. Stipe 30–40 × 2–2.5 mm, cylindric, equal, stiff, slender; red-brown; entirely pruinose, veil remnants none; dry, fistulose, often with strigose, white hairs at base, single in groups. Context red-brown especially in stipe. Odour and taste pleasant, not spermatic.

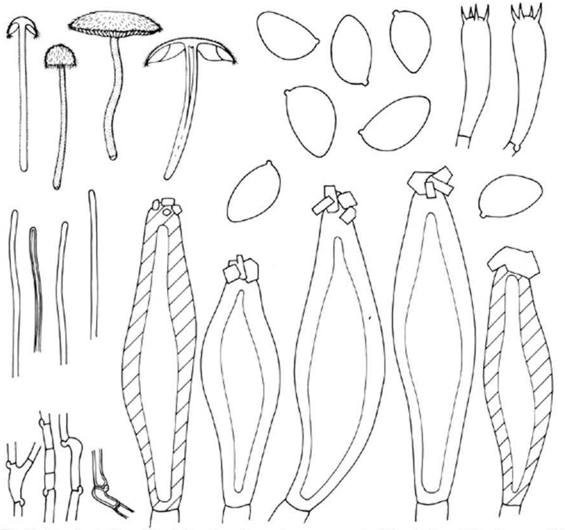

Fig. 15. *Inocybe strigiceps* Horak (type). — Carpophores, spores, basidia, cheilocystidia, pleurocystidia, cuticular hyphae.

Spores 6.5–8 × 4–5 μm, amygdaliform to pip-shaped, smooth, brown, membrane thin-walled, germ pore none. Basidia 24–27 × 5–6 μm, 4-spored. Cheilo-, pleuro-, and caulocystidia 50–90(–100) × 10–20 μm, fusoid, occasionally clavate at gill edge proper, membrane thick-walled (up to 5 μm diam.), yellow (KOH), encrusted with crystals. Cuticle consisting of long, cylindric hyphae (2–4 μm diam.) with slightly thickened membrane, apex obtusely rounded, septa found near base only, pigment absent. Clamp connections present.

HABITAT.—On soil in forests (*Nothofagus*). Papua New Guinea.

MATERIAL.—PAPUA NEW GUINEA: Eastern Highlands, Mt. Michael, Frigano, Hut Track, 2400 m, 8.XII.1971, *Horak* (ZT 71/400, holotype); Mt. Michael, Frigano, Hut Track, 2350 m, 31.XII.1971, *Horak* (ZT 71/480).

The comparison with *A. pusillima* Corn. & Horak (*1979*), described from Papua New Guinea and Singapore, demonstrates that this species and *I. strigiceps* are morphologically identical in all features except for the shape of the spores. The latter species seems to have an isolated position within the genus *Inocybe* since no closely related species can be found in the current literature (compare also Stangl & Veselský, *1979*).

Inocybe strigiceps forma **pygmaea** Horak, *f. nov.*—Fig. 16

Differt a typo statura et cystidiis minoribus. Ad terram in silvis fagineis. Nova Guinea. Typus formae: ZT 71/410.

Pileus 7–12 mm, convex to plane and expanded, occasionally with low umbo; pale brown to fuscous, margin with white, persistent, strigose hairs; dry, margin not striate. Lamellae (L 8–16, – 5) crowded, adnate to adnexed; cinnamon turning pale brown with reddish tint, edge white, fimbriate. Stipe 10–15 × 1 mm, cylindric, equal, fragile; reddish brown; pruinose over whole length, base often with white, strigose hairs, veil remnants absent; dry, solid, single in groups. Context pale brown. Odour and taste pleasant, fruity.

Spores 7–9 × 4.5–5 μm, amygdaliform to pip-shaped, smooth, brown, membrane thin-walled, occasionally with indistinct callus. Basidia 21–28 × 6–7 μm, 4-spored. Cheilo-, pleuro-, and caulocystidia 30–50(–60) × 12–18(–25) μm, fusoid, metuloid (membranes up to 3 μm diam.), yellow (KOH), encrusted with crystals. Cuticle composed of long, cylindric, hyaline, mostly thin-walled hyphae (3–4 μm diam.), membrane not gelatinised. Clamp connections present.

HABITAT.—On soil under *Nothofagus* spp. and *Lithocarpus* spp., rarely also on rotten wood. Papua New Guinea.

MATERIAL.—PAPUA NEW GUINEA: Eastern Highlands, Mt. Michael, Frigano, Okapa Track, 2400 m, 9.XII.1971, *Horak* (ZT 71/410, holotype of form); Mt. Michael, Frigano, Hut Track, 2350 m, 31.XII.1971, *Horak* (ZT 71/477); Northern district, Mt. Lamington, near Kaudata, 13.IV.1972, *Horak* (ZT 72/382; under *Lithocarpus* spp.).

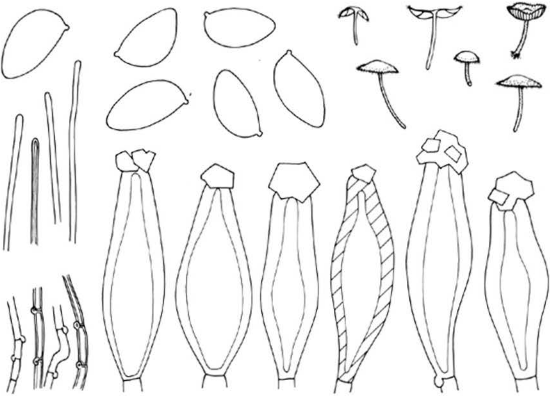

Fig. 16. *Inocybe strigiceps* Horak f. *pygmaea* Horak (type). — Carpophores, spores, cheilocystidia, pleurocystidia, cuticular hyphae.

INOCYBE SUBGEOPHYLLA Hennings apud Warburg—Fig. 17

Inocybe subgeophylla Hennings apud Warburg *in* Monsunia **1:** 154. 1900.

Pileus 15–30 mm, convex to expanded, always with distinct, conic or obtuse umbo at disc; pale red-brown, chestnut brown, or hazel brown; umbo smooth when young becoming squamulose-squarrose, fibrillose to rimose towards the not striate but (with age often) splitting margin; dry, veil remnants none. Lamellae (L 14–18, −5), crowded, adnexed, rather narrow (up to 3 mm wide); grey to argillaceous-grey or cinnamon, edge concolorous or white, fimbriate. Stipe 25–45 × 1.5–3 mm, cylindric, terete, equal or with subbulbous base; pale brown, cinnamon or pale red-brown, occasionally with faint lilac tint at pruinose apex, towards base covered with appressed, white fibrils, distinct cortina absent; solid, fistulose with age, dry, single or cespitose in groups. Context white in pileus, pale brown in stipe. Odour and taste spermatic.

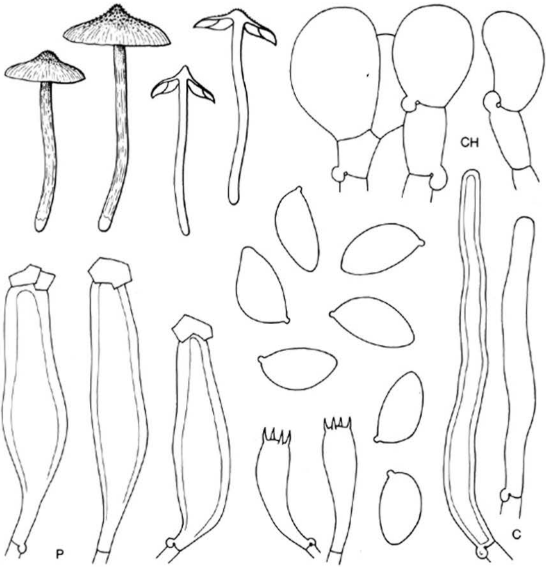

Fig. 17. *Inocybe subgeophylla* P. Henn. (ZT 77/189). — Carpophores, spores, basidia, cheilocystidia (CH), pleurocystidia (P), caulocystidia (C).

Spores 7.5–9 × 4–5 μm, amygdaliform, smooth, brown, membrane thin-walled. Basidia 20–26 × 6–7 μm, 4-spored. Cheilocystidia 35–60 × 10–15 μm, clavate, hyaline, thin-walled, scattered on gill edge. Pleurocystidia 45–70 × 10–18 μm, fusoid, metuloid (membrane up to 2.5 μm diam.), hyaline, encrusted with crystals. Caulocystidia not differentiated. Cuticle a cutis of cylindric hyphae (4–10 μm diam.), membrane occasionally thickend, smooth or encrusted with brown (KOH) pigment. Clamp connections present.

HABITAT.—On soil in forests under *Castanopsis* spp. and *Lithocarpus* spp. Indonesia (Java).

MATERIAL.—INDONESIA: Java, Tjibodas, 1500 m, 14.III.1977, *Horak* (ZT 77/189); Tjibodas, 1600 m, 16.III.1977, *Horak* (ZT 77/201); Tjibodas, VII.1898, *Fleischer* (B, holotype, material lost).

This redescription of *I. subgeophylla* is based upon fresh topotypical material from Java (Indonesia). In the original diagnosis all distinctive characters are well described by Hennings (*1900*) so that this *Inocybe* is readily recognized, although the specific epithet '*subgeophylla*' is misleading. In fact this name would much better apply to the white-coloured Javanese *Inocybe olorinata* Horak (see above) which also occurs in the same habitat (*Castanopsis-Lithocarpus* forests).

INOCYBE AUSTRALIENSIS Cleland & Cheel—Fig. 18A, B, C

Inocybe australiensis Cleland & Cheel *in* Trans. R. Soc. S. Australia **42:** 109. 1918.
Inocybe serrata Cleland *in* Trans. R. Soc. S. Australia **57:** 192. 1933.
Inocybe granulosipes Cleland *in* Trans. R. Soc. S. Australia **57:** 192. 1933.

Nothing can be added to the macroscopic description (cp. Cleland & Cheel, *1918*: l.c.). Odour unknown.

Spores 6.5–8 × 4.5–5 μm, ovoid to subamygdaliform, pip-shaped, brown, smooth, membrane thin-walled, germ pore none. Basidia 22–28 × 6–7 μm, 4-spored. Cheilo-, pleuro-, and caulocystidia 45–60 × 12–18 μm, fusoid to lageniform, membrane hyaline to pale yellow (KOH), metuloid (up to 2 μm diam.), encrusted with crystals, numerous. Cuticle a cutis or trichoderm of short, cylindric hyphae (8–16 μm diam.), strongly encrusted with brown (KOH) pigment. Clamp connections present.

HABITAT.—Ecology unknown. Australia.

ILLUSTRATION.—Cleland & Cheel, *1918*.

MATERIAL.—AUSTRALIA: New South Wales, Sydney, Neutral Bay, 19.V.1915, *Cleland* (ADW 12707, holotype of *Inocybe australiensis*, in good condition); Sydney, Chatswood, 21.V.1916, *Cleland* (ADW 12709); Sydney, *Cleland* (ADW 12708). South Australia: Mt. Lofty, 7.IV.1917, *Cleland* (ADW 12668, holotype of *I. serrata*); Stirling West, 23.VII.1927, *Cleland*, (ADW 12719, holotype of *I. granulosipes*).

All data observed both on *I. serrata* Clel. and *I. granulosipes* Clel. indicate that these taxa are synonymous to *I. australiensis*. Using European literature *I. australiensis* Clel. keys out near *I. gausapata* Kühn. The Australian species, however, differs from all other taxa in this difficult group (Stangl & Veselsky, *1977*) with *I. flocculosa* Berk. (compare remarks on doubtful species) as its most typical representative.

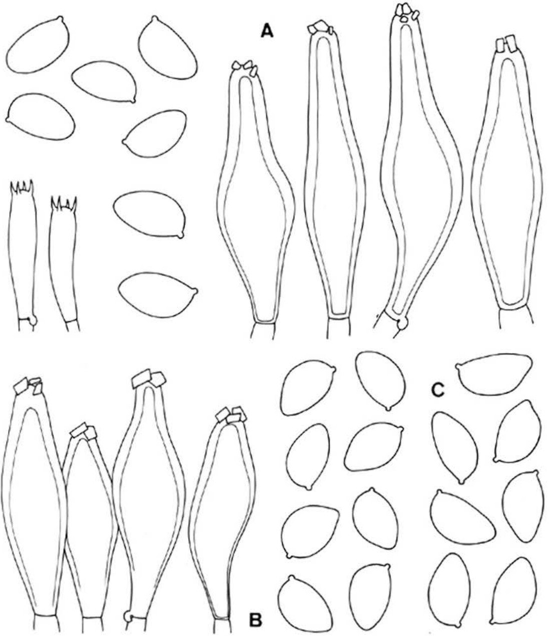

Fig. 18A. *Inocybe australiensis* Clel. & Cheel (type). — Spores, basidia, cheilocystidia, pleurocystidia. — Fig. 18B. *Inocybe serrata* Clel. (type). — Spores, cheilocystidia, pleurocystidia. — Fig. 18C. *Inocybe granulosipes* Clel. (type). — Spores.

Inocybe multicingulata Horak, *spec. nov.*—Fig. 19

Pileo – 12 mm, conico vel campanulato, umbrino, squamulis concoloribus erectisque dense obtecto. Lamellis adnexis, ochraceis dein argillaceo-olivaceis. Stipite – 25 × – 2 mm, cylindraceo, pallide rufo, squamis et zonis albis e velo conspicue instructo. Odore grato. Sporis 6–6.5 × 3.5–4 μm, subamygdaliformibus. Cystidiis metuloideis, luteis, incrustatis. Ad terram in silvis nothofagineis. Nova Guinea. Typus: ZT 71/369.

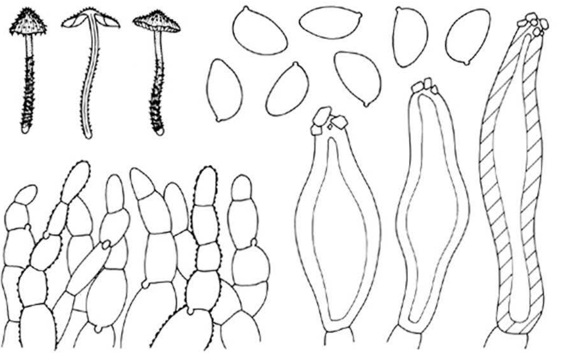

Fig. 19. *Inocybe multicingulata* Horak (type). — Carpophores, spores, cheilocystidia, pleurocystidia, cuticle.

Pileus 6–12 mm, hemispheric or convex becoming umbonate-expanded; dark brown; densely covered with small, erect (pyramidal at disc), concolorous, fibrillose scales, margin rather appressed-fibrillose in aged carpophores, white, triangular, persistent squamules from veil along margin, dry. Lamellae (L 14–20, −3) crowded, adnexed, ventricose; yellow-brown (mustard yellow) turning olive-brown, edge concolorous or white, fimbriate. Stipe 15–25 × 1.5–2 mm, cylindric, equal; pale red-brown, pruinose near apex, towards base with conspicuous, persistent, white, fibrillose zones and squamules from veil, occasionally forming complete girdles around stipe; dry, fistulose with age, single in groups. Context brown in pileus, pale red-brown in stipe. Odour pleasant, like fresh fruit.

Spores 6–6.5 × 3.5–4 µm, subamygdaliform, pip-shaped or ovoid, smooth, brown, membrane thin-walled. Basidia 22–26 × 6 µm, 4-spored. Cheilo-, pleuro-, and caulocystidia 40–70(−90) × 14–18(−20) µm, subfusoid, metuloid (membrane up to 3 µm diam.), yellow (KOH), encrusted with crystals. Cuticle a trichoderm of erect and densely packed chains of short, ovoid cells, membranes encrusted with brownish pigment. Clamp connections present.

HABITAT.—On soil under *Nothofagus* sp. Papua New Guinea.

MATERIAL.—PAPUA NEW GUINEA: Eastern Highlands, Mt. Michael, Frigano, Okapa Track, 2300 m, 5.XII.1971, *Horak* (ZT 71/369, holotype).

Macroscopically this small, dark brown *Inocybe* (associated with *Nothofagus* spp. in the Papua New Guinean highlands) is immediately recognized by the numerous white belts of veil on the stipe. Size, colour, and general habit of *I. multicingulata* resemble those of *I. phaeosquarrosa* Horak (*1979*), a native species in *Nothofagus* forests of New Zealand. Both taxa share also the small-sized spores but are microscopically definitely distinguished concerning the morphology of the cystidia and the structure of the pileocutis.

Inocybe fuscoperonata Corner & Horak, *spec. nov.*—Fig. 20

Pileo –35 mm, e conico convexopapillato, alboluteolo fibrillis fuscis dense obtecto, subviscido, zonis fuscis e velo marginem versus ornato. Lamellis adnexis vel subliberis, pallidis dein argillaceis. Stipite –70 × –3 mm, cylindraceo, tereti, albido, apicaliter pruinoso, basim versus zonis vel fibrillis fuscis agglutinatis e velo dense obtecto. Odore subspermatico. Sporis 7–8.5 × 4.5–5 μm, ovoideis, brunneis. Cheilocystidiis clavatis vel vesiculosis, metuloideis. Pleuro- et caulocystidiis fusoideis, metuloideis, incrustatis. Ad terram in silvis fagineis. Nova Guinea. Typus: ZT 72/75.

Pileus 15–35 mm, distinctly conic when young becoming convex with acute, conic, conspicuous papilla, even in mature specimens with fully expanded pileus; white to pale yellow, densely covered with delicate, fuscous, innate fibrils, subrimose towards not striate margin; viscid when moist, with dark brown, fibrillose, agglutinate, persistent patches and zones (along the margin) from the veil. Lamellae (L 12–18, –3) crowded, subfree to adnexed, ventricose; whitish at first turning pale argillaceous, white edge fimbriate. Stipe 30–70 × 2–3 mm, cylindric, equal or slightly attenuated above, slender; white, pruinose near apex, towards base covered with

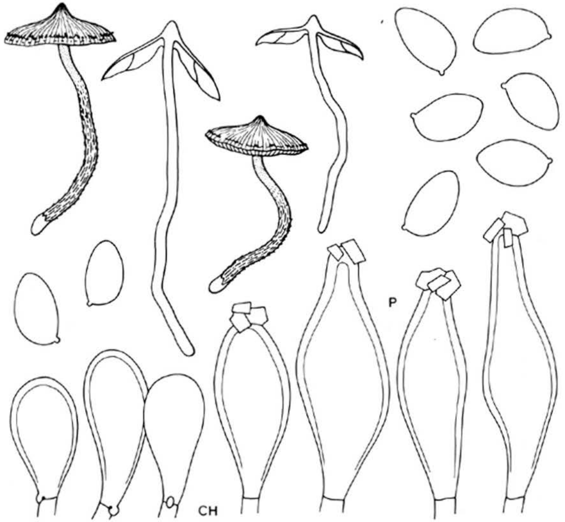

Fig. 20. *Inocybe fuscoperonata* Corner & Horak (type). — Carpophores, spores, cheilocystidia (CH), pleurocystidia (P).

persistent, conspicuous, fuscous, agglutinated (if moist) zones and coarse fibrils from the veil, distinct cortina absent; veil remnants viscid when moist, solid, fistulose with age, single and cespitose in groups. Context pale brown. Odour and taste slightly spermatic.

Spores 7–8.5 × 4.5–5 μm, ovoid (pip-shaped), rarely subamygdaliform, brown, smooth, membrane thin-walled, germ pore none. Basidia 22–27 × 7–8 μm, 4-spored. Cheilocystidia 25–40 × 15–20 μm, clavate to vesiculose, membrane metuloid at apex, hyaline, not encrusted. Pleuro- and caulocystidia 40–70 × 12–20 μm, fusoid, membrane metuloid (up to 2.5 μm diam.), hyaline, encrusted with crystals. Cuticle a cutis of short, cylindric hyphae (3–8 μm diam.), membranes gelatinised, with conspicuous, brown, plasmatic (!) pigment. Clamp connections numerous.

HABITAT.—On soil in montane, fagaceous forests (under *Nothofagus grandis*, *N. carrii*, and *Castanopsis acuminatissima* in Papua New Guinea). Papua New Guinea (type), Sabah.

MATERIAL.—PAPUA NEW GUINEA: Eastern Highlands, Goroka, Mt. Otto, 2300 m, 13.I.1972, *Horak* (ZT 72/75, holotype); Morobe District, Wau, Mt. Kaindi, 2300 m, 4.V.1972, *Horak* (ZT 72/437). – SABAH: Mt. Kinabalu, Bembangan River, 1700 m, 19.VIII.1961, *Corner* (ZT 80/178; RSNB 1876); same locality, 26.II.1964, *Corner* (ZT 80/179; RSNB 5476); same locality, 28.II.1964, *Corner* (ZT 80/180).

The dark brown, fibrillose pileus with conic papilla, the fuscous coarsely fibrillose and gelatinized (if moist) veil remnants on the stipe and the conspicuous, brown plasmatic pigment in the cuticular hyphae are the most distinctive features of this species. In Papua New Guinea *I. fuscoperonata* is found under both *Nothofagus* and *Castanopsis-Lithocarpus*, and it is assumed that the collections from Sabah (Mt. Kinabalu) are also associated with fagaceous trees as hostplants.

Inocybe zonatipes Horak, *spec. nov.*—Fig. 21

Pileo – 30 mm, papillato-convexo vel umbonato-explanato, castaneo, minute squamuloso, viscido. Lamellis adnatis, argillaceis. Stipite – 40 × – 4 mm, cylindraceo, albo-luteolo, basim versus e velo ochraceo-brunneo zonato. Odore subspermatico. Sporis 7.5–8.5 × 4.5–5 μm, subamygdaliformibus. Cystidiis fusoideis, metuloideis, incrustatis. Ad terram in silvis fagineis. Nova Guinea. Typus: ZT 72/378.

Pileus 15–30 mm, convex to expanded with distinct, conic papilla or obtuse umbo; chestnut brown, red-brown with orange tinge; viscid when moist, disc smooth, fibrillose-rimose towards margin, becoming densely covered by minute, concolorous squamules with age, veil remnants none. Lamellae (L 16–25, – 3) crowded, adnate to adnexed, ventricose; argillaceous with grey tinge, edge white, fimbriate. Stipe 25–40 × 2–4 mm, cylindric, equal; whitish to pale yellow, pruinose at apex, towards base with several, orange to ochraceous brown, fibrillose, mostly incomplete belts and squamules from the veil, cortina absent; dry, solid, single in groups. Context whitish in stipe. Odour and taste slightly spermatic.

Spores 7.5–8.5 × 4.5–5 μm, amygdaliform, smooth, brownish, membrane thin-walled, occasionally with distinct callus. Basidia 22–28 × 5–6 μm, 4-spored. Cheilo- and pleurocystidia 45–55 × 15–18 μm, fusoid, membrane thick-walled (up to 1.5 μm diam.), yellowish (KOH), encrusted with crystals. Caulocystidia present but not distinctive. Cuticle a cutis or a trichoderm of cylindric, slightly gelatinised hyphae (3–6 μm diam.), with yellow-brown, plasmatic pigment. Clamp connections present.

HABITAT.—On soil under *Castanopsis* and *Lithocarpus* (Fagaceae). Papua New Guinea.

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Bulolo, Manki, 1400 m, 7.IV.1972, *Horak* (ZT 72/378, holotype).

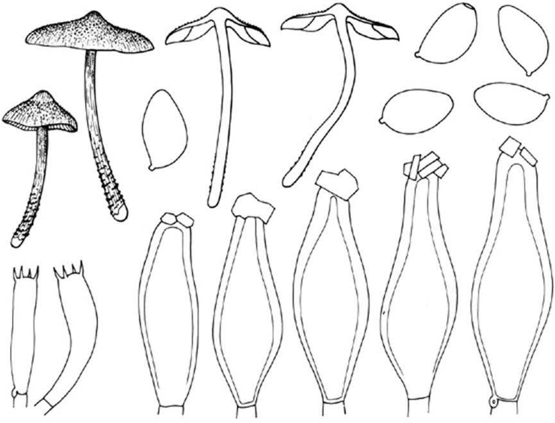

Fig. 21. *Inocybe zonatipes* Horak (type). — Carpophores, spores, basidia, cheilocystidia, pleurocystidia.

The most oustanding characters of *I. zonatipes* are the orange belts (from the persistent veil remnants) near the base of the stipe, the viscid pileus and the amygdaliform spores with often distinct callus. As in the preceding species, the yellow-brown pigment in the cuticular hyphae is dissolved in their cell sap.

Inocybe violeipes Horak, *spec. nov.*—Fig. 22

Pileo −25 mm, acuto-conico dein convexo papilla acuta instructo, ochraceo-brunneo, minute squamuloso, marginem versus e velo lilaceo obtecto. Lamellis adnatis, violaceis dein argillaceis. Stipite −40 × −4 mm, cylindrico vel subclavato, violaceo, luteolo ad basim, fibrillis violaceis e velo instructo. Odore nullo. Sporis 8.5 − 11 × 4.5–5.5 μm, amygdaliformibus, brunneis. Cheilocystidiis clavatis. Pleurocystidiis fusoideis, metuloideis, incrustatis. Ad terram in silvis fagineis. Nova Guinea. Typus: ZT 71/156.

Pileus 5–25 mm, acuto-conic when young becoming convex or expanded but always with distinct acute papilla; pale ochre-brown, margin covered with lilac fibrils from the veil; innately fibrillose or subrimose towards not striate margin, minutely squamulose, especially over disc, dry. Lamellae (L 10–14, −5) crowded, adnate to emerginate; lilac when young turning argillaceous in ageing carpophores, edge white, fimbriate. Stipe 20–40 × 1.5–4 mm, cylindric or subclavate at base; deep lilac, but white to yellowish at base; entirely appressed-fibrillose, below fibrillose lilac subpersistent cortina with several deshiscent zones of the veil (distinct in young carpophores only); dry, solid, single in groups. Context lilac, (especially in upper portion of stipe). Odour and taste not distinctive.

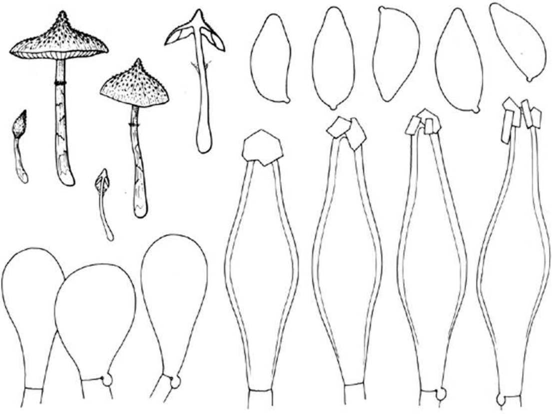

Fig. 22. *Inocybe violeipes* Horak (type). — Carpophores, spores, cheilocystidia, pleurocystidia.

Spores 8.5–11 × 4.5–5.5 µm, amygdaliform (to subfusoid), smooth, brown, membrane thin-walled. Basidia 22–28 × 7–8 µm, 4-spored. Cheilocystidia 15–35 × 9–18 µm, clavate to vesiculose, membrane thin-walled, hyaline. Pleurocystidia 50–65 × 14–20 µm, fusoid to lageniform, membrane metuloid (up to 1 µm diam.), hyaline, encrusted with crystals. Caulocystidia absent. Cuticle a cutis or trichoderm of cylindric hyphae (5–8 µm diam.), encrusted with brown pigment. Clamp connections present.
HABITAT.—On soil in forests under *Castanopsis acuminatissima* (Fagaceae). Papua New Guinea.

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Bulolo, Manki, 1250 m, 19.X.1971, *Horak* (ZT 71/156, holotype); Bulolo, Manki, 1400 m, 19.III.1973, *Horak* (ZT 73/82).

On young carpophores of *I. violeipes* lilac colours are most obvious on lamellae and in the context of the stipe. In addition the lilac coloured hyphae of the veil are visible as distinct fibrils on the margin of the pileus and as cortina (and occasionally also further appressed zones below) on the stipe. To present knowledge this species forms in Papua New Guinea ectotrophic mycorrhiza exclusively with *Castanopsis acuminatissima*.

Inocybe violaceovelata Horak, *spec. nov.*—Fig. 23

Pileo –40 mm, umbonato vel campanulato, fusco, minute squarroso. Lamellis emarginatis adnatisve, ex albo argillaceis. Stipite –55 × –5 mm, cylindrico, ad basim subclavato, pallide brunneo, zonis lilacinis e velo cingulato. Odore spermatico. Sporis 8–9 × 4–4.5 µm, ellipsoideis vel subphaseoliformibus. Cheilo- et pleurocystidiis metuloideis, incrustatis. Ad terram in silvis fagineis. Nova Guinea. Typus: ZT 73/182.

Pileus 15–40 mm, umbonate-convex to broadly campanulate; brown to fuscous; disc densely covered with small, squarrose or erect, concolorous scales, coarsely fibrillose towards estriate margin, in young specimens subpersistent, fibrillose or membranaceous remnants of the lilac veil especially near margin, dry. Lamellae adnate to broadly emarginate, ventricose, crowded; whitish to pale brown when young turning argillaceous, edge albo-fimbriate. Stipe 20–55 × 2–5 mm, cylindric, base subbulbous or swollen, not marginate; pale brown, towards base covered with numerous, persistent, fibrillose squamules and belts of the lilac veil, distinct cortina absent; dry, fibrillose, solid becoming hollow with age, single in groups. Context whitish to pale brown. Odour spermatic.

Spores 8–9 × 4–4.5 µm, ellipsoid to subphaseoliform, smooth, brown, membrane thin-walled, germ pore none. Basidia 18–26 × 7–8 µm, 4-spored. Cheilo- and pleurocystidia 35–55 × 15–22 µm, fusoid, hyaline, metuloid (–3 µm diam.), encrusted with crystals. Caulocystidia not differentiated. Gill edge also beset with short, clavate, thin-walled, hyaline cells. Cuticle a trichoderm of cylindric hyphae (4–8 µm diam.), with yellow-brown (KOH), plasmatic pigment. Clamp connections numerous.

HABITAT.—On soil in forests (under *Castanopsis* spp. and *Lithocarpus* spp.). Papua New Guinea.

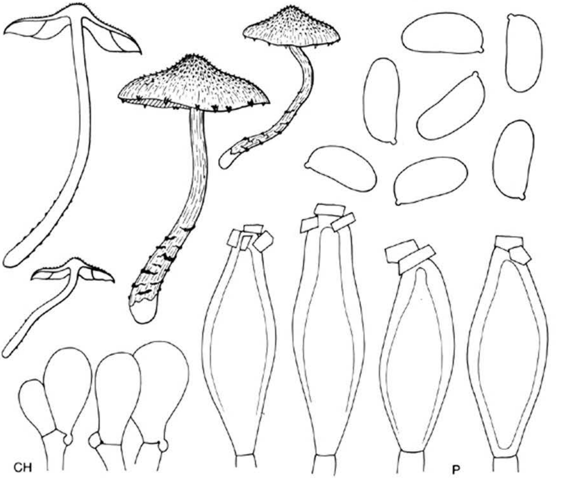

Fig. 23. *Inocybe violaceovelata* Horak (type). — Carpophores, spores, cheilocystidia (CH), pleurocystidia (P).

MATERIAL.—PAPUA NEW GUINEA: Morobe district, Bulolo, Manki, 24.IV.1973, *Horak* (ZT 73/182, holotype); Bulolo, Manki, 19.III.1973, *Horak* (ZT 73/102).

As in *I. violeipes* Horak (see above) the lilac veil remnants are the most conspicuous characters of *I. violaceovelata*, also occurring in Papua New Guinea's *Castanopsis-Lithocarpus* forests. The two species are separated by the different size, shape, and colour of the pileus and the shape of the spores which are elliptic-subphaseoliform in *I. violaceovelata*.

DOUBTFUL RECORDS AND INCOMPLETELY KNOWN SPECIES

cincinnatus. — *Agaricus (Inocybe) cincinnatus* Fr. – Cooke, Handb. Austr. Fungi 46. 1892.

Described from Victoria (Australia). No authentic material located in K.

flocculosus. – *Agaricus (Inocybe) flocculosus* Berk. – Cooke, Handb. Austr. Fungi, 47. 1892.

Reported from Victoria (Australia). Authentic collections are not kept in K. Cleland & Cheel (*1918*: 108) mention several collections of *I. flocculosa* (Berk.) Sacc. from South Australia and New South Wales. According to both authors the spores of these specimens are 'rather triangular'. The spores of the type collection—originally described from England—are, however, distinctly amdaliform.

fulvo-olivacea. — *Inocybe fulvo-olivacea* Clel. *in* Trans. R. Soc. S. Australia **57:** 192. 1933.

This small-spored species is described from South Australia. Unfortunately no type material could be located to establish its taxonomic position.

obscura. — *Inocybe obscura* (Pers. ex Pers.) Gillet. – Clel. & Cheel *in* Trans. R. Soc. S. Australia **42:** 107. 1918.

There is no material in Cleland's herbarium (ADW). According to the descriptive data this *Inocybe* is related to *I. flocculosa* (Berk.) Sacc. sensu Cooke. The two Australian collections represent probably an undescribed species yet which is closely allied to the European *I. obscura*.

EXCLUDED SPECIES

echinata. — *Inocybe echinata* (Roth) Cooke.

Reported from India by Hennings (*1901*: 332). Neither in K nor in B authentic material is deposited. This species probably is conspecific with *Lepiota* (*Melanophyllum*) *haematosperma* (Bull. ex Fr.) Quél.

gigaspora. — *Agaricus (Inocybe) gigaspora* Cooke & Mass. *in* Grevillea **18:** 3. 1889. — *Hebeloma gigasporum* (Cooke & Mass.) Sacc. *in* Syll. Fung. **9:** 102. 1892. — *Phaeomarasmius gigasporus* (Cooke & Mass.) Pegler *in* Austr. J. Bot. **13:** 333. 1965.

gomphodes. — *Agaricus gomphodes* Kalchbr. *in* Grevillea **8:** 152. 1880. — *Inocybe gomphodes* (Kalchbr.) Sacc. *in* Syll. Fung. **5:** 786. 1887.

In Kalchbrenner's original description there is no reference to the morphology of the spores and the presence or absence of cystidia. The type material (K) is in very poor condition (compare also Pegler *1965*: 334) and nothing else than the spores could be examined. These spores are: 10–13 × 5–6.5 μm, elliptic, smooth, thick-walled, dextrinoid, with conspicuous germ pore at the apical end. The combination of these characters definitely excludes the possibility that the material belongs to *Inocybe* (Fr.) Fr. Prior to Saccardo (1887) this species is also uncritically listed as '*Inocybe*' in Cooke (1892) and later again in Cleland & Cheel (*1918*: 106).

holophlebia. — *Inocybe holophlebia* Berk. apud Cooke *in* Grevillea **19:** 104. 1891 (basionym). — **Agrocybe holophlebia** (Berk. apud Cooke) Horak, *comb. nov.*

Spores 7–11 × 6.5–9 μm, ellipsoid, membrane brown, thick-walled, smooth, with broad apical germ pore. Basidia 20–28 × 10–11 μm, 4-spored. Cheilocystidia 35–50 × 15–24 μm, clavate to vesiculose, thin-walled, hyaline, often with yellow-brown plasmatic pigment or inclusion. Cuticle composed of clavate to vesiculose cells (20–35 × 12–25 μm) forming an hymeniderm. Clamp connections present.

MATERIAL EXAMINED.—INDIA: Masulipatan, XI. 1866, *E. S. Berkeley* (holotype, K).

lanuginosus. — *Agaricus (Inocybe) lanuginosus* Bull. ex Fries. — Cooke, Handb. Austr. Fungi, 46. 1892.

The spores of the authentic specimens (K, 'W.-Australia, Swan River, Nr. 229') have amygdaliform to sublimoniform spores (8–11 × 4.5–5.5 μm). Since the spores of the European *I. lanuginosa* are different in size and shape, this Australian material is misidentified.

longipes. — *Inocybe longipes* Mass. *in* Kew Bull. 1908: 4. 1908; non *Inocybe longipes* C. H. Kauffm. *in* N. Am. Fl. **10:** 248. 1924. — *Entoloma longipes* (Mass.) Horak *in* Beih. Nova Hedwigia **65:** 259. 1980.

murrayana. — *Inocybe murrayana* Clel. *in* Trans. R. Soc. S. Austr. **57:** 192. 1933. — *Astrosporina imbricata* Clel. *in* Trans. R. Soc. S. Austr. **57:** 192. 1933.

For further information see Horak (*1979*: 190).

ozes. — *Agaricus ozes* var. *crassipes* Cooke & Mass. *in* Grevillea **15:** 93. 1887. — *Collybia ozes* (Fr.) Quél. var. *crassipes* (Cooke & Mass.) Sacc. *in* Syll. Fung. **9:** 34. 1891. — *Inocybe crassipes* (Cooke & Mass.) Pegler *in* Austr. J. Bot. **13:** 342. 1965.

This Australian species ('Lake Bonney, Wehl, 22') is documented by poor type material including an illustration. There is no question that the specimens do not belong to *Collybia*. The very large, ellipsoid and yellow-brown spores are indicative for *Inocybe*; but since the fragmentary condition does not allow a thorough microscopic examination I consider Pegler's identification as doubtful.

plumosus. — *Agaricus (Inocybe) plumosus* Fries. — Cooke, Handb. Austr. Fungi, 46. 1892.

This species is reported from 'moist pine woods' (Victoria, Australia) and therefore it is in fact an introduced agaric. Unfortunately no authentic material could be found to ascertain its taxonomic position.

umbonata. — *Inocybe umbonata* Petch *in* Ann. R. bot. Gdns Peradeniya **6:** 202. 1917 (non Quél. 1876). —*Astrosporina petchii* (Boedijn) Horak *in* Persoonia **10:** 164. 1979.

A full description and illustrations of this species of *Astrosporina*, wide-spread in SE.-Asia, are published by Horak (l.c.).

victoriae. — *Agaricus (Inocybe) victoriae* Cooke & Mass. *in* Grevillea **16:** 72. 1888. — *Inocybe victoriae* (Cooke & Mass.) Sacc. *in* Syll. Fung. **9:** 101. 1891. — *Hebeloma victoriae* (Cooke & Mass.) Pegler *in* Austr. J. Bot. **13:** 347. 1965.

Little information can be extracted from the poor type material (K, 'Victoria, Australia, *F. Reader* Nr. *26*', 28.V.1887). The spores have been found to be smooth, pale yellow, slightly dextrinoid, ovoid and measure about 9–11 × 5–6.5 μm. According to these characters of the spores the specimens represent rather a taxon belonging to *Lepiota* than *Inocybe* or *Hebeloma*.

violacea. — *Inocybe violacea* Mass. *in* Kew Bull. 1899: 169. 1899.

The exsiccata preserved under this name in the Kew Herbarium ('Perak, *Ridley 2*') do not correspond with the original description of this Malaysian agaric (nom. conf.). In addition *I. violacea* Mass. (1889) is later synonym of *I. violacea* Pat. (Tab. anal. Fung. **2:** 20. 1887).

ADDENDUM TO AUSTRALASIAN SPECIES OF ASTROSPORINA
(compare Horak, *1979*)

albidipes. — *Inocybe albidipes* Clel. & Cheel *in* Trans. R. Soc. S. Austr. **42:** 107. 1918.

There is no type material in ADW. The original drawings, however, clearly indicate that this species is a representative of the genus *Astrosporina* Schroeter (*1889*).

Zusammenfassung

Aus Indomalaya und Australasien werden 23 Arten der Gattung *Inocybe* (Fr.) Fr. (1863; Agaricales) ausgeschlüsselt, ausführlich beschrieben und abgebildet. Sechzehn durch besonders auffällige morphologische Merkmale definierte Species und eine Form werden als neu vorgestellt. Die mikroskopischen (und zum Teil auch makroskopischen) Daten der restlichen sechs Taxa werden sowohl an Hand von Typus-Material als auch authentischen bzw. topotypischen Kollektionen ermittelt und diskutiert. Die neuseeländischen Arten von *Inocybe* sind schon früher (Horak, *1977*) ausfürlich beschrieben worden.

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COMPARISON OF ZYGOSPORE ORNAMENTATION IN INTRA- AND INTERSPECIFIC MATINGS IN SOME RELATED SPECIES OF MUCOR AND BACKUSELLA

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Zygospores resulting from intraspecific matings of *Mucor amphibiorum*, *M. inaequisporus*, *M. indicus*, *M. recurvus*, *M. variosporus*, *Backusella circina*, and *B. lamprospora* are compared with azygospores (zygospores) formed in matings of *Mucor amphibiorum* strain CBS 764.74 and strains of the other species by means of scanning electron microscopy. In general zygospores in interspecific matings cease to develop at an earlier stage than those of intraspecific matings. No proof could be obtained for our hypothesis that *M. amphibiorum* strain CBS 764.74 merely initiated a process of azygospore formation.

Sexuality in the Mucorales is based on the interaction of (+) and (−) thalli in heterothallic species, and on the interaction of (+) and (−) parts of the same thallus in homothallic species.

Sex specific substances are secreted by both (+) and (−), resulting in the production of sex hormones, trisporic acids, which initiate the formation of zygophores and probably also the mutual attraction prior to wall fusion and production of progametangia and gametangia. These first stages in the sexual process merely indicate that (+) and (−) interact hormonally; the reaction is mating type specific and can be induced by (+) and (−) strains of different species.

The fusion of (+) and (−) gametangia, the first step toward actual zygospore formation, is found only in matings of compatible strains of the same species. Both partners are involved in the formation of zygospores. Failure to fuse is caused not only by interspecific incompatibility, but also by physiological and environmental conditions. Partners isolated from the same source are often more prolific than partners isolated from different areas.

Occasionally a single gametangium gives riso to an azygospore. Two gametangia may be present, but in the absence of lysis of the fusion wall, an azygospore may develop from one of the gametangia. Azygospores are known in both hetero- and homothallic species, usually arising spontaneously in association with matings, rarely following induction by specifically distinct partners. Some heterothallic species have a pronounced tendency towards azygospore production in intraspecific matings, e.g. *Mucor indicus* Lendn. and *M. hiemalis* Wehmer f. *silvaticus* (Hagem) Schipper. Ling Young (*1930*) obtained an increased number of azygospores in intraspecific matings by growing one partner on a favourable medium and the other on an unfavourable one. Cutter (*1942*) studied a strain of *Zygorhynchus moelleri* Vuill. var. *agamus* Namyslowski which very infrequently produced zygospores, the majority of the zygospore-like bodies being azygospores.

Strains which produce only azygospores have been reported infrequently. *Absidia spinosa* Lendn. var. *azygospora* Boed. is an azygosporic variety of the homothallic zygosporic species

(Boedijn, *1958*). Certain heterothallic species have strains which produce only azygospores, e.g. *Mucor tenuis* Bainier (= *M. racemosus* Fres.) (Bainier, *1883*), *M. circinelloides* Tiegh. f. *azygosporus* Schipper, CBS 479.70 (Schipper, *1976*) and one strain of *Mucor indicus* Lendn., CBS 670.79, recently received for identification. '*M. globosus* Fischer, strain Naumov' was induced to produce azygospores when grown on meat peptone gelatin (Zach, *1935*). The latter strain was reported to have rough sporangiospores and is therefore probably a representative of *Mucor plumbeus* Bon. (with smooth columellae) or *M. fuscus* Bainier rather than of *M. globosus* (= *M. sphaerosporus* Hagem). Strain CBS 394.34 of *Rhizopus pseudochinensis* Yamazaki var. *thermosus* Takeda and CBS 344.29 of *R. pygmaeus* Naum. probably produced azygospores (as only one suspensor could be traced) in old slant cultures between the retracted agar and the glass. Azygospores could also be induced by inserting a slide at a sharp angle into the medium near the point of inoculation (cf. *Thermomucor* Subrahamanyam, Mehrotra & Thirum.; Schipper, *1979*). *Mucor bainieri* Mehrotra & Baijal, *in* Benjamin & Mehrotra, (*1963*), *M. azygospora* Benjamin, *in* Benjamin & Mehrotra (*1963*) and *M. ardhlaengiktus* Mehrotra & Mehrotra (*1979*) are obligate azygosporic species whose possible homo- or heterothallic counterparts are not known, although *M. ardhlaengiktus* is very similar to *M. variosporus* Schipper.

The occasional occurrence of azygospores in illegitimate contrasts was first observed by Blakeslee (*1915*). Schipper (*1978a*) found a great number of azygospores when testing interfertility among various species of *Mucor*. A few strains evoked reactions with strains of nearly all the species examined, resulting in the production of at least a few azygospores. These results motivated the present study.

The first question to be answered is which partner produces the azygospores. Is the common partner reacting to a stimulus received from the strain with opposite mating type, or are the azygospores produced by the various other strains, initiated by a stimulus from the common partner? Could both partners be reciprocally activated? When zygospores of the two partners in intraspecific matings are easily distinguished (e.g. roughened versus smooth walls, ridges versus warts) and the azygospores in interspecific contrasts show characters clearly pointing towards one of these types of zygospores, the question can be answered. Azygospores of undoubtful parentage have been induced in *Rhizomucor pusillus* (Lindt) Schipper (+) and (−) by both *Absidia corymbifera* (Cohn *in* Lichtheim) Sacc. & Trott. (Schipper, *1976*) and *A. blakesleeana* Lendn. (unpublished) of opposite mating type, in *Parasitella parasitica* (Bainier) Syd. (+) by *Mucor hiemalis* Wehmer f. *luteus* (Linnemann) Schipper (Schipper, *1978b*) and in *Gilbertella persicaria* (Eddy) Hesseltine (+) by *Rhizopus stolonifer* (Ehrenb. ex Fr.) Lind (−) (O'Donnell & *al.*, *1977*). When contrasting *Gilbertella persicaria* (−) and *Blakeslea trispora* Thaxt. (+), Hesseltine (*1960*) obtained zygospores similar to those of *Gilbertella* between parallel suspensors. If the *Gilbertella*-like zygospores were actually azygospores, then the parallel suspensors are quite extraordinary.

Unfortunately, zygospores of the *Mucor* species concerned are rather similar under the light microscope. The azygospores in the various contrasts display a wide variation in numbers and final degree of maturation. They may be rare, pale coloured and hardly ornamented when examined with the light microscope, but they can also be indistinguishable from mature

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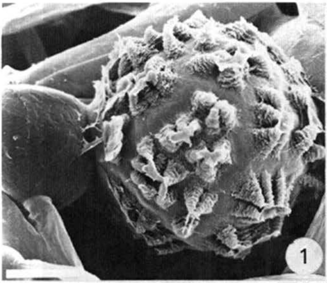
Figs. 1–4. *Mucor indicus* CBS 226.29 × CBS 422.71. — Figs. 5–6. *Mucor indicus* CBS 480.70 × CBS 423.71.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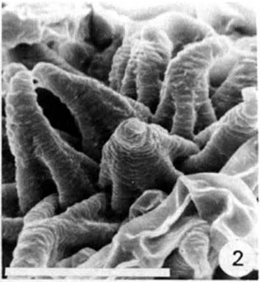
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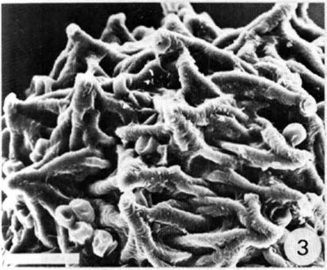
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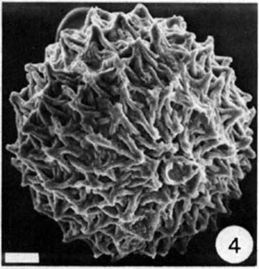
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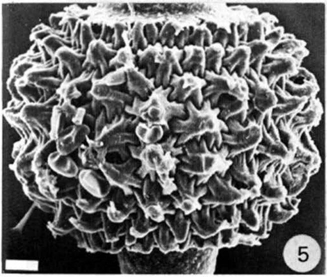
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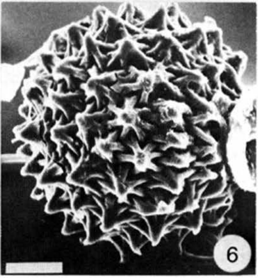
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zygospores formed in intraspecific matings. Schipper & *al.* (*1975*) demonstrated that the ornamentation of zygospores from separate species of the genus *Mucor* shows a wide variation when examined with the scanning electron microscope (SEM).

The aim of the present study is to find out whether the ornamentation of the azygospores formed in interspecific contrasts of species of *Mucor* shows a distinct tendency toward the typical (species) ornamentation of one of the individual partners or whether the ornamentation is intermediate.

Zygospores and azygospores of the matings indicated in Table I were examined with the SEM (1) to gain an insight into the variation in ornamentation of the zygospore wall in each of the species concerned, and (2) to establish any partner resemblance of azygospores from interspecific contrasts.

MATERIALS AND METHODS

The following strains of fungi were used during this study.—
Mucor amphibiorum Schipper (+): CBS 763.74; CBS 764.74;
(−): CBS 185.77.
Mucor inaequisporus Dade (+): CBS 496.66;
(−): CBS 255.36; CBS 351.50; CBS 497.66.
Mucor indicus Lendner (+): CBS 120.08; CBS 226.29; CBS 480.70;
(−): CBS 422.71; CBS 423.71; CBS 424.71.
Mucor recurvus Butler (+): CBS 318.52; CBS 195.71;
(−): CBS 992.70; CBS 196.71; CBS 673.75.
Mucor variosporus Schipper (+): CBS 651.78; CBS 652.78;
(−): CBS 837.70; CBS 650.78; CBS 654.78.
Backusella circina Ellis & Hesseltine (+): CBS 323.69; CBS 128.70
(−): CBS 322.69; CBS 129.70
Backusella lamprospora (Lendn.) Benny & Benjamin (+): CBS 195.28;
(−): CBS 196.28; CBS 850.71.

Zygospores and azygospores, obtained by mating on beerwort agar at 24 °C, were transferred to specimen studs covered with double-sided adhesive tape and air-dried. The specimens were coated with gold in a sputter coater for 3.5 min. at 1.2 KV and examined with a Leitz AMR 100A scanning electron microscope.

RESULTS

Seen under the light microscope, the zygospores of *Mucor amphibiorum*, *M. indicus*, *M. inaequisporus*, *M. variosporus*, *M. recurvus* and also of the related *Backusella circina* and *B. lamprospora* are rather similar. In each species the zygospores are black or brownish black,

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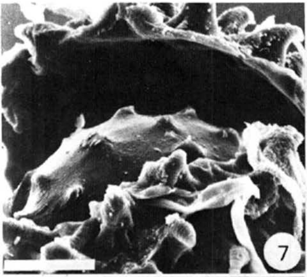
Fig. 7. *Mucor indicus* CBS 120.08 × CBS 423.71. — Figs. 8–10. *Mucor amphibiorum* CBS 763.74 × CBS 185.77. — Fig. 11. *Mucor amphibiorum* CBS 764.74 × *Mucor indicus* CBS 423.71. — Fig. 12. *Mucor amphibiorum* CBS 764.74 × *Mucor indicus* CBS 422.71.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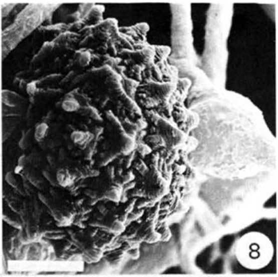
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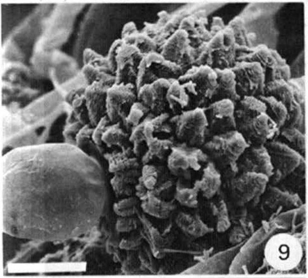
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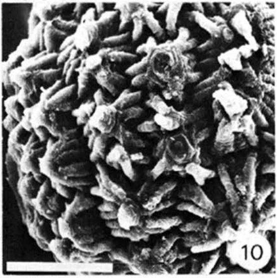
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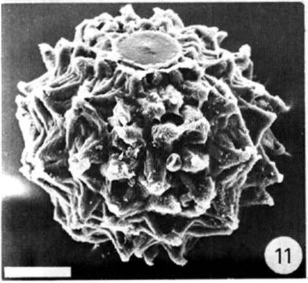
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stellate and of about the same size (up to 80–100 μm in diam., except those of *M. recurvus*, which are up to 160 μm in diam). Under a light microscope the deeply darkened mature zygospore wall disguises any later stages of ornamentation. SEM observations revealed that breakage of the gametangial wall follows a general pattern in all species. The development of this pattern, however, may stop at any stage, usually depending on the species.

TABLE I

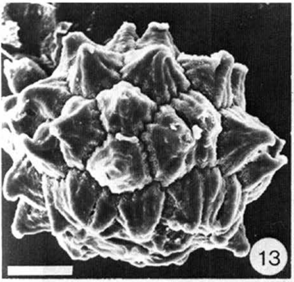
Survey of contrasts yielding sufficiently developed zygospores

+		185.77 M. amphibiorum	255.36 M. inaequisporus	351.50	497.66	422.71 M. indicus	423.71	424.71	992.70 M. recurvus	196.71	673.75	837.70 M. variosporus	650.78	654.78	322.69 B. circina	129.70	196.28 B. lamprospora	850.71
M. amphibiorum	763.74	o																
	764.74	o		X	X	X	X				X	X			X		X	
M. inaequisporus	496.66		o	o	o													
M. indicus	128.08					o	o	o										
	226.29					o	o											
	480.70					o	o	o										
M. recurvus	318.52								o									
	195.71								o	o	o							
M. variosporus	651.78											o	o	o				
	652.78											o						
B. circina	323.69															o		
	128.70														o	o		
B. lamprospora	195.28																	o

O intraspecific

X interspecific

Figs. 13–16. *Mucor variosporus*. — Fig. 13. CBS 651.78 × CBS 654.78. — Fig. 14. CBS 651.78 × CBS 650.78. — Figs. 15–16. CBS 652.78 × CBS 837.70. — Figs. 17–18. *Mucor amphibiorum* CBS 764.74 × *M. variosporus* CBS 837.70.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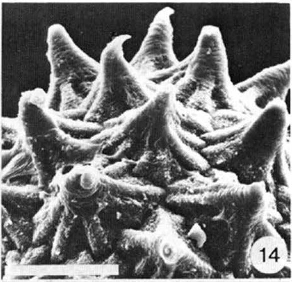
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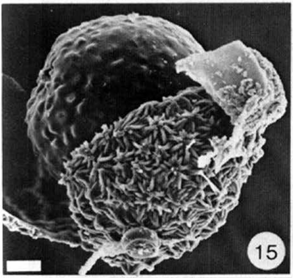
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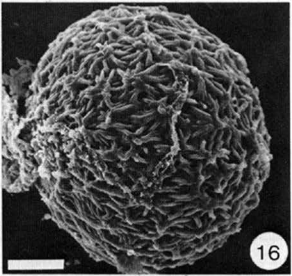
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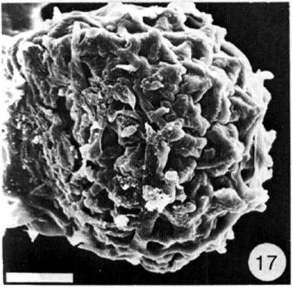
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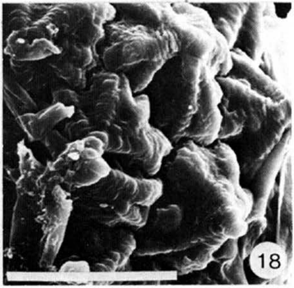
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After gametangial fusion a new zygospore wall is formed against the gametangial wall, subsequently breaking through at various places to form wart-like projections (Fig. 1). At first these warts may be more or less regularly grouped and often still connected by remnants of the old gametangial wall (Figs. 2, 8, 19), or they are isolated and regularly distributed from the very start (Figs. 30, 33), but they always become more or less regularly distributed. In this early stage the ornamentation is most spiny, i.e. here the distance from the apex to the base of the ornamentation is maximal. The warts (or spines) now start to split from the base toward the apex, resulting in 4–5 'arms', which interlock at the base (Figs. 3, 4). The division is never complete, always ending some distance from the top. Each arm may redivide, again from the base toward the top (Figs. 10, 29), though generally for a shorter distance and not through the whole width, being visible as a mere groove (Fig. 6). As the zygospore increases in size, the ornamentation becomes flattened (Figs. 16, 36), sometimes seeming nearly smooth when seen under the light microscope.

There is much variation in the final appearance of mature zygospores of *Mucor* and related genera, due to the fact that the development may stop at any stage. Moreover there is considerable variation in the degree of splitting, the length, and the length-width ratio of the arms. Within a single mating and generally within a species (exceptions will be discussed) the final stage is more or less similar, although this is not true for each individual zygospore; it is necessary to examine several zygospores of various ages. The appearance and variation of the various species is given below, followed by comparisons with interspecifically formed zygospores and azygospores of the species with *Mucor amphibiorum* CBS 764.74.

Contrasts which yielded insufficiently developed zygospores or azygospores have been omitted.

(1) *Mucor indicus* (Figs. 1–7).

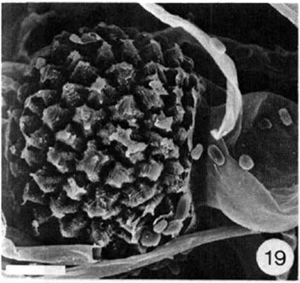
Young zygospores are stellate, warts (spines) 5–7 μm long. The ornamentation generally becomes gradually flattened, the individual arms reach up to 10 × 3 μm but are typically shorter. When well developed the zygospores ought to be classified in group A1 of Schipper *et al.* (*1975*) and not in group A2 as stated there (based on rather young zygospores). Nearly all matings examined finally showed this type of ornamentation, although the more spiny type sometimes remained dominant. Rarely flattened zygospores are found with the appearance of *Mucor recurvus* (or *Backusella lamprospora*) zygospores.

Matings with *M. amphibiorum* CBS 764.74 (Figs. 11–12) yield azygospores (zygospores) more closely resembling those of *M. indicus* than those of *M. amphibiorum*, with the restriction that the final stage with long, slender, separate arms is not found. The development stops at or before the more spiny phase. There are no warts with 8–10 arms.

(2) *Mucor amphibiorum* (Figs. 8–10).

Young zygospores are bluntly stellate, warts up to 4 μm long. Warts soon become more flattened and typically develop 8–10 arms of equal length (the primary and secondary splitting is often indistinguishable when the zygospore is mature). The arms remain rather compactly arranged and are up to about 4 × 1 μm. Sometimes warts are concrescent.

Figs. 19–22. *Mucor inaequisporus* CBS 496.66 × CBS 497.66. — Figs. 23–24. *Mucor amphibiorum* × *Mucor inaequisporus*. — Fig. 23. CBS 764.74 × CBS 351.50. — Fig. 24. CBS 764.74 × CBS 497.66.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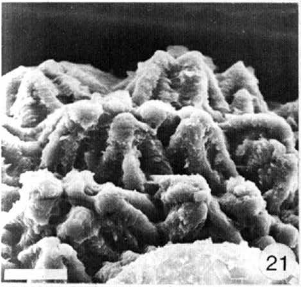
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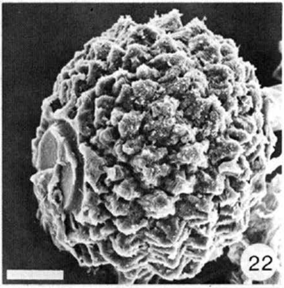
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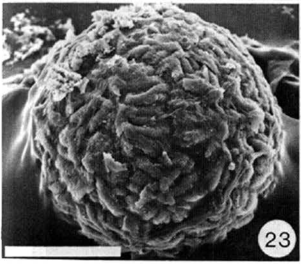
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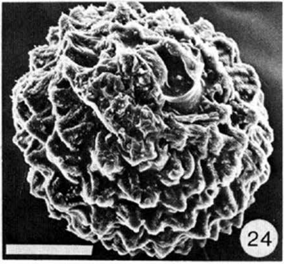
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There is some variation: matings with CBS 763.74 always show 8–10 more or less equal arms, while matings with CBS 764.74 may show dominant unequal splitting.

(3) *Mucor variosporus* (Figs. 13–16).

Young zygospores are stellate, warts up to 10 µm long, but sometimes considerably shorter (up to 6 µm). In all matings with CBS 651.78 this is the final stage; the warts may become somewhat flattened and blunt, but there are no deeply divided, slender arms. All other matings yielded zygospores of which the ornamentation became flattened and the arms long and slender (up to 5 × 1 µm).

Matings with *M. amphibiorum* CBS 764.74 (Figs. 17–18) resulted in the production of azygospores (zygospores) most like those of *M. variosporus*, and resembling the interspecifically formed azygospores (zygospores) of *M. indicus*.

(4) *Mucor inaequisporus* (Figs. 19–22).

The development of the zygospores stops at an early stage. The ornamentation is generally bluntly warted; warts up to 3 µm long, often without any sign of splitting, rarely stellate and basally split.

Mucor amphibiorum CBS 764.74 × *M. inaequisporus* CBS 351.50 (Figs. 23–24) yielded zygospores with blunt, very low warts with 8–10 arms. *Mucor amphibiorum* CBS 764.74 × *M. inaequisporus* CBS 497.66 produced azygospores (zygospores) with a very low and hardly differentiated ornamentation, though 8–10 arms could just be discerned.

(5) *Backusella circina* (Figs. 25–27).

Young zygospores have blunt, conical warts up to 6 µm long. These warts split into 4–5 arms, which usually redivide. There is normally little flattening, the arms often do not separate and are about 4–6 × 1.5 µm.

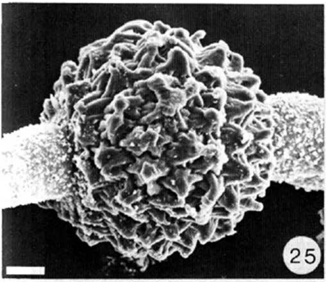
Azygospores (zygospores) produced in matings with *M. amphibiorum* CBS 764.74 (Fig. 28) develop warts with 4–5 arms, but warts with 8–10 arms are also found. The ornamentation remains low.

(6) *Backusella lamprospora* (Figs. 29–31).

The zygospore is slightly flattened between the broad suspensors. Warts are few and generally split to form 8–10(–12) about equal arms, measuring 6–10 × 1.5 µm (although zygospores with unequal arms are always found). Old zygospores may demonstrate a disrupted ornamentation with extremely long arms, caused by the increase in volume of the zygospore (and the scarcity of the warts).

Matings with *M. amphibiorum* CBS 764.74 (Fig. 32) yield azygospores (zygospores) with a low and sometimes indistinct ornamentation. The warts typically develop 4–5 arms, though warts with 8–10 arms are occasionally found.

Figs. 25–27. *Backusella circina.* — Fig. 25. CBS 128.70 × CBS 322.69. — Figs. 26–27. CBS 128.70 × CBS 129.70. — Fig. 28. *Mucor amphibiorum* CBS 764.74 × *Backusella circina* CBS 327.69. — Figs. 29–30. *Backusella lamprospora* CBS 195.28 × CBS 850.71.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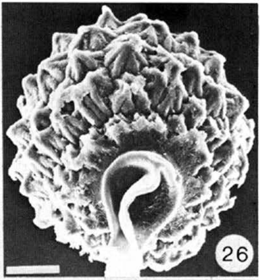
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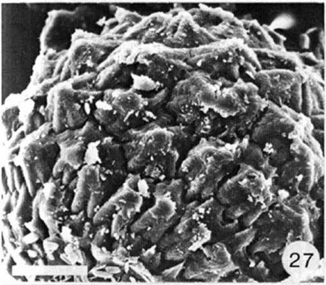
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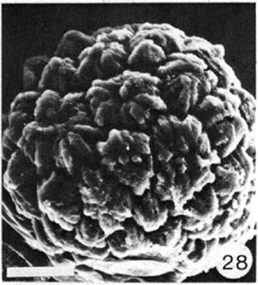
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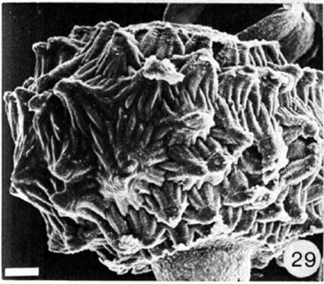
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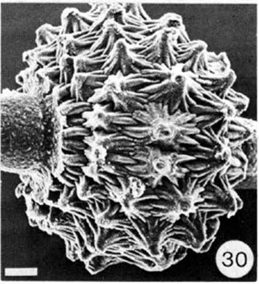
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(7) *Mucor recurvus* (Figs. 33–36).

The zygospores of *M. recurvus* are comparable to those of *B. lamprospora* in all respects. Azygospores (zygospores) produced in matings of *M. amphibiorum* CBS 764.74 with *M. recurvus* CBS 673.75 were rare and showed an indistinct ornamentation.

DISCUSSION

Interspecific matings of *Mucor amphibiorum* CBS 764.74 with strains of the other species produced azygospores (zygospores) generally resembling zygospores formed in intraspecific matings of these species, but stopping at an earlier stage in the development. This probably indicates that CBS 764.74 merely initiated azygospore production, but did not actually make a genetic contribution.

Therefore, a few other attempts were made to identify the potential parent. These experiments which are briefly summarized below, remained negative.

(1) Strains separated by a cellophane membrane, a method used by Burgeff (*1924*), did not show any reactions.

(2) Single cultures of the species concerned were grown together with *Blakeslea trispora* (+) and (−). Abundant (smooth) zygospores were produced in *Blakeslea*, indicating the presence of trisporic acids in the medium. The only detectable effect on the third partner was an orange-yellow colouring of the contacting zone of the aerial mycelium.

(3) Matings of *Circinella umbellata* produce smooth-walled zygospores. Contrasts with the *Mucor* species concerned at best resulted in the production of an orange-yellow mycelium, except in that progametangia were produced in a contrast with *M. guilliermondii* Nodson & Phillippov.

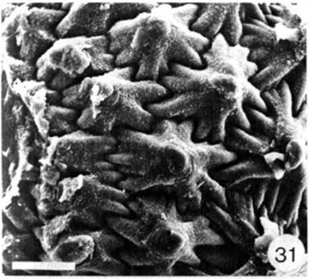
(4) *Mucor amphibiorum* CBS 764.74 (+) and *Backusella circina* CBS 322.69 (−), partners with a good mating potential, were used in a trial experiment, in which mating partners were roughly separated after two or three days.

To conclude, our results strongly suggest that *Mucor amphibiorum* CBS 764.74 induces azygospore formation in a number of species. This is an exceptional situation invoking many physiological questions, which cannot be answered without further study. Our results, combined with the occurrence of many other aberrations of patterns widely accepted as normal, tempted us to wider consideration (Schipper & Stalpers, *1980*), especially in the light of recent discoveries of mating type switching in yeasts.

ACKNOWLEDGEMENT

The authors are grateful to Miss H. Pannebakker for printing the photographs.

Fig. 31. *Backusella lamprospora* CBS 195.28 × CBS 850.71. — Fig. 32. *Mucor amphibiorum* CBS 764.74 × *Backusella lamprospora* CBS 196.28. — Figs. 33–36. *Mucor recurvus.* — Fig. 33. CBS 195.71 × CBS 992.70. — Figs. 34–36. CBS 195.71 × CBS 196.71.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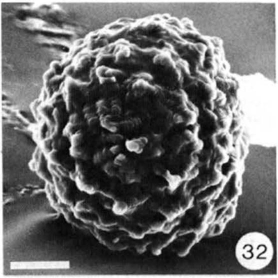
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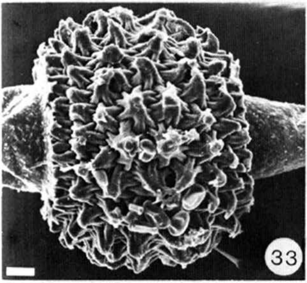
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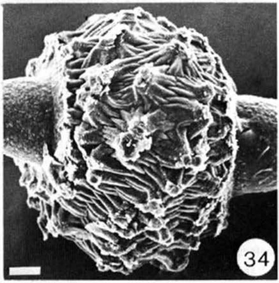
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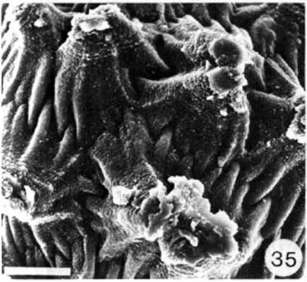
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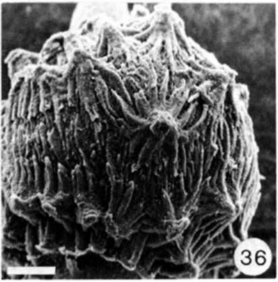
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VARIOUS ASPECTS OF THE MATING SYSTEM IN MUCORALES

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Several aspects of the sexuality in Mucorales are discussed. It is stated that neither heterothallism nor homothallism are absolute conditions and that a continuum exists between zygospores and azygospores. Mating type switching as known in ascomycetous yeasts would explain several up to now inexplicable phenomena.

The occurrence of zygospores or azygospores in interspecific contrasts in Mucorales (Stalpers & Schipper, *1980*) together with other encountered abberations of the generally accepted pattern, revived the interest of the authors in the literature on processes concerning sexual reproduction. Various aspects are treated here, followed by a discussion on the consequences of attributing to the Mucorales the system of mating type switches already known in the ascomycetous yeasts.

Heterothallism versus homothallism

Species belonging to the Mucorales are generally heterothallic. Outside the genus *Zygorhynchus* Vuill. few homothallic species are known. However, neither heterothallism nor homothallism are absolute conditions. Indications of dualism are to be found in both homothallic and heterothallic strains and species. Contrasts of homo- and heterothallic strains may result in imperfect conjugations. Homothallic strains sometimes show a preference for a particular mating type.

Satina & Blakeslee (*1930*) reported a strong reaction of two strains of the homothallic *Mucor genevensis* Lendn. to both (+) and (−) strains of heterothallic testers. They also found four strains of *Zygorhynchus heterogamus* (Vuill.) Vuill. (homothallic), which predominantly reacted with (−) strains and thus showing a (+) tendency and six strains of *Z. moelleri* Vuill. showing a (−) tendency. Werkman & van den Ende (*1974*) examined the conversion of sex-hormone precursors in the species mentioned above. Their strain of *M. genevensis* (originating from Blakeslee, but not necessarily used in Satina and Blakeslee's experiments) showed only a (−) reaction. They confirmed the (+) tendency of *Zygorhynchus heterogamus* and the (−) tendency of *Z. moelleri*. In homothallic species (+) and (−) characteristics could not always be demonstrated.

Mass inoculation is customary in mating experiments, and therefore aberrant behaviour of single spores cannot be detected. Blakeslee (*1920*) made a great number of single vegetative spore isolations from a strain of *M. genevensis* with a (−) tendency. Colonies with an aberrant appearance were studied in detail with regard to zygospore production and/or (+) or (−) tendency. The following deviations from the parent were observed:

1. Colonies with zygospore production like the parent, but with a (+) tendency toward heterothallic testers;
2. Colonies with hardly any zygospore and a (+) tendency in contrasts;
3. Colonies with hardly any zygospore and a (−) tendency like the parent.

Homothallic species with heterothallic tendencies as well as homothallic strains of typically heterothallic species have been reported. Namyslowski (*1906*) isolated a homothallic strain of *Rhizopus stolonifer* (Ehrenb. ex Fr.) Lind (= *R. nigricans* Ehrenb.). Single vegetative spore isolations produced zygosporic colonies (if grown under favourable conditions). However, the homothallic strain showed many parthenospores and incomplete conjugations. Namyslowski (*1910*) found another strain of a typically heterothallic species with a homothallic tendency, *Absidia glauca* Hagem var. *paradoxa* Namyslowski (referred to by Blakeslee *& al.* (*1927*) as *A. glauca* Hagem no. 920 (−)), which was morphologically identical with *A. glauca*, but showed incomplete conjugations in single culture. When grown with one of Hagem's mating partners of *A. glauca* (Hagem, *1908*), numerous zygospores were produced in the marginal area, while no reaction was observed to the other partner. Homothallic strains which are morphologically and physiologically indistinguishable from the heterothallic *Rhizomucor pusillus* (Lindt) Schipper but produce fully developed (mature) zygospores have been reported by Smith (*1957*), Schipper (*1969, 1978*), Scholer (*1970*) and Branner-Jørgensen & Ilum Nielsen (*1974*).

Homothallic strains were found not to be equally (+) and (−) in their response to heterothallic partners. Blakeslee *& al.* (*1927*) never found evidence of sex intergrades in heterothallic strains, though several thousands of intraspecific combinations were made. Recently, however, some indications of the occurrence of mixed (+) and (−) mating types in heterothallic strains have been found. Nottebrock *& al.* (*1974*) reported the production of zygospores in matings of certain strains of *Absidia corymbifera* (Cohn *in* Lichtheim) Sacc. & Trott. with both an accepted (+) and a (−) partner. Unmated strains did not produce zygospores. The present authors tested four of these strains, using the given medium and temperature. A few zygospores were obtained in CBS 429.75 × CBS 269.65; CBS 429.75 × CBS 582.65; and in CBS 269.65 × CBS 582.65.

Other indications of dormant ambivalency have been reported: van den Ende & Stegwee (*1971*) found that staling *Blakeslea trispora* Thaxt. (+) cultures occasionally produce small amounts of sex hormone. Since both (+) and (−) precursors are required for the production of the sex hormone, the complete enzyme system for biosynthesis was probably present. Werkman-Hoogland (*1977*) found by electrophoretical methods that methyldihydrotrisporate dehydrogenase activity is specifically found in *Mucor mucedo* L. ex Fr. (−). Occasionally, however, the same activity was also found in (+) cultures. The interpretation is, that normally this enzyme activity is suppressed in (+) strains, but that under particular circumstances this block is not absolute.

Presence of both (+) and (−) potentialities might also explain Ilum Nielsen's (*1978*) results using gamma-radiation of *Rhizomucor pusillus* (+) (the CBS tester strain). Single gamma-radiated sporangiospores were subcultured. Three (−) colonies were obtained of which two remained stable and one soon reverted to (+). Homothallic mutants were more numerous and mostly stable. Bu-Lock & Hardy (*1979*) mated the parent strain, a radiation (+) and a radiation

(−) each with *Mucor mucedo* (+) and (−). Imperfect reactions were obtained in accordance with the mating type. Trisporic acid production was demonstrated in mixed cultures of *Rhizomucor pusillus* (+) and (−), but not in separate cultures.

It can be concluded from the above evidence that neither homothallism nor heterothallism are absolute conditions, and cannot be accepted as sole characters for species distinction.

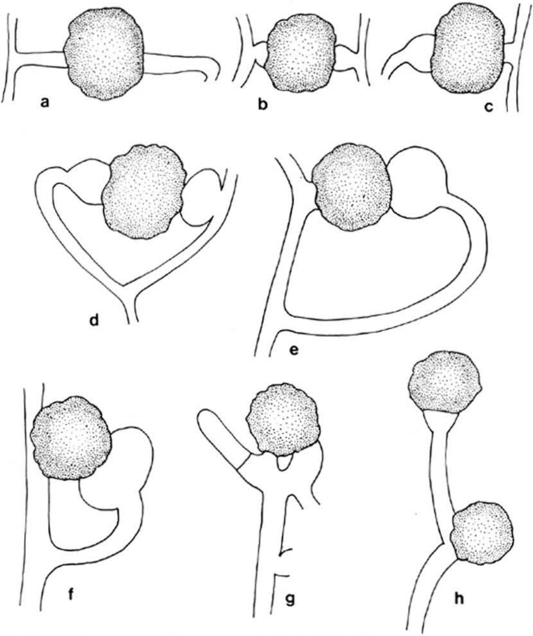

Fig. 1. Zygosporic stages. — a. *Rhizomucor pusillus*, heterothallic; *Rhizomucor pusillus*, homothallic. — b. *Mucor hiemalis*, heterothallic; *Mucor genevensis*, homothallic. — c. *Rhizopus microsporus*, heterothallic; *Rhizopus homothallicus*. — d. *Rhizopus sexualis*, homothallic. — e. *Rhizopus homothallicus*. — f. *Zygorhynchus moelleri*. — g. *Zygorhynchus japonicus*. — h. *Mucor bainieri*, azygosporic. — d., e. Occasional appearances; absence of a septum between suspensors intentional. — f. Young stage—in older stages a septum in the hypha bearing the 'smaller' suspensor is usual. (All schematic, after original drawings.)

FROM ZYGOSPORE TO AZYGOSPORE, A CONTINUUM

In heterothallic species zygospores always result from an interaction between hyphae of two strains of different mating-type, each secreting its own sex-specific substance. In homothallic species zygospores result from an interaction between two hyphae or parts of a hypha of the same strain, each secreting the same sex-specific substance as produced by heterothallic species.

In heterothallic species the two hyphae are not connected prior to copulation. In homothallic species the hyphae are connected though the distance of origin varies considerably (Fig. 1).

In homothallic strains of *Mucor* and *Rhizomucor* the copulating hyphae arise separately and independently from the substrate (Fig. 1a, b). In homothallic strains of *Rhizopus* they occasionally originate as lateral and terminal branches of the same aerial hypha (Fig. 1d, e). In *Zygorhynchus* they are typically formed by the same hypha: a straight lateral branch first recurves toward the terminal part of the main branch, from which it is usually separated by a septum. In *Zygorhynchus japonicus* Kominami copulating hyphae are close to each other and very short (Fig. 1g).

Sometimes there is no septum between conjugating parts, such that these are parts of the same cell. There is no fundamental difference between such a zygospore and an azygospore, when the processes causing zygospore formation are located not at different places in the same cell but closely adjacent, e.g. *Mucor azygosporus* R. K. Benjamin (O'Donnell *& al.*, *1977*) and *M. bainieri* Mehrotra & Baijal (Fig. 1h).

The locations of (+) and (−) nuclei, and consequently the sites of production of attracting substance, becomes less defined with decreasing distance and ultimately loose their significance altogether. In *Zygorhynchus moelleri* the terminal part of the main branch acts (−), the lateral (+). However, when the lateral fails to conjugate with the main branch, a second lateral may be formed which conjugates with the first lateral, acting (−) and producing (−) hormones (instead of the terminal branch) (Blakeslee, *1915*; Werkman, *1977*). Comparable behaviour was observed in *Absidia spinosa* Lendn. (Burgeff, *1924*).

In *Zygorhynchus*, zygospores and sporangia (with homothallic sporangiospores) occur on the same hypha. Ling Young (*1930*) figured a suspensor of *Z. moelleri* proliferating with a sporangium. In a CBS strain of *Z. moelleri*, a conjugating lateral branch was seen to produce the complete apparatus; no septum was observed (Fig. 2). Regeneration of single suspensors in homothallic species was found to produce only homothallic mycelium (Ling Young, *1930*; Callen, *1940*, inclusive a personal communication by Burgeff).

Lendner (*1908*) figured a conjugation of two appendages of the same suspensor in a cross mating of the heterothallic *Absidia orchidis* (Vuill.) Hagem.

Conclusion: the above observations imply that the location of (+) and (−) is not fixed.

LOSS OF SEXUAL REPRODUCTION

Strains presumably in the process of losing sexual reproduction are known in *Zygorhynchus moelleri* Vuill. var. *agamus* Namyslowski and *Syzygites megalocarpus* Ehrenb. ex Fr..

(A) *Zygorhynchus moelleri* (syn.: *Z. vuilleminii* Namyslowski, *Z. vuilleminii* race *agamus* Namyslowski, *Mucor saximontensis* Rall).

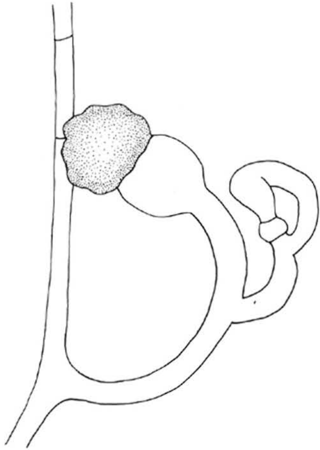

Fig. 2. Zygospore formation in *Zygorhynchus moelleri* CBS 501.66 (original drawing).

In *Zygorhynchus* all species are homothallic. However, after prolonged cultivation zygospore production may be reduced or even cease. Occasionally agamic strains of *Z. moelleri* have been isolated, e.g. *Z. vuilleminii* race *agamus* (Namyslowski, *1910*) and *Mucor saximontensis* (Rall, *1965*; Schipper, *1971*). Though zygospores were absent, or very infrequent, in single cultures of the agamic strains, they had not disappeared entirely.

Blakeslee (*1915*), Satina & Blakeslee (*1930*), found that their strains of both *Z. vuilleminii* and *Z. vuilleminii* race *agamus* each showed a (−) tendency; the small, terminal progametangium which reacted with (+) strains of *Mucor*, *Rhizopus* and *Absidia* spp., while occasionally azygospores were formed. Cutter (*1942*) noted that in *Z. vuilleminii* race *agamus* zygospores with two true suspensors were rare, the majority of zygospores developed without the presence of the smaller (−) gametangium. In the single progametangium, which later produced an azygospore, nuclei in the expanded form were present all through the development, but nuclear fusions were not encoutered. He concluded that the strain was practically impotent. Schipper (*1971*) obtained certain apparently normal zygospores with 2 suspensors, in Namyslowski's strain, through induction by (+) strains of *Mucor circinelloides* Tiegh., *M. hiemalis* Wehmer and *Backusella lamprospora* (Lendn.) Benny & R. K. Benjamin, and in '*Mucor*' *saximontensis* through induction by (−) strains of *Mucor subtilissimus* Oudem., *M. hiemalis*, and *Backusella lamprospora*. Under favourable conditions contrasted cultures of *Zygorhynchus vuilleminii* race *agamus* and *Mucor saximontensis* showed a wide line of zygospores where the colonies met.

In her investigation of sex-specific enzymes in Mucorales Werkman (*1976*) found, that in a strain of *Z. moelleri*, the terminal copulating hyphae were the apparent major site of activity of (−) enzymes.

Werkman, Smits & v. d. Ende, in Werkman-Hoogland (*1977*) could not detect any production of sex-hormones in the agamic '*Mucor saximontensis*', though the fungus was able to convert hormones added from the heterothallic *Blakeslea trispora*. In this manner, zygospores could be induced, though never in large numbers.

(B) *Syzygites megalocarpus* (Syn. *Sporodinia grandis* Link).

Ling Young (*1930*) observed repeated mitosis in the gametangia from their initiation. At the time of lysis of the fusion wall numerous nuclei were present in both gametangia, and plasma streaming was observed 'to help mix the nuclei'. Azygospores were not uncommon in Ling Young's strain. He illustrated the difficulty in determining (+) and (−) in homothallic strains, by figuring a young zygospore of *Syzygites megalocarpus* borne between suspensors originating from one hypha and in open connection with one another.

Cutter (*1942*) reviewed the literature on the nuclear cytology of *Syzygites*. Some rather controversial data were discussed. Cutter in his own studies never encountered any indication of nuclear fusion or meiosis. He speculated as to whether the stimulus of plasmogamy, instead of karyogamy, could induce 'zygospore' development (pseudosexual reproduction).

Zygospore production in this species is largely dependent on environmental factors. Werkman & v. d. Ende (*1974*) were able to induce abundant zygospores under 'naturally' unfavourable conditions, by the application of trisporic acids or the (+) and (−) precursors derived from *Mucor mucedo*. Both (+) and (−) precursors were shown to be transformed to trisporic acids.

ZYGOSPORE GERMINATION

Within the bounds of our knowledge, homothallically produced zygospores give homothallic mycelia on germination, the zygospores of heterothallic species produce germsporangia containing either (+) of (−) spores; with the exception of *Phycomyces* Kunze ex Fr., which produces (+), (−) and (+/−) spores in a single germsporangium—the (+/−) condition being only temporarly (cf. Blakeslee, *1906*; Burgeff, *1915*, *1928;* Cutter, *1942*a, *1942*b; Gauger, *1965*). Gauger (*1965*, *1966*, *1975*) germinated zygospores of *Mucor hiemalis* and obtained a few azygosporic strains which reverted to (+), (−) and azygosporic conditions. In the azygosporic strains sporangiospores proved to be large, predominantely uninucleate with large nuclei, compared to the relatively smaller, multinucleate spores with smaller nuclei of the heterothallic tester strains. The azygosporic strains are considered to be diploids, heterozygous for mating type. Gauger (*1977*) germinated immature zygospores of *Rhizopus stolonifer* and obtained bisexual strains which segregated into (+) and (−) strains. Paired suspensor isolates did not always give rise to the respective genotypes of the parents. An explanation for the exchange of features could not be given 'unless nuclear movement can occur, following meiosis, from immature zygospores into the suspensor cells'.

As mentioned earlier, Ling Young, Burgeff, and Callen found only homothallic mycelia after regeneration of single suspensors in homothallic species.

Burgeff (*1928*) and Eslava *& al.* (*1975*) stated that germsporangia in *Phycomyces* generally result from only one meiosis, while Cerda-Olmeda (*1975*) reported two meioses in each zygospore.

Olive (*in* Ainsworth & Sussman, *1965*) deduced from the results obtained by Burgeff (*1915*, *1928*) on germinating *Phycomyces blakesleeanus* Burgeff and *P. nitens* Kunze, by Köhler (*1935*) on *Mucor mucedo*, by Sjöwall (*1946*) on *Rhizopus stolonifer*, that only one member of the tetrad from meiosis survived.

NUCLEAR BEHAVIOUR

Hyphae in the Mucorales are coenocytic, as are progametangia, gametangia, and the resulting zygospores. Data in literature on the number of nuclei in sporangiospores are at variance, e.g. according to Cutter (*1942*) *Mucor hiemalis* resembles *M. genevensis*, the initials of sporangiospores in the latter being described as multinucleate blocks. Robinow (*1957*) recorded that most of the spores in *Mucor hiemalis* (+) and (−) had one nucleus, a few two. Gauger (*1975*) counted a high percentage of multinucleate sporangiospores (approx. 40–80%) in 'normal' strains of *Mucor hiemalis*, while in azygosporic strains the majority of sporangiospores were uninucleate. Storck & Morill (*1977*) reported in *Mucor hiemalis*, and also in some other *Mucor* species, predominantly uninucleate sporangiospores.

Active nuclei have changing forms and sizes (Cutter, *1942*; Robinow, *1957*; Laane, *1974*); chromosomes have never been actually seen. In actively growing parts, such as contacting progametangia, the number of nuclei increases, due to migrating nuclei with a strong cytoplasmatic flow and due to repeated nuclear division. In purely heterothallic strains, with one type of nucleus, the parts of the mycelium which become sexually active react as (+) or (−) after the mating type of the strain. In homothallic strains the nuclei seem to segregate after mating type: part of the mycelium becomes (+) and another part becomes (−), thus accomplishing a complete sexual cycle within the organism. The location of the (+) and (−) groups of nuclei, i.e. their distance, determines the type of zygospore as discussed earlier. After the breakdown of the fusion wall, the contents of the gametangia mix and the (+) and (−) nuclei generally fuse. However, Callen (*1940*) observed in *Rhizopus sexualis* (G. Smith) Callen an association of nuclei in pairs, but no fusion. This association of nuclei was also observed at points far removed from the partially dissolved fusion wall. Cutter (*1942*) was unable to determine the parental origin of such paired nuclei in several other species. Sassen (*1965*) observed paired nuclei in the progametangia of *Phycomyces blakesleeanus*, with a transmission electron microscope. Fusion of (+) and (−) nuclei could not be established.

Young zygospores contain numerous nuclei, old zygospores considerably less. The intermediate stage is uncertain as the dark zygospore wall prevents observation. The wall can be peeled off from the mature spore. No morphological evidence of meiotic division was found during zygospore formation and its dormancy (Laane, *1974*, on *Absidia glauca*).

Even less is known of the nuclear behaviour during germination of the zygospore. Burgeff (*1928*) observed that the germ tubes in *Phycomyces* contained or received large 'presumably diploid' nuclei. Cutter (*1942*) studied nuclear behaviour in 15 zygosporic Mucorales. From the number and volume of nuclei present, he—tentatively—determined time and site of 'meiosis'. He found four general patterns of development in this group of Mucorales. In zygospores of *Zygorhynchus moelleri*, *Mucor genevensis*, *M. hiemalis*, *Absidia spinosa*, *Parasitella parasitica* (Bainier) Syd., and *Blakeslea trispora* he observed fused nuclei only in the young stage (1–6 days), after that period all nuclei were unfused. In *Rhizopus stolonifer* and *Absidia glauca*, the germinating zygospore contained both fused and unfused nuclei. However, fused nuclei were not observed in the germ-tube, or in the germ sporangium. In *Phycomyces*, both 'fused' and 'unfused' nuclei occurred in germ tube and germ sporangium.

In *Zygorhynchus moelleri* var. *agamus* and *Syzygites megalocarpus*, both presumably in the process of losing 'sexual' reproduction as they lack true zygospores, fused nuclei were not encountered in any stage of the development.

TRANSPOSABLE GENES

Recently new data became available on mating type switches in ascomycetous yeasts (Herskowitz *& al. in* Loomis & Leighton, *1979*; Hicks *& al.*, *1979;* Leupold, *1980*). The phenomenon of transposable genes was described and a hypothesis developed, known as the 'cassette model'. This hypothesis allows switching of the opposite mating types a and α (homologous with + and −), which are both present on the same chromosome, though only one is expressed. The HO-gene (for homothallism) permits frequent switching, while the ho-gene normally prevents this.

In yeasts every nuclear division is expressed in an individual; homothallic strains thus consist of approx. 50% a and 50% α individuals. In the Mucorales, however, the situation is different. Supposing, that transposition of mating type also occurs in the Mucorales, then we have a coenocytic mycelium of which every cell contains a great number of nuclei. In a homothallic strain the number of the two types of nuclei will be about equal, but in heterothallic strains various models may occur. The most simple, and probably by far the most common case is the presence of only + or only − nuclei. However, although the ho-gene suppresses the transposition of the mating type, it does not prevent it in every case; this may result in an organism in which most of the nuclei have one mating type, but a minority have the other.

This hypothesis offers an explanation for some of the aberrations mentioned earlier. —

(1) It is in agreement with the statement that homothallism and heterothallism are not absolute conditions. Although it favours either a fifty-fifty distribution or the occurrence of only one type of nucleus, a different distribution is permitted.

(2) The results of Blakeslee (*1920*) are easily explained with the supposition that his original strain of *Mucor genevensis* contained a minority of nuclei with the opposite mating type.

(3) Homothallic strains of *Rhizomucor pusillus*, typically a heterothallic species, are found in nature (Schipper, *1969*), indicating that the ho-gene is relatively easily inactivated. It was therefore a suitable object for the experiments conducted by Ilum Nielsen (*1978*), in which the same effect was obtained using gamma-radiation.

(4) Homothallic species with heterothallic tendencies and heterothallic species with homothallic tendencies can be explained if the ratio of the mating type nuclei is not 1 or 0.

CONCLUSIONS

(a) Mating activity always starts in actively growing hyphae.

(b) Nutrition is very important in zygospore production.

(c) In intra-specific matings the sexual process is initiated by a strong plasmal and nuclear flow, and nuclear division.

(d) There is no proof that paired nuclei in zygospore initiation are necessarily of a mixed (+) and (−) nature; nuclei might even pair in the progametangium.

(e) The size of the nucleus is no certain indication towards diploidy or haploidy.

(f) Both (+) and (−) potentialities are probably present in each nucleus, though only one is expressed. Latent potentialities may become expressed by, for example, a strong impulse toward sexual reproduction when the mating partners are physiologically incompatible, thus resulting in the production of parthenospores. The interaction of fully active (+) and (−) factors is missing in parthenospore production; parthenospores develop later than true zygospores and are rarely fully developed.

(g) Neither homo- nor heterothallism are absolute conditions.

(h) From zygospore to azygospore is a continuum.

(i) Location of (+) and (−) in homothallic species is less fixed with decreasing distance.

(j) The theory of mating type switches offers an explanation for several 'aberrations'.

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PLEURODESMOSPORA, A NEW GENUS FOR THE ENTOMOGENOUS HYPHOMYCETE GONATORRHODIELLA COCCORUM

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The entomogenous fungus *Gonatorrhodiella coccorum* Petch is transferred to a new genus, *Pleurodesmospora*, which is characterized by erect or procumbent conidiophores with terminal and intercalary conidiogenous cells, bearing numerous minute, cylindrical conidiogenous pegs; dacryoid phialoconidia are produced in short, basipetal chains. The nomenclatural history of this fungus is reviewed and cultures isolated from spiders in Ghana are described.

When plating out *Verticillium (Cephalosporium) lecanii* during his studies on entomogenous fungi from Ceylon, Petch (*1925*) isolated an unusual contaminating fungus, which he also observed on black scale. He compared this fungus with *Gonatorrhodiella parasitica* Thaxt. and described it as *G. coccorum*. The genus *Gonatorrhodiella* Thaxt. (type species: *G. parasitica* Thaxt.) is not suited to accommodate this fungus and even Petch (l.c.) doubted about its affinity. Hughes (*1953*) synonymized *Gonatorrhodiella* with *Nematogonium* Desm. and transferred *G. parasitica* to that genus. In *Nematogonium* as circumscribed by Hughes (l.c.), Barron (*1968*) and Gams (*1976*) the holoblastic conidia are formed in acropetal sequence in chains arising synchronously from terminal and intercalary nodes of the conidiophores. The conidiogenous cells of *G. coccorum* are typically polyphialidic and the chains are basipetal.

Hansford (*1943*) observed this fungus on *Meliola* sp. in Uganda and described it in the illegitimate genus *Oospora* (Internat. Code bot. Nomencl., Art. 63) as *O. meliolae*. Gams (*1971*) transferred Hansford's fungus to *Aphanocladium* W. Gams which he then regarded as producing true phialides with several conidia on each opening. Gams (*1973*) corrected the diagnosis of *Aphanocladium* which he recognized as producing only solitary conidia on 'aphanophialides'. Hence, *A. meliolae* with catenate phialoconidia cannot be accommodated in that genus. De Hoog (*1972*) listed *G. coccorum* (syn.: *Beauveria coccorum*) amongst the species excluded from *Beauveria*.

From our recent collections, we can provide a more complete description of this fungus justifying the erection of a new genus.

Pleurodesmospora Samson, W. Gams & H. C. Evans, *gen. nov.*—Figs. 1, 2

Coloniae albae, subtiles, floccosae. Mycelium hyalinum, hyphae septatae. Conidiophora erecta vel procumbentia; rostella conidiifera numerosa in cellulis terminalibus et intercalaribus, saepe sub septis verticillata; rostella conidiifera brevia, cylindrica, catenas breves phialoconidiorum proferunt. Conidia hyalina, continua, levia, ellipsoidea ad dacryoidea, basi truncata. Teleomorphosis ignota. Species typica: *Pleurodesmospora coccorum* (Petch) Samson, W. Gams & H. C. Evans.

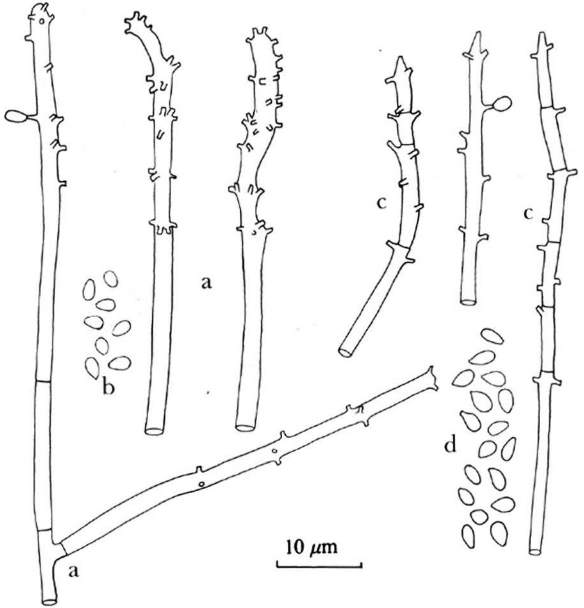
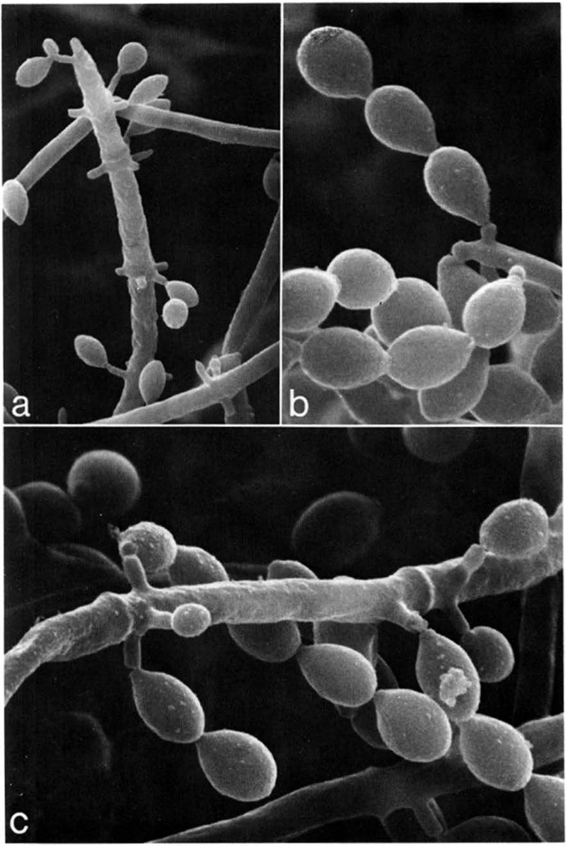


Fig. 1. *Pleurodesmospora coccorum.* — a, b. Conidiophores and conidia of type specimen. — c, d. Conidiophores and conidia of CBS 459.73 on oatmeal agar.

Fig. 2. Scanning electron micrographs of conidiogenous structures of *Pleurodesmospora coccorum.* — a. Conidiophore showing the conidiogenous pegs (× 4200). — b, c. Catenate conidia (× 8000).


a
b
c

Colonies white, thin, floccose. Mycelium hyaline, hyphae septate. Conidiophores erect or procumbent, bearing numerous minute phialidic conidiogenous pegs in terminal or mostly intercalary position, often in whorls below the septa. Conidiogenous pegs short-cylindrical, giving rise to short chains of conidia. Conidia hyaline, one-celled, smooth, ellipsoid to dacryoid with slightly truncate base. Teleomorph unknown.

Pleurodesmospora coccorum (Petch) Samson, W. Gams & H. C. Evans, *comb. nov.*

Gonatorrhodiella coccorum Petch *in* Trans. Br. mycol. Soc. **10**: 181. 1925 (basionym). — *Beauveria coccorum* (Petch) Linder *in* Lloydia **5**: 206. 1942.

Rhinotrichum album Petch *in* Trans. Br. mycol. Soc. **11**: 258. 1926.

Oospora meliolae Hansf. *in* Proc. Linn. Soc. Lond. **155**: 40. 1943. — *Aphanocladium meliolae* (Hansf.) W. Gams, *Cephalosporium*-artige Schimmelpilze: 198. 1971.

For a detailed description on insects see Petch (*1925*: 179).

Colonies on oatmeal agar attaining 4–6 cm diam. within 3 weeks at 25 °C, white, floccose, in sporulating areas becoming powdery due to the conidial masses. Vegetative hyphae smooth-walled, hyaline, 1.0–2.0 μm wide. Conidiophores erect or procumbent, hardly differentiated from the vegetative hyphae, usually branched, smooth- and thin-walled, 1.5–2.0 μm wide. Conidiogenous cells polyphialidic, terminal and intercalary, bearing numerous short-cylindrical, 1–3(–5) μm long and 0.5 μm wide conidiogenous pegs located mainly in the distal few cells of the conidiophores, in whorls often below the septa. Conidia form in disconnected short chains (3–10 conidia), one-celled, hyaline, smooth-walled, dacryoid with truncate base, 3–4 × 2.0–2.8 μm. Chlamydospores or teleomorph unknown.

HERBARIUM SPECIMENS EXAMINED.—CEYLON, on blak scale (*Aleyrodes* sp.) on mango (holotype of *Gonatorrhodiella coccorum* Petch; K). — UGANDA, on *Meliola* sp. (holotype of *Oospora meliolae* Hansf.; IMI 2693). — GHANA, on *Hemileia vastatrix* on *Coffea robusta*, *R. I. Leather*, 1958 (IMI 72340).

LIVING CULTURES EXAMINED.—CBS 458.73 and CBS 460.73, isolated from spiders on cocoa leaves, Tafo, Ghana; CBS 459.73, isolated from a spider, Begoro, Ghana, *H. C. Evans*, 1972. — CBS 471.80, isolated from scale insects on leaves of *Eugenia jambos*, Bellavista, Galapagos Islands, *H. C. Evans*, 1976.

Petch (*1931*) considered *G. coccorum* to be the same as *Rhinotrichum album* which he (*1926*) had described from a specimen of *Lecanium* sp. This synonymy was confirmed by de Hoog (*1972*) and ourselves after examination of the type material (K).

Pleurodesmospora coccorum seems to be a common fungus on arthropods. Petch (*1931*) observed it on *Lecanium*, *Aleyrodes*, aphids, and leaf-hoppers. In our studies on entomogenous fungi from Ghana it was observed on various hosts, but most often on Araneida. It was also found on scale insects from the Galapagos Islands. In a recent study on pathogens of mites in citrus grooves in Florida (Samson & McCoy, *1981*), *P. coccorum* was observed infecting the scavenger mite, *Tydeus gloveri* Ashmead. No studies have been carried out to clarify the pathogenicity of this fungus, but its occurrence on non-insect substrates (as *O. meliolae*) indicates that it may also be saprophytic or mycoparasitic.

Addendum

After this paper was submitted for publication, Dr. G. S. de Hoog drew our attention to a further synonym of *Pleurodesmospora coccorum.—Rhinotrichum depauperatum* Charles *in* Mycologia **32**: 540. 1940.

This fungus was observed on spider mites, *Paratetranychus yothersi* (McGregor), on *Eichhornia crassipes* in Florida. The conidia were indicated as measuring 2.5–3 × 1.5–2 μm, but on the type specimen (BPI 72565) we found them measuring 3.0–3.5(–4.0) × 2.0–2.5 μm, thus fitting well our circumscription of the species.

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CLADOBOTRYUM PENICILLATUM SP. NOV.

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Cladobotryum penicillatum sp. nov. was isolated from *Alnus* twigs in New Forest, Hampshire, U. K., in 1971, and from *Sebacina effusa* in the Houtribbos Forest, O.-Flevoland Polder, Netherlands, in 1980. The species has conidia intermediate in dimension between *C. varium* and *C. mycophilum*, and it differs from both species by having rather slow-growing colonies and long conidiophores with apical penicillate branching. Conidiogenesis is basipetal and retrogressive.

Species of *Cladobotryum* Nees ex Steud. have been described and revised in recent years by Gams & Hoozemans (*1970*), Matsushima (*1975*), de Hoog (*1978*), and Gray & Morgan Jones (*1980*). An apparently undescribed species has been isolated twice.

Cladobotryum penicillatum W. Gams, *sp. nov.*—Figs. 1, 2

Coloniae fere lente crescentes, post 10–14 dies ad 3 cm diam., rubrae et ochraceae, actinomycetum modo olentes. Conidiophora erecta, ad 350–450 µm alta, ad basim 10–12 µm crassa, hyalina, levia, sursum in 2–3 gradibus penicillate ramosa. Phialides 2–4 in verticillis, aculeatae, 15–25 µm longae, e 3–5 µm ad 1.5–3.0 µm angustatae, sed gradatim longitudine diminutae et apice latiore terminatae. Conidia in capitulis irregularibus siccis vel catenis imbricatis cohaerentia, cylindrico-ellipsoidea, constanter bicellularia, basi recte vel oblique apiculata et truncata, hyalina, levia, 15–20 × 6.0–8.0(–9.0) µm. Chlamydosporae catenis brevibus vel longis connexae, laterales vel intercalares, hyalinae, cellulis globosis, prolatis vel oblatis, 8–18 µm diam., parietibus 1.0–1.5 µm crassis, levibus. Teleomorphosis ignota. Typus vivus et exsiccatus CBS 407.80, lectus ad *Sebacinam effusam* (Bref.) Pat., in ligno frondoso dejecto in silva Houtribbos dicta, O.-Flevoland Polder in Neerlandia, 26 Jun. 1980, a *W. Gams*.

Colonies on 2% MEA or OA rather slow growing, reaching *c.* 3 cm diam. in 10–14 days at 20–22 °C, without further radial extension, partly deep red, partly ochreous to amber, with intensely coloured reverse; aerial mycelium velvety to floccose, ochreous, interspersed with areas of whitish conidial heads. Odour not strong, somewhat reminiscent of actinomycetes. Conidiophores erect, to 350–450 µm tall, 10–12 µm wide near the base, with about 6 septa in the unbranched stipe, hyaline, smooth-walled, penicillately branched in 2–3 stages in the upper part. Conidiogenous cells arranged in whorls of 2–4 on the metulae, awl-shaped, 15–25 µm long, tapering from 3–5 µm near the base to 1.5–3.0 µm at the tip, but shortening progressively with the opening widening to 3–4 µm and with internal wall thickening in older stages. Conidia cohering in irregular dry heads or imbricate chains, cylindrical-ellipsoidal, consistently 2-celled, with apiculate and truncate base, the apiculation straight or oblique, hyaline, smooth-walled, 15–20 × 6.0–8.0(–9.0) µm. Chlamydospores abundant after 14 days, forming short or long, lateral or intercalary chains, hyaline, with globose, elongate or oblate cells, 8–18 µm diam., wall 1.0–1.5 µm thick, smooth. Teleomorph unknown.

MATERIAL EXAMINED.—CBS 697.71, isolated from decaying twig of *Alnus glutinosa* underneath the bark, New Forest, near Lyndhorst, Hampshire, U. K., *W. Gams*, 17 Sept. 1971. — CBS 407.80, holotype, isolated from *Sebacina effusa* (Bref.) Pat. on decaying deciduous wood, Houtribbos, O.-Flevoland Polder, Netherlands, *W. Gams*, 26 June 1980.

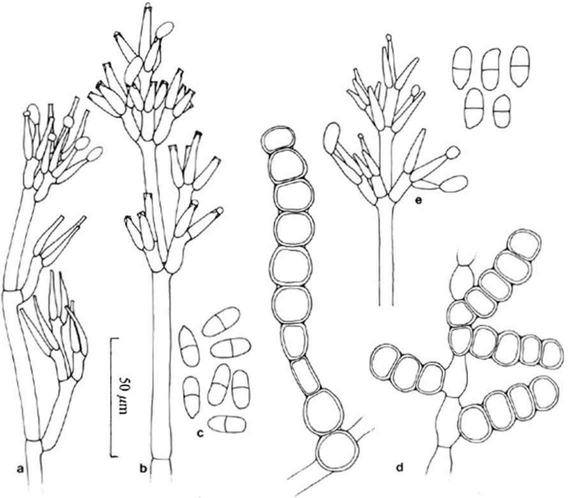

Fig. 1. *Cladobotryum penicillatum*. CBS 407.80, from 14-day-old freshly isolated culture on 2% MEA. — a. Young conidiophore. — b. Old conidiophore. — c. Conidia. — d. Chlamydospores. — e. Conidiophore and conidia from natural substrate.

Species of *Cladobotryum* tend to degenerate in culture after repeated transfer. The isolate CBS 697.71, maintained for nine years on agar media, has now lost its pigmentation and forms white colonies with slender, diffusely verticillate, not penicillate conidiophores. The conidia are somewhat narrower than in the fresh isolate (Fig. 2c). This isolate was supplied to Dr. G. T. Cole for a study of conidiogenesis; he did not consider this fungus to be distinct from *C. varium* Nees ex Duby and incorporated a drawing by the present author (fig. 5.5B, wrongly labelled *C. verticillatum*) in the book 'Patterns of development in conidial fungi' (Cole & Samson, *1979*). The same isolate was then studied by de Hoog (*1978*), who did not regard it as significantly different from *C. mycophilum* (Oudem.) W. Gams & Hoozemans (pers. comm.). Whilst the study of Gams & Hoozemans (*1970*) was mainly based on fresh isolates, de Hoog (*1978*) reexamined isolates preserved in the culture collection for several years and tried to overcome degeneration by growing them on a mushroom agar (made from shredded fruit-bodies of *Lactarius*, *Russula*, and *Boletus* species). He thus encountered some difficulties in distinguishing between the species with 2-celled conidia, *C. mycophilum* and *C. varium*, and tabulated the conidial measurements given by

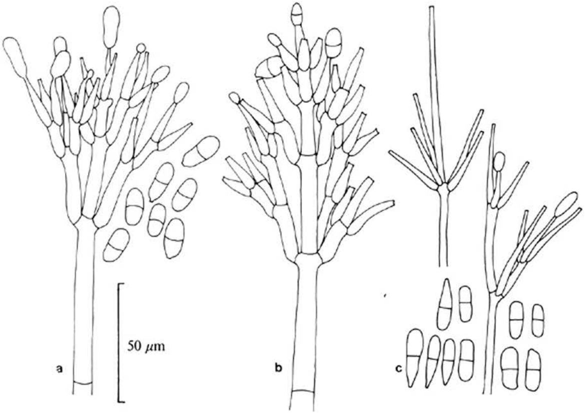

Fig. 2. *Cladobotryum penicillatum*. CBS 697.71, from freshly isolated culture on 2% MEA. — a. Young conidiophore and conidia. — b. Old conidiophore and conidia. — c. Conidiophores and conidia drawn in 1980 from 12-day-old culture on OA.

various authors for these species. A more complete comparison of fresh isolates of these two species and *C. penicillatum* is given in Table I.

As this comparison illustrates, the three taxa can reliably be distinguished on the natural substrate and in fresh isolates. The conidial measurements may show a considerable overlap as shown by de Hoog (*1978*). Consequently, the shape of conidiophores and chlamydospores appears more important than conidial sizes when discriminating between these species. The preferential substrates, polypores in *C. varium*, fleshy agarics in *C. mycophilum*, and other fungi in *C. penicillatum*, provide additional clues for their distinction.

CONIDIOGENESIS.—*Cladobotryum varium* is a well-known example of retrogressive conidiogenesis (Cole & Kendrick, *1971*; Cole & Samson, *1979*). *Cladobotryum mycophilum* did not show much change in phialide length under continuous observation (Gams & Hoozemans, *1970*), but the occurrence of broadly truncate tips in older conidiogenous cells suggests a similar mechanism being operative. *Cladobotryum penicillatum* has not been observed continuously, but the comparison of young and old conidiophores shows a very conspicuous shortening of the conidiogenous cells (Figs. 1a, 1b, 2a, and 2b). An unusual, as yet unmentioned feature of this type of conidiogenesis is the gradually increasing wall thickening inside the tip of the conidiogenous cell (Fig. 1b) which is typical of phialidic conidiogenesis. This shows that the various modes of conidiogenesis observed in the genus *Cladobotryum* as circumscribed by Gams & Hoozemans (*1970*) and de Hoog (*1978*), all anamorphs of *Hypomyces* species, are in principle not very different from phialides.

TABLE I

Comparison of fresh isolates of *Cladobotryum varium*, *C. penicillatum*, and *C. mycophilum*

	C. varium	*C. penicillatum*	*C. mycophilum*
Colony diameter in 10 days	>9 cm	*c.* 3 cm	>9 cm
Colony colour (reverse)	white to amber	red and ochreous	red to purple and ochreous
Odour	not pronounced	suggesting actinomycetes	suggesting camphor
Conidiophore branching	diffusely verticillate	apically penicillate	diffusely verticillate
Conidial size (most commonly observed range)	10.5–16 × 5–7 μm	15–20 × 6.0–8.0 (–9.0) μm	(15–)22–25(–32) × (7.5–)8.5–12 μm
Chlamydospores	1–4-celled;, cells 15–19 μm diam.	in ± long chains, rarely branched; cells 8–18 μm diam.	densely branching chains of swollen thick-walled cells, tending to form sclerotium-like clusters; cells 11–15 μm diam.

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CHAUNOPYCNIS ALBA, GEN. ET SP. NOV., A SOIL FUNGUS INTERMEDIATE BETWEEN MONILIALES AND SPHAEROPSIDALES

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Chaunopycnis alba gen. et sp. nov. is a cosmopolitan soil fungus with an unusual type of conidioma enclosed in a loosely knit wall of narrow hyaline hyphae which bear little-differentiated, branched conidiophores and cylindrical phialides at the inner surface.

Chaunopycnis W. Gams, *gen. nov.*

Coloniae albae, floccosae. Conidiomata irregulariter rotundata in mycelio aerio formantur, contextu laxo hypharum tenuium circumdata, quae intus conidiophora ramosa proferunt. E phialidibus cylindricis sursum attenuatis conidia continua oriuntur, capitulis mucidis aggregata. Species typica: *Chaunopycnis alba* W. Gams.

Colonies white, thinly floccose. Conidiomata embedded in the hyaline aerial mycelium, of irregular roundish shape, surrounded by a thin, loose weft of hyphae inwardly forming branched, indistinct conidiophores with cylindrical, distally tapering phialides and one-celled hyaline conidia aggregated in slimy heads.

Ethymology.—Greek *χαῦνοζ* = loose, *πυκνόζ* = solid, alluding to pycnidium.

Chaunopycnis alba W. Gams, *sp. nov.*—Figs. 1, 2, 3, 4

Coloniae lente crescunt, albae, in medio stratum granulosum conidiomatum formant. Conidiomata globosa vel irregularia, discreta vel confluentia, in mycelio aerio formata, 80–250 μm diam.; paries 25–50 μm crassus, e contextu laxo hypharum tenuium constans, intus conidiophora dense aggregata profert. Phialides cylindricae, in summo modice attenuatae, 3.5–10(–20) μm longae, basi 1.0–1.5 μm latae, collo 0.6–0.9 μm diam. Conidia globosa vel ovoidea, hyalina, levia, 1.5–2.0 μm diam., aggregata conidiomata replent. Conidiophora libera raro adsunt. Chlamydosporae absunt. Typus: CBS 869.73 (N8M), isolatus e terra sub *Picea abiete* in Suecia, *B. E. Söderström*, 1973.

Colonies on OA, CMA, or potato-carrot agar growing rather slowly, reaching 2.0–2.8 cm diam. after 10 days at 20 °C, white, thinly floccose, eventually (after 3–4 weeks) becoming centrally granular due to the conidiomata. Vegetative hyphae hyaline, smooth-walled, 0.8–1.5 μm wide. Conidiomata formed in the aerial mycelium (above the agar), globose or of irregular shape, discrete or confluent and then with several conidial cavities, 80–250 μm diam.; wall composed of a loose hyphal weft, 25–50 μm thick, inwardly lined by rather densely packed branched conidiophores which bear numerous phialides. Phialides cylindrical or with inflated base, slightly tapering in the distal part, 3.5–10(–20) μm long, 1.0–1.5 μm wide at the base, 0.6–0.9 μm wide at the tip, without signs of a collarette; conidia globose, hyaline, smooth-walled, 1.5–2.0 μm diam., rarely ovoid and to 3.5 μm long, aggregated in slimy heads, finally filling the cavity of the conidiomata. Similar conidiophores without surrounding hyphae rarely occur freely in the mycelium. Chlamydospores absent. Teleomorph unknown. Temperature minimum 10 °C, optimum 24–27 °C, maximum 34 °C on PCA.

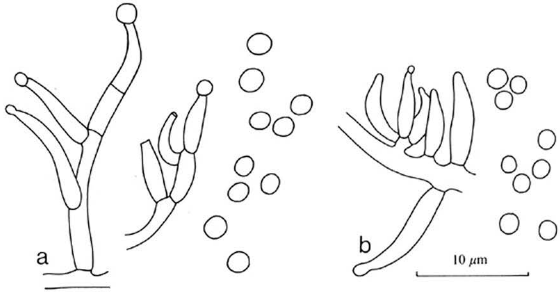


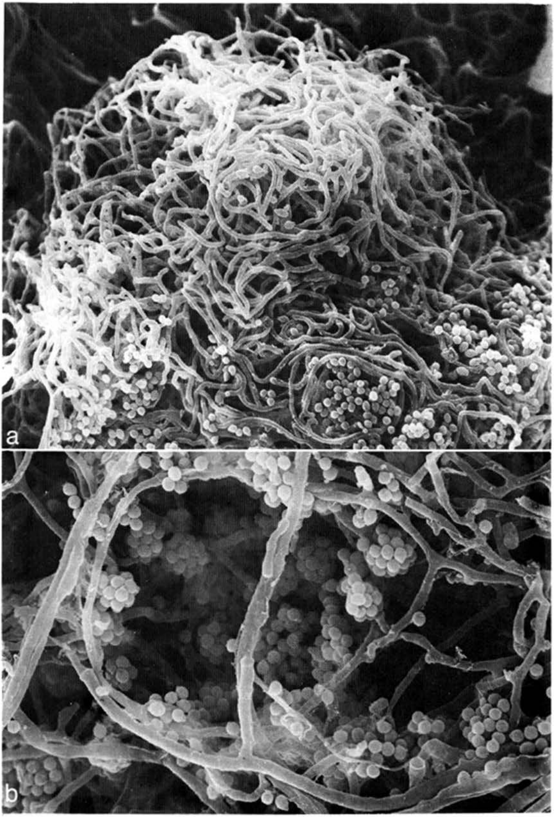
Fig. 1. *Chaunopycnis alba*, conidiophores and conidia. — a. CBS 176.75. — b. CBS 968.73C.

MATERIAL EXAMINED.—CBS 830.73 and 869.73 (type culture), ex forest soils under *Picea abies*, Sweden, *B. E. Söderström*, 1973; CBS 968.73A and B, ex agricultural soils, Wageningen, *J. H. van Emden*, 1968 and 1970; CBS 968.73C, ex greenhouse soil near Rotterdam, *J. A. Stalpers*, 1969; CBS 968.73D, ex flower buds, Edinburgh, *R. C. Warren*, 1973; CBS 478.74, ex *Inermisia fusispora* (Berk.) Rifai growing on sandy soil, National Park Hoge Veluwe, *W. Gams*, 24 March 1974; CBS 176.75, ex soil under *Hevea brasiliensis*, Sri Lanka, *S. A. R. D. Sebastian*, 1974; CBS 269.79, ex coniferous soil, Sweden, *B. E. Söderström*, 1979; 2-24, ex páramo soil under *Weinmannia*, *Clusia*, *Escallonia* etc., 3700 m alt., Parque Nacional del Puracé, Cauca y Huila, Colombia, *T. van der Hammen* and *R. Jaramillo*, July 1976; CBS 492.80A, ex burnt páramo soil, 3200 m alt., Monserrate nr. Bogotá, Colombia, *O. Vargas*, Feb. 1980; CBS 492.80B and C, ex decaying needles of *Abies alba*, France, *F. Gourbière*, Villeurbanne, 1980.

Chaunopycnis alba sporulates best on PCA and hay infusion agar, less on OA and CMA, and hardly or not at all on other currently used media. This fact and the minute sporulating structures may explain why this apparently rather common and cosmopolitan fungus has not yet been noticed by other mycologists.

The term 'conidioma' as defined by Kendrick & Nag Raj (*1979*) is undoubtedly suited to cover the structures observed in *Chaunopycnis*, though these conidiomata are difficult to characterize in conventional terms. No Coelomycete genus with such loosely knit pycnidia is known (Sutton, *1980*) and conidiophore aggregations in Hyphomycetes (sporodochia and synnemata) are not comparable with the rounded structures of *Chaunopycnis*. Nevertheless, the fungus more closely resembles a Hyphomycete than a Coelomycete. Comparable conidiomata but with different conidiogenesis and conidia are found in *Neta* Shearer & Crane (*1971*).

Fig. 2. *Chaunopycnis alba*, scanning electron micrographs of whole conidiomata, 2-24. – a. Surface of conidioma × 1400. — b. Conidia aggregated in heads and accumulating between peridial hyphae × 1800.


a
b

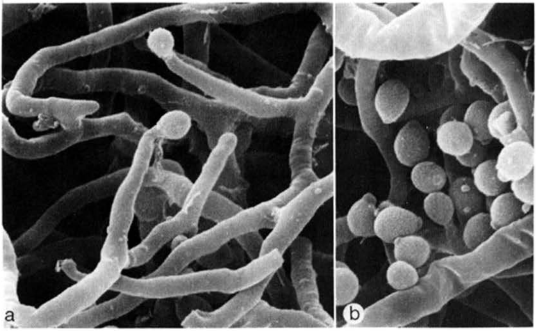


Fig. 3. *Chaunopycnis alba.* — a, b. Scanning electron micrographs of conidiophores and conidia, 2-24, × 5000.

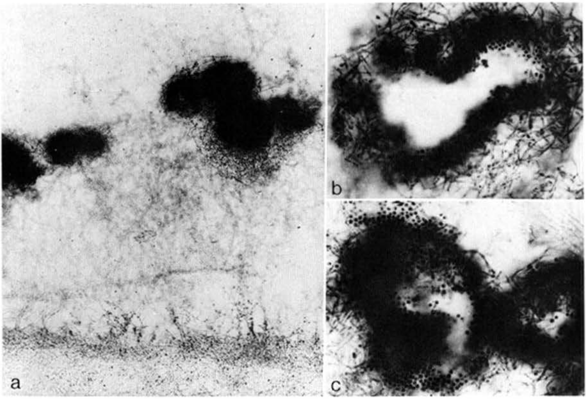


Fig. 4. *Chaunopycnis alba*, hand sections through conidiomata, stained with aniline blue, CBS 869.73. — a. Showing conidiomata situated in the aerial mycelium, agar with submerged mycelium visible underneath × 150. — b, c. Conidiomata × 400.

Macroscopically the conidiomata may be confused with ascomata of certain Gymnoascaceous fungi such as *Arachnotheca.*

In its conidiogenesis *Chaunopycnis* resembles *Tolypocladium* W. Gams (*1971*) which sporulates abundantly on all conventional media and the conidial structures of which do not tend to aggregate in conidiomata. Even under high magnification of the SEM, it is difficult to recognize a collarette in the phialides of *Chaunopycnis*, though conidiogenesis is most likely of the normal phialidic type. The conidia are minutely roughened when observed at high magnification in the SEM (Fig. 3b).

ACKNOWLEDGEMENT

I am indebted to the mycologists mentioned in the text who contributed cultures of *Chaunopycnis*. Dr. H. A. van der Aa kindly sectioned material which is illustrated in Fig. 4a–c and Miss M. Nieuwstad assisted in the SEM work.

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PERSOONIA
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TYPE STUDIES ON ENTOLOMATOID SPECIES IN THE VELENOVSKÝ HERBARIUM—II

Species described in the genera Entoloma, Eccilia, and Clitocybe

M. E. NOORDELOOS

Rijksherbarium, Leiden

In this second report on types of entolomatoid fungi in the Velenovský Herbarium at Prague* (PRC and PRM) seven of Velenovský's new species in *Entoloma*, two in *Eccilia* and one described in *Clitocybe* are treated. For each taxon microscopical characters are given, followed by a consize discussion on its status.

SPECIES DESCRIBED IN ENTOLOMA

autumnale. — *Entoloma autumnale* Velen., Novitates mycologicae: 133. 1939. — Holotype: *J. Velenovský*, 24 Sept. 1934, Mnichovice, 'in colle' (PRM 153706). — Fig. 3.

The type consists of one specimen, badly damaged by a mould, with the following microscopical characters.—Spores 7.0–8.7 × 6.5–7.6(–8.1) μm, Q = 1.0–1.05–1.2, (sub) isodiametrical 5–6–7-angled in side-view. Basidia 20–32 × 7.5–11 μm, 4-spored. Cystidia not found. Hymenophoral trama and pileitrama regular, made up of short, cylindrical or slightly inflated cells, 40–90(–130) × 8–15 μm. Covering layers impossible to study; no trace of any pigment seen.

The microscopical characters, particularly the small, isodiametrical spores, place *E. autumnale* in section *Entoloma*. The macroscopical characters given by Velenovský and the habitat agree in so many aspects with *E. prunuloides* (Fr.) Kumm. sensu Kühner (For a description see Kühner, *1977*: 457–459) that I do not hesitate in placing *E. autumnale* Velen. among the synonyms of the latter.

involutum. — *Entoloma involutum* Velen., České Houby: 616. 1921. — Holotype: *J. Velenovský*, July 1918, Roblin (PRC; bottle 440a).—Fig. 1.

The type collection contains one well preserved specimen on liquid with the following characters.—Pileus about 23 mm broad, convex with central depression and strongly involute margin. Lamellae moderately crowded, ventricose with decurrent tooth. Stipe 20 × 3 mm, straight, fibrillous. Spores 7.2–8.2(–8.7) × 6.7–7.2 μm, Q = 1.0–1.1–1.2, L–D = 0–0.8–1.5 μm, 5–6-angled in side-view, subisodiametrical. Basidia 30–42 × 9.2–13.5 μm, 2- rarely 1-spored.

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* The first report appeared in Persoonia **10**: 245–265(1979) and treated species described in *Nolanea*, *Leptonia*, and *Telamonia*.

Cystidia none. Hymenophoral trama regular, made up of broad, inflate cells, 110–220 × 13–21 μm, mixed up with 2–6 μm wide, cylindrical hyphae. Pileipellis difficult to study, most probably a thin cutis of up to 10 μm wide hyphae with minutely encrusted walls. Pileitrama regular, made up of cylindrical to inflated cells with minutely encrusted walls. Clamp-connections absent.

On account of the pigmentation and size and shape of the tramal elements *E. involutum* belongs to subgenus *Nolanea* in subsection *Cosmeoxonema*. It is closely related to *E. sericeoides* from which it differs by 2-spored basidia. *Entoloma bisporiger* (P. D. Orton) Noordeloos resembles *E. involutum* in habit and colour, but differs in having exclusively intracellular pigment and spores which are elongate in outline. Moreover the size and shape of the tramal elements make *E. bisporiger* a member of subgenus *Entoloma* (see Noordeloos, *1981a*).

microsporum. — *Entoloma microsporum* Velen., Novitates mycologicae: 140. 1939. — Holotype: *J. Velenovský*, Oct. 1938, Mnichovice, Božkov, 'in dumeto Pruni spinosae' (PRM 153702).—Fig. 2.

The type collection consists of the remnants of one carpophore, riddled by mites, with the following microscopical characters.—Spores 4.7–7.0 × 3.5–4.7 μm, ellipsoid in outline, not angular but minutely warty. Basidia 20–26 × 5–7 μm, 4-spored. Cystidia or pseudocystidia not found. Clamp-connections seen at base of basidia.

Entoloma microsporum is certainly not a species of *Entoloma* but must be ranged into the genus *Rhodocybe* Maire on account of the minutely warty spores. The bad state of the type-collection does not permit a reliable determination, as important characters for that genus, such as the possible presence, shape and chemical characters of pseudocystidia, could not be verified.

olivaceum. — *Entoloma olivaceum* Velen., Novitates mycologicae: 140. 1939. — Holotype: *J. Velenovský*, 26 Sept. 1939, Mnichovice, 'ad limum piscinae' (PRM 153703).—Fig. 6.

The type-collection consists of one specimen in relatively good state with the following microscopical characters.—Spores (8.7–)9.3–10.4 × (7.6–)8.1–8.7(–9.3) μm, Q = 1.07–1.17–1.30, L–D = 0.6–1.5–2.3 μm, 6(–7)-angled in side-view. Basidia 27–42 × 8–12.5 μm, 4-spored. Cystidia none. Hymenophoral trama regular, made up of inflated or cylindrical hyphae with cells 40–140 × 8–17 μm. Pileipellis difficult to study, probably the suprapellis damaged, subpellis a compact cutis of inflated cells, up to 120 μm long, 15–22 μm wide with brown intracellular pigment. Clamp-connections observed in hymenium and hymenophoral trama.

Entoloma olivaceum belongs to section *Rhodopolii* and is characterised by its olivaceous pileus and white stipe. Other *Entoloma* species with olivaceous pilei, such as *E. versatilis*, *E. ambrosium*, *E. icterinum*, and *E. chlorophyllum* (all belonging to other subgenera) differ among many other things in their distinctly coloured stipe.

pomaceum. — *Entoloma pomaceum* Velen., Novitates mycologicae: 139. 1939. — Holotype: *J. Velenovský*, 30 Sept. 1938, Všesimy (PRM 153707).—Fig. 7.

The type-collection consists of one specimen with the following characters.—Pileus 20 mm broad. Stipe 30 × 2–3 mm. Spores 9.3–11.5 × 8.1–10.4 μm, Q = 1.0–1.15–1.3, L–D = 0–1.5–2.4 μm, (4–)5–6-angled in side-view with blunt base. Basidia 39–46 × 9–11 μm, 4-spored. Cystidia none. Hymenophoral trama regular, made up of cylindrical cells, 65–120 × 5–11.5 μm. Pileipellis impossible to reconstruct. Pileitrama regular, made up of cylindrical to slightly inflated cells, up to 140 μm long and 5–17 μm wide, with intracellular pigment. Clamp-connections observed in the hymenium.

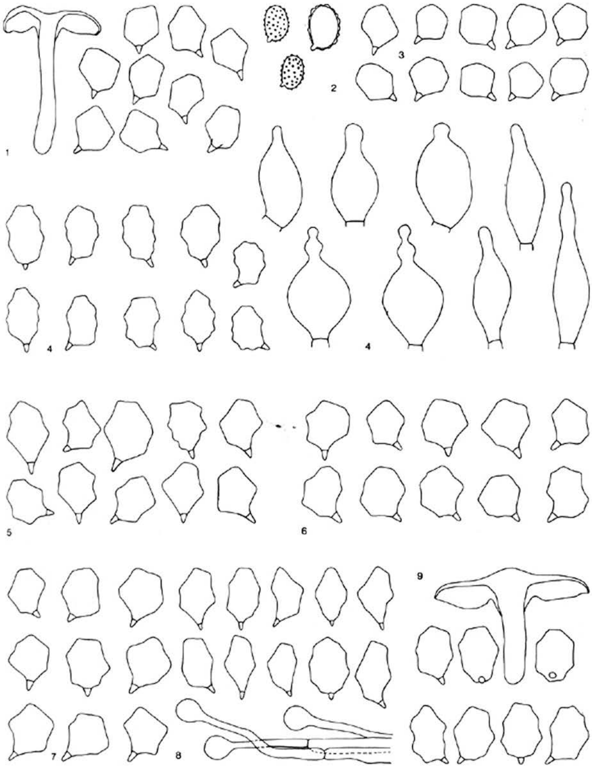

Fig. 1. *Entoloma involutum*, habit and spores. — Fig. 2. *Entoloma microsporum*, spores. — Fig. 3. *Entoloma autumnale*, spores. — Fig. 4. *Entoloma rostellatum*, spores and cheilocystidia. — Fig. 5. *Entoloma rigidulum*, spores. — Fig. 6. *Entoloma olivaceum*, spores. — Fig. 7. *Entoloma pomaceum*, spores. — Fig. 8. *Eccilia nivea*, spores and hairs of pileus. — Fig. 9. *Clitocybe opaca*, habit and spores (habit × 1; spores × 1000; cheilocystidia and hairs of pileus × 670).

Entoloma pomaceum resembles *E. ameides* in habit, pale greyish pileus, strong aromatical smell (Velenovský compared the smell with that of apples) and also more or less in size and shape of the spores. However, the pileus is said to be not hygrophanous and the colour of the stipe to turn into blue. Therefore *E. pomaceum* may key out in section *Entoloma*, close to *E. madidum* and *E. prunuloides*, which is supported by the size and the shape of the tramal elements. For the time being the status of this taxon remains obscure to me.

pustulatum. — *Entoloma pustulatum* Velen. *in* Mykologia **5**: 113. 1928. — No type material is left at PRC, nor at PRM.

rigidulum. — *Entoloma rigidulum* Velen., Novitates mycologicae: 139. 1939. — Holotype: *J. Velenovský*, July 1937, Mnichovice, 'noster hortus' (PRM 153709).—Fig. 5.

The type-collection contains two specimens, partly damaged by a mould, with the following microscopical characters.—Spores (8.7–)9.2–10.4(–11.5) × 7.6–8.7 μm, Q = 1.1–1.2–1.3, L–D = 1.2–1.5–2.7 μm, pronouncedly 6-angled in side-view, very variable. Basidia 26–40 × 7.5–10 μm, very difficult to reinflate, probably all 4-spored. Cystidia not seen. Hymenophoral trama regular, made up of cylindrical cells, 70–200 × 8–15 μm. Covering layers damaged. Pigment probably intracellular. Clamp-connections present.

The umbilicate pileus and the rigid, subcartilagineous flesh remind me of *E. politum* and related species. Particularly the size and shape of the spores are very similar to *E. caccabus*. However, according to Velenovský *E. rigidulum* does not have a hygrophanous pileus and the stipe is said to be white and striate. The size and shape of the spores of *E. rigidulum* make a close relationship with species from the *E. rhodopolium*-*E. nidorosum* complex improbable. It is not impossible that *E. rigidulum* is an older name for *E. caccabus*, but because of the condition of the type this cannot be proved.

rostellatum. — *Entoloma rostellatum* Velen., Novitates mycologicae: 139. 1939. — Holotype: *J. Velenovský*, 11 Nov. 1935, Mnichovice 'in Nardetis decliv. desertorum' (PRM 153704).—Fig. 4.

The type consists of fragments of two pilei in relatively good state with the following microscopical characters.—Spores 9.3–11.5(–12.7) × (6.5–)7.0–8.7(–9.3) μm, Q = (1.2–)1.3–1.45–1.5, L–D = 2.7–3.2–4.0 μm, rather irregularly nodulose-multiangled in side-view with blunt base (probably a basal facet). Basidia 32–45 × 11.5–14 μm, 2- and 4-spored. Cheilocystidia numerous, 30–54 × 6–25 × 3.5–7.5(–10) μm, versiform, slenderly lageniform to tibiiform or lecithiform, than often with broad, swollen basal part and elongate, slender, capitate or moniliform neck. Hymenophoral trama regular, made up of cylindrical to broadly inflated cells, 80–200 × 10–17 μm. Pileipellis an entangled layer of hyphae with numerous fusiform endcells, up to 250 μm long and 15–32 μm wide, often in bundles forming a transition to a trichodermium, with abundant, brown, intracellular pigment. Pileitrama regular, made up of cylindrical to inflated cells, 60–200 × 12–27 μm. Clamp-connections abundant in hymenium and also observed at some septa in pileipellis and hymenophoral trama.

Entoloma rostellatum belongs to subgenus *Trichopilus* and resembles *Entoloma jubatum* very much. It seems to differ, however, from the latter by the slightly more elongate and longer spores. (compare Arnolds & Noordeloos, *1980*, pl. 95, fig. b; Kits v. Waveren, *1976*: 460; Largent, *1977*: 122–123). Perhaps the presence of 2- and 4-spored basidia in the hymenium is the cause of this variability. *Entoloma pophyrophaeum* usually has spores with similar size and shape as in *E. rostellatum*, but is usually much larger and shows violaceous grey-brown tinges in pileus and stipe.

SPECIES DESCRIBED IN ECCILIA

minuta. — *Eccilia minuta* Velen., Novitates mycologicae novissimae: 81. 1947. — Holotype: *J. Velenovský*, Aug. 1944, Mnichovice (PRM 153714).

The type-collection is in a very poor state and consists of a fragment of the stipe-base of one carpophore connected with the substratum (a moss). No fragments of pileus or lamellae were found. Therefore *Eccilia minuta* remains a nomen dubium to me.

nivea. — *Eccilia nivea* Velen., Novitates mycologicae novissimae: 81. 1947. — Holotype: *J. Velenovský*, 1944, Kožený vrch, Mnichovice (PRM 153715).—Fig. 8.

The type collection consists of 4 specimens glued on a piece of blue cardboard and is partly riddled by mites; complete lamellae are not present. The following microscopical characters have been observed.—Spores (8.7–)9.2–10.8 × 6.2–7.2(–7.4) μm, Q = 1.3–1.45–1.6, L–D = 2–3.2–4 μm, (4–)5–6-angled in side-view with dihedral base. Basidia 23–40 × 12.5–13 μm, 4-spored. Cystidia none(?). Pileipellis with capitate terminal cells with capitulum up to 10 μm wide. Clamp-connections not seen.

Eccilia nivea is undoubtedly identical with *Entoloma cephalotrichum* (P. D. Orton) Noordeloos (= *Rhodophyllus molliusculus* (Lasch) sensu Kühner & Romagn.).

A SPECIES DESCRIBED IN CLITOCYBE

opaca. — *Clitocybe opaca* Velen., České Houby: 268. 1920. — Holotype: *J. Velenovský*, August. 1918, Kožený near Mnichovice (PRC, bottle 186).—Fig. 9.

The label of bottle 186 in the Velenovský herbarium at PRC bears the following note in (Velenovský's?) handwriting: '*Leptonia opacus* (Vel.) (cf. *Clitocybe opaca* Vel., p. 268. 1918)'. It contains two well preserved specimens with the following characters.—Pileus about 20 mm broad, plano-convex with faint umbo or with flattened centre, with more or less crenate margin, with villose-subsquamulose surface, particularly at centre. Lamellae L = 30–35, l = 1–3, adnate with decurrent tooth, pink with brown tinge. Stipe 20 × 3 mm, cylindrical, straight, paler than pileus. Flesh thickish. Spores (8.0–)9.3–10.3(–11.3) × 7.2–8.2 μm, Q = 1.25–1.3–1.4 (–1.55), L–D = 2.0–2.3–2.7(–3.2) μm, 6–7-angled in side-view, probably with basal facet. Basidia 34–38 × 10–14.5 μm, 4-spored. Cystidia not found. Hymenophoral trama regular, made up of inflated cells. Pileipellis a trichodermium made up of broad, inflated hyphae with repent or ascending terminal cells, 30–100 × 12–25 μm, with brown intracellular pigment. Pileitrama regular, made up of inflated cells up to 250 μm long and 12–33 μm wide with brown, intracellular pigment. Stipitepellis a cutis of cylindrical hyphae, up to 12 μm wide, without any visible pigment. Clamp-connections seen in hymenium and covering layers, but rare in trama.

'*Clitocye opaca*' belongs to section *Erophila* in subgenus *Trichopilus* and is closely related to *E. plebejum* Kalchbr. sensu Romagnesi. The description of Velenovský differs from Romagnesi's concept of *E. plebejum* in the white stipe and the decurrent tooth of the lamellee. In *E. plebejum* the colour of the stipe usually is some shade of grey-brown and the lamellae are usually emarginate. The status of *Clitocybe opaca* Velen. will be treated in a future paper on subgenus *Trichopilus* (Noordeloos, *1981b*).

NEW COMBINATIONS USED IN THE TEXT

Entoloma caccabus (Kühn.) Noordeloos, *comb. nov.* Basionym. *Rhodophyllus caccabus* Kühn. apud Kühn. & Romagn. *in* Rev. Mycol. **19:** 3. 1954 (Kühn. & Romagn., Fl. anal.: 195. 1953, nom. nud.).

Entoloma bisporiger (P. D. Orton) Noordeloos, *comb. nov.* Basionym: *Eccilia bisporigera* P. D. Orton *in* Notes Roy. Bot. Gdn., Edinb. **29**: 99. 1969.

Entoloma (Fr.) Kumm. subgenus **Trichopilus** (Romagn.) Noordeloos, *comb. nov.* Basionym: *Rhodophyllus* Quél. subgenus *Trichopilus* Romagn. *in* Beih. Nova Hedwigia **59**: 50. 1978.

Entoloma (Fr.) Kumm. section **Erophila** (Romagn.) Noordeloos, *comb. nov.* Basionym: *Rhodophyllus* section *Erophili* Romagn. *in* Bull. mens. Soc. linn. Lyon **43**: 332. 1974.

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—— (1981b). *Entoloma* subgenus *Trichopilus* in the Netherlands and adjacent regions with a reconnaissance of its remaining taxa in Europe. *In* Persoonia **11** (in prep.).

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TWO SPECIES OF ASCOBOLUS NEW TO BRITAIN

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The coprophilous *Ascobolus rhyhidosporus* sp. nov. and the wood-inhabiting *Ascobolus hansenii* Paulsen & Dissing are described from British collections.

Ascobolus rhytidosporus Brumm., *spec. nov.*—Fig. 1

Apothecia solitaria, sessilia, (0.2–) 0.3–0.6 mm diam. Receptaculum initio subglobulare vel pulvinare, denique lenticulare, hyalinum, prope basem dilute lutescenti-brunneum, laeve, immarginatum. Excipulum textura globulosa vel angulari. Asci crasse clavati, apicibus rotundatibus, (115–)120–135(–145) × 20–30(–35) μm, 8-spori, parietibus cum iodo caerulescentibus. Ascosporae ellipsoideae, (11.6–)12.1–14.4(–16.0) × (6.5–)6.8–8.4(–9.3) μm, pigmentorum stratis valde rugosis vel irregulariter vesiculosis ornatae. Paraphyses simplices vel ramosae, cylindracae, 1.8–2.5(–4.0) μm crassae, apice valde incrassatae. In fimo murinum aut in reliquis plantarum prope fimum murinum crescit.—Typus: *M. C. Clark*, Broadway, Worcestershire, Anglia, 23.II.1979 (K).

Apothecia solitary, superficial, sessile, sometimes on a narrow base, (0.2–)0.3–0.6 mm diameter, 0.2–0.4 mm high. Receptacle at first subglobose to pulvinate, becoming more expanded, finally lenticular, hyaline, pale yellowish brown near the base; surface smooth; without margin. Disc convex, hyaline, at maturity roughened by the protruding purple tips of ripe asci. Hymenium 120–140(–150) μm thick. Hypothecium scarcely differentiated, of isolated groups of thin-walled subglobular to elongated cells, 4–9 × 4–6 μm. Flesh 100–140 μm thick, of isodiametric to elongated cells 8–18 × 6–9 μm, intermingled with hyphae 2–4 μm wide, hyaline. Excipulum clearly differentiated, 30–40 μm thick, near the base up to 50 μm thick, hyaline with some pale brownish intercellular pigment near the base, consisting of subglobular or somewhat polyhedral cells (9–)15–30(–37) × (8–)12–25(–30) μm (textura globulosa to angularis). Asci broadly clavate, with a short stalk, rounded at the apex, (115–)120–135(–145) × 20–30(–35) μm, 8-spored; the wall staining blue in Melzer's reagent. Ascospores irregularly biseriate, sometimes irregularly arranged in a loose cluster, ellipsoid (length/breadth ratio 1.6–1.9, rarely 1.5 or 2.1), at first hyaline, then purplish red, becoming purplish brown at maturity, (11.6–)12.1–14.4(–16.0) × (6.5–)6.8–8.4(–9.3) μm (without ornamentation), with homogeneous contents, rather thick-walled (1.0–1.2 μm), ornamented with a strongly wrinkled or irregularly vesiculose layer (0.2–0.4 μm) of pigment; ornamentation up to 1.5 μm thick. Paraphyses septate, slender cylindrical, simple or branched, hyaline, 1.8–2.5(–4.0) μm thick, strongly swollen up to 15(–18) μm at the tip, not embedded in mucus, containing many small granules and globules especially in the terminal element.

HABITAT.—On mouse dung or debris associated with mouse dung.

ETYMOLOGY.—From Greek, *ῥυτιζ*, a fold, a wrinkle and *σπορα*, a seed: with wrinkled spores.

SPECIMENS EXAMINED.—GREAT BRITAIN: *M. C. Clark 1371*, on mouse dung, near Yarningale Common, Warwickshire, 25.IV.1973 (L); *M. C. Clark 2013*, on mouse dung, Yarningale Common, Warwickshire, 2.IV.1977 (drawing and notes only, K); *M. C. Clark s.n.*,

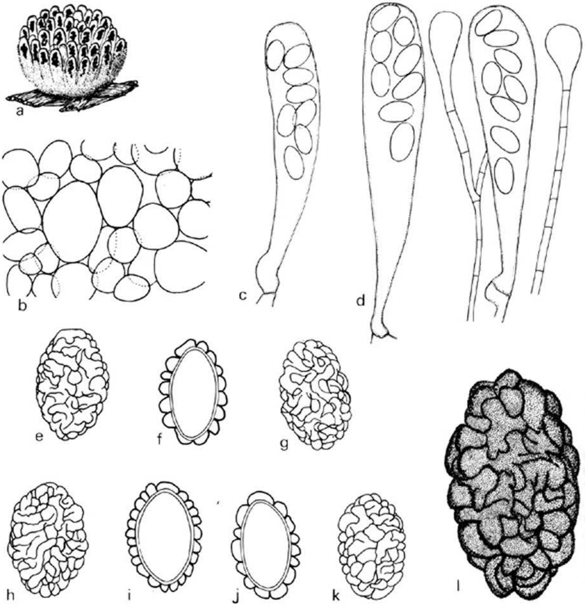

Fig. 1. *Ascobolus rhytidosporus*. — a. Habit of fruit body × 50. — b. Texture of excipulum seen from outside × 630. — c, d. Asci and paraphyses × 630. — e, g, h, k. Ascospores × 1600. — f, i, j. Ascospores in optical section × 1600. — l. Ascospore × 3200. (a, c, e-l from type of *A. rhytidosporus*; b, d from *M. C. Clark*, Weatheroak, 9.II.1980, K.).

on mouse dung, Broadway, Worcestershire, 23.II.1979 (holotype of *A. rhytidosporus*, K); *M. C. Clark s.n.*, on mouse dung, near Anchor Inn, Kerry, Montgomeryshire, 23.V.1979 (K); *M. C. Clark s.n.*, on litter associated with mouse dung, Bentley Thrift, near Bromsgrove, Worcestershire, 24.I.1980 and 21.III.1980 (K); *M. C. Clark s.n.*, on debris associated with mouse dung, Weatheroak, Worcestershire, 9.II.1980 (K); *J. T. Palmer 2306* and *2307*, on dead plant debris under a large heap of myomorphic droppings, Houghton Green, near Denton, Greater Manchester County, 8.III.1964 (L).

The distinctive ornamentation of the ascospores and the strongly inflated tips of paraphyses make this fungus a readily recognizable species.

In *Ascobolus rhytidosporus* the purplish pigment is deposited in a thin layer of uniform thickness which is strongly wrinkled or forming vesicles on the primary spore wall (Fig. 1f, i, j). This layer of pigment is only in contact with the underlying layer according to an irregular pattern of curved lines (Fig. 1e, g, h, k). As this phenomenon is constantly present from the beginning in all pigmented ascospores, it cannot be an artifact, as was presumed at first. As far as could be studied from dried specimens, the development of the pigment layer in this species is quite unique within the Ascobolaceae.

Although the variation in the shape (length/width ratio 1.53–1.83) and the measurements (12.1–13.6 × 7.0–8.4 μm) of the ascospores in the type specimen is rather restricted, some other collections (especially *Palmer 2306* and *2307*) show a wider range of variability in these characters.

This species with minute fruit bodies has been collected only from a few localities in England. It is certainly due to the special attention of the collectors that it was discovered.

The tendency of the ascospores to form irregular, loose clusters and the paragymnohymenial to eugymnohymenial ascomata justify a disposition in *Ascobolus* sect. *Pseudosaccobolus* Brumm. (van Brummelen, *1967*). In no instance were the ascospores found to be arranged in compact or regular clusters, nor were they found glued together by their pigment layers, which is characteristic of the genus *Saccobolus* Boud.

Ascobolus candidus Schroet. described from hare dung near Wrocław, Poland (Schroeter, *1893*) might be related because of the minute, smooth, white fruit bodies and the size of the ascospores, but this latter species differs in the smooth surface of the ascospores and the absence of swollen tips of the paraphyses. Since no type material of Schroeter's species seems to be in existence, it will be difficult to clarify its name.

ASCOBOLUS HANSENII Paulsen & Dissing—Fig. 2

Ascobolus hansenii Paulsen & Dissing *in* Bot. Tidsskr. **74:** 75. 1980 ('1979').

Apothecia solitary or gregarious, superficial, sessile, 0.5–1.0 mm diameter, 0.3–0.5 mm high. Receptacle at first closed and subglobular, then opening by an irregular aperture, becoming cup-shaped, finally expanding and discoid, brown to purplish brown, surface covered with rather regularly disposed warts; margin crenulate or granulose. Disc concave then flat, roughened by the protruding tips of ripe asci, yellowish, becoming purplish or brownish with age. Hymenium 150–180 μm thick. Hypothecium 15–25 μm thick, of groups of closely compacted thin-walled isodiametric cells, 4–8 μm diameter. Flesh of varying thickness of thin walled polyhedral cells 5–22 × 5–12 μm. Excipulum clearly differentiated, 30–40 μm thick, near the base up to 55 μm thick, consisting of subglobular or elongate rather thick-walled cells 9–28 × 7–21 μm (textura globulosa), with amorphous or granular brownish intercellular pigment, covered with small groups of globular cells 14–25 μm diameter with amorphous and semi-crystalline purplish-brown pigment on the outside. Asci cylindric-clavate narrower towards the base, rounded above 120–140 × 13–15 μm, 8-spored; the wall not or scarcely blue in Melzer's reagent. Ascospores biseriate or obliquely uniseriate, fusiform (length/breadth ratio 2.5–2.8(–2.9), average 2.68), at first hyaline, then violet, purplish brown at maturity, (18.6–)19.5–21.4(–22.0) × 7.4–8.4 μm (without ornamentation), with homogeneous contents, ornamented with rather broad longitudinal occasionally anastomosing lines, 3 to 5 of which are visible in each view of the spore, locally with caps or semi-globular deposits of pigment up to 2.5 μm thick. Paraphyses septate, cylindrical, simple or branched, hyaline, 1.9–2.8 μm thick, enlarged up to 7 μm at the tip, embedded in yellowish mucus (containing small yellowish crystals in dried material).

HABITAT.—On wood partly covered with algae.

SPECIMEN EXAMINED.—GREAT BRITAIN: *D. L. Hawksworth 4951*, on *Salix* wood associated with algae, Rivership L.N.R., Middlesex, 9.VI.1979 (part of IMI 239401 in K).

Ascobolus hansenii has been described recently as a new species by Paulsen & Dissing (*1980*). They reported it only from a single locality in Denmark growing on pigeon droppings. A recent acquisition of the Kew Herbarium (*Hawksworth 4951*) appears to be conspecific with the Danish fungus. There is a high degree of similarity of macroscopic and microscopic characters between both collections.

Among its relatives in *Ascobolus* sect. *Ascobolus*, *A. hansenii* can be distinguished by (i) the rather regularly disposed warts of the excipulum, (ii) the semi-crystalline purplish brown pigment on the exposed surface of excipular and wart cells, (iii) the clearly fusiform ascospores, and (iv) the pattern of spore ornamentation with rather broad longitudinal striae and locally semi-globular deposits of pigment.

A slight discrepancy between the characters of Hawksworth's collection and the Danish material is observed in the shape and the size of the ascospores, mainly due to their somewhat greater length and smaller width in the British material. A considerable variation of spore-measurements, however, is not uncommon in closely related species like *A. epimyces* (Cooke) Seaver, *A. viridis* Curr., and *A. denudatus* Fr.

According to Paulsen & Dissing (l.c.), the ascospores in the type specimen are fusiform, measuring 17.3–19.0–20.3 × 8.3–9.2–10.5 μm (with an estimated length-breadth ratio varying between 2.0 and 2.25).

In the very closely related *A. epimyces* the ascospores are fusoid or ellipsoid with pointed ends (15.5–)17.5–19.5(–20) × (6.5–)7–9(–10) μm (length-breadth ratio 2.1–2.5) and an ornamentation pattern of rather closely spaced longitudinal anastomosing lines (cf. van Brummelen, *1967*).

Ascobolus viridis is clearly distinct by the rather large, stalked apothecia and the ascospores. The latter are fusiform or ellipsoid with strongly pointed ends (23.5–)28.5–37.5 × (10–)11–14 μm (exceptionally up to 52 × 24 μm), ornamented with long or short longitudinal ridges of pigment up to 2 μm thick (van Brummelen, l.c.).

In *A. denudatus* the apothecia are sessile, often on a small base. The ascospores are ellipsoid with blunt ends (16–)18–22(–23) × (8.5–)9.5–11.5 μm and a wide variation in the pattern of ornamentation (cf. van Brummelen, l.c.).

The occurrence of ascospores with irregularly disposed, rather thick lumps or caps of pigment, is a phenomenon well-known from *A. denudatus* and somewhat less-pronounced from *A. viridis* and *A. demangei* Pat. In contrast to *A. hansenii*, where this character is constant, pustulate ascospores occur in these species only as a percentage of the total number.

Forms with pustulate ascospores have been distinguished at species-level as *Ascobolus angulisporus* Boud. and *A. pani* Velen. or at variety-level as *A. fimiputris* Quél. var. *lindaviana* P. Henn. These taxa were placed in the synonymy of *A. denudatus* (van Brummelen, l.c.) because of their ellipsoid ascospores without pointed ends and other characters.

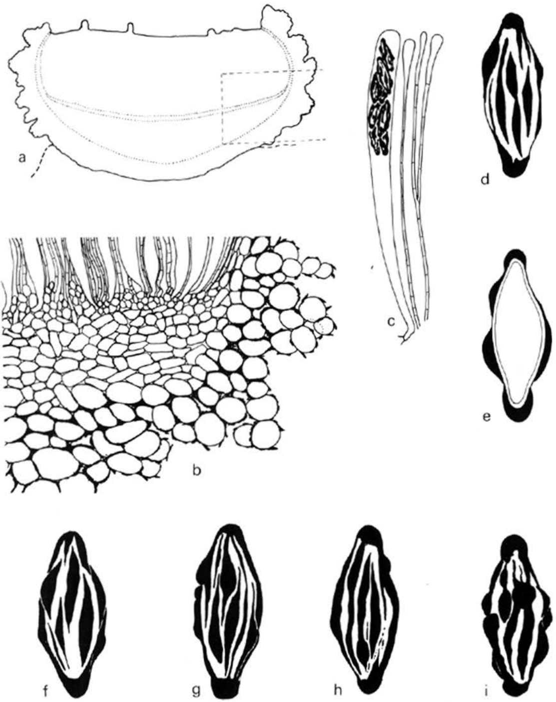

Fig. 2. *Ascobolus hansenii.* — a. Diagrammatic section of fruit body × 100. — b. Detail of median section of fruit body × 400. — c. Ascus and paraphyses × 400. — d, f-i. Ascospores × 1600. — e. Ascospore in optical section × 1600. (From *D. L. Hawksworth 4951.*)

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The author is indebted to both Mr. J. T. Palmer and Mr. M. C. Clark for sending him their collections; Mr. B. M. Spooner is acknowledged for his interest and the loan of specimens from the Herbarium of the Royal Botanic Gardens at Kew.

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STUDIES IN MYCENAS—15

A tentative subdivision of the genus Mycena in the northern Hemisphere

R. A. MAAS GEESTERANUS

Oegstgeest

The genus *Mycena* is subdivided into 23 sections, three of which are further subdivided into subsections. A number of these sections are described as new or proposed as new combinations, as follows. *Mycena* sect. *Luculentae* (with the subsections *Elegantes*, *Rosellae*, and *Pterigenae*), *M.* sect. *Polyadelphia*, *M.* sect. *Monticola*, *M.* sect. *Cinerellae*, *M.* sect. *Intermediae*, *M.* sect. *Pudicae*, *M.* sect. *Rubromarginatae*, subsections *Purae* and *Violacellae* (of sect. *Calodontes*), subsections *Hiemales* and *Omphaliariae* (of sect. *Hiemales*).

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PREFACE, ACKNOWLEDGMENTS

Perhaps it is no exaggeration to state that great effort is involved in finding one's way in the genus *Mycena*. Of course, there are two excellent monographs, by R. Kühner (*1938*) and A. H. Smith (*1947*), while much and useful work has been done by such authors as J. E. Lange, P. Konrad & A. Maublanc, R. Singer, and several others. But, none the less, the difficulties remained. Some of these difficulties, I am convinced, originate from the fact that as far as the subdivision of the genus is concerned every author seemed to speak a mycologically different language. Inevitably, this resulted in a great many synonyms which to sort out has been the aim of the present paper.

In order to remove all doubts, the genus *Mycena* in this paper is largely taken in the sense and circumscription as given by Singer (*1975*). I also followed to some extent his taxonomic arrangement. However, as is apparent from the subtitle of this paper, the names of the subgeneric taxa accommodating the species of *Mycena* of the southern Hemisphere have been left out of account. Even with my field confined within so much narrower limits, I have not been able to assign every single species to its proper place.

It is to be regretted that because of belated delivery of the Bull. mens. Soc. linn. Lyon I have been unable to take into account the part on *Mycena* in Kühner's series entitled 'Les grandes lignes de la classification des Agaricales'. The instalments published in 1979 were received after I had completed my manuscript.

I owe a great debt to the late Dr. M. A. Donk whose preliminary work on subdivisional names in *Mycena* stored away in his card index saved me many months of patiently combing the literature; in many cases I have followed his suggestions as to the choice of lectotypes. Special thanks are given to Dr. M. Svrček (Praha) for the gift of some of Velenovský's works. Acknowledgment is also made to the Director of the 'Rijksherbarium' for providing working facilities.

KEY TO SECTIONS AND SUBSECTIONS

1. Pileus viscid, hyphae of pileipellis forming a gelatinous, separable layer.
   2. Basidiomata with bluish or blue-green colours, usually at the base of the stipe, sometimes also at the margin of the pileus:. . . . . § *Viscipelles*, p. 98
   2. Basidiomata without bluish colours.
      3. Cheilocystidia smooth or forked to somewhat branched, or apically with few excrescences.
         4. Lamellae remaining attached to the stipe. Stipe without basal disc.
            5. Pileus glabrous. Spores pip-shaped: . . . . § *Caespitosae*, p. 110
            5. Pileus puberulous to tomentose. Spores elongate to almost cylindrical: § *Calamophilae*, p. 111
         4. Lamellae free or stellately seceding from the stipe. Stipe with more or less pronounced, pubescent basal disc: . . . . § *Basipedes*, p. 97
      3. Cheilocystidia with numerous, shorter or longer and variously shaped, often contorted excrescences.
         5*. Basidiomata with yellowish, more rarely purplish, colours. Lamellae ascending, decurrent with a tooth: . . . . § *Hygrocyboideae*, p. 109
         5*. Basidiomata with brownish, more rarely whitish, colours. Lamellae arcuate to more or less horizontal: . . . . § *Fuliginellae*, p. 110
1. Pileus dry or moist, in some cases becoming lubricous, but pileipellis not separable as a gelatinous layer.
   6. Basidiomata growing on woody substrata. Pileus with granular to floccose surface, white to greyish, densely covered with vesiculose to elongate, diverticulate cells. Lamellae ascending, narrowly adnate: § *Sacchariferae*, p. 96
   6. Basidiomata differently characterized.
      7. Entire pileus brightly coloured (bright pink, orange, red; not yellow or white). Stipe not brownish. Odour, on drying, not of iodoform. Spores amyloid.
         8. Lamellae subhorizontal, broadly adnate. Pleurocystidia present. Pileipellis somewhat gelatinized: . . . . § *Luculentae-Rosellae*, p. 102
         8. Lamellae ascending-uncinate. Pleurocystidia absent. Pileipellis not gelatinized: § *Luculentae-Pterigenae*, p. 102
      7. Differently characterized.
         9. Stipe bright pink. Spores hardly, if at all, amyloid. Cheilocystidia diverticulate. Pleurocystidia absent. Pileipellis somewhat gelatinized (but not separable): . . . . § *Monticola*, p. 103
         9. Differently characterized.
            10. Spores practically always amyloid; where spores are (or seem to be) non-amyloid, lamellar trama stains vinaceous to purplish brown in Melzer's reagent.

11. Lamellae with the edge of a different colour (deep yellow, pinkish brown, red-brown, purplish brown, olive brown, blackish, dark greenish) and usually more intensely coloured than the sides, except in one case where the stipe is deep yellow throughout. Lamellae ascending, not tinged purplish on the sides. Stipe not exuding red juice when cut. Cheilocystidia either smooth or somewhat branched or variously covered with long and often contorted excrescences. Hyphae of the pileipellis usually diverticulate. § *Rubromarginatae*, p. 106

11. Differently characterized.

12. Lamellae with the edge yellow, orange, orange-red, or purplish brown.

13. Cheilocystidia more or less densely, only apically, and usually very regularly covered with warts or longer excrescences (cheilocystidia with long, irregularly shaped and/or branched excrescences being rare and always mixed with the usual warted kind). Lamellae ascending: § *Luculentae-Elegantes*, p. 101

13. Cheilocystidia smooth. Lamellae more or less horizontal, tinged purplish. Hyphae of the pileipellis smooth: . . . § *Calodontes-Marginatae*, p. 112

12. Lamellae with the edge concolorous with the sides or paler to whitish.

14. Cheilocystidia apically, more rarely ventrally, covered with shorter or longer excrescences; the former (shorter) kind usually very numerous, the latter often variously shaped, branched and/or contorted.

15. Spores pip-shaped.

16. Cheilocystidia with apical excrescences.

17. Basidiomata small to minute, growing on non-woody stems or dead leaves. Stipe insititious or with mycelial filaments radiating from the base: . . . . § *Polyadelphia*, p. 103

17. Differently characterized.

18. Lamellae ascending; edge convex.

19. Stipe fragile. Cheilocystidia as a rule densely and regularly covered with warts or somewhat longer (but mostly narrow) excrescences: . . § *Filipedes*, p. 99

19. Stipe rigid or elastic-tough. Cheilocystidia sparingly to moderately covered with variously shaped, not infrequently branched and contorted excrescences: § *Mycena*, p. 100

18. Lamellae horizontal to arcuate-decurrent; edge in some species more pronouncedly concave than in others: § *Cinerellae*, p. 104

16. Cheilocystidia with warts or longer excrescences usually in the ventral part: . . . . § *Intermediae*, p. 104

15. Spores spherical or almost so: . . . . § *Supinae*, p. 98

14. Cheilocystidia smooth, not infrequently apically attenuated to form a neck, sometimes with a furcate neck, or somewhat branched or with few prominent excrescences.

20. Basidiomata small, fragile, white. Pileus and stipe puberulous. Lamellae horizontal to somewhat arcuate: . . . . § *Pudicae*, p. 105

20. Differently characterized.

21. Lamellae ascending.

22. Stipe exuding a watery, milky or coloured juice when cut: § *Lactipedes*, p. 108

22. Stipe not thus characterized: . . . § *Fragilipedes*, p. 106

21. Lamellae more or less horizontal, mostly tinged lilac to purplish. Stipe not exuding a copious juice when cut. Hyphae of the pileipellis smooth.

23. Spores amyloid. Edge of the lamellae smooth to fimbriate: § *Calodontes-Purae*, p. 112
23. Spores non-amyloid. Edge of the lamellae coarsely corroded-crenate: . . . . § *Calodontes-Violacellae*, p. 112

10. Spores non-amyloid. Lamellae not flesh-coloured or violaceous. Lamellar trama not staining vinaceous in Melzer's reagent or only weakly reddish.
    24. Pileus whitish, generally tinged brownish, never violaceous, centrally sometimes very dark; exceptionally pure white but then pileus not hygrophanous.
        25. Lamellae ascending, edge convex:. . . . . . . § *Hiemales-Hiemales*, p. 114
        25. Lamellae more or less horizontal to arcuate, edge concave: § *Hiemales-Omphaliariae*, p. 115
    24. Pileus brightly coloured (yellow, orange, red, pink, pure white), hygrophanous, at least in the white forms.
        26. Hyphae of the stipe continuous with those of the pileus: . § *Adonideae*, p. 112
        26. Hyphae of the stipe abruptly distinct from those of the pileus: § *Aciculae*, p. 114

SYNONYMY AND DESCRIPTIONS OF THE SUBDIVISIONS

MYCENA (Pers. ex Fr.) S. F. Gray

Agaricus [sect.] *Mycena* Pers., Tent. Fung. Suppl.: 69. 1797. — *Agaricus* sect. *Mycena* Pers., Syn. meth. Fung.: xvi, 375. 1801. — *Agaricus* trib. *Mycena* Pers. ex Fr., Syst. mycol. **1**: 9, 140. 1821. — *Mycena* (Pers. ex Fr.) S. F. Gray, Nat. Arr. Br. Pl. **1**: 619. 1821. — Lectotype (Donk, *1962*: 190): *Mycena galericulata* (Scop. ex Fr.) S. F. Gray.

Basidiomata small to large, of mycenoid or omphalioid habit, more rarely collybioid. Pileus glabrous, granular, floccose, puberulous, or pruinose, sometimes covered with a gelatinous, separable pellicle. Lamellae ascending, horizontal or arcuate, almost free or narrowly adnate to decurrent. Stipe fragile to cartilaginous or elastic-tough, in part or entirely pruinose or puberulous, or glabrous, sometimes dilated below to form a basal disc, often basally covered with long, coarse fibrils. Basidia 2- or 4-spored. Spores usually pip-shaped, less frequently almost cylindrical or spherical, generally amyloid, more rarely non-amyloid. Cheilocystidia clavate, obpyriform, fusiform, lageniform or, more rarely, cylindrical, smooth, branched or with variously shaped, simple or branched excrescences. Pleurocystidia numerous, scarce or absent. Hyphae of the pileipellis diverticulate, less frequently smooth. Lamellar trama staining vinaceous to purplish brown in Melzer's reagent, in a few cases remaining unaltered.

1. Sect. SACCHARIFERAE Kühn. ex Sing.

Mycena [sect.] *Sacchariferae* Kühn., Genre *Mycena*: 159, 205. 1938 (not val. publ.: no Latin descr.); Sing. *in* Annls mycol. **41**: 137. 1943 (formally accepted as section; not val. publ.: no Latin descr.); *Mycena* sect. *Sacchariferae* Kühn. ex Sing. *in* Sydowia **15**: 65. 1962. — *Mycena* subsect. *Sacchariferae* (Kühn.) Métrod *in* Prodr. fl. mycol. Madagasc. **3**: 19, 21, 26. 1949 (not val. publ.: no Latin descr.). — Lectotype (Sing., *1951*: 356): *Mycena tenerrima* (Berk.) Quél.

Pseudomycena Cejp *in* Publ. Fac. Sci. Univ. Charles **104**: 138, 157. 1930. — *Mycena* subgen. *Pseudomycena* (Cejp) A. H. Smith, N. Am. spec. *Mycena*: 38, 44. 1947. — Lectotype (Donk, *1962*: 254): *Mycena tenerrima*.

Mycena sect. *Tenerrimae* A. H. Smith, N. Am. spec. *Mycena*: 38, 44, 45. 1947 (not val. publ.: no Latin descr.). — Lectotype (Donk, unpublished): *Mycena tenerrima*.

Mycena stirps *Tenerrima* A. H. Smith, N. Am. spec. *Mycena*: 38. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena tenerrima*.

Basidiomata delicate, never blue. Pileus not gelatinizing, powdered with vesiculose cells which are covered with warts or minute cylindrical excrescences. Lamellae ascending. Stipe covered with hairs below or somewhat woolly, with slightly incrassate base or widened into basal disc. Basidia 2- or 4-spored. Spores amyloid. Cheilocystidia clavate to fusiform, covered with warts or minute cylindrical excrescences.

SPECIES.—*Mycena nucicola* Huijsm., *M. osmundicola* J. E. Lange, *M. tenerrima* (Berk.) Quél.

Imazeki & Toki (*1955*: 8) described a *Mycena cryptomeriaecola* which they took to be related to the other members of the present section, although they were well aware of the differences, one of the more serious of which is that the spores of their species were said to be non-amyloid.

2. Sect. BASIPEDES (Fr.) Quél.

Agaricus [sect.] *Basipedes* Fr., Epicr. Syst. mycol.: 117. 1838; Cooke, Handb. Br. Fungi **1**: 75. 1871 (formally accepted as section). — *Mycena* [sect.] *Basipedes* (Fr.) Quél., Champ. Jura Vosges: 109. 1872; Sing. *in* Annls mycol. **41**: 137. 1943 (formally accepted as section). — *Pseudomycena* sect. *Basipedes* (Fr.) Cejp *in* Publ. Fac. Sci. Univ. Charles **104**: 139. 1930. — Lectotype (Kühn., *1931*: 125): *Mycena stylobates* (Pers. ex Fr.) Kummer.

Basidopus Earle *in* Bull. N. Y. bot. Gdn **5**: 426. 1909. — Type species (Earle, l.c.): *Mycena stylobates*.

Mycena stirps *Mucor* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena mucor* (Batsch ex Fr.) Gillet.

Mycena stirps *Longiseta* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Monotype: *Mycena longiseta* Höhn.

Mycena stirps *Stylobates* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena stylobates*.

Basidiomata fairly small, without blue or green colours. Pileus often not exceeding 10 mm, pileipellis gelatinous. Lamellae ascending to subhorizontal, free or stellately seceding from the stipe. Stipe with more or less pronounced, pubescent basal disc made up of inflated hyphae; hyphae at the apex of the stipe abruptly distinct from those of the pileus. Basidia 4-spored. Spores amyloid or, in one case, inamyloid. Cheilocystidia somewhat variable, usually more or less clavate, smooth or sparingly branched or with few plump to very slender excrescences.

SPECIES.—*Mycena bulbosa* (Cejp) Kühn., *M. clavularis* (Batsch ex Fr.) Sacc., *M. longiseta* Höhn., *M. mucor* (Batsch ex Fr.) Gillet, *M. stylobates* (Pers. ex Fr.) Kummer, *M. tenuispinosa* Favre.

Kobayasi (*1951*: 4) described a new species which he called *Mycena pseudostylobates* (an earlier homonym of *M. pseudostylotabes* Sing. unless the latter is actually meant as an anagram!) and which he thought 'to be very near to *Mycena stylobates* Fr. and *Mycena mucor* Fr.' However, he failed to mention the presence, on the pileus, of a detachable gelatinous pellicle, and the apparent lack of cheilocystidia renders it doubtful whether the species belongs at all to *Mycena*.

Another species placed in this section is *M. gaultheri* A. H. Smith (*1947*: 51), which was followed by Singer (*1951*: 357; *1975*: 388), but this disposition may well prove to be untenable. (i) Smith did not indicate whether the stipe in *M. gaultheri* is separable from the pileus, a character which he did not fail to observe in *M. stylobates*, and which appears to be a feature common to the members of the present section enumerated above. (ii) The cheilocystidia of *M. gaultheri* as depicted by Smith (fig. 1: 9) are altogether different from the kind prevailing in the species of sect. *Basipedes*.

3. Sect. VISCIPELLES Kühn.

Mycena [sect.] *Viscipelles* Kühn. *in* Bull. bimens. Soc. linn. Lyon **10**: 125. 1931; Sing. *in* Lilloa **22**: 357. ('1949') 1951 (formally accepted as section). — Lectotype (Sing., *1951*: 357): *Mycena cyanorhiza* Quél. sensu Kühn.

Mycena subgen. *Insiticia* Kühn. *in* Botaniste **17**: 93. 1926. — *Mycena* [rank?] *Insiticia* (Kühn.) Kühn., Genre *Mycena*: 172. 1938. — Lectotype (Donk, unpublished): *Mycena pachyderma* Kühn.

Mycena [sect.] *Insititiae* Kühn. *in* Botaniste **17**: 93. 1926 (illegitimate: later homonym); not *Mycena* sect. *Insititiae* (Fr.) Quél., 1872: 109. — Type species (Kühn., l.c.): *Mycena pachyderma*.

Mycena [sect.] *Cyanescentes* Kühn., Genre *Mycena*: 159, 190. 1938 (not val. publ.: no Latin descr.); Sing. *in* Annls mycol. **41**: 137. 1943 (formally accepted as section; not val. publ.: no Latin descr.). — Lectotype (Donk, unpublished): *Mycena cyanorhiza* sensu Kühn.

Mycena stirps *Amicta* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena amicta* (Fr.) Quél.

Basidiomata small to moderately large, with bluish or blue-green pigment, usually at the base of the stipe, less frequently also at the margin of the pileus. Pileus viscid. Lamellae ascending. Stipe without basal disc, puberulous to tomentose. Basidia 4-spored. Spores amyloid. Cheilocystidia (i) short, clavate or ovoid, and covered with few, flexuous excrescences, or (ii) elongate, cylindrical to somewhat fusiform, smooth. Hyphae of the pileipellis embedded in a gelatinous, separable layer.

SPECIES.—*Mycena amicta* (Fr.) Quél., *M. cyanorhiza* Quél. sensu Kühn., *M. pachyderma* Kühn., *M. subcaerulea* (Peck) Sacc.

Kühner (*1938*: 202) held the opinion that *Mycena cyanescens* Vel. also belonged to this section, although it differs appreciably from the other members (the stipe shows no bluish pigment but turns blue only when rubbed; the cheilocystidia have a broadly rounded head and are said to have yellow contents). Later on (Kühner & Romagnesi, *1953*) the name of the species was dropped.

Singer (*1951*: 356) pointed out that the binomial *M. cyanescens* of Velenovský, being a later homonym of *M. cyanescens* (Mont.) Sacc., could not be used and turned to *M. cyanipes* Godey which he thought to be synonymous. I am by no means convinced, however, that *M. cyanescens* Vel. and *M. cyanipes* really are identical. The descriptions of both, reproduced by Kühner (*1938*: 202–203), show discrepancies too serious to be disregarded.

Even with these two species removed, the section seems to me to be an oddly disparate assemblage.

4. Sect. SUPINAE Konr. & Maubl.

Mycena sect. *Supinae* Konr. & Maubl., Ic. sel. Fung. **6**: 274. 1934. — Lectotype (Donk, unpublished): *Mycena supina* (Fr.) Gillet.

Mycena [rank?] *Exsuccae* Kühn., Genre *Mycena*: 160, 237. 1938 (not val. publ.: no Latin descr.). — *Mycena* sect. *Exsuccae* (Kühn.) Sing. *in* Annls mycol. **41**: 138. 1943 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena supina*.

Mycena [subsect?] *Corticolae* Kühn., Genre *Mycena*: 160, 237. 1938 (not val. publ.: no Latin descr.). — *Mycena* stirps *Corticola* (Kühn.) Sing. *in* Annls mycol. **41**: 138. 1943; *in* Lilloa **22**: 358. ('1949') 1951 (inadmissible term denoting rank). — *Mycena* sect. *Corticolae* (Kühn.) A. H. Smith, N. Am. spec. *Mycena*: 39, 60, 66. 1947 (not val. publ.: no Latin descr.). — *Mycena* subsect. *Corticolae* (Kühn.) Sing., Agar. mod.

taxon., 3rd ed.: 389. 1975 (not val. publ.: no Latin descr.). — Lectotype (Sing., *1975*: 389): *Mycena corticola* sensu Pat., Kühn.

Mycena [ser?] *Calodontes* Kühn., Genre *Mycena*: 238. 1938 (nomen nudum). — Monotype: *Mycena venustula* Quél.

Mycena [ser?] *Concolores* Kühn., Genre *Mycena*: 240. 1938 (nomen nudum). — Lectotype (here chosen): *Mycena supina*.

Mycena stirps *Corticola* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena corticola* sensu Kühn.

Mycena stirps *Supina* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena supina*.

Basidiomata small, inhabiting wood or bark of living trees. Pileus pruinose to floccose, more rarely glabrous. Lamellae little ascending, usually more or less horizontal and broadly adnate. Stipe with the base pubescent, tomentose or strigose. Basidia 2- or 4-spored. Spores spherical or almost so, amyloid. Cheilocystidia clavate to pyriform, apically covered with short to fairly long, simple to branched, and sometimes irregularly shaped excrescences. Pleurocystidia scarce or absent.

SPECIES.—*Mycena corticalis* A. H. Smith, ?*M. madronicola* A. H. Smith, *M. meliigena* (Berk. & Cooke apud Cooke) Sacc. (= *M. corticola* sensu Kühn.), *M. pseudocorticola* Kühn., *M. supina* (Fr.) Kummer, *M. venustula* Quél.

In connection with the present section, attention must be drawn to an old sectional name. This is sect. *Insititiae* (Fr.) Quél., originally published by Fries (*1838*: 118) as *Agaricus* [sect.] *Insititii* ('*Insititiae*'). Earle (*1909*: 425) was prompted to raise this section to generic level under the name *Insiticia*, of which he indicated *Agaricus corticola*, as Fries must have known it, as the type species. It is not difficult to see that this choice has led Donk (unpublished) to select the same species as the lectotype of sect. *Insititiae*. As explained in a previous paper (Maas Geesteranus, 1979: 280), there are two concepts regarding the interpretation of the specific epithet *corticola*: (i) Singer had pointed out that the species as redescribed by Kühner must be renamed *M. meliigena* (Berk. & Cooke apud Cooke) Sacc., with which I agree; (ii) *Agaricus corticola* as understood by Fries, however, is a nomen ambiguum. It follows that the name of a section typified by an unidentifiable species cannot be used.

5. Sect. FILIPEDES (Fr.) Quél.

Agaricus [sect.] *Filipedes* Fr., Epicr. Syst. mycol.: 111. 1838 ('*Filopedes*'); Cooke, Handb. Br. Fungi **1**: 70. 1871 ('*Filopedes*', formally accepted as section). — *Mycena* [sect.] *Filipedes* (Fr.) Quél., Champ. Jura Vosges: 106. 1872 ('*Filopedes*'). — *Mycena* [subsect?] *Filipedes* (Fr.) Kühn., Genre *Mycena*: 161, 279. 1938. — *Mycena* subsect. *Filipedes* (Fr.) Métrod *in* Prodr. fl. mycol. Madagasc. **3**: 20, 21, 33. 1949. — Lectotype (here chosen): *Mycena filopes* (Bull. ex Fr.) Kummer.

Linopodium Earle *in* Bull. N. Y. bot. Gdn **5**: 427. 1909. — Type species (Earle, l.c.): *Mycena filopes*.

Mycena stirps *Vitilis* Sing. *in* Annls mycol. **41**: 138. 1943 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena vitilis* sensu Kühn. (= *Mycena filopes*).

Mycena stirps *Metata* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena metata* (Fr.) Kummer.

Mycena stirps *Filipes* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena filopes*.

Basidiomata fairly small to medium large. Pileus dry. Lamellae ascending, narrowly adnate, usually rather narrow but with the edge always convex. Stipe usually elongate, narrow, fragile, never viscid, at the base covered with long, coarse fibrils. Basidia 2- or 4-spored. Spores amyloid. Cheilocystidia clavate to obpyriform or vesiculose, more rarely somewhat irregularly shaped, more or less densely covered apically with warts or elongate excrescences. Pleurocystidia more or less similar or absent. Hyphae of the pileipellis (as far as known) diverticulate.

SPECIES.—?*Mycena alcaliniformis* (Murrill) Murrill, *M. alexandri* Sing., *M. atroalboides* Peck, *M. filopes* (Bull. ex Fr.) Kummer, *M. hudsoniana* A. H. Smith, ?*M. lineata* (Bull. ex Fr.) Kummer (a species about which I am as yet somewhat uncertain), *M. metata* (Fr.) Kummer, *M. mirata* (Peck) Sacc., *M. oortiana* Hora, *M. peyerimhoffii* Maire, *M. rapiolens* Favre, *M. sepia* sensu Lundell (see Maas Geesteranus, *1980b*: 185), *M. urania* (Fr. ex Fr.) Quél., *M. xantholeuca* Kühn.

'*Filipedes*' is the grammatically correct form, and Fries (*1874*: 4, 144) changed the sectional name accordingly. But the specific epithet of *Mycena filopes*, being the time-honoured notation, is maintained.

6. Sect. Mycena

Agaricus trib. *Propriae* Fr., Obs. mycol. **2**: 155. 1818. — Lectotype (Donk, unpublished): *Agaricus galericulatus* Scop.

Agaricus [sect?] *Mycenae-genuinae* Fr., Syst. mycol. **1**: 140. 1821. — Lectotype (here chosen): *Agaricus galericulatus*.

Agaricus [sect.] *Rigidipedes* Fr., Epicr. Syst. mycol.: 104. 1838; Cooke, Handb. Br. Fungi **1**: 67. 1871 (formally accepted as section). — *Mycena* [sect.] *Rigidipedes* (Fr.) Quél., Champ. Jura Vosges: 104. 1872; Sing. *in* Lilloa **22**: 357. ('1949') 1951 (formally accepted as section). — *Mycena* [subsect?] *Rigidipedes* (Fr.) Kühn., Genre *Mycena*: 161, 317. 1938. — *Mycena* groupe *Rigidipedes* (Fr.) Konr. & Maubl., Agar.: 321. 1948 (inadmissible term denoting rank). — Lectotype (Sing., *1951*: 357): *Agaricus galericulatus*.

Stereopodium Earle *in* Bull. N. Y. bot. Gdn **5**: 426. 1909. — Type species (Earle, l.c.): *Mycena galericulata*.

Mycena subgen. *Eu-Mycena* J. E. Lange *in* Dansk bot. Ark. **1** (5): 11, 12, 18. 1914 (inadmissible name: Art. 21. 3). — Lectotype (here chosen): *Mycena galericulata*.

Mycena sect. *Granulatae* J. E. Lange *in* Dansk bot. Ark. **1** (5): 11, 15, 28. 1914. — *Mycena* [rank?] *Granulatae* (J. E. Lange) Kühn., Genre *Mycena*: 237. 1938. — *Mycena* subsect. *Granulatae* (J. E. Lange) Sing. *in* Annls mycol. **41**: 138. 1943; *in* Lilloa **22**: 358. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 390. 1975 (illegitimate: later homonym); not *Mycena* subsect. *Granulatae* (Kühn.) Sing., *1943*: 137. — Lectotype (Sing., *1951*: 358): *Mycena galericulata*.

Mycena [subsect.] *Concolores* J. E. Lange *in* Dansk bot. Ark. **1** (5): 15, 28. 1914 (illegitimate: later homonym); not *Mycena* [subsect.] *Concolores* J. E. Lange, 1914: 13, 20. — Lectotype (here chosen): *Mycena galericulata*.

Mycena subgen. *Eumycena* Kühn. *in* Botaniste **17**: 93. 1926 (inadmissible name: Art. 21. 3). — Lectotype (here chosen): *Mycena galericulata*.

Mycena [sect.] *Typicae* Kühn. *in* Botaniste **17**: 93. 1926; *in* Bull. bimens. Soc. linn. Lyon **10**: 123. 1931. — Lectotype (Donk, unpublished): *Mycena galericulata*.

Mycena [subsect.] *Agummosae* Oort *in* Meded. Ned. mycol. Ver. **16–17**: 200, 228. 1928. — Lectotype (Donk, unpublished): *Mycena galericulata*.

Mycena subgen. *Mycenopsis* Cejp *in* Publ. Fac. Sci. Univ. Charles **104**: 4, 7, 153. 1930. — *Mycena* [rank?] *Mycenopsis* (Cejp) Kühn., Genre *Mycena*: 160, 212. 1938; not *Mycenopsis* Vel., 1947: 35; not *Delicatula* [sect.] *Mycenopsis* Locq., *1956*: 118. — Lectotype (here chosen): *Mycena galericulata*.

Mycena sect. *Typicae* Cejp *in* Publ. Fac. Sci. Univ. Charles **104**: 4, 7. 1930. — Lectotype (here chosen): *Mycena galericulata*.

Mycena sect. *Galericulatae* Konr. & Maubl., Ic. sel. Fung. **6**: 271. 1934. — Lectotype (Donk, unpublished): *Mycena galericulata*.

Mycena [subsect.] *Typicae* J. E. Lange, Fl. agar. dan. **2**: 32, 43. 1936. — Lectotype (Donk, unpublished): *Mycena galericulata.*

Mycena stirps *Galericulata* Sing. *in* Annls mycol. **41**: 139. 1943; *in* Lilloa **22**: 359. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 390. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena galericulata.*

Mycena stirps *Pusilla* A. H. Smith, N. Am. spec. *Mycena:* 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena pusilla* A. H. Smith.

Mycena stirps *Fagetorum* A. H. Smith, N. Am. spec. *Mycena:* 40. 1947 (nomen nudum). — Monotype: *Mycena fagetorum* (Fr.) Gillet.

Mycena stirps *Megaspora* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena megaspora* Kauffm.

?*Mycena* stirps *Parabolica* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena parabolica* sensu Kauffm.

Mycena stirps *Inclinata* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena inclinata* (Fr.) Quél.

Mycena stirps *Galericulata* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena galericulata.*

Mycena subgen. *Mycena*; Locq., Petite fl. champ. Fr. **1**: 174. 1956. — Lectotype (here chosen): *Mycena galericulata.*

Basidiomata fairly large to large, sometimes densely fasciculate. Pileus without gelatinous, detachable pileipellis but in some cases lubricous when wet. Lamellae ascending, with age tending to become subhorizontal. Stipe usually rigid and tenacious, or elastic-tough, the base covered with long, coarse fibrils, not infrequently radicating. Basidia 2- or 4-spored. Spores amyloid. Cheilocystidia clavate to subfusiform or irregularly shaped, simple to somewhat branched, more or less densely covered with short to long and then often flexuous excrescences, more rarely smooth. Pleurocystidia none.

SPECIES.—*Mycena atrochalybaea* Huijsm., *M. fagetorum* (Fr.) Gillet, *M. flos-nivium* Kühn., *M. galericulata* (Scop. ex Fr.) S. F. Gray, *M. hemisphaerica* Peck, *M. inclinata* (Fr.) Quél., *M. maculata* P. Karst., *M. megaspora* Kauffm., *M. occidentalis* Murrill, *M. pusilla* A. H. Smith, *M. radicatella* (Peck) Sacc., *M. rugulosiceps* (Kauffm.) A. H. Smith, *M. tintinnabulum* (Fr.) Quél.

7. Sect. **Luculentae** Maas G., *sect. nov.*

Basidiomata statura media. Pileus omnino vel margine saltem laete coloratus, haud in stratum gelatinosum vergens, plerumque tamen hyphis superficialibus parietibus submucosis praeditis. Lamellae acie laete coloratae, haud albae. Stipes plus minusve elongatus. Basidia 4-sporigera. Sporae amyloideae. Cheilocystidia apice verrucis vel setulis praedita, saepius suco colorato repleta. Hyphae pileipellis verrucosae vel spinulis tenuibus munitae. — Species typica: *Mycena aurantiomarginata* (Fr.) Quél.

Basidiomata medium large. Pileus entirely or at least marginally brightly coloured, without gelatinous, detachable pellicle but frequently the hyphae of the pileipellis more or less gelatinizing. Lamellae with the edge brightly coloured but not white. Stipe more or less elongate. Basidia 4-spored. Spores amyloid. Cheilocystidia apically warted or with longer excrescences, often with coloured contents. Hyphae of the pileipellis verrucose or finely spinulose.

7.1. Subsect. **Elegantes** Sing. ex Maas G., *subsect. nov.*

Mycena [subsect.] *Marginatae* J. E. Lange *in* Dansk bot. Ark. **1** (5): 15, 28. 1914 (illegitimate: later homonym); not *Mycena* [subsect.] *Marginatae* J. E. Lange, 1914: 13, 18. — Lectotype (here chosen): *Mycena elegans* (= *M. aurantiomarginata*).

Mycena [subsect?] *Calodontes* Kühn., Genre *Mycena*: 161, 265. 1938 (illegitimate: later homonym); not *Mycena* [sect.] *Calodontes* (Fr. ex Berk.) Quél., 1872: 102. — Lectotype (here chosen): *Mycena elegans*.

Mycena [ser?] *Filipedes* Kühn., Genre *Mycena*: 268. 1938 (nomen nudum). — Lectotype (here chosen): *Mycena elegans*.

Mycena stirps *Elegans* Sing. *in* Annls mycol. **41**: 138. 1943; *in* Lilloa **22**: 358. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 390. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena elegans*.

Mycena subsect. *Granulatae* A. H. Smith, N. Am. spec. *Mycena*: 40, 196. 1947 (illegitimate: later homonym); not *Mycena* sect. *Granulatae* J. E. Lange, 1914: 15, 28. — Lectotype (here chosen): *Mycena aurantiomarginata*.

Mycena stirps *Elegans* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena elegans*.

Mycena (subsect?] *Echinidae* Locq., Petite fl. champ. Fr. **1**: 174. 1956 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena flavescens* Vel.

Basidiomata characteribus sicut in sect. *Luculentae* sed lamellae adscendentes angusteque adnatae, pleurocystidiis nullis vel clavatis verrucosisque.

Basidiomata with features as in sect. *Luculentae* but lamellae ascending and narrowly adnate, and either without pleurocystidia or pleurocystidia with warted apices.

SPECIES.—*Mycena aurantiomarginata* (Fr.) Quél., *M. chlorantha* (Fr. ex Fr.) Kummer, *M. flavescens* Vel., *M. strobilinoides* Peck.

7.2. Subsect. **Rosellae** Sing. ex Maas G., *subsect. nov.*

Mycena stirps *Rosella* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — *Mycena* stirps *Rosella* Sing. *in* Lilloa **22**: 359. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 390. 1975 (inadmissible term denoting rank). — Monotype: *Mycena rosella* (Fr.) Kummer.

Basidiomata characteribus sicut in sect. *Luculentae* sed lamellae subhorizontales lateque adnatae, pleurocystidiis ampullaceo-fusiformibus laevibus munitae. Pileipellis subgelatinosa.

Basidiomata with features as in sect. *Luculentae* but lamellae subhorizontal and broadly adnate, and characterized in having ampullaceous to fusiform, smooth pleurocystidia. Pileipellis somewhat gelatinized (but not separable).

SPECIES.—*Mycena rosella* (Fr.) Kummer.

7.3. Subsect. **Pterigenae** Maas G., *subsect. nov.*

Mycena [ser?] *Insititiae* Kühn., Genre *Mycena*: 267. 1938 (nomen nudum). — Monotype: *Mycena pterigena* (Fr. ex Fr.) Kummer.

Mycena stirps *Pterigena* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena pterigena*.

Mycena subsect. *Subincarnatae* A. H. Smith, N. Am. spec. *Mycena*: 103. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena pterigena*.

Basidiomata characteribus sicut in sect. *Luculentae* sed lamellae adscendentes-uncinatae, cheilocystidia setulis longis praedita, pleurocystidia absentia. Pileipellis haud gelatinosa. — Species typica: *Mycena pterigena*.

Basidiomata with features as in sect. *Luculentae* but lamellae ascending-uncinate, cheilocystidia with long excrescences, and pleurocystidia lacking. Pileipellis not gelatinized.

SPECIES.—*Mycena pterigena* (Fr. ex Fr.) Kummer.

Singer (*1943*: 138) first placed this species in stirps *Elegans*, later (*1951*: 358; *1975*: 390) in stirps *Polyadelpha*, but it differs from both in some characters that cannot be ignored. This has led me to regard *M. pterigena* as a species in a somewhat solitary position.

8. Sect. **Polyadephia** Sing. ex Maas G., *sect. nov.*

Mycena [subsect?] *Insititiae* Kühn., Genre *Mycena*: 161, 248. 1938 (illegitimate: later homonym); not *Mycena* [sect.] *Insititiae* (Fr.) Quél., 1872: 109.

Mycena stirps *Polyadelpha* Sing. *in* Annls mycol. **41**: 138. 1943; *in Lilloa* **22**: 358. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 390. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena polyadelpha* (Lasch) Kühn.

Mycena stirps *Capillaris* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena capillaris* (Schum. ex Fr.) Kummer.

Mycena subsect. *Fuscae* A. H. Smith, N. Am. spec. *Mycena*: 109. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena capillaris*.

Mycena [subsect?] *Foliicolae* Locq., Petite fl. champ. Fr. **1**: 174. 1956 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena polyadelpha*.

Basidiomata parva vel minuta, ad caules vel ad folia dejecta. Pileus usque ad *c*. 7 mm latus, glaber vel rarius granulatus vel subpubescens, albus vel cinereofuscus vel non raro laetius coloratus. Lamellae haud numerosae, adscendentes vel horizontales vel subarcuatae, acie lateribus concolore. Stipes insiticius vel basi filamentis radiantibus instructus. Basidia 2- vel 4-sporigera. Sporae amyloideae sed interdum haud manifeste. Cheilocystidia clavata vel obpyriformia, apice verrucosa. Hyphae pileipellis diverticulatae.

Basidiomata small to very small, growing on non-woody stems or fallen leaves. Pileus up to *c*. 7 mm wide, glabrous, more rarely granular to somewhat pubescent, white to greyish brown but not infrequently with brighter colours. Lamellae not numerous, ascending or horizontal or subarcuate, with the edge concolorous with the sides. Stipe insititious or with mycelial filaments radiating from the base. Basidia 2- or 4-spored. Spores amyloid but discolouring sometimes hardly noticeable. Cheilocystidia clavate to obpyriform, apically verrucose. Hyphae of the pileipellis diverticulate.

SPECIES.—*Mycena capillaris* (Schum. ex Fr.) Kummer (not *M. capillaris* P. Karst.), *M. juncicola* (Fr.) Gillet, *M. lohwagii* Sing., *M. polyadelpha* (Lasch) Kühn., *M. quercus-ilicis* Kühn., *M. smithiana* Kühn., *M. tubarioides* (Maire) Kühn., *M. typhae* (Schweers) Kotlaba.

9. Sect. **Monticola** Sing. ex Maas G., *sect. nov.*

Mycena stirps *Monticola* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — *Mycena* stirps *Monticola* Sing. *in* Lilloa **22**: 359. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 390. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena monticola* A. H. Smith.

Basidiomata statura media. Pileus glaber, ruber. Lamellae crebrae, adscendentes-adnatae, denique horizontales, acie lateribus concolore. Stipes primo roseus, basi sparsim fibrillosus. Basidia 4-sporigera. Sporae vix amyloideae. Cheilocystidia spinulis sat longis munita. Pleurocystidia absentia. Pileipellis subgelatinosa.

Basidiomata medium large. Pileus glabrous, red. Lamellae numerous, ascending-adnate, becoming horizontal, with the edge concolorous with the sides. Stipe at first bright pink, sparsely fibrillose at the base. Basidia 4-spored. Spores very weakly amyloid (Singer, l.c.) or perhaps non-amyloid (Smith, l.c.). Cheilocystidia with fairly long excrescences. Pleurocystidia none. Pileipellis subgelatinous, but not separable.

SPECIES.—*Mycena monticola* A. H. Smith.

10. Sect. **Cinerellae** Sing. ex Maas G., *sect. nov.*

Mycena [subsect?] *Omphaliariae* Kühn., Genre *Mycena*: 161, 354. 1938 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena cinerella* (P. Karst.) P. Karst.

Mycena stirps *Misera* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena misera* sensu A. H. Smith.

Mycena stirps *Cinerella* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — *Mycena* stirps *Cinerella* Sing. *in* Lilloa **22**: 360. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 391. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena cinerella*.

?*Mycena* stirps *Subconcolor* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Monotype: *Mycena subconcolor* A. H. Smith.

?*Mycena* stirps *Clavicularis* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Monotype: *Mycena clavicularis* (Fr.) Gillet.

Basidiomata aliquantula, habitu plus minusve omphalioideo, austere colorata. Pileus siccus vel plus minusve lubricus. Lamellae horizontales, late adnatae vel arcuato-decurrentes. Stipes siccus vel viscosus. Basidia 2- vel 4-sporigera. Sporae amyloideae. Cheilocystidia clavata vel raro subcylindracea, apice surculis brevibus vel longioribus, saepius diverse formatis atque ramosis instructa. Pleurocystidia absentia vel rara.

Basidiomata fairly small, more or less omphalioid, with dull colours, greyish to subfuscous. Pileus dry to more or less lubricous. Lamellae horizontal, broadly adnate to arcuate-decurrent. Stipe dry to viscous. Basidia 2- or 4-spored. Spores amyloid. Cheilocystidia clavate, more rarely almost cylindrical, apically covered with shorter or longer, often variously shaped and branched excrescences. Pleurocystidia lacking or rare.

SPECIES.—*Mycena aleuriosma* Favre, *M. cariciophila* Redhead, *M. cinerella* (P. Karst.) P. Karst., *M. cineroides* Hintikka, *M. clavicularis* (Fr.) Gillet, *M. concolor* (J. E. Lange) Kühn., *M. pseudopicta* (J. E. Lange) Kühn.

Singer (*1951*: 360, *1975*: 391) considered *Mycena subconcolor* to be a member of this section, but the description by Smith (*1947*: 366) of a 'wide band ... of distinctly gelatinous hyphae, occurring beneath the hypoderm ...' seems to be an anomalous feature. *Mycena clavicularis* may be yet another species that had better be removed (Maas Geesteranus, *1980c*: 415).

11. Sect. **Intermediae** Kühn. ex Maas G., *sect. nov.*

Mycena [subsect?] *Intermediae* Kühn., Genre *Mycena*: 160, 375, 1938 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena latifolia* (Peck) A. H. Smith.

Mycena stirps *Intermedia* Sing. *in* Annls mycol. **41**: 140. 1943 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena latifolia*.

Mycena stirps *Latifolia* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — *Mycena* stirps *Latifolia* Sing. *in* Lilloa **22**: 360. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 391. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena latifolia*.

?*Mycena* stirps *Borealis* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — *Mycena* stirps *Borealis* Sing. *in* Lilloa **22**: 360. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 391. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena borealis* A. H. Smith.

Basidiomata statura media vel magna, colore griseofusco vel multo obscuriore. Pileus siccus vel lubricus dicitur. Lamellae adscendentes vel subhorizontales, anguste vel late adnatae vel paulo uncinatae. Stipes plus minusve cartilagineus. Basidia 2- vel 4-sporigera. Sporae amyloideae. Cheilocystidia obovata, clavata, subcylindracea, fusiformia vel lageniformia, vulgo in parte ventricosa verrucis vel spinulis ornata; Pleurocystidia interdum numerosa.

Basidiomata medium large to large, greyish brown to very dark coloured. Pileus dry or said to be lubricous. Lamellae ascending to subhorizontal, narrowly to broadly adnate or decurrent with a tooth. Stipe more or less cartilaginous. Basidia 2- or 4-spored. Spores amyloid. Cheilocystidia obovate, clavate, subcylindrical, fusiform or lageniform, usually in the ventral part covered with warts or longer excrescences. Pleurocystidia present, sometimes numerous.

SPECIES—?*Mycena borealis* A. H. Smith, *M. font-queri* Maire, *M. latifolia* (Peck) A. H. Smith.

It has long been assumed that Saccardo (*1887*: 268) was the author who made the recombination *Mycena latifolia*, but this is an error. The binomial as published by Saccardo was preceded by an asterisk, which could be interpreted as the indication of a subspecies, as did e.g. Reid (*1968*: 14). Later (*1911*: 146), however, and referring to his earlier publication, Saccardo made it perfectly clear that *latifolia* was meant as a varietal epithet. As far as I am aware A. H. Smith (*1935*: 599) was (unwittingly) the first author to have published the recombination *Mycena latifolia*.

12. Sect. **Pudicae** Maas G., *sect. nov.*

Mycena stirps *Quisquiliaris* Sing. *in* Lilloa **22**: 360. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 392. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena quisquiliaris* (Joss.) Kühn. (= *Mycena pudica* Hora).

Basidiomata parva, fragillima, alba. Pileus siccus, puberulus. Lamellae horizontales vel subarcuatae, late adnatae. Stipes puberulus. Basidia 4-sporigera. Sporae amyloideae. Cheilocystidia fusiformia vel lageniformia, laevia, interdum apice capitata. Pleurocystidia nulla. — Species typica: *Mycena pudica* Hora.

Basidiomata small, very fragile, white. Pileus dry, puberulous. Lamellae horizontal or somewhat arcuate, broadly adnate, Stipe puberulous. Basidia 4-spored. Spores amyloid. Cheilocystidia fusiform to lageniform, smooth, sometimes apically capitate. Pleurocystidia absent.

SPECIES.—*Mycena pudica* Hora.

Singer (l.c.) included several species more in his stirps *Quisquiliaris*, such as *Mycena brownii* A. H. Smith and *M. pseudoclavicularis* A. H. Smith. However, both these species differ too much from *M. pudica* to consider them even remotely related. *Mycena brownii* (Smith, *1947*: 363) was described as having a well-pigmented pileus, moderately pliant flesh, a fairly long stipe with abruptly bulbous base, and often contorted or branched cheilocystidia. *Mycena pseudoclavicularis* was stated to have a pileus with viscid surface, pliant-cartilaginous flesh, a long, cartilaginous-pliant, and glabrous stipe which becomes lubricous when wet, and too short spores if compared with those of *M. pudica*.

13. Sect **Rubromarginatae** Sing. ex Maas G., *sect. nov.*

Mycena [subsect?] *Calodontes* Kühn., Genre *Mycena*: 162, 394. 1938 (illegitimate: later homonym); not *Mycena* [sect.] *Calodontes* (Fr. ex Berk.) Quél., 1872: 102. — Lectotype (here chosen): *Mycena capillaripes* Peck.

Mycena stirps *Rubromarginata* Sing. *in* Annls mycol. **41**: 140. 1943; *in* Lilloa **22**: 360. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 392. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena rubromarginata* (Fr. ex Fr.) Kummer.

Mycena subsect. *Ciliatae* A. H. Smith, N. Am. spec. *Mycena*: 40, 196, 206. 1947 (illegitimate: later homonym); not *Mycena* sect. *Ciliatae* J. E. Lange, 1914: 11, 13, 18. — Lectotype (here chosen): *Mycena capillaripes*.

Mycena stirps *Capillaripes* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena capillaripes*.

Mycena stirps *Elegantula* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena elegantula* Peck.

Mycena [subsect?] *Marginatae* Locq., Petite fl. champ. Fr. **1**: 174. 1956 (illegitimate: later homonym); not *Mycena* [subsect.] *Marginatae* J. E. Lange, 1914: 13, 18. — Lectotype (here chosen): *Mycena rubromarginata*.

Basidiomata aliquantula vel statura media. Pileus vulgo hygrophanus, pigmentis diversissimis coloratus. Lamellae adscendentes, anguste vel late adnatae, plus minusve ventricosae, acie haud concava, fere semper intensius colorata. Stipes elongatus, tenuis, media parte plerumque glaber, basi tamen vulgo fibrillis crassis longisque munitus. Basidia (raro 2-) 4-sporigera. Sporae amyloideae. Cheilocystidia numerosa, obpyriformia, clavata, subcylindracea, fusiformia vel lageniformia, laevia vel surculis diverse formatis atque ramosis instructa. Pleurocystidia nulla vel cheilocystidiis similia. Pileipellis e hyphis vulgo diverticulatis.

Basidiomata fairly small to medium large. Pileus pruinose or glabrous, usually hygrophanous, variously coloured. Lamellae ascending, narrowly to broadly adnate, more or less ventricose, with the edge never concave and almost always more intensely coloured than the sides. Stipe elongate, slender, often glabrous in the middle part, but with the base usually covered in long and coarse fibrils. Basidia (rarely 2-) 4-spored. Spores amyloid. Cheilocystidia numerous to abundant, obpyriform, clavate, subcylindrical, fusiform or lageniform, smooth or with variously shaped and branched excrescences. Pleurocystidia lacking or similar to the cheilocystidia. Hyphae of the pileipellis usually diverticulate.

SPECIES.—*Mycena albidolilacea* Kühn. & Maire apud Kühn., *M. atromarginata* (Lasch) Kummer, *M. capillaripes* Peck, *M. cheboyganensis* A. H. Smith, *M. citrinomarginata* Gillet, *M. elegantula* Peck, *M. luteoalcalina* sensu Kühn., *M. olivaceobrunnea* A. H. Smith, *M. olivaceomarginata* (Massee apud Cooke) Massee (and *M. neoavenacea* Hongo which may be only a form), *M. purpureofusca* (Peck) Sacc., *M. renati* Quél., *M. roseomarginata* Hongo (if distinct from the next), *M. rubromarginata* (Fr. ex Fr.) Kummer, *M. seynii* Quél., *M. viridimarginata* P. Karst.

Singer (l.c.) also included *Mycena luteoalcalina* Sing. but, according to Moser (*1978*: 18), this is the same as *M. renati*.

As regards *M. thymicola* Vel., also taken to be a member of the present section, I have insufficient experience to be certain whether or not it is a distinct species.

14. Sect. FRAGILIPEDES (Fr.) Quél.

Agaricus [sect.] *Fragilipedes* Fr., Epicr. Syst. mycol.: 108. 1838; Cooke, Handb. Br. Fungi **1**: 68. 1871 (formally accepted as section). — *Mycena* [sect.] *Fragilipedes* (Fr.) Quél., Champ. Jura Vosges: 105. 1872. — *Mycena* [ser?] *Fragilipedes* (Fr.) Kühn., Genre *Mycena*: 457. 1938. — *Mycena* groupe *Fragilipedes* (Fr.)

Konr. & Maubl., Agar.: 319. 1948 (inadmissible term denoting rank). — Lectotype (here chosen): *Agaricus alcalinus* Fr. ex Fr.

Mycena sect. *Ciliatae* J. E. Lange *in* Dansk bot. Ark. **1** (5): 11, 13, 18. 1914. — *Mycena* [rank?] *Ciliatae* (J. E. Lange) Kühn., Genre *Mycena*: 383. 1938. — *Mycena* subsect. *Ciliatae* (J. E. Lange) Sing. *in* Annls mycol. **41**: 140. 1943; *in* Lilloa **22**: 360. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 392. 1975. — Lectotype (Sing., *1951*: 360): *Mycena alcalina*.

Mycena [subsect.] *Concolores* J. E. Lange *in* Dansk bot. Ark. **1**(5): 13, 20. 1914. — Lectotype (here chosen): *Mycena alcalina*.

Mycena sect. *Alcalinae* Konr. & Maubl., Ic. sel. Fung. **6**: 270. 1934. — Lectotype (Donk, unpublished): *Mycena alcalina*.

Mycena sect. *Polygrammae* Konr. & Maubl., Ic. sel. Fung. **6**: 271. 1934. — Lectotype (Donk, unpublished): *Mycena polygramma* (Bull. ex Fr.) S. F. Gray.

Mycena [subsect?] *Fuscescentes* Kühn., Genre *Mycena*: 162, 453. 1938 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena alcalina*.

Mycena [ser?] *Rigidipedes* Kühn., Genre *Mycena*: 494. 1938 (illegitimate: later homonym); not *Mycena* sect. *Rigidipedes* (Fr.) Quél., 1872: 104. — Lectotype (here chosen): *Mycena filopes* sensu Kühn. (= *Mycena vitilis*).

Mycena stirps *Alcalina* Sing. *in* Annls mycol. **41**: 141. 1943; *in* Lilloa **22**: 361. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 392. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena alcalina*.

Mycena stirps *Polygramma* Sing. *in* Annls mycol. **41**: 143. 1943 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena polygramma*.

Mycena stirps *Subcana* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Monotype: *Mycena subcana* A. H. Smith.

?*Mycena* stirps *Subsupina* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena subsupina* A. H. Smith.

Mycena stirps *Leptocephala* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena leptocephala* (Pers. ex Fr.) Gillet.

Mycena stirps *Praelonga* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena praelonga* (Peck) Sacc.

Mycena stirps *Vitilis* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena vitilis* (Fr.) Quél.

Mycena stirps *Polygramma* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Monotype: *Mycena polygramma*.

Mycena stirps *Algeriensis* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena algeriensis* Maire apud Kühn.

Mycena stirps *Laevigata* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena laevigata* (Lasch) Gillet.

?*Mycena* subsect. *Cinereae* A. H. Smith, N. Am. spec. *Mycena*: 126. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena subsupina* A. H. Smith.

Basidiomata medium large to large. Pileus glabrous to fibrillose, often hygrophanous, grey-brown in various shades, not infrequently very dark to almost black at the centre, more rarely pale to whitish. Lamellae ascending, narrowly to broadly adnate, sometimes decurrent with a tooth, grey to grey-brown or whitish, sometimes becoming stained with reddish brown spots, edge always convex, concolorous to whitish. Stipe elongate, fissile or fragile in some species, firm to tenacious and somewhat cartilaginous in others, glabrous for the greater part, but as a rule pubescent or with coarse fibrils at the base, largely concolorous with the pileus. Basidia 4-spored. Spores amyloid. Cheilocystidia numerous, often large, clavate, subcylindrical, fusiform or lageniform, frequently apically attenuated to form a narrow neck, smooth to somewhat branched or with several prominent excrescences. Pleurocystidia numerous to absent. Hyphae of the pileipellis smooth to more or less densely diverticulate.

SPECIES.—*Mycena aetites* (Fr.) Quél., *M. alcalina* (Fr. ex Fr.) Kummer, *M. algeriensis* Maire apud Kühn., *M. alnetorum* Favre, *M. atrocyanea* (Batsch ex Fr.) Gillet, *M. avellaneibrunnea*

Thiers, *M. excisa* (Lasch) Kummer, *M. fragillima* A. H. Smith, *M. fusco-ocula* A. H. Smith, *M. griseiconica* Kauffm., *M. jacobi* Maire, *M. kauffmaniana* A. H. Smith, *M. laevigata* (Lasch) Gillet, *M. leptocephala* (Pers. ex Fr.) Gillet, *M. niveipes* Murrill, *M. polygramma* (Bull. ex Fr.) S. F. Gray, *M. overholtsii* Smith & Solheim, *M. praelonga* (Peck) Sacc., *M. radicata* Thiers, *M. strobilicola* Favre & Kühn. apud Kühn., *M. subcana* A. H. Smith, ?*M. subcucullata* A. H. Smith, *M. subfumosa* A. H. Smith, *M. subfusca* A. H. Smith, ?*M. subsupina* A. H. Smith, *M. vitilis* (Fr.) Quél., *M. zephirus* (Fr. ex Fr.) Kummer.

The section as it is conceived here may be judged to be somewhat too inclusive. Species like *M. subcucullata* and *M. subsupina*, both of which are members of Smith's stirps *Subsupina*, were described to possess 'rigid' to 'rather tough and cartilaginous' stipes, which is contrary to the description of the section by Fries (*1838*: 108): 'Stipes *fragilis*'. On the other hand, it should be remembered that Kühner apparently was in no doubt about the correct position of *M. algeriensis* (*1938*: 490, 'stipe ... fibro-cartilagineux élastique') and *M. excisa* (*1938*: 493, 'stipe ... *tenace, cartilagineux*') in a group which also comprises such species as *M. abramsii* (= *M. praecox*) (*1938*: 482, 'stipe ... *non tenace*, mais au contraire tendre et *cassant*') and *M. aetites* (*1938*: 475, 'stipe ... fragile'), in other words, species that he considered true *Fragilipedes*. Yet, it may be necessary to look into this matter at some time in the near future.

15. Sect. LACTIPEDES (Fr.) Quél.

Agaricus [sect.] *Lactipedes* Fr., Epicr. Syst. mycol.: 114. 1838; Cooke, Handb. Br. Fungi **1**: 72. 1871 (formally accepted as section). — *Mycena* [sect.] *Lactipedes* (Fr.) Quél., Champ. Jura Vosges: 107. 1872; Sing. *in* Lilloa **22**: 361. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 393. 1975 (formally accepted as section). — *Mycena* subsect. *Lactipedes* (Fr.) Métrod *in* Prodr. fl. mycol. Madagasc. **3**: 20, 21, 57. 1949. — Lectotype (Sing., *1951*: 361): *Agaricus galopus* Pers. ex Fr.

Galactopus Earle *in* Bull. N. Y. bot. Gdn **5**: 426. 1909. — Lectotype (Donk, unpublished): *Mycena haematopus* (Pers. ex Fr.) Kummer.

Mycena [rank?] *Genuinae* Kühn., Genre *Mycena*: 160, 212. 1938 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena galopus*.

Mycena [rank?] *Granulatae* Kühn., Genre *Mycena*: 160, 213. 1938 (not val. publ.: no Latin descr.). — *Mycena* subsect. *Granulatae* (Kühn.) Sing. *in* Annls mycol. **41**: 137. 1943 (not val. publ.: no Latin descr.). — Lectotype (Sing., l.c.): *Mycena crocata* (Schrad. ex Fr.) Kummer.

Mycena [rank?] *Ciliatae* Kühn., Genre *Mycena*: 161, 216. 1938. — *Mycena* subsect. *Ciliatae* (Kühn.) Sing. *in* Annls mycol. **41**: 137. 1943 (illegitimate: later homonym); not *Mycena* sect. *Ciliatae* J. E. Lange, 1914: 11, 13, 18. — Lectotype (here chosen): *Mycena sanguinolenta*.

Mycena [rank?] *Calodontes* Kühn., Genre *Mycena*: 216. 1938 (nomen nudum). — Lectotype (here chosen): *Mycena sanguinolenta*.

Mycena [rank?] *Concolores* Kühn., Genre *Mycena*: 223. 1938 (nomen nudum). — Lectotype (here chosen): *Mycena galopus*.

Mycena stirps *Galopus* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena galopus*.

Mycena stirps *Haematopus* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena haematopus*.

Basidiomata medium large to large. Pileus dry (somewhat viscid in one case), more or less hygrophanous, variously coloured. Lamellae ascending, adnate, often decurrent with a tooth, edge concolorous with the sides or paler, in one case more intensely coloured. Stipe dry, glabrous to more or less pubescent, exuding a watery, milky or coloured juice when cut or broken, Basidia 2- or 4-spored. Spores amyloid. Cheilocystidia numerous, clavate, subcylindrical, fusiform or lageniform, usually smooth but not infrequently also with irregularly placed and/or shaped excrescences. Pleurocystidia absent to fairly numerous. Hyphae of the pileipellis more or less densely diverticulate.

SPECIES.—*Mycena abramsii* (Murrill) Murrill (syn. *M. praecox* Vel.), *M. atkinsoniana* A. H. Smith, *M. cayugaensis* A. H. Smith, *M. crocata* (Schrad. ex Fr.) Kummer, *M. erubescens* Höhn., *M. galopus* (Pers. ex Fr.) Kummer, *M. haematopus* (Pers. ex Fr.) Kummer, *M. sanguinolenta* (Alb. & Schw. ex Fr.) Kummer, *M. subsanguinolenta* A. H. Smith.

In my opinion *M. abramsii* is better placed in section *Lactipedes* instead of section *Fragilipedes* as considered by Kühner (*1938*: 482).

On account of its more or less viscid pileus and, more expecially, its rather small and differently shaped cheilocystidia, *Mycena crocata* stands apart from the other members of the present section.

Smith (*1947*: 39) introduced a stirps *Anomala* (a nomen nudum, to be sure) which he considered intermediate between his stirpes *Galopus* and *Haematopus*. It would seem, however, that its lectotype (here chosen)—*Mycena anomala* Beardslee—is better placed in the genus *Hydropus* (Kühn.) Sing.

16. Sect. HYGROCYBOIDEAE (Fr.) Sing.

Agaricus [sect.] *Hygrocyboideae* Fr., Syst. mycol. **1**: 155. 1821. — *Mycena* sect. *Hygrocyboideae* (Fr.) Sing. *in* Beih. Sydowia **7**: 49. 1973 ('*Hygrocybeoideae*'). — Lectotype (Singer, *1975*: 394): *Mycena epipterygia* (Scop. ex Fr.) S. F. Gray.

Agaricus [sect.] *Glutinipedes* Fr., Epicr. Syst. mycol.: 116. 1838; Cooke, Handb. Br. Fungi **1**: 73. 1871 (formally accepted as section). — *Mycena* [sect.] *Glutinipedes* (Fr.) Quél., Champ. Jura Vosges: 108. 1872; Singer *in* Lilloa **22**: 362. ('1949') 1951 (formally accepted as section). — *Mycena* [subsect?] *Glutinipedes* (Fr.) Kühn., Genre *Mycena*: 161, 346. 1938. — Lectotype (Sing., *1951*: 362): *Mycena epipterygia*.

Collopus Earle *in* Bull. N. Y. bot. Gdn **5**: 426. 1909. — Monotype: *Mycena epipterygia*.

Mycena sect. *Gummosae* J. E. Lange *in* Dansk bot. Ark. **1**(5): 11, 16, 36. 1914. — *Mycena* [subsect.] *Gummosae* (J. E. Lange) Oort *in* Meded. Ned. mycol. Ver. **16–17**: 200, 242. 1928. — Lectotype (Donk, unpublished): *Mycena epipterygia*.

Mycena [sect.] *Glutinosae* Kühn. *in* Bull. bimens. Soc. linn. Lyon **10**: 125. 1931. — Lectotype (Donk, unpublished): *Mycena epipterygia*.

Mycena stirps *Epipterygia* Sing. *in* Annls mycol. **41**: 139. 1943 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena epipterygia*.

Mycena subgen. *Glutinipes* A. H. Smith, N. Am. spec. *Mycena*: 41, 43, 401. 1947 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena epipterygia*.

?*Mycena* stirps *Insignis* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Monotype: *Mycena insignis* A. H. Smith.

Mycena stirps *Epipterygia* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena epipterygia*.

Mycena stirps *Griseoviridis* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Monotype: *Mycena griseoviridis* A. H. Smith.

Mycena sect. *Viscosae* A. H. Smith, N. Am. spec. *Mycena*: 41, 401. 418. 1947 (not val. publ.: no Latin descr.). — Lectotype (Donk, unpublished): *Mycena viscosa* Maire.

?*Mycena* stirps *Tenax* A. H. Smith, N. Am. spec. *Mycena*: 42. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena tenax* A. H. Smith.

Mycena subsect. *Gummosae* Sing. *in* Lilloa **22**: 362 ('1949') 1951; Agar. mod. taxon., 3rd ed.: 394. 1975 (illegitimate: later homonym); not *Mycena* sect. *Gummosae* J. E. Lange, *1914*: 11, 16, 36. — Type species (Sing., *1951*: 362): *Mycena viscosa* Maire.

Mycena [subsect?] *Viscosae* Locq., Petite fl. champ. Fr. **1**: 175. 1956 (not val. publ.: no Latin descr.). — Type species (Locq., l.c.): *Mycena epipterygia.*

Basidiomata medium large. Pileus viscid, never orange. Lamellae ascending, decurrent with a tooth, with gelatinizing edge which is separable as an elastic-tough thread. Stipe viscid, usually with some yellowish colour, sometimes reddening with age. Basidia 2- or 4-spored. Spores amyloid. Cheilocystidia variously shaped but generally clavate, with shorter or longer and variously shaped excrescences. Pleurocystidia none. Hyphae of the pileipellis diverticulate, embedded in a gelatinous, separable layer.

SPECIES.—*Mycena epipterygia* (Scop. ex Fr.) S. F. Gray with its numerous varieties (see Maas Geesteranus, *1980a*), *M. simia* Kühn. apud Kühn. & Lamoure, *M. subinamyloidea* Sing.

Some of the stirpes mentioned by Smith have been included in the present section with some doubt, and it may well be asked whether stirps *Tenax* would not deserve to be removed to form a separate group. Kühner (*1938*: 383) apparently was equally uncertain where to place *Mycena tenax* A. H. Smith.

Mycena lilacifolia (Peck) A. H. Smith (*1947*: 414) might be considered related to the members of the present section on account of the yellow colours of pileus and stipe, but it deviates in that the edge of the lamellae does not gelatinize, in the lack of cheilocystidia, and in the non-amyloid spores. Smith placed the species in his section *Caespitosae*, where it is equally anomalous.

17. Sect. FULIGINELLAE (A. H. Smith ex Sing.) Maas G.

Mycena stirps *Vulgaris* Sing. *in* Annls mycol. **41**: 139. 1943 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena vulgaris* (Pers. ex Fr.) Kummer.

Mycena sect. *Fuliginellae* A. H. Smith, N. Am. spec. *Mycena*: 42, 401, 429. 1947 (not val. publ.: no Latin descr.). — *Mycena* subsect. *Fuliginellae* (A. H. Smith) Sing. *in* Lilloa 22: 362. ('1949') 1951 (not val. publ.: no Latin descr.). — *Mycena* subsect. *Fuliginellae* A. H. Smith ex Sing. *in* Sydowia **15**: 65. 1962. — *Mycena* sect. *Fuliginellae* (A. H. Smith ex Sing.) Maas G. *in* Proc. K. Ned. Akad. Wet. (C) **83**: 406. 1980. — Lectotype (Sing., 1951: 362): *Mycena vulgaris.*

Mycena stirps *Vulgaris* A. H. Smith, N. Am. spec. *Mycena*: 42. 1947 (nomen nudum). — Lectotype (here chosen): *M. vulgaris.*

Mycena groupe *Vulgares* Kühn. & Romagn., Fl. analyt. champ. sup.: 109. 1953 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena vulgaris.*

Basidiomata medium large. Pileus viscid. Lamellae hardly ascending, arcuate to more or less horizontal, broadly adnate, edge gelatinizing and separable as an elastic-tough thread. Stipe viscid to glutinous, pallid to fuscous, not reddening with age. Basidia 4-spored. Spores amyloid. Cheilocystidia apically profusely branched. Pleurocystidia absent. Hyphae of the pileipellis diverticulate, embedded in a gelatinous, separable layer.

SPECIES.—*Mycena vulgaris* (Pers. ex Fr.) Kummer.

18. Sect. CAESPITOSAE (A. H. Smith ex Sing.) Maas G.

Mycena sect. *Caespitosae* A. H. Smith, N. Am. spec. *Mycena*: 41, 401, 406. 1947 (not val. publ.: no Latin descr.). — *Mycena* subsect. *Caespitosae* (A. H. Smith) Sing. *in* Lilloa **22**: 362. ('1949') 1951 (not val. publ.: no Latin descr.). — *Mycena* subsect. *Caespitosae* A. H. Smith ex Sing. *in* Sydowia **15**: 65. 1962. — *Mycena* sect. *Caespitosae* (A. H. Smith ex Sing.) Maas G. *in* Proc. K. Ned. Akad. Wet. (C) **83**: 407. 1980. — Lectotype (Sing., *1951*: 362): *Mycena texensis* A. H. Smith.

Mycena stirps *Leaiana* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena leaiana* (Berk.) Sacc.

Mycena stirps *Subepipterygia* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Monotype: *Mycena subepipterygia* Murrill.

Basidiomata fairly large to large, lignicolous and usually cespitose. Pileus glabrous, viscid, entirely white or with the centre grey-brown, orange in one species. Lamellae adnate to somewhat decurrent (with the subhymenium in at least some species known to be gelatinous). Stipe viscid to glutinous. Basidia apparently 2- or 4-spored. Spores pip-shaped, at least in some species known to be amyloid. Cheilocystidia clavate, fusiform or lageniform, smooth or apically somewhat lobed or with a few, irregularly shaped, blunt excrescences. Pleurocystidia scattered or absent. Hyphae of the pileipellis embedded in a gelatinous, separable layer.

SPECIES.—*Mycena austinii* (Peck) Kühn., *M. euspeirea* (Berk. & Curt.) Sacc., *M. glutinosa* Beardslee, *M. hondurensis* A. H. Smith, *M. leaiana* (Berk.) Sacc., *M. subepipterygia* Murrill, *M. texensis* A. H. Smith.

19. Sect. CALAMOPHILAE Maas G.

Mycena sect. *Calamophilae* Maas G. *in* Proc. K. Ned. Akad. Wet. (C) **83**: 409. 1980. — Monotype: *Mycena belliae* (Johnst. apud Berk.) P. D. Orton.

Basidiomata medium large, arising from a mycelial patch. Pileus soon becoming umbilicate, puberulous to tomentose, then glabrescent and becoming viscid. Lamellae arcuate-decurrent, somewhat elastic. Stipe densely puberulous, then glabrescent and becoming somewhat viscid, reddening at the base with age. Basidia 4-spored. Spores elongate to almost cylindrical, amyloid. Cheilocystidia fusiform to clavate, smooth or forked to somewhat branched. Pleurocystidia absent. Cortical layer of the pileus an ixotrichodermium, forming a viscid, tough, separable pellicle. Hyphae of the stipe continuous with those of the pileus. Subhymenium not gelatinized.

SPECIES.—*Mycena belliae* (Johnst. apud Berk.) P. D. Orton.

The present section and sect. *Caespitosae* clearly have much in common. Unfortunately, several members of the latter are incompletely known, which renders it difficult to decide whether these sections had not better be subordinated as subsections within a larger entity.

20. Sect. CALODONTES (Fr. ex Berk.) Quél.

Agaricus subtrib. *Calodontes* Fr., Syst. mycol. **1**: 111. 1821 (inadmissible term denoting rank). — *Agaricus* [sect.] *Calodontes* Fr. ex Berk. *in* J. E. Smith, Engl. Fl. **5** (2): 43. 1836; Fr., Epicr. Syst. mycol.: 99. 1838; Cooke, Handb. Br. Fungi **1**: 63. 1871 (formally accepted as section). — *Mycena* [sect.] *Calodontes* (Fr. ex Berk.) Quél., Champ. Jura Vosges: 102. 1872. — *Mycena* subsect. *Calodontes* (Fr. ex Berk.) Métrod, Prodr. fl. mycol. Madagasc. **3**: 20, 32. 1949. — Lectotype (Donk, unpublished, but see also Berk., l.c.): *Agaricus pelianthinus* Fr.

Basidiomata medium large to large, collybioid. Pileus moist but not viscid (said to be lubricous in one species), hygrophanous. Lamellae more or less horizontal, sinuate-adnate, broadly adnate or decurrent with a tooth. Stipe fragile. Basidia 4-spored. Spores amyloid or non-amyloid. Cheilocystidia clavate, subcylindrical, more or less fusiform or lageniform with broadly rounded apex. Pleurocystidia, if present, silimilar. Hyphae of the pileipellis smooth.

20.1. Subsect MARGINATAE J. E. Lange

Prunulus S. F. Gray, Nat. Arrang. Br. Pl. **1**: 63. 1821. — Lectotype (Earle, *1909*: 393, 427): *Agaricus denticulatus* [= *Mycena pelianthina* (Fr.) Quél.].

Mycena sect. *Ciliatae* [subsect.] *Marginatae* J. E. Lange *in* Dansk bot. Ark. **1** (5): 13, 18. 1914. — Lectotype (Donk, unpublished): *Mycena pelianthina*.

Mycena stirps *Pelianthina* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — *Mycena* stirps *Pelianthina* Sing. *in* Lilloa **22**: 363. ('1949') 1951 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena pelianthina*.

Mycena [subsect.] *Pelianthinae* Locq., Petite fl. champ. Fr. **1**: 174. 1956 (not val. publ.: no Latin descr.). — Lectotype (Donk, unpublished): *Mycena pelianthina*.

Basidiomata with features as in sect. *Calodontes*, but lamellae with the edge more intensely coloured than the sides. Spores amyloid.

SPECIES.—*Mycena pelianthina* (Fr.) Quél., *M. rutilantiformis* (Murrill) Murrill.

20.2. Subsect. **Purae** (Konr. & Maubl.) Maas G., *comb. nov.*

Mycena sect *Purae* Konr. & Maubl., Ic. sel. Fung. **6**: 269. 1934. — Lectotype (Sing., *1951*: 363): *Mycena pura* (Pers. ex Fr.) Kummer.

Mycenula P. A. Karst. *in* Medd. Soc. Fauna Fl. fenn. **16**: 89. 1889. — Type species (Donk, *1962*: 193): *Mycena pura*.

Mycena [subsect?] *Janthinae* Kühn., Genre *Mycena*: 162, 445. 1938 (not val. publ.: no Latin descr.). — *Mycena* subsect. *Janthinae* (Kühn.) A. H. Smith, N. Am. spec. *Mycena*: 40, 149, 185. 1947 ('*Ianthinae*', not val. publ.: no Latin descr.). — Lectotype (Donk, unpublished): *Mycena pura*.

Mycena stirps *Janthina* Sing. *in* Annls mycol. **41**: 141. 1943 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena pura*.

Mycena stirps *Pura* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — *Mycena* stirps *Pura* Sing. *in* Lilloa **22**: 363. ('1949') 1951; Agar. mod. taxon., 3rd ed.: 395. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena pura*.

Basidiomata with features as in sect. *Calodontes*, but lamellae with the edge concolorous with the sides or paler. Spores amyloid.

SPECIES.—*Mycena kuehneriana* A. H. Smith, *M. pura* (Pers. ex Fr.) Kummer, *M. subaquosa* A. H. Smith.

20.3. Subsect. **Violacellae** Sing. ex Maas G., *subsect. nov.*

Mycena stirps *Violacella* Sing., Agar. mod. taxon., 3rd ed.: 395. 1975 (inadmissible term denoting rank). — Lectotype (here chosen): *Mycena violacella* (Speg.) Sing.

Basidiomata with features as in sect. *Calodontes*, but spores non-amyloid.

SPECIES.—*Mycena pearsoniana* Dennis ex Sing.

21. Sect. ADONIDEAE (Fr.) Quél.

Agaricus [sect.] *Adonidei* Fr., Epicr. Syst. mycol.: 101. 1838 ('*Adonideae*'); Cooke, Handb. Br. Fungi **1**: 65. 1871 (formally accepted as section). — *Mycena* [sect.] *Adonideae* (Fr.) Quél., Champ. Jura Vosges: 103. 1872; Sing., Agar. mod. taxon., 3rd ed.: 395. 1975 (formally accepted as section). — *Mycena* [subsect?] *Adonideae*

(Fr.) Kühn., Genre *Mycena*: 163, 546. 1938 ('*Adonidae*'). — *Hemimycena* sect. *Adonideae* (Fr.) Sing. *in* Annls mycol. **41**: 120, 123. 1943 ('*Adonidae*'). — *Marasmiellus* sect. *Adonidei* (Fr.) Sing. *in* Lilloa **22**: 301. ('1949') 1951 ('*Adonidi*'). — Lectotype (Sing., *1951*: 301): *Agaricus adonis* Bull. ex Fr.

Mycena sect. *Flavoalbae* Konr. & Maubl., Ic. sel. Fung. **6**: 276. 1934. — Lectotype (Donk, unpublished): *Mycena flavoalba* (Fr.) Quél.

Mycena [sect?] *Genuinae* Kühn., Genre *Mycena*: 163, 538. 1938. — Lectotype (here chosen): *Mycena flavoalba*.

Mycena subsect. *Typicae* A. H. Smith, N. Am. spec. *Mycena:* 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena adonis* (Bull. ex Fr.) S. F. Gray.

Mycena stirps *Luteopallens* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Monotype: *Mycena luteopallens* (Peck) Sacc.

Mycena stirps *Flavoalba* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena flavoalba*.

Mycena stirps *Adonis* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena adonis*.

Mycena stirps *Amabilissima* A. H. Smith, N. Am. spec. *Mycena*: 40. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena amabilissima* (Peck) Sacc.

Mycena subsect. *Euadonidae* A. H. Smith, N. Am. spec. *Mycena*: 149. 163. 1947 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena adonis*.

Mycena [subsect.] *Amabilissimae* Locq., Petite fl. champ. Fr. **1**: 174. 1956 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena flavoalba*.

Basidiomata fairly small to medium large. Pileus glabrous to pruinose, more or less moist, in one species somewhat lubricous, hygrophanous, mostly very brightly coloured, usually very much paling with age. Lamellae ascending at first, becoming more or less horizontal, adnate to somewhat uncinate, usually brightly coloured. Stipe glabrous to puberulous, at the base as a rule covered with long fibrils, usually brightly coloured, hyphae continuous with those of the pileus. Basidia 2- or 4-spored. Spores weakly amyloid or non-amyloid. Cheilocystidia fusiform to lageniform, smooth. Pleurocystidia similar. Hyphae of the pileipellis as far as known diverticulate.

SPECIES.—*Mycena adonis* (Bull. ex Fr.) S. F. Gray, *M. amabilissima* (Peck) Sacc., *M. argillascens* Mitchel & Smith, *M. aurantiidisca* Murrill (if distinct from *M. adonis*), *M. flavoalba* (Fr.) Quél., ?*M. fusipes* Murrill, *M. leptophylla* (Peck) Sacc., *M. luteopallens* (Peck) Sacc., *M. roseipallens* Murrill, ?*M. roseocandida* (Peck) Sacc.

Among the stirpes here taken to be synonymous with sect. *Adonideae*, Smith (*1947*: 40) also mentioned stirps *Flavifolia*, of which *Mycena flavifolia* Peck is the monotype. However, this species with its clavate and densely diverticulate cheilocystidia is definitely not a member of the present section. It may be judged to have some relation with sect. *Polyadelphia*.

Stirps *Carolinensis* A. H. Smith (*1947*: 40), typified by *Mycena carolinensis* Smith & Hesler, is another dubious group, about which I can say no more than that it does not belong to the *Adonideae*.

I am reluctant to follow Kühner who placed *Mycena roseipallens* (*1938*: 565) and *M. leptophylla* (*1938*: 581) in the section *Hiemales*.

M. Lange (*1955*: 41) described a *Mycena citrinovirens* which he compared with some members of the section *Adonideae*. A serious barrier, however, is the fact that the cheilocystidia are shown to have fairly long excrescences, much in the way of those found in section *Hygrocyboideae*. But Lange stated that the pileus has a 'pellicle ... hardly subgelatinous in KOH', while he also made no mention of the tough, thread-like edge that can be lifted from the lamellae. Clearly, *M. citrinovirens* needs re-examination.

22. Sect. ACICULAE Kühn. ex Sing.

Mycena [subsect?] *Aciculae* Kühn., Genre *Mycena*: 163, 602. 1938 (not val. publ.: no Latin descr.). — *Hemimycena* sect. *Aciculae* (Kühn.) Sing. *in* Annls mycol. **41:** 120, 121, 123. 1943 (not val. publ.: no Latin descr.). — *Marasmiellus* sect. *Aciculae* (Kühn.) Sing. *in* Lilloa **22:** 301. ('1949') 1951 (not val. publ.: no Latin descr.). — *Mycena* sect. *Aciculae* Kühn. ex Sing. *in* Sydowia **15:** 65. 1962. — Lectotype (Sing., *1951*: 301): *Mycena acicula* (Schaeff. ex Fr.) Kummer.

Mycena stirps *Acicula* A. H. Smith, N. Am. spec. *Mycena*: 39. 1947 (nomen nudum). — Lectotype (here chosen): *Mycena acicula*.

Mycena subsect. *Rubrae* Métrod *in* Prodr. fl. mycol. Madagasc. **3:** 20, 21, 88. 1949. — Lectotype (Donk, unpublished): *Mycena acicula*.

Basidiomata fairly small. Pileus pruinose, becoming glabrous, brightly coloured. Lamellae ascending, adnate to more or less decurrent with a tooth, brightly coloured. Stipe firm, puberulous, with long fibrils at the base, brightly coloured, hyphae abruptly distinct from those of the pileus. Basidia 2- or 4-spored. Spores narrowly pip-shaped, non-amyloid. Cheilocystidia clavate, subcylindric to fusiform, smooth, more rarely apically forked. Pleurocystidia similar. Hyphae of the pileipellis densely branched or diverticulate.

SPECIES.—*Mycena acicula* (Schaeff. ex Fr.) Kummer, *M. oregonensis* A. H. Smith.

23. Sect. HIEMALES Konr. & Maubl.

Mycena [sect.] *Hiemales* Konr. & Maubl., Ic. sel. Fung. **6:** 274. 1934; Sing., Agar. mod. taxon., 3rd ed.: 396. 1975 (formally accepted as section). — *Marasmiellus* sect. *Hiemales* (Konr. & Maubl.) Sing. *in* Lilloa **22:** 302. ('1949') 1951. — Lectotype (Sing., *1951*: 302): *Mycena hiemalis* (Osb. apud Retz. ex Fr.) Quél.

Mycena [subsect?] *Hiemales* Kühn., Genre *Mycena*: 164, 564. 1938 (not val. publ.: no Latin descr.). — *Hemimycena* sect. *Hiemales* (Kühn.) Sing. *in* Annls mycol. **41:** 120, 121, 123. 1943 (not val. publ.: no Latin descr.). — Lectotype (Donk, unpublished): *Mycena hiemalis*.

Basidiomata fairly small to medium large, usually corticolous or lignicolous. Pileus glabrous to somewhat pruinose, never brightly coloured. Lamellae narrowly to broadly adnate. Stipe glabrous to puberulous, white to whitish or horn-coloured, apically bright yellow in one variety. Basidia 2- or 4-spored. Spores as far as known non-amyloid. Cheilocystidia cylindrical, fusiform or somewhat lageniform, smooth or apically forked. Pleurocystidia absent or similar. Hyphae of the pileipellis smooth or diverticulate.

23.1. Subsect. **Hiemales** Maas G., *subsect. nov.*

Mycena [sect?] *Epiphloeae* Kühn., Genre *Mycena*: 163, 564. 1938 (not val. publ.: no Latin descr.). — Lectotype (here chosen): *Mycena hiemalis*.

Mycena [subsect?] *Typicae* Kühn., Genre *Mycena*: 164, 564. 1938 (not val. publ.: no Latin descr.). — *Marasmiellus* subsect. *Typici* (Kühn.) Sing. *in* Lilloa **22:** 302. ('1949') 1951 (not val. publ.: no Latin descr.). — *Mycena* subsect. *Typicae* (Kühn.) Sing., Agar. mod. taxon., 3rd ed.: 396. 1975 (not val. publ.: no Latin descr.). — Lectotype (Sing., *1951*: 302): *Mycena hiemalis*.

Basidiomata characteribus sicut in sect. *Hiemales* sed lamellae adscendentes, acie convexa. — Species typica: *Mycena hiemalis*.

Basidiomata with features as in sect. *Hiemales*, but lamellae ascending and with the edge convex.

SPECIES.—*Mycena grisellina* Favre, *M. hiemalis* (Osb. apud Retz. ex Fr.) Quél., *M. olida* Bres., *M. radicifer* Favre.

23.2. Subsect. **Omphaliariae** Kühn. ex Maas G., *subsect. nov.*

Mycena [subsect?] *Omphaliariae* Kühn., Genre *Mycena*: 164. 582. 1938 (not val. publ.: no Latin descr.). — *Marasmiellus* subsect. *Omphaliarii* (Kühn.) Sing. *in* Lilloa **22:** 302. ('1949') 1951 (not val. publ.: no Latin descr.). — *Mycena* subsect. *Omphaliariae* (Kühn.) Sing., Agar. mod. taxon., 3rd ed.: 396. 1975 (not val. publ.: no Latin descr.). — Lectotype (Sing., *1951*: 302): *Mycena speirea* (Fr. ex Fr.) Gillet.

Mycena stirps *Speirea* A. H. Smith, N. Am. spec. *Mycena*: 41. 1947 (nomen nudum). — Monotype: *Mycena speirea.*

Basidiomata characteribus sicut in sect. *Hiemales* sed lamellae subhorizontales vel arcuatae, acie concava.

Basidiomata with features as in sect. *Hiemales*, but lamellae more or less horizontal to arcuate, with the edge concave.

SPECIES.—*Mycena alba* (Bres. apud Sacc.) Kühn., *M. atropapillata* Kühn. & Maire apud Kühn., *M. phaeophylla* Kühn., *M. speirea* (Fr. ex Fr.) Gillet.

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