

STUDIES IN HYDNOID FUNGI—I

On some genera with hyphal pegs*

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(With six Text-figures)

Mycobonia flava and *Epitele typhae* are described. Two new genera are introduced, viz. *Mycothele* (for *Mycobonia disciformis* Cunn.) and *Epitelopsis* (for *Epitele fulva* Cunn.).

On *Mycobonia*

When Patouillard (1892) established the genus *Bonia*, he based it on a resupinate species, *B. papyrina*, from Tonkin. In the same publication (p. 49) he remarked that '*Hydnum flavum* Berk. doit être rapporté au genre *Bonia*'. Later he found this generic name to be preoccupied by *Bonia* Balansa (1890, Gramineae) and placed (1894) his *B. papyrina* in the synonymy of *Heterochaete tenuicola* (Lév.) Pat. which according to Bodman (1952) is a synonym of *Heterochaete delicata* (Klotzsch ex Berk.) Pat. In the same year (1894), Patouillard established a new genus, *Mycobonia*, based on *Hydnum flavum*. Some years later, Banker (1906) created the genus *Grandinioides* for the same species, whereas the generic name *Bonia* Pat. was maintained by Hennings (1898: 123) in the first edition of Engler/Prantl, Natürl. PflFamilien, as well as by Killermann (1928: 140) in the second edition of the same work.

Another genus, also typified by *Hydnum flavum*, is *Hirneola* Fr. 1825, introduced as a monotypic genus. In 1848, Fries once more used the generic name *Hirneola*, this time for species belonging to the Auriculariales. To avoid confusion and to save the genus *Hirneola* Fr. 1848, Donk (1941) proposed conservation of *Mycobonia* against *Hirneola* Fr. 1825. This proposal was adopted in 1953, leaving *Mycobonia* the correct generic name for *Hydnum flavum*.

The type species of the genus *Mycobonia* was originally published as a *Peziza* by Swartz in 1788, based on a collection from Jamaica. Later Berkeley (1842) transferred it to *Hydnum* and in 1859 described a very similar species, *H. brunneoleucum* Berk. & Curt. from Venezuela. The latter species is closely related to if not identical with *Mycobonia flava*. *Mycobonia* has remained a rather small genus; only four species names could be found:

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Mycobonia brunneoleuca (Berk. & Curt.) Pat. 1900,
disciformis Cunn. 1956,
flava (Sw. ex Fr.) Pat. 1894,
winkleri Bres. 1911.

Of *M. brunneoleuca* and *M. winkleri* no material was available, therefore this preliminary study is restricted to the two remaining species.

As defined by its type species, *Mycobonia* is a stereoid fungus with effuso-reflexed or somewhat stipitate and rather thick basidiocarps, hyphal pegs, a dimitic hyphal system, medium-sized basidia, and rather large, ellipsoid and inamyloid spores. The hyphal pegs, i.e. sterile hyphal fascicles projecting beyond the hymenial surface, constitute a curious character. Only a few genera are known to possess this feature: *Epithela*, *Gloiothela*, *Heterochaete*, *Mycobonia* and *Veluticeps*. For some species of *Coriolus* and other genera of polypores hyphal pegs are reported, but these never are such a conspicuous character there. True hyphal pegs are always sterile, also at their base adjacent to the hymenial layer. Contrary to this the teeth of odontoid or hydroid fungi are always fertile, although in fast growing species the apical part of the teeth may be sterile. As far as I know there has never been described an intermediate form between sterile hyphal pegs and fertile teeth. Up to now the species with hyphal pegs have always been kept apart from other hydroid species and placed in genera of their own. This generic delimitation is often supported by the presence of other differential characters. Nevertheless the genera with hyphal pegs are more or less closely related to other genera with hydroid or smooth hymenial surface, and a separation in a family of their own is not justified.

There is an outspoken disagreement among mycologists as to the question to which family the genus *Mycobonia* belongs. According to Donk (1964: 294) this genus belongs to the Stereaceae although he mentioned it to be closely related to *Pseudofavolus* Pat., Polyporaceae. Singer (1962, 1975) placed it in the Polyporaceae: 'The absence of a hymenophore differentiates the genus clearly from other Polyporaceae. However, this genus is not, as may otherwise be expected, related to any "hydnceous" or "stereaceous" genus.' (1975: 179). His conception was criticized by Smith (1963: 696): 'I think by including *Mycobonia* he has de-emphasized the taxonomic value of the configuration of the hymenophore to an almost ridiculous degree. There can be parallelisms in anatomical structure and hyphal arrangement just as there are for spore ornamentation and pigmentation of the basidiocarp.'

After having studied the microscopical structure of the genus I prefer to leave it in the Stereaceae where it fits very well the characters of the other genera. At least for the moment I cannot decide whether the similarities in hyphal structure really indicate such a close relationship with genera of the Polyporaceae *sensu stricto* as Singer suggested. In my opinion there are more connections with the Stereaceae.

Mycobonia is probably a monotypic genus. The species *M. disciformis* Cunn. has been studied by me and appeared to represent a genus of its own for which I propose the name *Mycothela*.

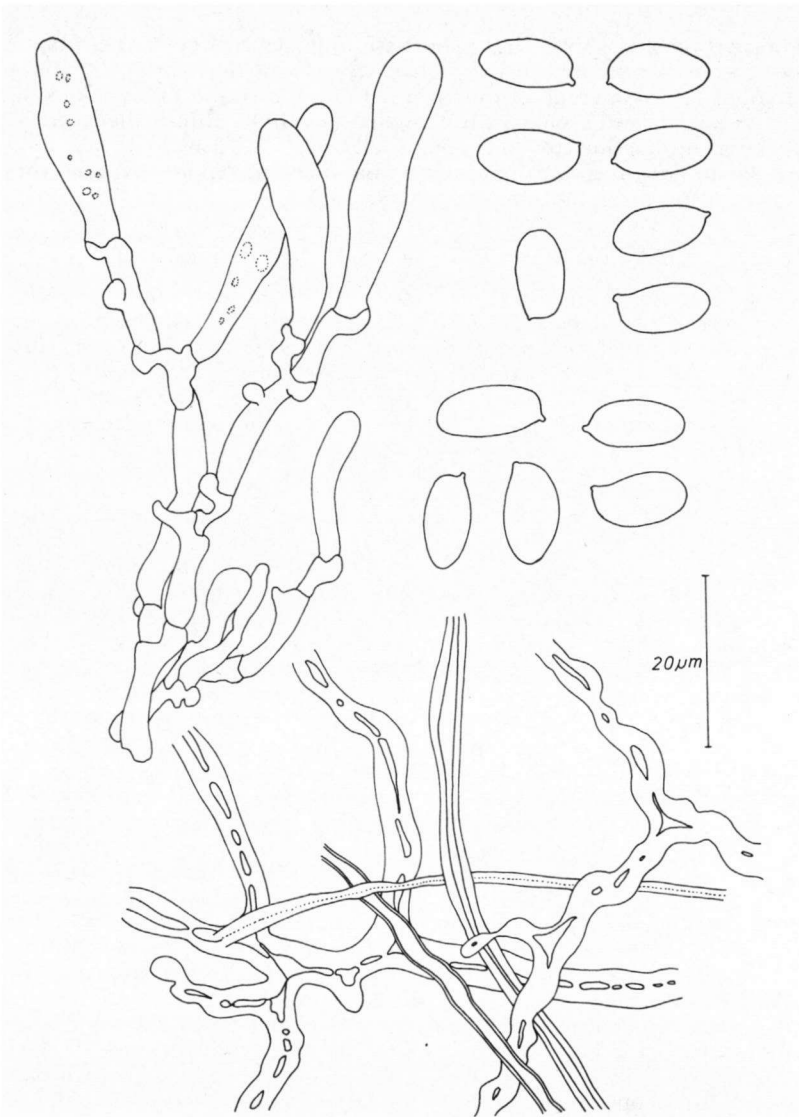


Fig. 1. *Mycobonia flava*, Argentine, *Bettuci-Gómez*. — Basidia. — Spores. — Tramal hyphae.

MYCOBONIA Pat., nom. cons.

Mycobonia Pat. in Bull. trimest. Soc. mycol. Fr. 10: 76. 1894. — Type species: *Peziza flava* Sw. ex Fr. 1822.

Hirneola Fr., Syst. Orb. Veg. 93. 1825 (nom. rejic.); not Fr. 1848; not ~ Velen. 1939. — *Grandinioides* Banker in Mem. Torrey bot. Cl. 12: 179. 1906.

Basidiocarp pileate, sessile to short-stipitate, several cm large, about 1–2 mm thick; consistency firm and brittle when dry. Hymenial surface ‘hydroid’, with sterile hyphal pegs consisting of thick-walled to almost solid hyphae lacking clamps. Hyphal system dimitic. Generative hyphae hyaline, thin-walled, with clamps. Binding hyphae hyaline to somewhat yellowish, thick-walled to solid. Basidia hyaline, clavate, c. 30–40 μm long, with a basal clamp. Spores hyaline, thin-walled, ellipsoid, c. 10–20 μm long, smooth, inamyloid.

MYCOBONIA FLAVA (Sw. ex Fr.) Pat.—Figs. 1, 2

Peziza flava Sw., Nova Gen. Sp. Prodr.: 150. 1788 (devaluated name). — *Peziza flava* Sw. ex Fr., Syst. mycol. 2: 161. 1822. — *Hirneola flava* (Sw. ex Fr.) Fr., Syst. Orb. Veg.: 93. 1825 (indirect reference). — *Hydnum flavum* (Sw. ex Fr.) Berk. in Ann. Mag. nat. Hist. 10: 380. 1842. — *Bonia flava* (Sw. ex Fr.) Pat. in Bull. trimest. Soc. mycol. Fr. 8: 49. 1892. — *Mycobonia flava* (Sw. ex Fr.) Pat. in Bull. trimest. Soc. mycol. Fr. 10: 77. 1894. — *Auricularia flava* (Sw. ex Fr.) Farlow, Bibl. Index North Am. Fungi 1: 307. 1905; not ~ Lloyd 1922. — *Grandinioides flava* (Sw. ex Fr.) Banker in Bull. Torrey bot. Cl. 12: 179. 1906.

Basidiocarp pileate, concavo-convex, sessile, up to 10 × 10 cm, c. 0.5–1.8 mm thick (excl. of hyphal pegs), with yellowish brown, reddish brown or dark brown upper surface, with basal part attenuate or short-stipitate; stipe mostly dark, if well developed c. 3 mm wide, broadened to an about 6 mm wide disc-shaped foot on substrate; consistency said to be fleshy to subgelatinous when fresh, firm and brittle when dry. Hymenial surface ochraceous, hydroid, with densely crowded 50–85 μm wide hyphal pegs projecting 120–180 μm and originating 80–150 μm beneath the hymenial surface; pegs consisting of more or less interwoven hyphae of same kind as in trama (skeletal-like, not or rarely branched) but slightly more pigmented with age; in young basidiocarps hyphal pegs conical or almost cylindrical, but in older basidiocarps apical parts becoming fimbriate. Hyphal system dimitic, with binding hyphae. Hyphae of hymenial layer and trama hyaline to slightly yellow, in hyphal pegs more distinctly yellow. Generative hyphae cylindrical, thin-walled, loosely arranged, 2.5–3.5 μm in diam., with smooth surface; clamps present (but not always easily visible); contents homogeneous or with some small guttules. Binding hyphae sometimes scarcely but more often extensively branched, with hyphal ends thinning out, irregularly cylindrical or torulose, thick-walled to almost solid, loosely arranged, 1.5–5 μm in diam., at some places inflated and up to 20 μm wide, with non-gelatinized walls. In some (young) specimens a layer of thick-walled cylindrical to ellipsoid cystidia-like bodies present c. 80–120 μm under hymenial layer; cystidioid bodies sometimes nearly solid, 25–40 × 10–15 μm with, one or several apical appendages reaching into hymenial layer and sometimes even slightly projecting. Hymenial cystidia and gloeocystidia lacking. Basidia hyaline, thin-walled, cylindrical when young, irregularly clavate when mature, 26–36 × 5.5–9 μm , with basal clamp, contents homogeneous, 4-spored. Spores hyaline, thin-walled, ellipsoid, 10–15–20 × 5–7.5 μm , with distinct apiculus (c. 1 μm long), smooth; contents homogeneous or somewhat guttulate.

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

DISTRIBUTION.—From the southern states of North America to Argentine.

MATERIAL STUDIED.—U. S. A., Louisiana, St. Martinsville, 20 Aug. 1898, *A. B. Langlois 2817* (S). — CUBA: Fungi Cub., *Wright 343* (S); Monte Verde, on logs in dense woods, *C. Wright 237* (S). — BRAZIL: Caldas, Regnell (S); S. Leopoldo, 1904, *Rick* (S). — COLOMBIA, distr. Cauca, ad pag. El Tambo, 1700 m, 1 Nov. 1937, *Kjell von Sneidern* (S). — ARGENTINE, Tucumán, Tafí Viejo, 5 Feb. 1965, *Bettucci-Gómez* (ex LPS 32 700) (L).

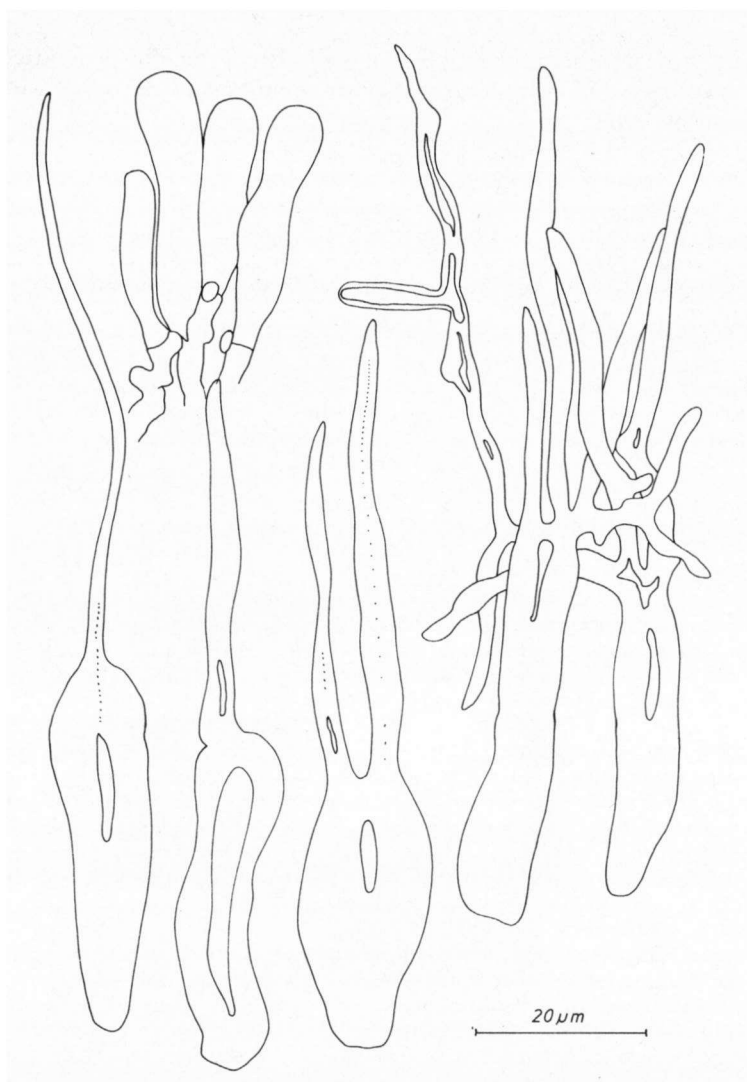


Fig. 2. *Mycobonia flava*, Argentine, *Bettuci-Gómez*. — Tramal 'cystidia'.

According to Martin (1939: 248) the spores are noticeably thick-walled; this could not be confirmed with the present study.

Also according to Martin (1939: 249): 'The presence or absence of a stipe seems to be determined by the accident of position, and especially by the size of the substratum, forms growing on small twigs, as was the specimen first studied by Berkeley, showing a greater tendency to be sessile than applanate sporophores growing laterally on large trunks.'

I do not know whether the cystidia-like bodies are formed by generative hyphae or not, but it seems not impossible since I never could find a connection with the thick-walled binding hyphae.

Mycothele Jülich, gen. nov.

Carposoma resupinatum, membranaceum vel ceraceum, hydnoideum, aculeis sterilibus ex trama proventis. Systema hypharum monomiticum. Hyphae hyalinae, fibulatae. Basidia hyalina, clavata, circa 40–50 μm longa. Sporae hyalinae, tenui-tunicatae, satis magnae (circa 8–12 μm), inamyloideae.

TYPE: *Mycobonia disciformis* Cunn. 1956.

Basidiocarp resupinate, effused, membranaceous to ceraceous. Hymenial surface hydroid; teeth sterile, of tramal origin. Hyphal system monomitic. Hyphae hyaline, with clamps. Basidia hyaline, clavate, about 40–50 μm long. Spores hyaline, thin-walled, rather large (about 8–12 μm), inamyloid.

Mycothele disciformis (Cunn.) Jülich, comb. nov.—Fig. 3

Mycobonia disciformis Cunn. in Trans. R. Soc. N.Z. 83: 635. 1956 (basionym).

Basidiocarp annual, resupinate, disciform, only the central part attached to the substrate, up to 10 mm in diam., about 0.5 mm thick, adnate; consistency firm-membranaceous to ceraceous; margin determinate, free from the substrate but not involute; exterior part brownish; rhizomorphs or hyphal strand lacking. Hymenial surface hydroid, with acute, sterile, up to 1 mm long, cream-coloured teeth of tramal origin. Hyphal system monomitic. Hyphae hyaline, thin-walled, cylindrical or slightly torulose, with clamps at all septa; contents homogeneous or granular; large masses of crystals present especially in teeth. Cystidia and gloeocystidia lacking. Basidia hyaline, stalked-clavate, 37–45–55 \times 7–9–11 μm , thin-walled, with clamp at base, with granular contents, with four subulate, slightly curved sterigmata 7–10 \times 1.5–2 μm . Spores hyaline, broadly ellipsoid to subglobose, thin-walled, smooth, 8–12 \times 6.5–9 μm , with rather large apiculus and homogeneous or granular contents, not amyloid, dextrinoid, nor cyanophilous.

HABITAT & DISTRIBUTION.—Only found on *Rhopalostylis sapida*, an endemic species of Palmae in New Zealand. Cunningham cites eight specimens.

NOTE.—Contrary to Cunningham's description I found the large masses of crystals mostly inside the tissue of the teeth.

On Epithele

The genus *Epithele* was established by Patouillard in 1900 for resupinate species with flocculent to hypochnoid basidiocarps and an even hymenial surface with scattered, short, sterile spines originating in the trama. He mentioned two species: in the first place '*Epithele typhae* (Fuckel) Pat.'; the second one was *E. dussii* Pat. In the treatment of Bourdot & Galzin (1928) three species are mentioned (*E. galzini* Bres., *E. typhae* (Pers.) Pat., *E. ochracea* Bres.).

The genus remained small, until Boquiren (1971) published a revision, recognizing 13 species. As the principal character she considered the presence of hyphal pegs on

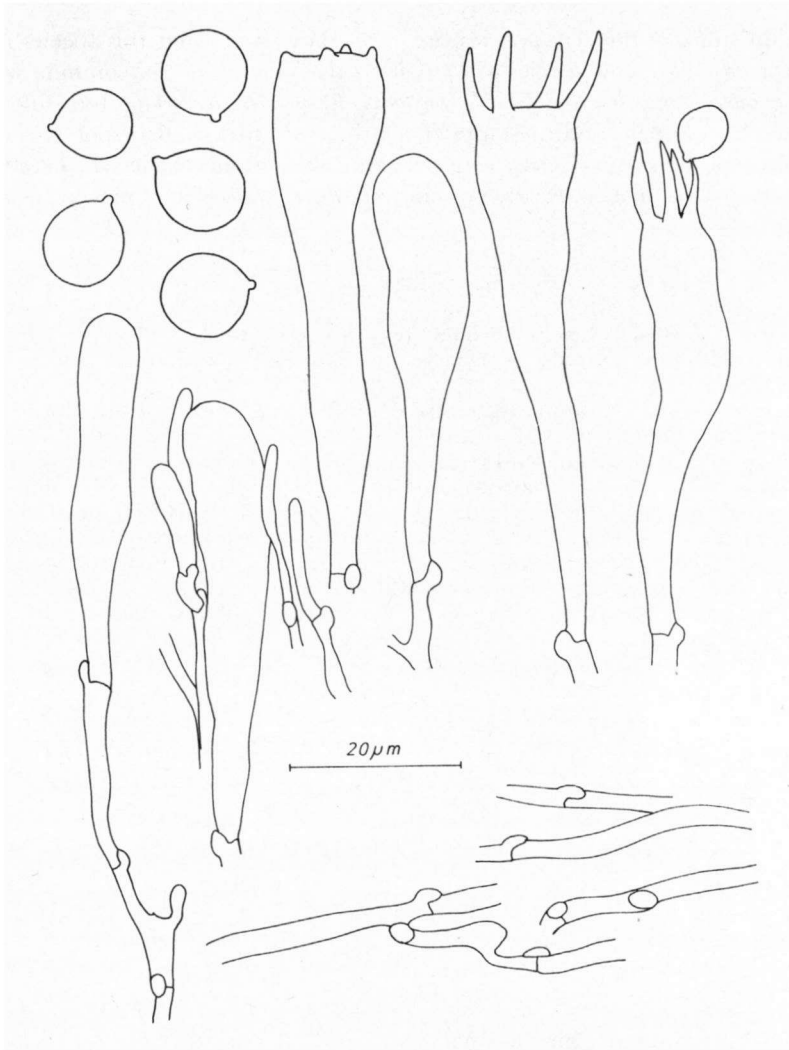


Fig. 3. *Mycothele disciformis*, New Zealand, type.

the hymenial surface, although she claimed (1971: 938) that other characters are also significant in delimitating the genus: 'texture and manner of growth of the fructification, nature of the subicular hyphae, and morphology of the basidia, sterigmata, and basidiospores.' Boquiren combined with *Epithele* two species for which both Oberwinkler (as *Tubulicium*; 1965: 53) and Parmasto (as *Tubulixenasma*; 1965: 231) had created a special genus, characterized by rather short basidia and multirooted lycostidia.

A careful study of the type species, *E. typhae* showed me that this species is quite different from most other species of *Epithele*. It has much more in common with the typical species of *Radulomyces* (like *R. confluens*, *R. molaris*, *R. rickii*), but differs from these in its hyphal pegs and the large and ultimately thick-walled spores.

A revision of the genus *Epithele* is in preparation, but one species (*E. fulva* Cunn.) is so aberrant that it can already be removed from *Epithele* and placed in a genus of its own.

EPITHELE (Pat.) Pat.

Hypochnus sect. *Epithele* Pat. in Bull. trimest. Soc. mycol. Fr. 15: 202. 1899. — *Epithele* (Pat.) Pat., Essai tax. Hymén. 59. 1900. — Type species: *Epithele typhae* (Pers.) Pat.

Basidiocarp annual, resupinate, effused, several cm large, soft-membranaceous; context homogeneous; hymenial surface whitish to cream-coloured, even, penetrated by sterile hyphal fascicles (hyphal pegs) originating in trama; margin pale, indeterminate, thinning out; rhizomorphs and hyphal strands lacking. Hyphal system monomitic. Hyphae hyaline, cylindrical to torulose, often rather indistinct, more or less thin-walled; clamps present. Cystidia lacking. Basidia (podobasidia) hyaline, stalked-clavate, rather large, thin-walled, with smooth surface, with basal clamp, and with four subulate, large sterigmata. Spores hyaline to slightly yellowish, ellipsoid to fusiform, rather large, thick-walled when mature (up to 1.0 μm), with smooth surface, non-amyloid.

SUBSTRATE.—Saprophytic on plant debris.

The systematic position of the genus is uncertain. It somewhat resembles the genus *Jaapia* with regard to the spores, but seems related to *Radulomyces* with regard to the basidia.

EPITHELE TYPHAÆ (Pers.) Pat.—Figs. 4, 5

Athelia typhae Pers., Mycol. europ. 2: 84. 1822. — *Thelephora typhae* (Pers.) Fr., Elench. Fung. 1: 226. 1828. — *Corticium typhae* (Pers.) Desm., Plantes crypt., Ed. I, No. 2161. 1851. — *Hypochnus typhae* (Pers.) Pat., Tab. anal. fung. 2: 31. 1887. — *Kneiffia typhae* (Pers.) Pat. apud Pat. & Lag. in Bull. trimest. Soc. mycol. Fr. 9: 132. 1893. — *Epithele typhae* (Pers.) Pat. ("Fuck"), Essai tax. Hymén.: 59. 1900.

Basidiocarp resupinate, membranaceous, 100–150 μm thick, adnate; hymenial surface cream-coloured, odontoid, with sterile hyphal pegs (100–200 μm long), slightly cracked when dry; margin white, distinct, slightly fimbriate, narrow. Hyphae hyaline, torulose, rather indistinct, 1–2 μm in diam., thin-walled, with smooth surface, with clamps at all septa; contents homogeneous or somewhat guttulate. Cystidia lacking. Paraphysoid hyphae between basidia present, of hymenial to subhymenial origin, hyaline, flexuous-cylindrical, 1.5–2.5 μm in diam., thin-walled, smooth, clamped, with homogeneous or slightly guttulate contents, not projecting; apical part easily detaching and perhaps acting as conidium. Basidia (podobasidia) hyaline, flexuous-cylindrical to stalked clavate, 55–70 \times 8–11 μm , with smooth surface, with basal clamp, with homogeneous or guttulate contents, and with four large, subulate, slightly curved sterigmata (8–13 \times 2–3 μm). Spores hyaline, but slightly yellowish when fully mature, narrowly ellipsoidal to fusiform,

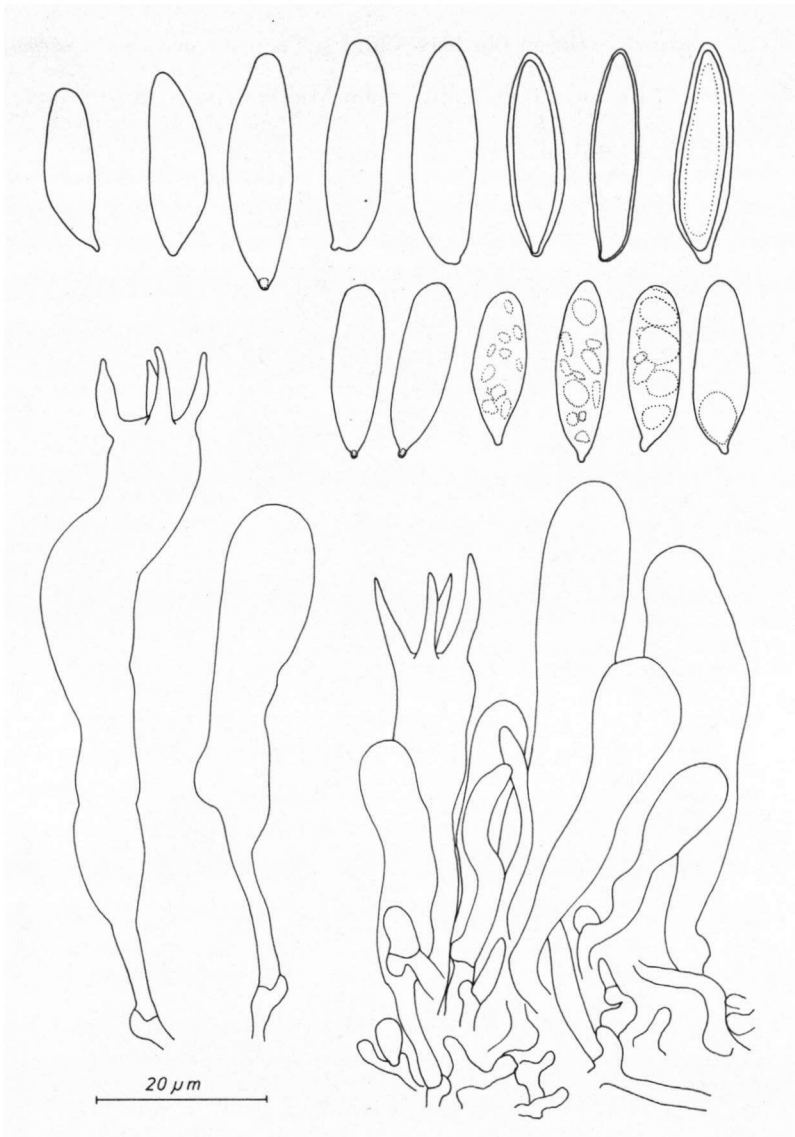


Fig. 4. *Epithele typhae*, Germany, Jülich 1534.

with distinct, often refractive apiculus, $16-28 \times 5.5-8 \mu\text{m}$, not glued together, thin-walled, only late in development (perhaps after detachment) thick-walled (up to $1.0 \mu\text{m}$), with smooth surface, contents often guttulate, especially when young, not seldom with homogeneous contents when mature, non-amyloid.

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

SUBSTRATE.—Saprophytic on old leaves and stems of Cyperaceae (*Scirpus*, *Carex*, *Typha*).

DISTRIBUTION.—In Europe only known from Middle- and South-Europe.

MATERIAL STUDIED.—GERMANY: Hessen, Weissenborn, Graburg, 24 Sept. 1968, W. Jülich 1534 (herb. Jülich).

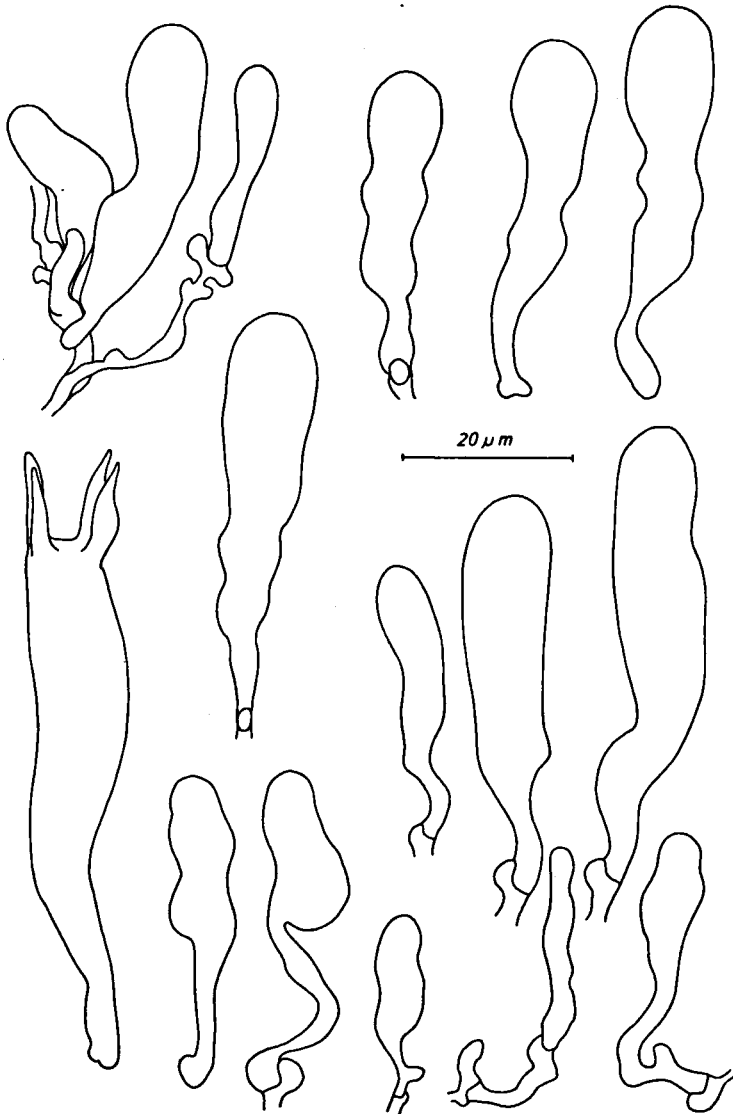


Fig. 5. *Epithele typhae*, Germany, Jülich 1534. — Basial ontogeny.

Epithelopsis Jülich, *gen. nov.*—Fig. 6

Carposoma resupinatum, effusum, adnatum, membranaceum, hydroideum, fasciculis sterilibus ex trama proventis. Systema hypharum dimiticum. Hyphae generativae hyalinae, distinctae, incrassate tunicatae, fibulatae; hyphae skeleticae hyalinae, crasse-tunicatae. Gloeocystidia nonnumquam adsunt. Basidia hyalina, clavata, tetraspora, fibulata. Sporae magnae, hyalinae, late ellipsoideae, incrassate tunicatae, valde cyanophilae.

Typus: *Epithele fulva* Cunn. 1956.

Basidiocarp annual, resupinate, effused, several cm large, adnate; consistency membranaceous; context homogeneous; hymenial surface pale coloured, odontoid, with sterile hyphal pegs composed of hyaline skeletal hyphae. Hyphal system dimitic. Generative hyphae hyaline, cylindrical, loosely arranged, distinct, thick-walled (at least the basal ones), with clamps. Skeletal hyphae hyaline, thick-walled. Gloeocystidia may be present. Basidia hyaline, clavate, 4-spored, with basal clamp. Spores large, hyaline, somewhat thick-walled, strongly cyanophilous.

Epithelopsis fulva (Cunn.) Jülich, *comb. nov.*

Epithele fulva Cunn. in *Trans. R. Soc. N.Z.*, 83: 631. 1956 (basionym).

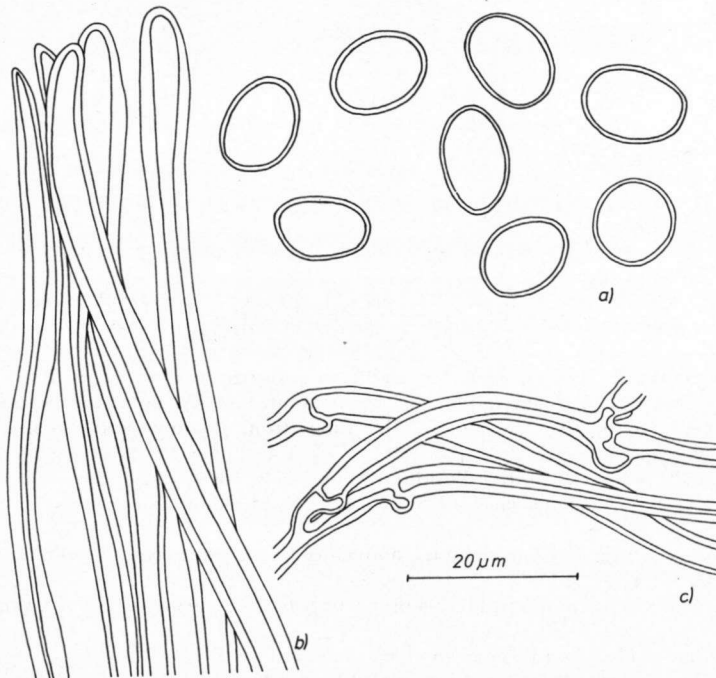


Fig. 6. *Epithelopsis fulva*, New Zealand, type.

Basidiocarp resupinate, up to 15 cm large, up to 250 μm thick, membranaceous, adnate, separable in small pieces; context homogeneous, cream-coloured; hymenial surface at first white, later cream-coloured to ochraceous, odontoid, with sterile hyphal pegs (200–500 \times 30–100 μm); margin concolorous, indistinct, thinning out, arachnoid; rhizomorphs and hyphal strands lacking. Hyphal system dimitic. Generative hyphae hyaline, cylindrical, distinct, loosely arranged in subhymenium and trama, branching near septa, 2.5–6 μm in diam., thin-walled in subhymenium, thick-walled in trama (0.8–1.5 μm), smooth; clamps always present; contents homogeneous. Skeletal hyphae hyaline, cylindrical, loosely arranged, 3–5.5 μm in diam., thick-walled (0.8–2.0 μm), smooth, often with secondary septa. Gloeocystidia scanty, of subhymenial to tramal origin, cylindrical to moniliform, 60–110 \times 5–6 μm . Basidia hyaline, clavate, 25–35 \times 6–8 μm , thin-walled, smooth, with basal clamp, with four sterigmata. Spores hyaline, broadly ellipsoidal, with small apiculus, 10–12 \times 5–8 μm , not glued together, thick-walled (c. 0.5 μm), smooth, not amyloid but strongly cyanophilous.

REACTIONS.—Spores strongly cyanophilous; no other part of basidiocarp is amyloid, dextrinoid, or cyanophilous.

SUBSTRATE.—On decorticated rotting wood, rarely on bark (Cunningham, 1956).

DISTRIBUTION.—New Zealand.

MATERIAL STUDIED.—NEW ZEALAND: Taranaki, Dawson Falls, Mt. Egmont, 850 m, Jan. 1953, J. M. Dingley, on *Schefflera digitata* (PDD 14245) (K; type).

NOTE.—Contrary to Cunningham (1963) I found the hyphal system to be dimitic.

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