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THE GENERA OF THE HYPHODERMOIDEAE (CORTICIACEAE)

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(With 19 Text-figures)

The type species and additional species of the genera of the Hyphodermoideae have been studied. Key-characteristics, based mainly on basidial morphology, have been elaborated for a delimitation of the genera. The new genera *Cylindrobasidium*, *Bulbillomyces*, and *Lagarobasidium* are described. Several new combinations are proposed. A key to the genera is given.

There are many examples in the Corticiaceae of species being much easier to determine than the genera to which they belong. For many of the species the delimitation is rather well known, but to gain a clear insight into the limits of a genus one has to study as many of its species as possible, thus trying to synthezise a genus-concept. Another possibility, of course, is to recur to the generic description published by the author of the genus in question, but this is where difficulties often arise. The older genera are not seldom poorly defined and also several recent genera published between 1950 and 1960, mainly by Donk and Eriksson, are not clearly delimited. Sometimes a genus which was well defined in the beginning becomes a jumble-shop through the accumulation of species of unknown affinities, and finally nobody knows how it is really to be delimited—as for instance is the case in the genera *Phlebia* Fr. emend. Donk and *Radulomyces* Christ. emend. Parm. Other genera are known which never had a good circumscription, such as *Hyphoderma* Wallr. emend. Donk and *Hyphodontia* Eriksson.

Donk (1957) opens his description of *Hyphoderma* with the sentence: "The average species may be characterized as follows". What follows is a rather elaborate characterization of the most common species which by no means covers all of the 24 species he combines under this genus; unfortunately no figures are given and nothing is said about the shape and size of the basidia.

Eriksson (1958) on the other hand gives beautiful figures of ten species of the genus *Hyphodontia*, combines 20 species of which he gives no description, while the entire diagnosis of the genus consists of barely two lines: "Genus Hymenomycetum corticioideum et hydnoideum, generi Hyphodermati affine sed differt basidiis minoribus, fructificationibus fibrosis et hyphis angustioribus". This was judged by Gilbertson (1968, published 1971) a "very brief and rather vague description". He was indeed the first to give a clear and extensive description of the genus.

Since I had and often still have serious difficulties in naming collections especially from tropical regions—and by this I mean mainly the determination of the genus to which they belong—I undertook a study of the type-species of the genera of the subfamily Hyphodermoideae, while I intend to extend this work to the Phlebioideae. As shown in the present paper I was above all interested in disclosing the differences between *Hyphoderma* and *Hyphodontia*, two rather large genera of cosmopolitan distribution, and of which, besides the type-species, I studied another ten species each.

This study was not designed to solve all the problems, because this is only possible—at the earliest—after good monographs of the larger genera have become available. But I hope to give a working basis which may be adapted to such needs as may arise. It emphasizes some points which have been overlooked or forgotten, while its main aim is to bring out the basidial morphology.

I adopted the arrangement in subfamilies as given by Parmasto (1968), and of the Hyphodermoideae I studied only the genera he listed. I fully realize that there are some genera within other subfamilies of the Corticiaceae which ultimately have to be transferred to the Hyphodermoideae, but for the moment I found it more practicable to restrict myself to this subfamily as delineated by Parmasto; however, *Odontician* Parm. has been omitted.

Numerous observations have been made on the hyphae of the genera here treated, although surely more remains to be done. Not nearly as much is known about the basidia, however, and since I believe that their properties have to be used as the main characteristics of the Corticiaceae, description of size, shape and origin of the basidia is the main purpose of the present study. In this connection it is interesting to note for instance that for only two out of 21 species treated in his excellent work on the Swedish species of *Peniophora* sect. *Coloratae*, Eriksson (1950) gives a figure of an entire basidium from top to base, whereas in all other species only the upper part of the basidia is illustrated. I know from personal experience that in some species it is very difficult or almost impossible to get a clear view of the whole basidium, but this should not be a deterrence to try again and again (in this respect *Peniophora* surely does not seem to belong to the most difficult genera).

The genus *Radulomyces* Christ. may serve as an example of the importance to study the whole basidium. The basal parts of the basidia are conspicuously constricted, thus giving the basidium a distinctly stalked appearance. This provides an excellent basis for separating this genus from the other genera of the Hyphodermoideae.

Another interesting fact is that in *Peniophora quercina* the basal parts of the basidial walls are clearly thickened (up to 0.8 μm). Since the sterigmata are formed only at a very late stage of basidial development, unripe basidia (not seldom with secondary clamps) look very much like cystidia.

An interesting but not yet exhaustively studied feature is the difference in shape of young and adult basidia. In the Hyphodermoideae in most cases the young basidia are cylindrical or ± narrowly clavate, but in *Basidioradulum* Nobles their shape is completely different: the young basidia are broadly ellipsoidal or even pyriform, thus rather strongly differing from those of *Hyphoderma*.

I tried to establish the number of nuclei in the cells of the basidiocarp of all species treated here. Unfortunately the results where not always equally good, since the uptake of the nuclear stain (carmine, orcein, or coriphosphine) depends on the condition of the basidiocarp and the chemicals used for poisoning the fungi. In *Pulcherricium caeruleum* this study yielded the interesting observation that dendrophyses can develop into basidia, thus functioning as probasidia.

The most difficult group of the Hyphodermoideae is formed by the genera *Basidioradulum*, *Hyphoderma*, *Hyphodontia*, and *Metulodontia*, since the shape of their basidia seems to be identical. The type species of *Basidioradulum*, *B. radula*, has been transferred by Donk to *Hyphoderma*. There is, in fact, no difference between both genera as to size and shape of the mature basidia, but the hyphal texture of the subhymenium is much more dense in *Basidioradulum*, while in this genus the developing basidium passes from broadly ellipsoidal or even pyriform to subirniform.

In *Hyphoderma* itself the basidia develop from cylindrical to clavate or subornifom. It would seem that the difference in basidial ontogeny as well as in the structures of the basidiocarps (hymenial surface, hyphal texture) carry sufficient weight to maintain *Basidioradulum* as a separate, although probably small or even monotypic genus.

Metulodontia shows no difference from *Hyphoderma* as far as hyphae and basidia are concerned but differs in having thick-walled, heavily incrusted and aseptate cystidia.

The remaining genera to be discussed are *Hyphodontia* and *Hyphoderma*. It is possible to recognize a group of species with mostly grandinioid or odontoid basidiocarps, small basidia (up to about 16 µm) and spores, and narrow, often somewhat thick-walled hyphae and cystidia. These have been placed in *Hyphodontia*. There is another group of species with mostly even basidiocarps, larger basidia (approximately 20–45 µm long) and spores, wider hyphae (which are at least as thick-walled as in *Hyphodontia* but with a wider lumen) and often larger cystidia (in some species also with gloeocystidia). These species have been placed in *Hyphoderma*. Several species placed by Eriksson in *Hyphodontia*—e.g. *Corticium niveum* Bres., *Thelephora sambuci* (Pers.) ex Pers.—differ in having typical large basidia and rather thin-walled hyphae; consequently they are transferred to *Hyphoderma*.

Many species of *Hyphodontia* have the walls of the basal hyphae of the basidiocarp not much thickened so that they are reminiscent of a miniature *Hyphoderma*. This is where the two genera under discussion seem to touch, and the only clear-cut difference I can see lies in the size of the basidia. This is the reason why the separation of the two genera seems to be merely a matter of taste and convenience, although it is true that often their outward appearance is somewhat different, a smooth hymenium being a characteristic of *Hyphoderma*, a hydnoid hymenium of *Hyphodontia*. At this junction, therefore, I prefer to keep the two groups of species separated, not in the least because the union of the two rather large genera, which are likely to grow in the near future, is bound to result in an unwieldy supergenus.

At first I tried to maintain *Metulodontia* as a separate genus, which differs from *Hyphoderma* solely on account of its thick-walled, aseptate and incrusted cystidia, whereas the hyphal structure and especially the size and shape of the basidia are

identical. If such a separation is accepted, three species of *Hyphoderma* [viz. *H. mutatum* (Peck) Donk, *H. heterocystidium* (Burt) Donk, *H. populneum* (Peck) Donk] will have to be transferred to *Metulodontia* since they all have the same type of cystidia. On the other hand they exhibit in addition glococystidia which is also a feature of "true" Hyphodermas, like *H. argillaceum* (Bres.) Donk and *H. clavigerum* (Bres.) Donk.

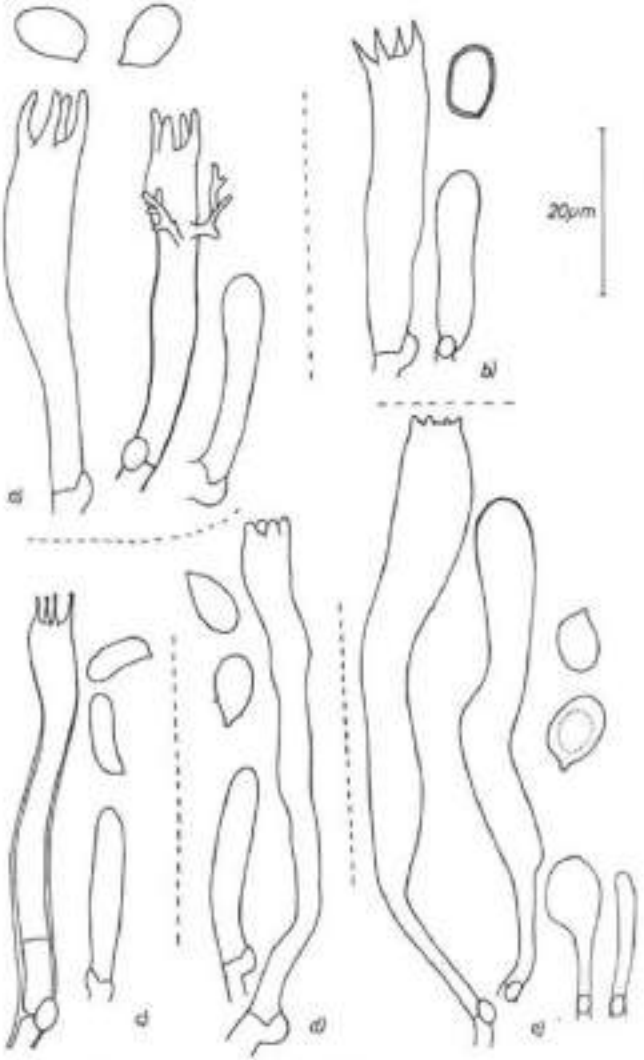

Fig. 1. Basidia: a. *Pulcherricium caeruleum*; b. *Hypochnicium bombycinum*; c. *Peniophora quercina*; d. *Cylindrobasidium evolvens*; e. *Radulomyces confluens*.

This means that the three species mentioned above are intermediate between *Hyphoderma* and *Metulodontia*. After having studied all the species enumerated above (with the exception of *H. populneum*) I see no possibility to keep *Hyphoderma* and *Metulodontia* apart on morphological grounds.

However, this disposition clashes with the findings of Boidin, Mc Keen and others who have studied the sexual behaviour of corticiaceous species. Boidin & Lanquetin (1965) found *Peniophora nivea* (Karst) Bourd. & Galz.—the type species of *Metulodontia*—to be tetrapolar, whereas all other species of *Hyphoderma* were reported by Boidin to be bipolar. In addition, McKeen found *H. heterocystidium*, *mutatum* and *populneum* to be bipolar too. It would seem to me that too much emphasis is laid upon the importance of the difference between bipolar and tetrapolar behaviour. I am not convinced that it can be used as a differential character at the generic level. The two modes of sexual behaviour occur in taxa of great morphological similarity. In a tabel given by Boidin 1964 the genera *Hyphodontia*, *Peniophora* and *Radulomyces* are indicated as being tetrapolar, while *Hyphoderma* and *Phlebia* are said to be bipolar. If the differential sexual behaviour as accepted as an infallible character, *Hyphoderma* and *Metulodontia* must be considered to be quite different genera, while many other taxonomic problems among the genera of the Corticiaceae would be solved. The disturbing fact remains, however, that as yet no good morphological characters are known to separate the two genera in question. I have no personal experience with cultures, neither did I study the sexual behaviour of Corticiaceae, but literature provides an interesting example which very suitably illustrates my point. Boidin 1971 mentioned the genus *Gloeocystidiellum* as consisting of bipolar, tetrapolar, and homothallic species. But unfortunately this example bears new problems. Boidin here came across difficulties which he tried to explain by assuming that e.g. in the homothallic species the verticillate clamps were "derived . . . by overevolution", followed by the sentence that "the verticillate clamps have not been derived but are an extravagant reinvention".

Since I am unable to reduce terms like "overevolution" and "extravagant reinvention" to a purely morphological level, I am inclined to lay the emphasis on the morphological facts rather than on interfertility tests in such cases where seemingly different results are obtained. This applies all the more since the two genera *Hyphoderma* (bipolar) and *Hyphodontia* (tetrapolar), kept so widely apart by Boidin, are surely much more closely related to each other than to any other bipolar respectively tetrapolar genus. It may even be said that the distinction between the two genera, which is based merely on different sizes of basidia, spores and hyphae, often seems to be more a matter of taste.

Key to the genera (see Figs. 1–2)

1a. Spores thick-walled (*c.* 0.4–0.8 µm), smooth or sculptured 2
1b. Spores thin-walled, smooth 4
2a. Spores distinctly thick-walled; young basidia more or less cylindrical; imperfect *Aegerita*-state absent 3

2b. Spores only slightly thick-walled; basidia 20–26–32 µm long, in young state broadly ellipsoidal; imperfect *Aegerita*-state present . . . . . *Bulbillomyces*, p. 69
3a. Basidia 30–45–60 × 5–7–9 µm; spores smooth or sculptured . . . . *Hypochnicium*, p. 81
3b. Basidia 10–18–20 × 4–6 µm; spores smooth . . . . . *Lagarobasidium*, p. 84
4a. Cystidia with bifurcate base, covered with crystals arranged in longitudinal rows; basidia exhibiting repetition (difficult to observe) . . . . . *Subulicystidium*, p. 95
4b. Cystidia lacking or different, never with bifurcate base and crystals arranged in rows; no repetitive basidia 5
5a. Dendrophyses present 6
5b. Dendrophyses absent 7
6a. Basidiocarp bright or dull coloured, never blue; hyphal texture dense, individual hyphae difficult to observe; if dendrophyses present, then always together with gloeocystidia or thick-walled cystidia, or not covered with blue granules; dendrophyses not developing into basidia . . . . . *Peniophora* pro parte, p. 87
6b. Basidiocarp blue or greenish-blue; hyphae distinct; only dendrophyses present, some of which may develop into basidia; no gloeocystidia or thick-walled cystidia formed *Pulcherricium*, p. 88
7a. Basidia clavate or distinctly stalked (the basal part abruptly constricted); if irregularly cylindrical, then *c.* 40–80 µm long 8
7b. Basidia urniform or suburniform, up to 35–45 µm long 11
8a. Basidiocarp bright or dull coloured, rather compact, mostly ceraceous; hyphal texture dense, individual hyphae difficult to observe; dendrophyses, gloeocystidia or lampeocystidia (thick-walled, aseptate, heavily incrusted) present; spore-print said to be red *Peniophora*, p. 87
8b. Basidiocarp mostly cream-coloured, pellicular, membranaceous or only slightly ceraceous; hyphae distinct; cystidia and gloeocystidia present or absent; spore-print white 9
9a. Basidiocarp pellicular, with a distinct subiculum of loosely interwoven hyphae; cylindrical cystidia with septa and clamps present . . . . . *Amphinema*, p. 65
9b. Basidiocarp membranaceous, no well developed subiculum present; cystidia absent, gloeocystidia or hyphidia may be present 10
10a. Basidia stalked, up to 50–70 µm long, with abruptly constricted basal part, the early stages often like a long-stalked pleurobasidium; cystidia or gloeocystidia absent, hyphidia in some species present . . . . . *Radulomyces*, p. 92
10b. Basidia narrowly clavate, up to 80 µm long, the basal parts not abruptly constricted, the early stages distinctly and narrowly cylindrical; fusiform cystidioles present *Cylindrobasidium*, p. 72
11a. Cystidia present, aseptate, thick-walled and heavily incrusted, 7–12–18(–24) µm wide; basidia urniform or suburniform 12
11b. Cystidia lacking or present, septate or aseptate, but then not thick-walled, never heavily incrusted and only up to *c.* 7–8 µm wide; basidia suburniform 13
12a. Basidia suburniform, slightly constricted in the middle; young basidia more or less cylindrical or narrowly clavate; imperfect *Aegerita*-state absent *Hyphoderma* pro parte, p. 87
12b. Basidia urniform to suburniform, mostly strongly constricted in the middle; young basidia broadly ellipsoidal; imperfect *Aegerita*-state present . . . . . *Bulbillomyces*, p. 69
13a. Young basidial stages broadly ellipsoidal or even pyriform, adult basidia *c.* 20–30 µm long; basidiocarp raduloid . . . . . *Basidioradulum*, p. 67
13b. Young basidial stages cylindrical to narrowly clavate; basidiocarp even, grandinioid or odontioid 14
14a. Basidia rather small, *c.* 10–16 × 3–5 µm; spores mostly less than 7 µm long (up to 8 µm) *Hyphodontia*, p. 80
14b. Basidia longer, *c.* 20–35–45 × 6–8 µm; spores mostly more than 7 µm long (up to 12–15 µm) . . . . . *Hyphoderma*, p. 78

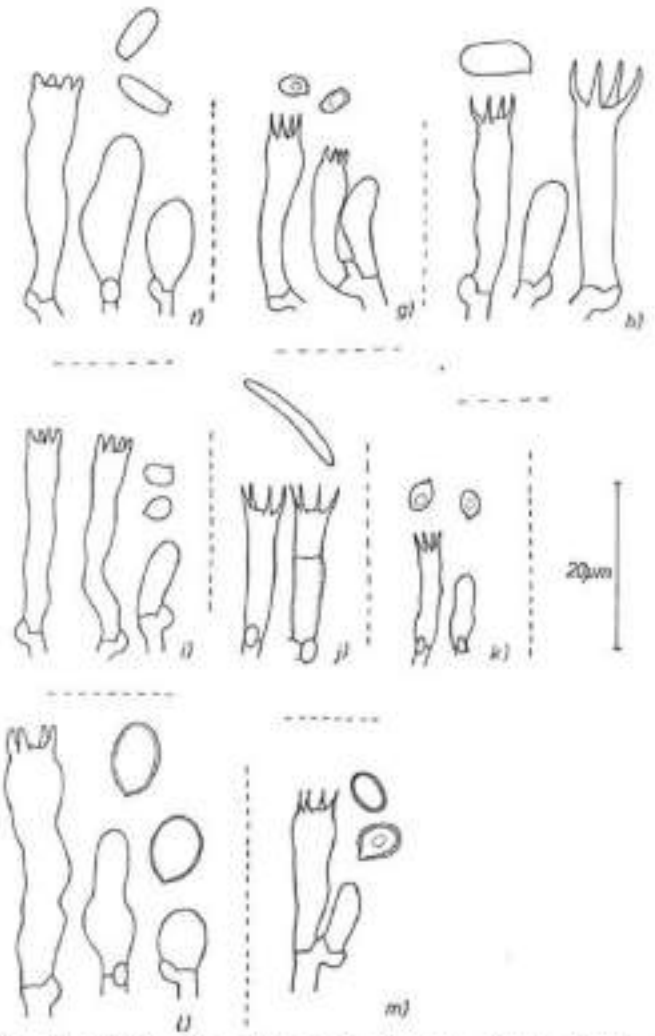

Fig. 2. Basidia: f. *Basidioradulum radula*; g. *Amphinema byssoides*; h. *Hyphoderma setigerum*; i. *Metulodontia nivea*; j. *Subulicystidium longisporum*; k. *Hyphodontia pallidula*; l. *Balbillosyces farinaceus*; m. *Lagarobasidium pruinosum*.

Amphinema P. Karst.

Amphinema P. Karst. *in* Bidr. Känn. Finl. Nat. Folk **51**: 228. 1892 (name change for *Diplonema* P. Karst. 1889, not ~ G. Don 1837, not ~ De Not. 1846, not ~ Kjellmann 1855). — Type species: *Diplonema sordescens* P. Karst. = *Thelephora byssoides* Pers. ex Fr.

Basidiocarp effused, pellicular with a subiculum of loosely interwoven hyphae, rarely membranaceous and closely adnate; rhizomorphs present. Hymenial surface even, under a lens hairy owing to the far projecting cystidia. Hyphal system monomitic. Hyphae yellowish, rarely hyaline, often covered with small granules, more or less thin-walled, *c.* 2–4 μm in diameter. Cystidia hypha-like, cylindrical, nodose-septate, yellowish, rarely hyaline, densely covered with small granules, slightly thick-walled. Basidia suburniform or clavate, four-spored, clamped, *c.* 20–25 μm long. Spores hyaline, small, thin- to slightly thick-walled, often guttulate, not amyloid.

SCOPE.—One or two species of cosmopolitan distribution.

AMPHINEMA BYSSOIDES (Pers. ex Fr.) J. Erikss.—Fig. 3

Thelephora byssoides Pers. ex Fr., Syst. mycol. **1**: 432. 1821. — *Amphinema byssoides* (Pers. ex Fr.) J. Erikss. *in* Symb. bot. upsal. **16** (1): 112. 1958. — For the synonymy, see Rogers & Jackson (1943).

Basidiocarp effused, soft-membranaceous or often pellicular, loosely attached to the substrate, consisting of a rather thick subiculum of loosely interwoven hyphae supporting a thin hymenial layer; yellowish rhizomorphs often present. Hymenial surface even, more or less cream-coloured, slightly velvety owing to the projecting cystidia; often crater-like depressions can be seen on the surface: these are small patches of the basidiocarp where the basidia are lacking and the hyphae of the subiculum are visible. Hyphal system monomitic. Hyphae yellowish, cylindrical, distinct, rather thin-walled (0.2–0.3 μm), 2–3–4 μm in diameter, with clamps throughout, the surface often granulose, not cyanophilous. Cystidia hypha-like, yellowish, with clamps, slightly thick-walled (0.3–0.6 μm), 70–150 × 4–6 μm, 40–90 μm projecting, the surface mostly granulose, not cyanophilous; sometimes the cystidia develop from the clamps or more rarely apically a basidium or a cluster of basidia. Basidia cylindrical to mostly clavate, somewhat irregularly shaped, mostly smooth, but sometimes covered with small granules (like those found on hyphae and cystidia), hyaline, 20–25 × 4–5 μm, with four subulate, short sterigmata *c.* 2–3 × 0.8 μm; young basidia cylindrical. Spores hyaline, ellipsoidal, smooth, thin-walled to very slightly thick-walled (*c.* 0.3 μm), 4–4.5 × 2–2.5 μm, often 1-guttulate, with small, lateral apiculus; neither amyloid nor dextrinoid, not or only slightly cyanophilous (contrary to the statement by Eriksson & Ryvarden (1973) who found a "strong reaction to cotton blue").

CYTOLOGY.—Hyphae, cystidia and young basidial stages 2-nucleate, spores 1-nucleate.

SUBSTRATE.—Saprophytic on wood or bark of coniferous or frondose trees, on leaves, mosses, lichens, and on soil; also in mouse-holes, often met with under *Cladonia*-cushions.

MATERIAL STUDIED.—Germany: West-Berlin, Grunewald, 2.12.1967, *W. Jülich 955*; West-Berlin, Langes Luch, 14.2.1968, *W. Jülich 993*; Hessen, Weiszenborn, Graburg, 24.9.1968, *W. Jülich 2083*; Hessen, Albungen, Bilstein, 26.9.1968, *W. Jülich 2101*; Bayern, Füssen, 20.4.1968, *W. Jülich 1016*; Bayerischer Wald, Preying, 17.7.1968, *W. Jülich 1203*.

Austria: Hohentauern, 29.7.1968, *W. Jülich 1156*; Kärnten, Windisch Bleiberg, 17.9.1968, *W. Jülich 1409*; Kärnten, Göltschach südl. Klagenfurt, 16.9.1968, *W. Jülich 1246*; Kärnten, Gotschuchen, 18.9.1968, *W. Jülich 1439* (all specimens in Herb. Jülich).

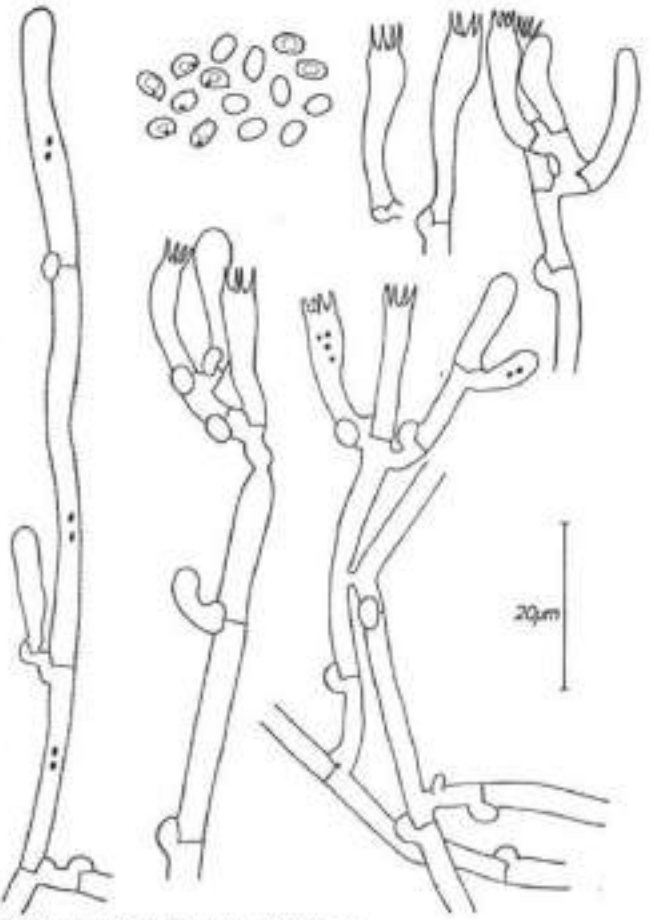

Fig. 3. *Amphinema byssoides*, Germany, *Jülich 955*.

Normally there is no difficulty in recognizing this yellowish coloured species even macroscopically, but there are some colour-variations: I collected two specimens with pure white basidiocarps, hyphae and rhizomorphs, (*W. Jülich 1409, 2101*) which are microscopically absolutely identical with the normal yellow forms.

Basidioradulum Nobles

Basidioradulum Nobles in Mycologia **59**: 192. 1967. — Type species: *Hydnum radula* Fr.

Basidiocarp effused, resupinate or effuso-reflexed, membranaceous or with a ceraceous hymenial layer. Hymenial surface raduloid. Hyphal system monomitic. Hyphae hyaline, the basal ones more or less loosely arranged, the hymenial layer

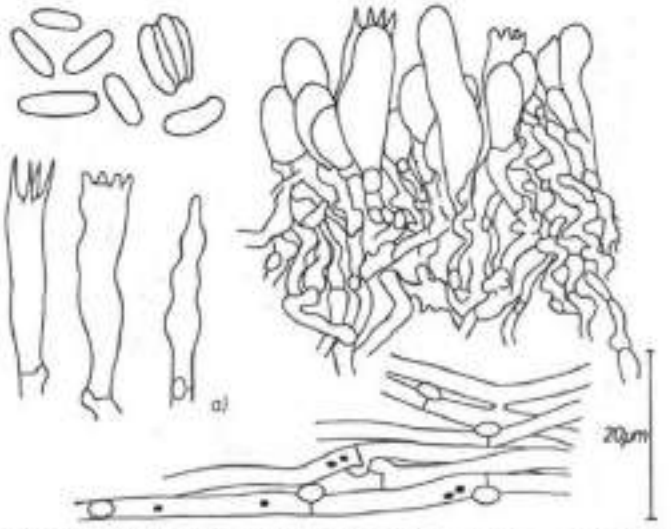

Fig. 4. *Basidioradulum radula*, Netherlands, *Maas Geesteranus 11785*. — a. Moniliform hypha.

compact; thin-walled, clamped. Cystidioles present. Basidia when mature subturniform and constricted in the middle, the young stages broadly ellipsoidal or pyriform; with clamps at the base. Spores hyaline, thin-walled, cylindrical, non-amyloid.

SCOPE.—Only a few species or perhaps monotypic.

BASIDIORADULUM RADULA (Fr. ex Fr.) Nobles—Fig. 4

Hydnum radula Fr. ex Fr., Syst. mycol. **1**: 422. 1821. — *Basidioradulum radula* (Fr. ex Fr.) Nobles *in* Mycologia **59**: 192. 1967. — For the synonymy, see Nobles (1967).

Basidiocarp orbicular, later confluent, effused, up to several decimetres long in one direction, thick-membranaceous; margin adnate or reflexed, rhizomorphs lacking. Hymenial surface at first even, but soon covered with teeth of variable shape, from cylindrical or conical to plate-like, the tip in younger stages fertile, after rapid growth often sterile, scattered over the whole surface or slightly fasciculate; cream-coloured, the margin lighter. Hyphal system monomitic. Hyphae hyaline, rather thin-walled (0.2–0.4 µm), 2–3.5–5 µm in diameter, with clamps at all septa, the basal ones distinct and straight, the subhymenial ones often tortuous-torulose and indistinct. Cystidia and gloeocystidia lacking but moniliform cystidioles (35–60 × 5–7 µm) sometimes present. Basidia at first broadly ellipsoidal, later irregularly cylindrical to narrowly clavate, 22–30 × 4.6–6 µm, clamped at the base, with four subulate sterigmata *c.* 4–5 × 0.8–1 µm. Spores hyaline, cylindrical, often slightly curved, 7–10–11 × 2.3–3 µm, with small apiculus; neither amyloid nor dextrinoid or cyanophilous.

CYTOLOGY.—Hyphae 2-nucleate; I was unable to see nuclei in the basidia and the spores.

SUBSTRATE.—On bark of frondose trees (*Populus, Betula, Carpinus, Salix, Acer, Philadelphus*).

MATERIAL STUDIED.—Netherlands: Voorne, Oostvoorne, 6.10.1956, *R. A. Maas Geesteranus 11785* (L); Voorne, Rockanje, Quackjeswater, 6.5.1956, *R. A. Maas Geesteranus 11540* (L); Rijssen, Rijsserberg, 11.9.1955, *R. A. Maas Geesteranus 10664* (L); Wassenaar, Meyendel, Kijlhoek, 16.10.1954, *R. A. Maas Geesteranus 10170* (L); St. Pietersberg, Oosthelling, 17.10.1952, *R. A. Maas Geesteranus 9201* (L); Wassenaar, Meyendel, Bierlap, 30.10.1952, *C. Bas & R. A. Maas Geesteranus 9272* (L).

Germany: Lengerich, .12.1898, *W. Brinkmann* in Brinkmann, Westf. Pilze 85 (L).

England: Stockgrove Woods, Heath and Reach, near Rushmere Lodge, 14.5.1955, *D. A. Reid* (L 943.250–050).

Sweden: Gästrikland, Gävle, 18.4.1965, *J. A. Nannfeldt 19375* (L).

Finland: Elimäki, Mustiala, 29.6.1963, *O. von Schulmann* (L 962.271–112).

Bulbillomyces Jülich, *gen. nov.*

Carposoma resupinatum, membranaceum, adnatum, margo indistincta. Hymenium laeve, griseum vel crenerum. Systema hypharum monomiticum. Hyphae hyalinae, distinctae vel indistinctae, ± tenuitunicatae, fibulatae. Cystidia crasse tunicata, incrustata, fibulata. Basidia urniformia vel suburniformia, *c.* 20–30 µm longa, tetraspora, fibulata. Sporae hyalinae, tenui- vel incrassate tunicatae, inamyloideae. — Status imperfectus adest (*Aegerita*), cellis terminalibus ± clavatis, fibulatis. Typus: *Kneiffia farinosa* Bres. 1903.

Basidiocarp effused, adnate, membranaceous, margin indistinct. Hymenial surface even, greyish to ochraceous. Hyphal system monomitic. Hyphae hyaline, distinct or soon collapsed, rather thin-walled, with clamps, guttulate. Thick-walled cystidia present, incrusted, clamped. Basidia urniform or suburniform, *c.* 20–30 µm long, with four sterigmata and a clamp at the base. Spores hyaline, smooth, thin- or somewhat thick-walled, not amyloid. — Imperfect state present (*Aegerita*); its terminal cells more or less clavate and clamped.

The genus differs from other genera of the Hyphodermoideae in having urniform or strongly constricted suburniform basidia, thick-walled and incrusted cystidia (this is also the case in *Metulodontia*), and an imperfect *Aegerita*-state.

Bulbillomyces farinosus (Bres.) Jülich, *comb. nov.*—Figs. 5, 6

Kneiffia farinosa Bres. *in* Ann. mycol. **1**: 105. 1903 (basionym).

Peniophora farinosa (Bres.) Höhn. & Litsch. *in* Sber. Akad. Wiss. Wien **117**: 1095. 1908. — *Metulodontia farinosa* (Bres.) Parm., Consp. Syst. Cortic. 118. 1968.

Thelephora lactea Fr. *sensu* Fuckel *in* Jb. nassau. Ver. Naturk. **27–28**: 8. 1873 (misapplied).

Peniophora aegerita Höhn. & Litsch. *in* Sber. Akad. Wiss. Wien **116**: 810. 1907. — *Kneiffia aegerita* (Höhn. & Litsch.) Lindau, Krypt.-Fl. f. Anf. **1**: 13. 1911.

Peniophora candida Lyman *in* Proc. Boston Soc. nat. Hist. **33**: 168. 1907. — *Kneiffia candida* (Lyman) Herter, Krypt.-Fl. Mark Brandenb. **6**: 109. 1910.

Imperfect state: *Aegerita candida* Pers. ex Fr. 1821.

Basidiocarp effused, at first very thin and closely adnate, later more or less soft-membranaceous; margin indistinct, rhizomorphs lacking. Hymenial surface even, at first light greyish, later ochraceous, under a lens hispid owing to the long projecting cystidia. Hyphal system monomitic. Hyphae hyaline, thin- to slightly thick-walled

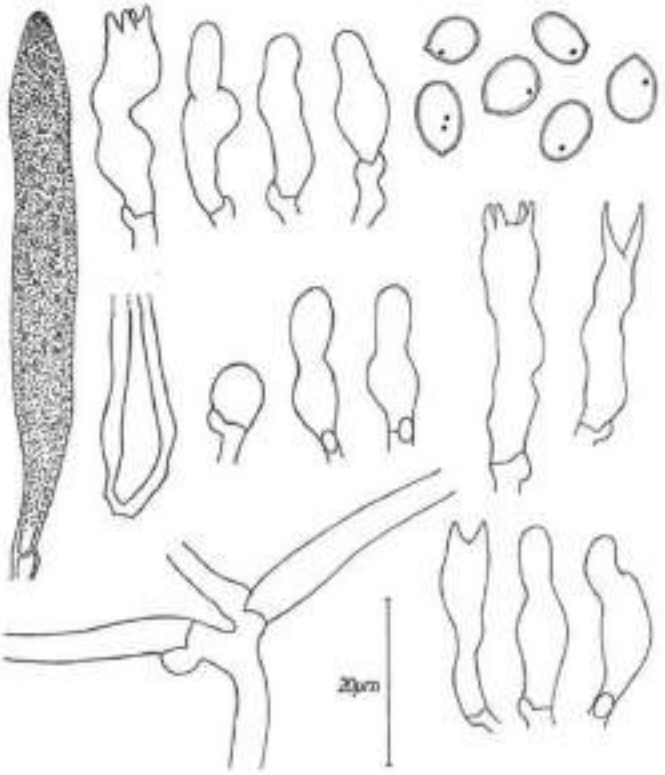

Fig. 5. *Bulbillomyces farinosus* (perfect state), Netherlands, *Maas Geesteranus 12911*.

(*c.* 0.3–0.4 µm), easily collapsed, *c.* 3–6 µm in diameter, with clamps. Cystidia present, thick-walled (*c.* 2–3 µm), incrusted, with a basal clamp, approximately cylindrical, gradually tapering towards the obtuse apex, 50–100 × 8–10 µm, projecting up to 60 µm. Basidia at first subglobose to pyriform, becoming urniform, later growing out at the apical part, giving the mature basidium a suburniform appearance, 20–26–32 × 6–8 µm, with four (*c.* 3 × 1 µm) rarely two (5–6 × 1.6 µm) sterigmata and a basal clamp. Spores smooth, hyaline, subglobose to broadly ellipsoidal, slightly thick-walled (*c.* 0.3–0.4 µm), 6–8.5–10 × 5–7 µm, with small apiculus, neither amyloid nor dextrinoid, not or only very slightly cyanophilous.

Aegerita candida-state: bulbils mostly ochraceous, sometimes pure white but becoming ochraceous in the herbarium, more or less ovoid (*c.* 0.2 × 0.1 mm), composed of centrifugally arranged branching chains of progressively larger cells, with clamps at all septa and numerous anastomoses; the apical cells broadly clavate and often stalked (*c.* 15–23 × 10–13 µm), at the apex with slightly thickened walls, otherwise thin-walled; the cytoplasma immediately turns a reddish brown colour in Melzer's reagent.

SUBSTRATE.—On wood or bark of frondose trees, mostly in very wet places.

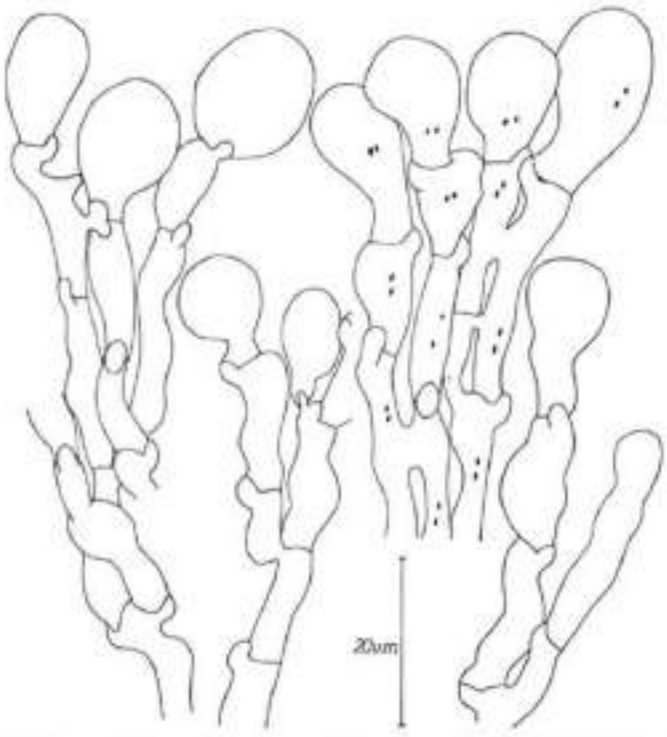

Fig. 6. Bulbillomyces farinosus (imperfect state), *Aegerita candida*, Netherlands, *Maas Geesteranus 12911*.

CYTOLOGY.—Spores mostly 1-nucleate, some 2-nucleate; in the Aegerita-state all the cells have constantly two nuclei.

MATERIAL STUDIED.—Poland: (all under the name *Peniophora farinosa* Bres. n. sp.) (*sine loc.*), 1901, *Eichler* (S); (*sine loc.*), ad ramos deciduos, August, *Eichler 12* (S); (*sine loc.*), Auf *Ulmus*, Oktober, *Eichler 120* (S).

Germany: West-Berlin, Spandau, Teufelsbruch, 12.11.1966, *W. Jülich 81*; 4.11.1967, *W. Jülich 873*, 887 (Herb. Jülich); Prov. Brandenburg, Triglitz in der Prignitz, 15.10.1913, *O. Jaap* in Jaap, Fung. sel. exs. 663 (L).

Netherlands: Groenekan, (Utr.), .11.1929, *H. Hirsch & M. A. Donk 1684* (L.); 's-Gravenhage, Haagsche Bosch, 10.1930, *M. A. Donk 2172* (L.); Goor-Diepenheim, 9.1929, *M. A. Donk 1935* (L.); Ulvenhout, Ulvenhoutse Bos, 18.8.1959, 1.9.1959, *R. A. Maas Geesteranus 12911*, *12923* (L.); Slangenburg prope Doetinchem, 10.9.1935, *W. J. Lütjeharms 2018* (L.); Nuenen, Nederwetten, 24.9.1961, *R. A. Maas Geesteranus 13558* (L.); Winterswijk, Walienseweg, 29.9.1956, *R. A. Maas Geesteranus 11763* (L.); 's-Graveland, "Boekesteyn", 12.11.1966, *J. Daams* (L).

France: Aveyron, Loubotis, 26.11.1913, *Galzin 14910* (L); (*sine loc.*), *L. Maire* (L).

Czechoslovakia: Jevany, 8.1924, *A. Pildt* (L).

The synonymy has been extensively discussed by Weresub (1961) who showed *Kneiffia farinosa* Bres. to be the oldest available name for the perfect state. In the Persoon herbarium at Leiden, one specimen is filed under the name "*Aegerita candida* P. / Specimen e Suecia missum. / Albert. et Schw. in herb. Pers." (L 910.249–1205); the bulbils are identical with the often collected imperfect state of *Kneiffia farinosa* Bres.

Cylindrobasidium Jülich, *gen. nov.*

Carposoma resupinatum vel raro resupinato-reflexum, molle, membranaceum, margo fimbriata. Hymenium laeve, cremeum. Systema hypharum monomiticum. Hyphae hyalinae vel leviter flavidae, laxe intertextae, distinctae, fibulatae. Cystidiola fusiformia adsunt. Basidia longa, plus minusve cylindracea vel paene clavata, 40–80 µm longa, tetraspora, fibulata. Sporae hyalinae, tenuitunicatae, inamyloideae. Typus: *Thelephora evolvens* Fr. ex Fr., Syst. mycol. **1**: 441. 1828.

Basidiocarp resupinate or seldom effuso-reflexed, membranaceous, with more or less fimbriate margin. Hymenial surface even, about cream-coloured. Hyphal system monomitic. Hyphae hyaline or slightly yellowish, loosely interwoven, distinct, with clamps. Fusiform cystidioles present. Basidia rather long, cylindrical to narrowly clavate, about 40–80 µm long, with clamps at the base, four-spored. Spores hyaline, thin-walled, non-amyloid.

SCOPE: One or two species.

Cylindrobasidium evolvens (Fr. ex Fr.) Jülich, *comb. nov.*—Figs. 7, 8

Thelephora evolvens Fr. ex Fr., Syst. mycol. **1**: 441. 1821 (basionym).

Thelephora crustia Pers. ex Fr. *sensu* Fr., Syst. mycol. **1**: 444. 1821.

Corticium laeve f. *cucullatum* Bourd. & Galz., Hym. Fr.: 184. 1928. — *Corticium evolvens* f. *cucullatum* (Bourd. & Galz.) Donk *in* Meded. Ned. mycol. Ver. **18–20**: 142. 1931. — Type locality: France.

Corticium laeve f. *cystidiolatum* Bourd. & Galz. *in* Bull. Soc. mycol. Fr. **27**: 232. 1911. — Type locality: France.

Thelephora evolvens Fr., Obs. mycol. 154, pl. 4, fig. 12, b. 1815 (devalidated name; ex Fr., Syst. mycol. **1**: 441. 1821. — *Corticium evolvens* (Fr. ex Fr.) Fr., Epicr.: 557. 1838. — *Stereum evolvens* (Fr. ex Fr.) Karst. *in* Bidr. Känn. Finl. Nat. Folk **37**: 126. 1882; *in* Medd. Soc. Fauna Fl. fenn. **9**: 52. 1882. — *Auricularia evolvens* (Fr. ex Fr.) Quél., Fl. mycol. France: 25. 1888. — *Basidioradulum evolvens* (Fr. ex Fr.) Parm., Consp. Syst. Cortic.: 112. 1968. — Neotype: "*Corticium evolvens* Fr., Lund" (Herb. E. Fries, UPS).

Corticium laeve f. *expallidum* Bres. *apud* Strass. *in* Verh. zool.-bot. Ges. Wien **52**: 430. 1902 (nom. nud.). — Type: not seen.

Corticium incarnatum var. *fallax* (Pers.) *sensu* E. P. Fries in herb. E. Fries, UPS.

Thelephora fibrosa Desm. in herb. E. Fries, UPS.

Thelephora fusilis Pers., Mycol. europ. **1**: 133. 1822. — Lectotype: "*Thelephora fusilis*. Mycol. Europ., — hirsuta (detrita?) vix" (L 910.267–465).

Thelephora flaccida Fr. in herb. E. Fries, UPS.

Thelephora floccolenta Fr., Elench. **1**: 184. 1828. — Fide Donk 1959.

Corticium laeve f. *imbricato-reflexum* Bourd. & Galz., Hym. Fr.: 184. 1928 (lacking descr.). — *Corticium evolvens* f. *imbricato-reflexum* (Bourd. & Galz.) ex Donk *in* Meded. Ned. mycol. Ver. **18–20**: 142. 1931. — Type locality: France.

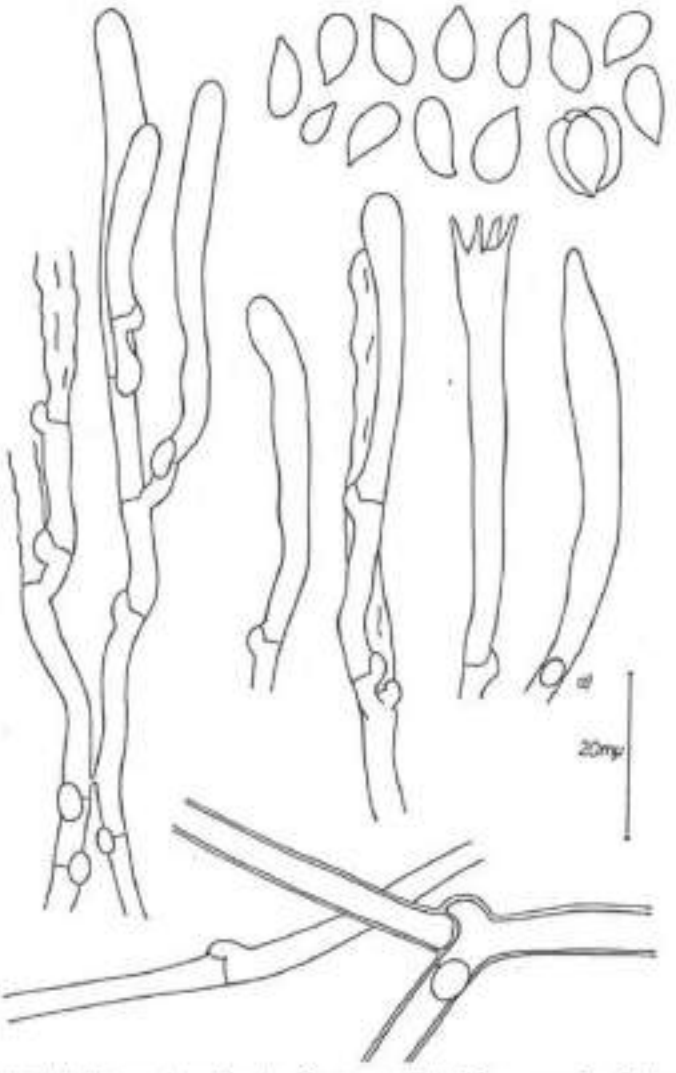

Fig. 7. *Cylindrobasidium evolvens*, Sweden, Neotypus, Herb. Fries. — a. Cystidiole.

Corticium laeve Pers. *in* Neues Mag. Bot. **1**: 110. 1794; Tent. Disp. Fung.: 30. 1797 (devalidated name). — *Thelephora laevis* Pers., Syn. Fung.: 575. 1801 (devalidated name). — *Thelephora laevis* (Pers.) ex Fr., Syst. mycol. **1**: 451. 1821; Pers., Mycol. europ. **1**: 130. 1822. — *Corticium laeve* (Pers. ex Fr.) Fr., Epicr.: 560. 1838. — *Hypochnus laevis* (Pers. ex Fr.) Bonord., Handb. Allg. Mykol.: 160. 1851. — *Sistrum laevis* (Pers. ex Fr.) Karst. *in* Medd. Soc. Fauna Fl. fenn. 9: 70. 1882. — *Peniophora laevis* (Pers. ex Fr.) Bart *apud* R. Fries *in* Acta R. Sci. Soc. gothob. IV, **3**: 36. 1900 (misapplied). — *Kneiffia laevis* (Pers. ex Fr.) Bres. *in* Annls mycol. **1**: 100. 1903

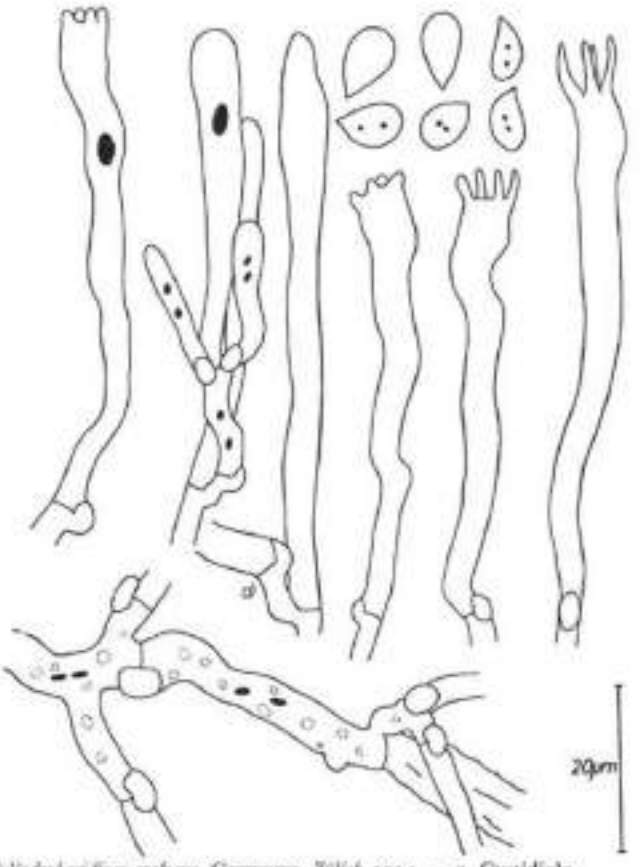

Fig. 8. *Cylindrobasidium evolvens*, Germany, *Jülich 1014*. — a. Cystidiole.

(misapplied). — Lectotype: "*Thelephora laxa*. Syn. fungorum" [scripsit Persoon] (L 910.267-619).

Thelephora laxa Pers., Mycol. europ. **1**: 143. 1822; not ∽ Fr., Elench. **1**: 196. 1828. — *Corticium evolvens* subsp. *laxum* (Pers.) Fr., Epicr.: 557. 1838. — Lectotype: "*Thelephora*" [scripsit Mougeot] "*laxa*. Myc. Europ. **1**. p. 148. *Th. evolvens* var. d. Fries. Elench. fung. p. 182" [scripsit Persoon] "Ecorce de Hêtres morts au sommet de Voges" [scripsit Mougeot] (L 910.267-613).

Cladoderris minima Berk. & Br. *in* Ann. Mag. nat. Hist. V, **1**: 24. 1878. — *Stereum minimum* (Berk. & Br.) Lloyd in Mycol. Writ. **4** (Syn. stip. Ster.): 36. 1913. — Fide D. A. Reid 1962. *Stereum nudulatum* v. Post in herb. E. Fries, UPS.

Corticium laeve f. *odontioides* W. Brinkm. *in* Bot. Z. **67** II: 229. 1909 (without separate descr.). — No specimen mentioned.

Thelephora populina Sommerf., Suppl. Florae Lapp.: 284. 1826; Fr., Elench. **1**: 183. 1828 (not definitely accepted: "...utrum varietates, an species haud dicam."); not ∽ Fr., Elench. **1**: 184. 1828 ("ined.", as synonym of *Thelephora flocculenta* Fr.). — *Corticium populinum* (Sommerf.) Fr., Epicr.: 559. 1838. — Type: not seen.

Athelia salicum Pers. *sensu* Fr. 1828 et 1838.

Thelephora sarcoides Fr., Elench. **1**: 185. 1828. — *Corticium sarcoides* (Fr.) Fr., Epicr.: 558. 1838. — Terana sarcoides (Fr.) O.K., Rev. Gen. Pl. **2**: 872. 1891 ("*sarcodes*"). — *Lenatina sarcoides* (Fr.) Höhn. & Litsch. *in* Ann. mycol. **4**: 294. 1906. — *Cytidia sarcoides* (Fr.) Herter *in* KryptogFl. Brandenb. **6**: 84. 1910 (misapplied); W. B. Cooke *in* Mycologia **43**: 204. 1951 (misapplied). — Neotype: "*Corticium sarcoides* Fr., Femsjö" (Herb. E. Fries, UPS).

Alevrodiscus sendaiensis Yas. *apud* Lloyd *in* Mycol. Writ. **7**: 1162. 1922 (nom. nud.). — Fide Lemke 1964.

Basidiocarp membranaceous, at first forming rounded resupinate patches with white fimbriate margin, often with one wart in the middle, then confluent and widely effused, up to several decimeters in one direction, totally resupinate and adnate or with loosened margins or more rarely effuso-reflexed with distinct small pilei; rhizomorphs lacking. Hymenial surface even, cream coloured or ochraceous. Hyphal system monomitic. Hyphae almost hyaline, but the basal and older ones often slightly yellowish-brownish; thin- to somewhat thick-walled (up to 0.4–1.0 μm), 3–4–5 μm in diameter, with clamps, guttulate. Fusiform cystidioles present, sometimes rare, *c.* 60–80 × 6–7.5 μm, clamped. Basidia cylindrical to very narrowly clavate, not distinctly stalked, 40–60–80 × 6–7–8 μm, always clamped at the base, with four sterigmata *c.* 4–6 × 1–1.5 μm. Spores hyaline, pyriform, thin-walled, 8–10–12 × 4–5–6 μm, with large apiculus, often agglutinated, not amyloid or dextrinoid, in some specimens slightly cyanophilous.

CYTOLOGY.—Hyphae, young basidial stages and spores bi-nucleate.

SUBSTRATE.—On leaves, wood or bark of frondose and coniferous trees.

This is a very common and variable species. For the pileate form Fries (Obs. mycol., 1815) created the name *Thelephora evolvens* after a specimen he received from Acharius. His description runs as follows (p. 154): "197. *Thelephora evolvens*, junior subrotunda clausa, dein evolvens subcupulaeformis, extus marginaeque pallida tomentosa, disco glabro obscurioei". Plate IV, fig. 1 shows two globular fruitbodies, the younger one *c.* 4 mm in diam. and still closed, the adult one *c.* 7–8 mm in diameter and opened with a *c.* 2–3 mm wide mouth. In 1821 (Mycol. europ. **1**) Fries repeats his first diagnosis with only slight modifications (p. 441): "*T. evolvens*, junior, subrotunda clausa, dein evoluta cupulaeformis, . . .". In 1828 (Elench. **1**) he speaks of "resupinata, submarginata", but recognizes several very variable forms: "forma, effusa excepta, nulla constans; variat a) cupularis; b) effuso-reflexa, pileata; c) minuta, immarginata, sed demum involuta; d) prorsus immarginata et effusa" (l.c.). In 1838 (Epicr.: 557) he describes the species as "molle, resupinatum, submarginatum" and mentions a cupular, an effuso-reflexed, and a resupinate form.

Several further synonyms have been given by Fries (1828) and later mycologists, but not all of them really belong to this species.

evolvens. — Under this name three specimens determined by Fries himself are present in his herbarium (UPS): a) *Corticium evolvens* Fr., Lund", consisting of several small, more or less pileate basidiocarps on bark of *Betula*, in outer appearance and substrate coming closest to the original description. Fries (1815: 155) describes substrate and collector as follows: "In ramis & truncis betulinis rarissimam & distinctissimum speciem invenit mecumque liberalissime communicavit ill. Prof. & Eques

Acharius". In his later work (Fries, 1821: 442) we only find: "Ad cortices Betulae. Aut. (v.s.)". — Since there is no indication that this is the holotype sent by Acharius, I consider this specimen the neotype of the species. — b) "*Corticium evolvens*, Upsaliae". Basidiocarp effused, resupinate, strongly cracked. — c) "*Corticium evolvens* Fr., Femsjö". Basidiocarp resupinate, adnate; on bark of a coniferous tree.

f a l l a x. — Herb. E. Fries, UPS. — "*Corticium incarnatum* v. *fallax* (P.), Upsala 1857, E. P. Fries". Basidiocarp more or less orbicular, tuberculate, confluent and resupinate.

f i b r o s u s. — A specimen filed under *Corticium evolvens* Fr. in herb. E. Fries, UPS was sent to E. Fries by Desmazières. The latter gave an extensive description of this fungus, followed by the sentences: "Cette espèce a des rapports avec le thelephora sericea. Si ce nest pas lui comme je le pense on pourroit l'appeler thel: fibrose. Votre opinion s'il vous plait, Desmazières"

f i s s i l i s. — There are three specimens in the Persoon herbarium filed under this name, all of them are identical with *Thelephora evolvens* Fr. The first one (L 910.267-465) bears the following label in Persoon's handwriting: "*Thelephora fissilis.* — hirsuta (detrita?)". Later (because the colour of the ink is different) Persoon added to fissilis "Mycol. Europ." and to hirsuta "vix". The morphology of the basidiocarp agrees very well with his description in Mycol. europ. **1**: 133. 1822: "longitudinaliter effusa, sordide alutacea, demum in particulas basi cohaerentes fissa, papillis copiosis magnis subaequalibus". He (loc. cit.) already suggests an affinity to *Thelephora laevis*, but also to *T. incarnata*, now a *Peniophora*. The other two specimens are: "*Thelephora*" [scripsit Mougeot] "*fissilis* Mycol. Europ. **1**. p. 133. — *laevis* var?" [scripsit Persoon] "in ramulis Aceris Pseudoplatani" [scripsit Mougeot] (L 910.267-471). — "*Th. fissilis?*" [scripsit Persoon] "*Thelephora frustulata* Pers. p. 577 / celle ci me paroit se rapporter d'avantage à votre description mais qu'est le No. 193" [scripsit Mougeot] (L 910.267-464).

f l a c c i d u s. — "*Thelephora flaccida. Corticium*". Herb. E. Fries, UPS. — Basidiocarps resupinate, adnate or with loosened margins; on bark of *Betula*. The genus name *Corticium* has later been added.

l a e v i s. — In 1797 Persoon described his fungus (p. 30) as "...Juvenili quidem orbiculata & papilla saepe unica instructa, in adultis vero speciminibus superficies tota laevis est & papillae evanescunt". Later, in Persoon 1801, 1822, Fries 1821, 1828, 1838, 1874, the papillae are no longer mentioned.

Several specimens of *Thelephora laevis* are in the Persoon herbarium, one of them is here designated as lectotype: "*Thelephora laevis.* Syn. fungorum" scripsit Persoon (L 910.267-619); it agrees very well with the descriptions in Persoon and Fries and is well preserved. Furthermore it is the only collection collected before 1821 and 1822 and the only one which has been accepted by Persoon without adding "?", "var?" or other remarks. All other specimens have been studied with the following results:

a) "No. 13 thelephora laevis Mycolog. p. 130.? / on le trouve maintenant sur divers arbres abattus et dénudés d'écorce, il n'a pas changé de couleur par la dessication" [scripsit Desmazières] (L 910.267-621); is this species. — b) "*Theleph. laevis* ? var.? *tuberculosa*" [scripsit Persoon] (L 910.267-558); is this species.

c) "*Theleph. laevis*?" [scripsit Persoon] (L 910.267-549); has narrow, clamped hyphae; is not this species. — d) "*Thelephora laevis* Pers. p. 575" [scripsit Chaillet] "*Thelephora*" [scripsit Persoon] (L 910.267-551); is a *Peniophora* spec. — e) "*Thelephora laevis*. var.? / sed margo non villosus est. / Sylvula Vincennes / prope Parisios / Junio-Julio, 1828". [scripsit Persoon] (L 910.267-64); is not this fungus. — f) "*Thelephora? laevis?* / Prope Parisios" [scripsit Persoon] (L 910.267-63); is not this fungus.

laxus. — The lecto-type specimen (L 910.267-613) agrees, as to the morphology of the basidiocarp, perfectly with the description given by Persoon (1822: 143): "... orbicularis .... Forte nondum bene evoluta. Affinitatem habere videtur cum *Peziza amorpha*". The type locality "Hab. in summitatibus montium Vogesiorum". (Pers., loc. cit.) is identical with the habitat written by Mougeot "au sommet de voges." — Two other specimens are present in the Persoon herbarium: a)" "*Thelephora*" [scripsit Mougeot] "*mesenterica laxa* ? / an fungus bene evolutus?" [scripsit Persoon] "Je n'ai trouvé qu'un Echantillon de cette espece que je partage avec vous, voila Monsieur vous en voyez ici si peu." [scripsit Mougeot]; this specimen is *Peniophora polygonia* (Pers. per Fr.) Bourd. & Galz. — b) "*Thelephora ? laxa* / prope Parisios" [scripsit Persoon]; the fungus has disappeared. — According to Fries (1828, Elench. **1**: 182) *Thelephora laxa* Pers. is identical with his variety α "fide spec. Mougeot!".

nodulosus. — Herb. E. Fries, UPS. — "*Stereum ? nodulosum* v.P., pa Björkqvist — Entragen 9/11, 61, H. v. Post". Basidiocarp resupinate; on bark of *Betula*.

populinus. — Of this species, one specimen is present in herbarium E. Fries, UPS: "*Corticium Populi* Smrft (teste Blytt), Christiania, M. N. Blytt" scripsit Th. M. Fries; this is identical with *Thelephora evolvens* Fr. According to Bresadola (cited in J. Egeland, *in* Nytt Mag. Naturvid. **49**: 374. 1912) "Likeledes es Sommerfelts *Corticium populinum* identisk med *C. evolvens* Fr. hvilket Bresadola har fastslaat i skrivelse til mig efter undersokelse av typer fra Sommerfelts herbarium."

salicum. — *Athelia salicum* Pers. is a true species of *Athelia*, relate to *A. epiphylla* Pers. but differs in having broader ellipsoidal spores. *Athelia salicum* Pers. sensu Fries is identical with *Thelephora evolvens* Fr. Fries based his opinion on a specimen he received from Chaillet with the following remark: "*Athelia salicum* N. E. J'ignore complettement la plante que Persoon me met sur le corps, je lui ai envoyé celle ci sous le nom de *Thelephora salicum*, dans sa reponce il l'appellait frustulata. si ce nest pas celle ci je ne scais ce que c'est. Chaillet" (Herb. E. Fries, UPS) (sub *Corticium evolvens*).

sarcoides. — "*Corticium sarcoides* Fr., Femsjö" Herb. E. Fries, UPS. — Basidiocarps mostly small, orbicular or tuberculate, some of them with reflexed edges; on bark of *Betula*. "*Corticium sarcoides*, Christiania, M. N. Blytt" Herb. E. Fries, UPS. — Basidiocarps resupinate, with loose margins; on bark of *Betula*.

FURTHER SPECIMENS STUDIED.—Germany: Füssen im Algau, 20.4.1968, *H. Wunder* (Herb. Jülich 1014).
Tunisia: N. of Hammamet, 9.4.1968, *W. Jülich 1012* (Herb. Jülich).
Canada: Ontario, Nashville, York Co., 30.10.1953, *R. F. Cain* (L.958.142–029).

HYPHODERMA Wallr. emend. Donk

Hyphoderma Wallr., Fl. crypt. Germ. **2**: 576. 1833; not ~ Fr. 1849; emend. Donk *in* Fungus **27**: 13. 1957. — Type species: *Hyphoderma spiculosum* Wallr. = *Thelephora setigera* Fr.
Kneiffia Fr., Fl. scand. 340. 1835 (nom. nud.); Fr., Gen. Hym. 17. 1836; not ~ Spach 1835. — Type species: *Thelephora setigera* Fr.
Kneiffiella Underw. *in* Bull. Torrey bot. Cl. **24**: 205. 1897; not ~ Karst. 1889. — Isonym[1] of *Kneiffia* Fr.
Kneiffiella Henn. *in* Engl. & Prantl, Natürl. PflFam. **1**(1**): 139. 1898. — Isonym of *Kneiffia* Fr.
Neokneiffia Sacc., Tab. comp. Gen. Fung. **11**: 1898; Syll. Fung. **14**: 11. 1899. — Isonym of *Kneiffia* Fr.
Pycnodon Underw. *in* Bull Torrey bot Cl. **25**: 631. 1898. — Isonym of *Kneiffia* Fr.
Athelioderma Parm., Consp. Syst. Cortic. 73. 1968. — Type species: *Athelioderma miraitile* Parm.
Metuloidontia Parm., Consp. Syst. Cortic. 117. 1968. — Type species: *Kneiffia nivea* Karst.

Basidiocarp effused, membranaceous or somewhat ceraceous, in some species pellicular. Hymenial surface mostly even, in some species grandinioid or odontioid. Hyphal system monomitic. Hyphae hyaline, thin-walled to slightly thick-walled, normally cylindrical (*c.* 3–5 μm in diameter), but in some species ampulliform (up to 10 μm in diameter), with clamps at the primary septa. Cystidia, gloeocystidia or cystidioles present in most species. Basidia when mature suburniform and constricted in the middle, when young cylindrical to narrowly clavate, *c.* 20–45 × 6–8 μm, with a basal clamp, often guttulate. Spores hyaline, thin-walled, cylindrical to ellipsoidal, normally longer than 7 μm, often guttulate, non-amyloid.
SCOPE: More than 40 species.

HYPHODERMA SETIGERUM (Fr.) Donk—Fig. 9

Thelephora setigera Fr., Elench. **1**: 208. 1828. — *Hyphoderma setigerum* (Fr.) Donk, *in* Fungus **27**: 15. 1957. — For the synonymy, see Rogers & Jackson 1943: 282–283.

Basidiocarp resupinate, membranaceous, loosely adnate, with arachnoid margin; rhizomorphs lacking. Hymenial surface even or mostly mealy-granulose to slightly odontioid, more or less cream-coloured. Hyphae hyaline, loosely interwoven, thin-walled to somewhat thick-walled (up to 1.0 μm), 3–5 μm in diameter, with clamps; in older hyphae some secondary hyphae with simple septa present. Cystidia hyaline to slightly yellowish, long, cylindrical, mostly septate, smooth or loosely covered with crystals, somewhat thick-walled (up to 1.0 μm), 100–200 × 7–10 μm, projecting about 30–80–130 μm; the primary septa have always a clamp whereas the secondary septa of the older cystidia are simple. Basidia clavate, 15–25–35 × 6–8 μm, with basal clamp; with four sterigmata *c.* 5–6 × 1.5 μm. Spores hyaline, cylindrical to slightly allantoid, thin-walled, 9–12–14 × 4–5 μm, with small lateral apiculus, neither amyloid nor dextrinoid or cyanophilous.

[1] Isonym, a name having the same basionym.

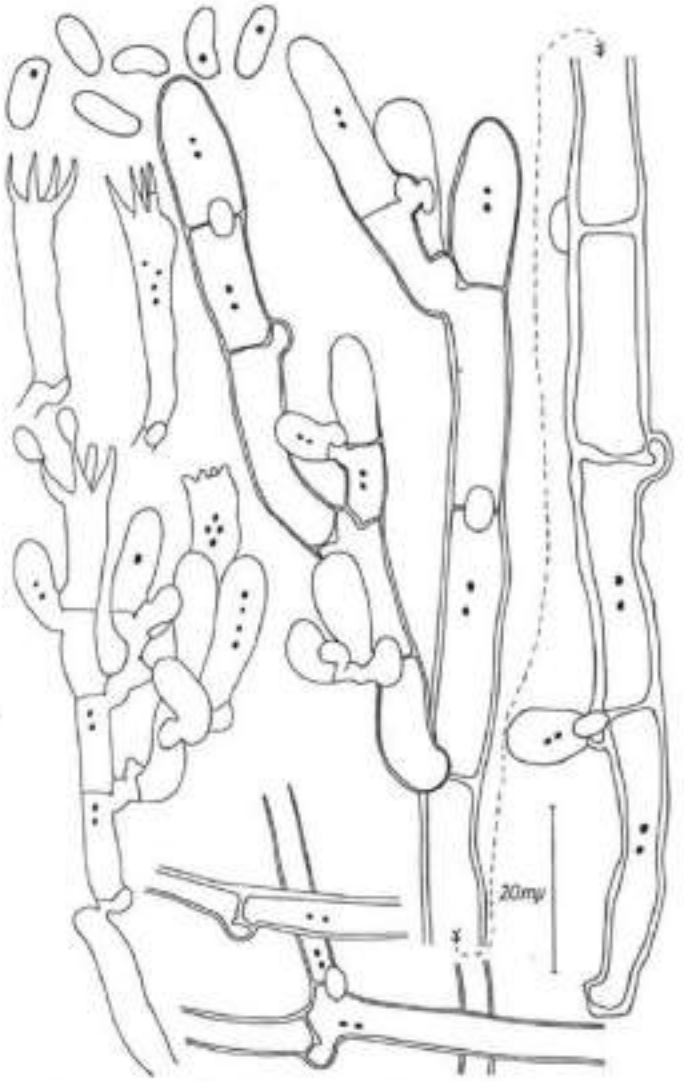

Fig. 9. *Hyphoderma setigerum*, Netherlands, Meyendel, 1973, *Jülich*.

CYTOLOGY.—Hyphal cells, young basidial stages and cystidial cells 2-nucleate, spores 1-nucleate.

SUBSTRATE.—On wood or bark of coniferous or frondose trees.

MATERIAL STUDIED.—E n g l a n d: Kings, Langley, Herts., 19.10.1953, *D. A. Reid* (L 954.017-061).

Germany: Berlin-West, 1967 and 1968, *W. Jülich 562, 614, 861, 880, 1171.* (Herb. Jülich); Hessen, Eschwege, Lotzenkopf, 25.9.1968, *W. Jülich 2046* (Herb. Jülich).
Austria: Kärnten, Viktring, 19.9.1968, *W. Jülich 1936* (Herb. Jülich).

Some species have to be transferred to *Hyphoderma*: **Hyphoderma alienum** (Parm.) Jülich, *comb. nov.* (basionym: *Basidioradulum alienum* Parm., Consp. Syst. Cortic. 204. 1968); **Hyphoderma anthracophilum** (Bourd.) Jülich, *comb. nov.* (basionym: *Corticium anthracophilum* Bourd. *in* Rev. sci. Bourbonn. **23**: 9. 1910); **Hyphoderma bresadolae** Jülich, *nom. nov.* (basionym: *Corticium niveum* Bres. *in* Annls mycol. **1**: 98. 1903, not *Hyphoderma niveum* Fuck. 1869); **Hyphoderma compta** (Jacks.) Jülich, *comb. nov.* (basionym: *Peniophora compta* Jacks. *in* Can. J. Res. **26**: 138. 1948); **Hyphoderma cremeo-album** (Höhn. & Litsch.) Jülich, *comb. nov.* (basionym: *Corticium cremeo-album* Höhn. & Litsch., Wiesner-Festschrift 63. 1908); **Hyphoderma cremeo-alutaceum** (Parm.) Jülich, *comb. nov.* (basionym: *Metulodontia cremeo-album* Parm., Consp. Syst. Cortic. 216. 1968); **Hyphoderma gemmiferum** (Bourd. & Galz.) Jülich, *comb. nov.* (basionym: *Corticium gemmiferum* Bourd. & Galz. *in* Bull. Soc. mycol. France **27**: 250. 1911); **Hyphoderma griseo-flavescens** (Litsch.) Jülich, *comb. nov.* (basionym: *Corticium griseo-flavescens* Litsch. *in* Pilát & Lindtner, Bull. Soc. sci. Skopje **18**: 178. 1938); **Hyphoderma karstenii** Jülich, *nom. nov.* (basionym: *Kneiffia nivea* Karst. *in* Hedwigia **35**: 173. 1896; not *Hyphoderma niveum* Fuck. 1869); **Hyphoderma mirabile** (Parm.) Jülich, *comb. nov.* (basionym: *Atheloderma mirabile* Parm., Consp. Syst. Cortic. 200. 1968); **Hyphoderma orientale** (Parm.) Jülich, *comb. nov.* (basionym: *Atheloderma orientale* Parm., Consp. Syst. Cortic. 202. 1968); **Hyphoderma probatum** (Jacks.) Jülich, *comb. nov.* (basionym: *Peniophora probata* Jacks. *in* Can. J. Res. **26**: 134. 1948); **Hyphoderma pruni** (Lasch) Jülich, *comb. nov.* (basionym: *Odontia pruni* Lasch *in* Rabenh., Fung. eur. exs. 1514. 1872); **Hyphoderma sambuci** (Pers. ex Pers.) Jülich, *comb. nov.* (basionym: *Thelephora sambuci* Pers. ex Pers., Mycol. europ. **1**: 152. 1822.

HYPHODONTIA J. Erikss.

Hyphodontia J. Erikss. *in* Symb. bot. upsal. **16**(1): 101. 1958. — Type species: *Peniophora pallidula* (Bres.) Bres. ex Bourd. & Galz.

Basidiocarp effused, resupinate, membranaceous, sometimes pellicular or thin-ceraceous; rhizomorphs absent. Hymenial surface rarely even, more often grandinioid or odontoid. Hyphal system monomitic (but with a tendency to dimitism). Hyphae narrow-cylindrical, thin-to somewhat thick-walled, mostly with clamps. Cystidia often present. Basidia when mature suburniform, constricted in the middle, cylindrical to narrowly clavate when young, *c.* 12–16 × 3–5 µm, with four (rarely two) sterigmata, mostly with a clamp at the base. Spores hyaline, thin-walled, subglobose to cylindrical or allantoid, in most species not longer than 7 µm, non-amyloid.

SCOPE.—More than 30 species.

The genus *Fibricium* J. Eriksson 1958 is very similar, differing only in the dimitic hyphal system. I studied three specimens of *Corticium rude* Karst. (ex S) which are identical with *F. greschikii* (Bres.) J. Erikss.: **Fibricium rude** (Karst.) Jülich, *comb. nov.* (basionym: *Corticium rude* Karst. *in* Bidr. Känn. Finl. Nat. Folk **37**: 143. 1882; Meddn Soc. Fauna Fl. fenn. **9**: 53. 1882 (Lat. diagn.); not ~ Pat. 1915).

HYPHODONTIA PALLIDULA (Bres.) J. Erikss.—Fig. 10

Gonatobotrys pallidula Bres. *in* Ann. mycol. **1**: 127. 1903. — *Hyphodontia pallidula* (Bres.) J. Erikss. *in* Symb. bot. upsal. **16**(1): 104. 1958. — For the synonymy, see Rogers & Jackson, 1943. — *Hyphodontia alutaria* (Burt) J. Erikss. is probably another synonym.

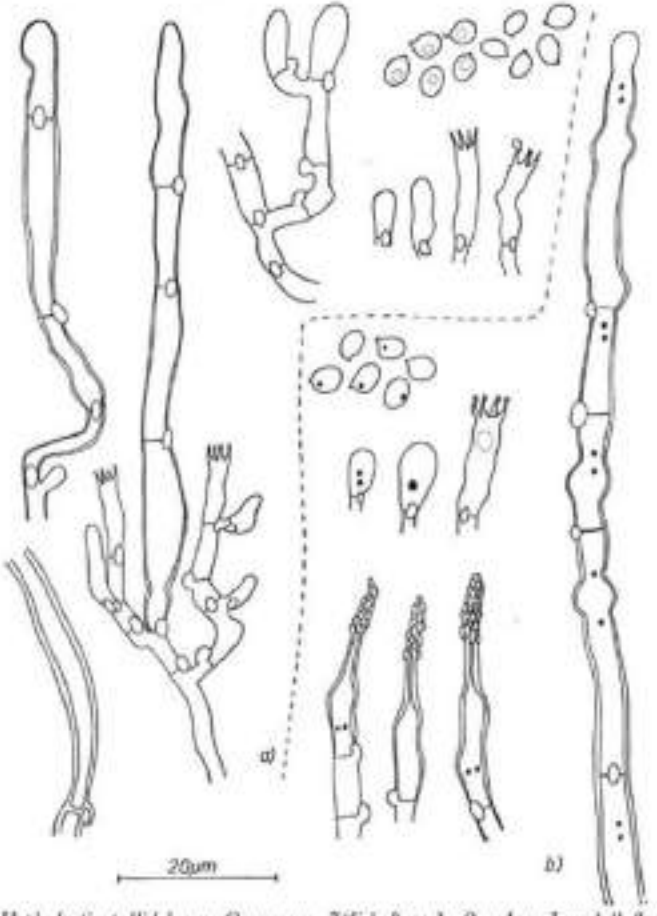

Fig. 10. *Hyphodontia pallidula*: a. Germany, *Jülich 849*; b. Sweden, Lundell & Nannfeldt, Fung. exs. suec. 572.

Basidiocarp effused, resupinate, membranaceous, thinning out towards the margin which is not definite; rhizomorphs lacking. Hymenial surface even to grandinioid, pale greyish-ochraceous. Hyphal system monomitic, but the basal hyphae often rather thick-walled. Hyphae cylindrical, hyaline to slightly yellowish (the basal ones), rather thick-walled (0.4–0.8–1.2 μm), 2.5–4 μm in diameter, with clamps, cyanophilous. Cystidia irregular-cylindrical with apical and intercalary swellings, rather thick-walled (0.4–0.8 μm) *c.* 40–90 × 4–7(–10) μm, up to 50 μm projecting, with clamped septa; the top of the cystidia often somewhat capitate and thin-walled, which seems to suggest that the cystidia are capable to grow out from this point, keeping pace with the thickening hymenium; distinctly cyanophilous. Lagenocystidia, i. e. short cystidia with abruptly narrowed and incrusted apical part, may be present. Basidia irregularly cylindrical with a constriction in the middle, 12–16 × 3.2–4.5 μm, with a basal clamp; with four subulate sterigmata curved inwards, *c.* 3 × 1 μm; somewhat cyanophilous; young basidia broadly cylindrical to ellipsoidal. Spores hyaline, smooth, broadly ellipsoidal, thin-walled, 3.5–4.5 × 2.5–3.5 μm, with distinct apiculus, often 1-guttulate, neither amyloid nor dextrinoid, not or only slightly cyanophilous.

CYTOLOGY.—Hyphae, cystidia and young basidia 2-nucleate, spores 1-nucleate.

SUBSTRATE.—On rotten wood of frondose and coniferous trees.

MATERIAL STUDIED.—Sweden: Västergötland, Östad, SO. om St. Kangekärr, 15.9.1968, *K. Hjortstam* (S); Småland, Fernsjö par., the N. slope of Dullaberget, 10.8.1937, *S. Lundell* (S).

Denmark. Amager, Kongelunden, 1.10.1955, *MP. Christiansen* (L).

Germany: Niedersachsen, Harz, Achtermann, 20.10.1967, *W. Jülich 849, 897* (Herb. Jülich); Görlitz, 10.1933, *A. Pildt* (PC).

Great Britain. Cumberland, Keswick, 3.6.1962, *D. A. Reid* (L).

Canada: Little White River, Twp. 1. B., Algoma D. Ont., 14.9.1956, *R. F. Cain* (L).

HYPOCHNICIUM J. Erikss.

Hypochnicium J. Erikss. *in* Symb. bot. upsal. **16**(1): 100. 1958. — Type species: *Corticium bombycinum* (Sommerf.) Karst.

Basidiocarp resupinate, effused, membranaceous; rhizomorphs lacking. Hymenial surface even, grandinioid or odontoid. Hyphal system monomitic. Hyphae hyaline, thin-walled to somewhat thick-walled, with clamps. Gloeocystidia or cystidioles often present. Basidia clavate or suburniform when mature, almost cylindrical when young, clamped at the base with four sterigmata. Spores hyaline or slightly yellowish, distinctly thick-walled, the surface smooth or sculptured, non-amyloid.

SCOPE.—About 10 species.

HYPOCHNICIUM BOMBYCINUM (Sommerf.) J. Erikss.—Fig. 11

Thelephora bombycina Sommerf., Suppl. Fl. lapp. ed. Wahlenb. 284. 1826; Fries, Elench. **1**: 211. 1828. — *Corticium bombycinum* (Sommerf.) Karst. *in* Hedwigia **32**: 120. 1893. — *Hypochnicium bombycinum* (Sommerf.) J. Erikss. *in* Symb. bot. upsal. **16** (1): 101. 1958.

Basidiocarp effused, adnate, membranaceous, with fimbriate margin, lacking rhizomorphs. Hymenial surface even or sometimes warted, about cream-coloured.

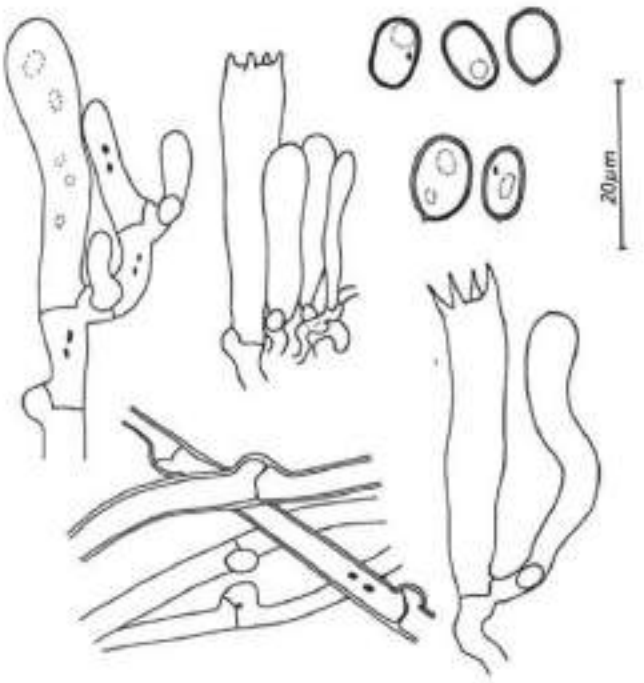

Fig. 11. *Hyphochnicium lombycinum*, Norway, type.

Hyphal system monomitic. Hyphae hyaline, thin- to thick-walled (up to 0.8–1.2 µm), 3–6 µm in diameter, with clamps at the septa (rarely some secondary septa lacking clamps). Cystidia lacking, but in compact basidiocarps hyphidia may be present. Basidia large, clavate, somewhat flexuous, thin-walled to slightly thick-walled, hyaline, 30–35–45 × 7–8–9 µm, clamped at the base, containing oil-drops in the cytoplasma, with four subulate sterigmata c. 4–5 × 0.8–1 µm. Spores hyaline, broadly ellipsoidal, smooth, distinctly thick-walled (0.4–0.6–0.8 µm), 8–11 × 6–8 µm, with small apiculus, neither amyloid nor dextrinoid but often weakly cyanophilous, mostly with 1–2 guttules.

CYTOLOGY.—Hyphae, hyphidia and young basidial stages 2-nucleate, spores 1-nucleate.

SUBSTRATE.—On wood or bark of frondose trees.

MATERIAL STUDIED.—Norway: "Saltdalen, in cortice Alni, 10/23, *Sommerfelt*" (type, S).

Sweden: Västergötland, Östad, 10.9.1968, *K. Hjortstam* (S). Västergötland, Vänga par., 25.9.1969, *K. Hjortstam* (S).

Germany: Westfalen, Lengerich, Winter 1898/99, *W. Brinkmann* (Brinkmann, Westf. Pilze 11) (L); West-Berlin, Grunewald, 6.10.1968, *W. Jülich 1239* (Herb. Jülich); Hessen, Weißenborn, Graburg, 24.9.1968, *J. Poelt W. Jülich 2137* (Herb. Jülich).

Lagarobasidium Jülich, *gen. nov.*

Carposoma late effusum, membranaceum, albidum vel cremeum, adhaerens; rhizomorphae desunt. Hymenium laeve vel aculeis ornatum. Systema hypharum monomiticum. Hyphae distinctae, saepe incrassatae tunicatae, fibulatae, *c.* 2.5–5 µm in diam. Cystidia, gloeocystidia vel cystidiola adsunt, tenuiter vel paulum incrassate tunicata, haud crasse incrustata. Basidia suburniformia, 10–20 µm longa, tetraspora, fibulata. Sporae laeves, ellipsoideae, hyalinae vel leviter flavidae, incrassate tunicatae, saepe guttulatae, non amyloideae. Typus: *Odontia pruinosa* Bres.

Basidiocarp effused, membranaceous, rhizomorphs lacking. Hymenial surface even or odontioid. Hyphal system monomitic. Hyphae hyaline, almost cylindrical, thin-walled to somewhat thick-walled, *c.* 2.5–5 µm in diameter, with small clamps at the primary septa. Cystidia, gloeocystidia or cystidioles present, thin-walled to somewhat thick-walled, not heavily incrusted, with a basal clamp. Spores hyaline to very slightly yellowish, smooth, ellipsoidal, thick-walled, often guttulate, not amyloid.

SCOPE.—Three species.

Lagarobasidium pruinosum (Bres.) Jülich, *comb. nov.*—Fig. 12

Odontia pruinosa Bres. *apud* Bourd. & Galz. *in* Bull. Soc. mycol. France **30**: 265. 1914; Bres. *in* Annls. mycol. **18**: 43. 1920 (with Latin diagnosis; basionym).

Basidiocarp thin-membranaceous, somewhat pruinose, margin indistinct, rhizomorphs lacking. Hymenial surface even to grandinioid, ochraceous. Hyphae hyaline, distinct, cylindrical, 2–4 µm in diameter, slightly thick-walled (up to 0.6 µm), with clamps. Cystidia lacking. Gloeocystidia present, hyaline, clavate, thin-walled (but the base often thick-walled up to 1.5 µm), 80–110 × 8–10 µm, projecting up to 50 µm, with a clamp at the base. Some cystidioles present, thin-walled, subulate, *c.* 16 × 3 µm. Basidia suburniform, 14–18–20 × 4.5–6 µm, with four small subulate sterigmata *c.* 3 × 0.8 µm, with a clamp at the base. Spores hyaline, smooth, somewhat thick-walled (0.4–0.8 µm), subglobose to broadly ellipsoidal, 5–6 × 4–5 µm, with small apiculus, often guttulate, neither amyloid nor dextrinoid, only slightly cyanophilous.

MATERIAL STUDIED.—*Odontia pruinosa* Bres., Lengerich (Westfalen), *W. Brinkmann, 3310* (type, L).

Two other species have to be transferred to this genus, viz. **Lagarobasidium cymosum** (Rog. & Jacks.) Jülich, *comb. nov.* (Basionym: Peniophora cymosa Rog. & Jacks. *apud* Jackson *in* Can. J. Res. **26** (C): 133. 1948), and **Lagarobasidium nikolajevae** (Parm.) Jülich, *comb. nov.* (Basionym: *Hyphodontia nikolajevae* Parmasto, Consp. Syst. Cortic., Tartu 213. 1968).

Metulodontia Parm.

Metulodontia Parmasto, Consp. Syst. Cortic. 117. 1968 — Type species: *Peniophora nivea* (Karst.) Bourd. & Galz.

Basidiocarp resupinate, effused or effuso-reflexed, membranaceous to ceraceous; rhizomorphs present or absent. Hymenial surface even to hydnoid. Hyphal system monomitic. Hyphae hyaline, thin-walled to slightly thick-walled, with clamps.

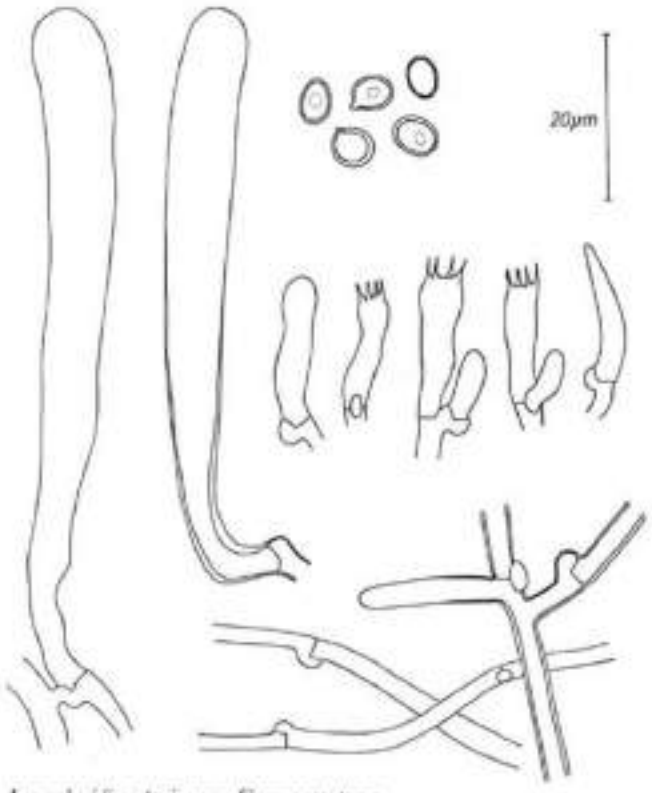

Fig. 12. *Lagarobasidium praiswum*, Germany, type.

Cystidia present, thick-walled (but the top often thinner), aseptate, heavily incrusted, with clamps. Basidia when mature suburniform or clavate, cylindrical or narrowly clavate when young, with clamps, normally with four sterigmata, with clamps. Spores hyaline, thin-walled, non-amyloid.

As explained in the introduction, I see no reason to keep this genus apart from *Hyphoderma* since the same type of cystidia is present in both genera and no difference in basidial morphology is to be found.

To facilitate a comparison of the two genera in question, a description and figures are given of the type species of *Metulodontia*. From these it is clear, that *Metulodontia* has to be treated as a synonym of *Hyphoderma*.

Metulodontia nivea (Karst.) Parm.—Fig. 13

Kneiffia nivea Karst. in Hedwigia **35**: 173. 1896. — *Peniophora nivea* (Karst.) Bourd. & Galz. in Bull. Soc. mycol. Fr. **28**: 394. 1913. — Metulodontia nivea (Karst.) Parm., Consp. Syst. Cort. 118. 1968.

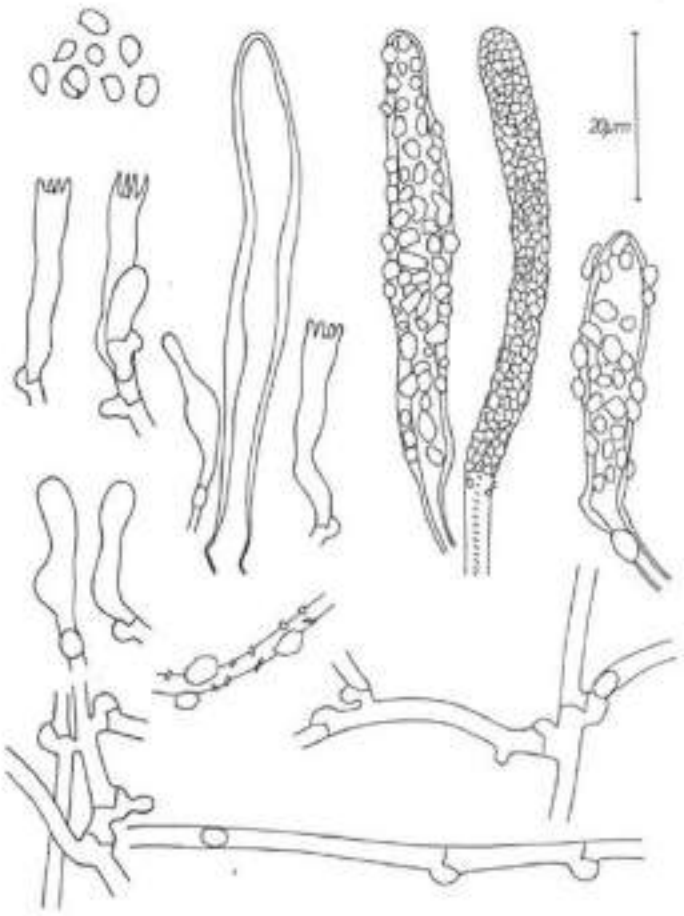

Fig. 13. *Metulodontia nivea*, France, *Galzin 7670*.

Basidiocarp effused, adnate, membranaceous; the margin slightly fimbriate; rhizomorphs present. Hymenial surface even or tuberculate, cream-coloured. Hyphal system monomitic. Hyphae loosely arranged, hyaline, distinct, rather thin-walled, 2–4 µm in diameter, with clamps at all septa; the basal hyphae straight and partly covered with small crystals, the subhymenial hyphae somewhat torulose. Cystidia abundant, clavate, moderately thick-walled (1–2 µm), heavily incrusted, immersed or projecting up to 50 µm, 20–40–100 × 5–8–12 µm. A few conical cystidioles present, *c.* 20 × 6 µm. Basidia flexuose, narrowly clavate, 18–20–25 × 4–5 µm, clamped at the base, with four subulate sterigmata *c.* 3–4 × 1 µm. Spores hyaline, smooth, more or less ellipsoidal, thin-walled, 4–6 × 2.5–3.5 µm, with small apiculus, neither amyloid nor dextrinoid or cyanophilous.

SUBSTRATE.—On wood or bark of frondose and coniferous trees.

MATERIAL STUDIED.—France: Aveyron, Loubotis, sur Cerisier, 29.11.1910, *Galzin 7670* (*Bourdot 7570*; L.); Lyon, 1919, *L. Maire* (L 930.58-28).

PENIOPHORA Cooke emend. Donk

Peniophora Cooke *in* Grevillea **8**: 20. 1879; emend. Donk *in* Fungus **27**: 15. 1957 (see there for synonymy). — Type species: *Corticium quercinum* (Pers. ex Fr.) Fr.

Basidiocarp effused, resupinate, or effuso-reflexed, membranaceous or more often ceraceous. Hymenial surface even to slightly tuberculate. Hyphal system monomitic. Hyphae hyaline, mostly forming a dense layer in which individual hyphae are hardly discernible, the basal hyphae sometimes brown and distinct; thin- to thick-walled, in most species with-clamps. Cystidia in most species present, in some species gloeocystidia or dendrophyses are formed. Basidia narrowly clavate, thin-walled to somewhat thick walled, the older ones not seldom with secondary septa, in most species with clamps at the base, normally with four sterigmata. Spores hyaline, thin-walled, smooth, cylindrical or ellipsoidal, non-amyloid, said to be pale red in mass.

SCOPE.—More than 30 species.

PENIOPHORA QUERCINA (Pers. ex Fr.) Cooke—Fig. 14

Thelephora quercina Pers. ex Fr., Syst. mycol. **1**: 442. 1821. — *Peniophora quercina* (Pers. ex Fr.) Cooke *in* Grevillea **8**: 20. 1879. — For the synonymy see J. Eriksson, 1950.

Basidiocarp effused, up to 0.5 mm thick, the margin at first adnate but soon reflexed and showing a blackish underside, ceraceous; rhizomorphs lacking. Hymenial surface even, greyish-violaceous. Hyphae hyaline, only those at the extreme base being brown, forming a compact ceraceous layer, thick-walled (*c.* 0.5–2.0 μm), about 4–5 μm in diameter, with thick-walled clamps; thin secondary septa lacking clamps are often present. Cystidia hyaline, mostly thick-walled, almost conical, with heavily incrusted apical part, 40–60 × 10–15 μm, projecting about 20 μm, clamped at the base; gloeocystidia lacking. Basidia elongate-cylindrical to narrowly clavate, 30–50–64 × 5–7 μm, thin-walled at the apex, but otherwise, especially at the basal part, slightly thick-walled (*c.* 0.4–0.8 μm), with clamps at the base; sterigmata four, very slender, about 5 × 0.2–0.4 μm; in older basidia several thin secondary septa may be present; young basidial stages narrowly cylindrical. Spores hyaline, cylindrical to slightly allantoid, thin-walled, 8–11 × 3–4 μm, with small apiculus, neither amyloid nor dextrinoid or cyanophilous.

CYTOLOGY.—Hyphae and young basidial stages 2-nucleate, spores 1-nucleate; no nuclei observed in the cystidia. The nuclear division seems to take place only in fairly adult basidia with sterigmata.

MATERIAL STUDIED (Of this well known and often studied species only four collections are cited.).—Germany: West-Berlin, Tegel, Jungfernheide, 25.8.1968, *W. Jülich 1163* (Herb. Jülich).
Austria: Kärnten, Viktring, Ostseite des Opferholzes, 19.9.1968, *W. Jülich 1474* (Herb. Jülich).
Tunisia: Atlas-Mountains, 7 km south of Ain Draham, 11.4.1968, *W. Jülich 1047* (Herb. Jülich); Zaghouan, Djebel Zaghouan, 15.4.1968, *W. Jülich 1044* (Herb. Jülich).

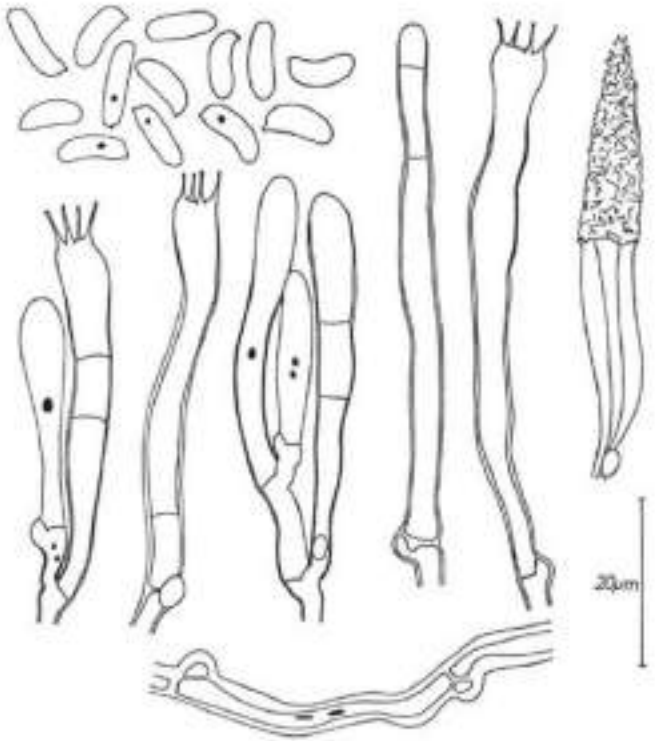

Fig. 14. *Peniophora quercina*, Austria, *Jülich 1474*.

PULCHERRICIUM Parm.

Pulcherricium Parm., Consp. Syst. Cortic. 132. 1968. — Type species: *Thelephora caerulea* Fr.

Basidiocarp effused, resupinate or effuso-reflexed, membranaceous. Hymenial surface at first blue, later bluish-greenish, smooth. Hyphal system monomitic. Hyphae bluish, distinct, somewhat thick-walled, 4–6 µm in diameter, with clamps. Cystidia and gloeocystidia lacking. Dendrophyses present, the appendaged covered with dark blue granules, at least some of them capable of growing out to form basidia, with a clamp at the base. Basidia clavate, hyaline or slightly bluish, with clamps at the base and four sterigmata; some basidia with lateral appendages. Spores hyaline to slightly bluish, rather thin-walled, large, non-amyloid.

SCOPE.—Monotypic.

PULCHERRICIUM CAERULEUM (Fr.) Parm.—Fig. 15, 16

Thelephora caerulea Fr., Elench. 1: 202. 1828. — *Pulcherricium caeruleum* (Fr.) Parm., Consp. Syst. Cortic. 133. 1968.

Basidiocarp membranaceous, effused, resupinate, sometimes slightly reflexed, with fimbriate and light-coloured margin; rhizomorphs lacking. Hymenial surface

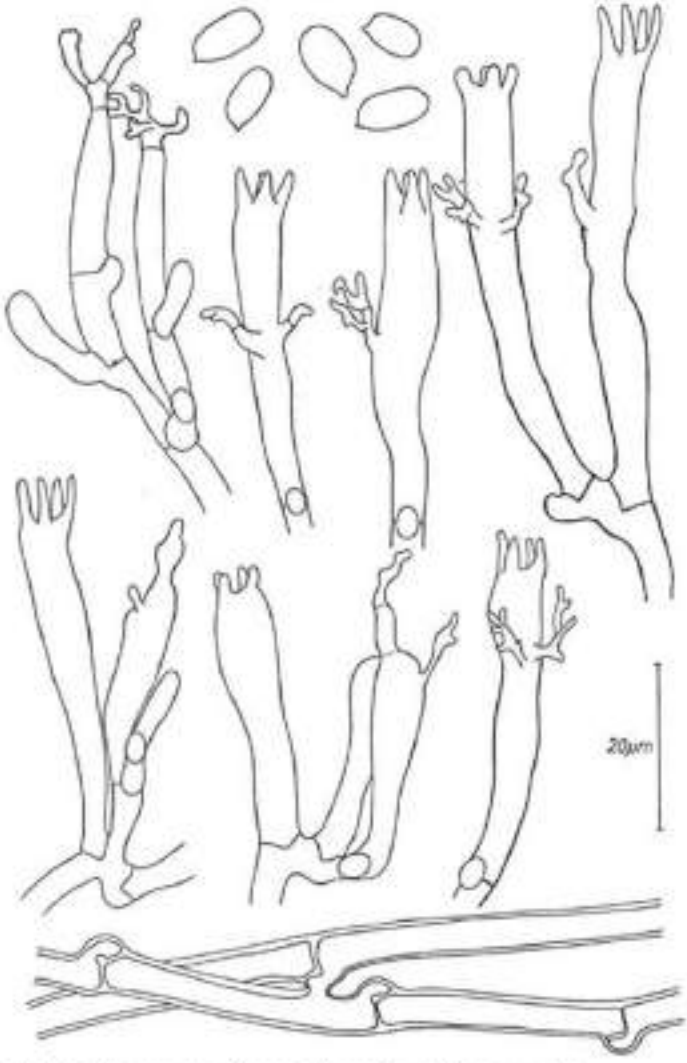

Fig. 15. *Pulcherricium caeruleum*, France, Desmazières, Fung. exs. 307.

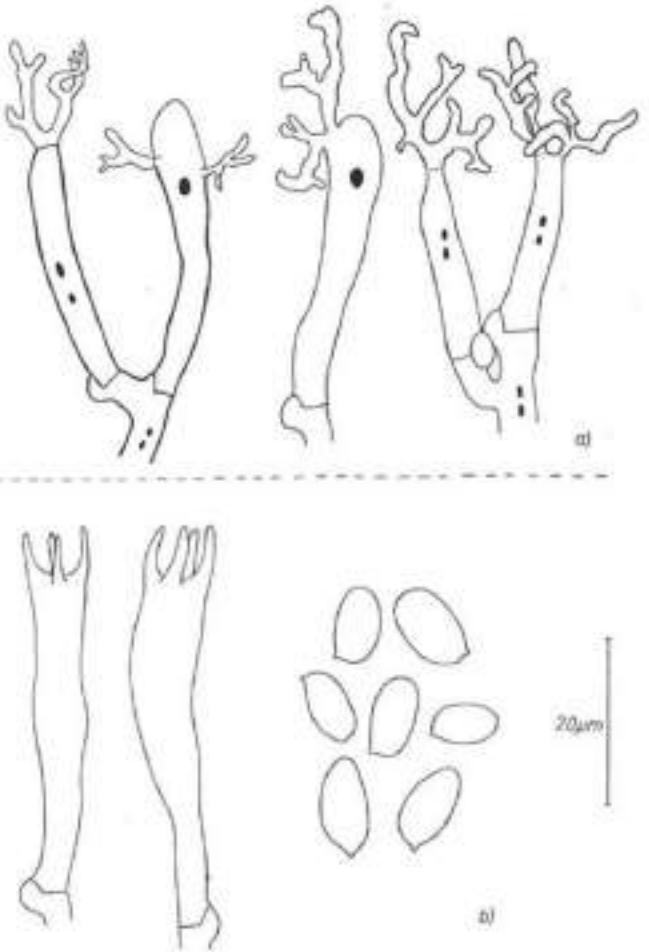

Fig. 16. *Pulcherricium caeruleum*: a. Kenya, *Macs Geesteranus 5299*; b. Germany, *Bakhuis*.

even, of a deep blue colour when immature, later becoming dirty bluish-greenish. Hyphae mostly bluish or greenish, the basal ones slightly brownish, somewhat thick-walled (*c.* 0.4–0.8 µm), 4–6 µm in diameter, always with clamps; the surface can be incrusted with a dark blue substance or is somewhat covered with small, hyaline crystals. Dendrophyses present, *c.* 20–40 × 4–6–8 µm, with appendages of very variable length and shape, which are often coloured with darkblue granules; clamped at the base. Basidia clavate, hyaline or slightly bluish, thin-walled or slightly thick-walled (*c.* 0.4 µm), 30–60 × 5.5–8 µm, with clamps at the base, with four rather large sterigmata (*c.* 6–8 × 2 µm), sometimes laterally with small appendages resembling those of the dendrophyses. Spores hyaline to slightly bluish, ellipsoidal, rather thin-walled, 8–10–13 × 5–7 µm, neither amyloid nor dextrinoid or cyanophilous.

CYTOLOGY (only studied in African material).—hyphae 2-nucleate; dendrophyses 2-nucleate but some of them with a synkaryon.

SUBSTRATE.—On wood or bark of (only?) frondose trees.

MATERIAL STUDIED.—Netherlands: 's-Gravenhage, 1888, *C. E. Destrée* (L.). Germany: Westfalen, Höxter, 2.1881, *Beckhaus* (L.); Lengerich, Winter 1902, *W. Brinkmann* (Brinkmann, Westf. Pilze 106; L.); Prov. Brandenburg, Triglitz in der Prignitz, 30.3.1899, *O. Jaap* (Jaap, Fung. sel. exs. 23; L.). Denmark: Skårup, Fünen, Nov. 1877, *E. Rostrup* (in: Thümen, Herb. myc. oeconom. 641; Thümen, Mycotheca univ. 1207; L.). France: Environs de Toulouse, 6.1879, *C. Roumeguère* (Roumeguère, Fung. sel. gall. 505; L.); without locality, *Léveillé* (L.); Andelot, Ht. Marne, 1918, 1920, and without locality 1926, *L. Maire* (L.); Aveyron, St. Priest en Murat, 6.1931, *H. Bourdot & M. A. Donk* (L). without locality, *Desmazières* (Desmazières, Fung. exs. 307; L.); Corsica, *Otto* (L.). Italy: Avellino, 2.1904, *A. Trotter* (D. Saccàrdo, Mycoth. ital. 1418; L). Florentia, 1.1865, *L. Caldesi* (Rabenhorst, Fung. eur. 1005; L.); Longobardia, in horto botanico ticinensi, hyeme, *Cavara* (Cavara, Fung. Longobard. exs. 13; L.). U.S.A.: Illinois, Metropolis, 29.10.1919, *C. J. Humphrey 9656* (L.); Indiana, Athens, 10.1925, J. H. Miller (L.); Alabama, Dallas Co., S. of Selma on rt. 22, 11.11. 1961, *D. E. Stone* (L.). Tunisia: Zaghouan, Djebel Zaghouan, 15.4.1968, *W. Jülich 1024* (L). Kenya: Nyanza Province, Distr. of Kisumu-Londiani, Tinderet Forest Reserve, 1.7.1949, *R. A. Maas Geesteranus 5299* (L.). Indonesia: Java, Tjibodas, 4.1930, *K. B. Boedijn 529* (L.).

Although this is a cosmopolitan species which has been collected in America, Europe, Africa, Java, and Australia, it obviously occurs mainly in warmer subtropical and tropical regions. In Europe it has been collected fairly often in the southern countries (France, Italy), but is rather rare in Germany and Great Britain and extremely rare in Denmark and Scandinavia: for Denmark Christiansen (1960) has seen only specimens from two places — the most recent collections dating from 1882, and according to Eriksson (1958) the species in Scandinavia is "not found outside the region with the mildest winter climate".

The appendages of the dendrophyses are very variable in legth and ramification, generally being much longer and more often ramified in southern, warmer countries than farther north. The material from Germany and Denmark, e.g., shows rather short appendages on the dendrophyses, whereas the longest and best developed ones where those in the specimen from Kenya; similarly the material from Africa shows a more intense colour and a denser incrustation of hyphae and dendrophyses.

The two specimens from Tunisia and Kenya showed — as was to be expected — a dikaryon in the dendrophyses, but in the larger ones a synkaryon was formed. The nuclear fusion, which normally takes place only in basidia, indicates that in dendrophyses, too, a meiotic division of the synkaryon and spore-production may occur. Although the two specimens were collected so young as to lack basidia, some dendrophyses were observed to have a change in shape. Normally the appendages are at the apex of the cells, but some of the latter which were obviously capable to enlarge had grown out to become distinctly clavate in shape, as a result bearing the

appendages laterally. The cell-walls in the newly formed parts were seen to be thinner, almost hyaline, and not incrusted. Such dendrophyses (with their synkaryon) looked very much like clavate, immature basidia with lateral appendages.

In order to get a better impression of what happens with these dendrophyse/basidium-like cells, a well developed specimen of Desmazière's exsiccate was studied. A rather large number of basidia — with well developed sterigmata — were seen to have lateral appendages of the typical shape, although they were not as long as those in the African material. Thus it is clear that many dendrophyses are able to grow out to normal basidia. This is very interesting from a theoretical point of view. Usually cystidia, gloeocystidia, and dendrophyses are considered to be sterile elements of the hymenium, cytologically characterized by a synkaryon with permanently separated nuclei, which never fuse and eventually perish, leaving behind a dead cell. But in the case of *P. caerulea*, obviously the dendrophyses do not behave as exclusively sterile elements in that at least a number of them can develop into normal basidia. In this case the dendrophyses function as probasidia. It is probable that especially in some species of *Aleurodiscus sensu lato* the same phenomenon may occur which, as far as I know, has never been studied cytologically.

To avoid a wrong impression, it is necessary to emphasize that in a full-grown basidiocarp of *P. caerulea* most basidia develop in the normal way, arising from side-branches of the subhymenial hyphae. The indirect way via dendrophyses obviously occurs only in an early stage of hymenial development: the fungus remains sterile for a longish time, then at least some of the dendrophyses develop further into basidia and form a proper hymenium. Probably all basidia which follow originate directly from subhymenial hyphae and consequently show no appendages (like those found on the dendrophyses). It may be pointed out that, in contrast with the material of Desmazière's exsiccate, the dendrophyses in the German and Danish collections seen (which happened to be poorly developed) exhibit only rather small appendages, while the basidia seemed to be without any.

RADULOMYCES Christ.

Radulomyces Christ. in Dansk bot. Ark. **19**: 230. 1960. — Type species: *Thelephora confluens* Fr. ex Fr.

Basidiocarp effused, resupinate or effuso-reflexed, membranaceous or slightly ceraceous. Hymenial surface more or less cream-coloured, even to hydnoid. Hyphal system monomitic. Hyphae hyaline, rather distinct, thin-walled to slightly thick-walled, *c.* 2–5 μm in diameter, with clamps. Thick-walled cystidia lacking. Basidia elongate-clavate, distinctly stalked, when young at first cylindrical, becoming long-stalked clavate or long-stalked pleurobasidial, with clamps at the base, normally with four sterigmata and often oil drops in the cytoplasma. Spores hyaline, thin-walled to slightly thick-walled, smooth, often guttulate, large, non-amyloid.

SCOPE.—*c.* 5 species.

RADULOMYCES CONFLUENS (Fr. ex Fr.) Christ.—Fig. 17

Thelephora confluens Fr. ex Fr., Syst. mycol. **1**: 447. 1821. — *Radulomyces confluens* (Fr. ex Fr.) Christ. *in* Dansk bot. Ark. **19**: 231. 1960. — For synonymy see Rogers & Jackson, 1943.

Basidiocarp effused, at first appearing as small patches with fimbriate margin, later confluent and several cm long, membranaceous, adnate; rhizomorphs lacking. Hymenial surface even, cream-coloured or ochraceous, sometimes slightly greyish. Hyphae hyaline, thin- to slightly thick-walled (up to 0.4 μm), 2.5–4–5 μm in diameter, not or only weakly cyanophilous; cystidia lacking. Basidia elongate-clavate, distinctly stalked, thin-walled, but the walls at the top of the larger basidia (which still lack the sterigmata) distinctly thickened (up to 0.4 μm) and then often slightly cyanophilous; young basidia cylindrical, then stalked-clavate or of irregular shape; 30–50–70 × 8–9 μm, with clamps at the base, often with small oil drops, with four curved sterigmata c. 5 × 1.2 μm. Spores hyaline, broadly ellipsoidal, rather thin-walled, 7–10 × 6–8 μm, with rather large and distinct apiculus, not amyloid or dextrinoid, but sometimes slightly cyanophilous.

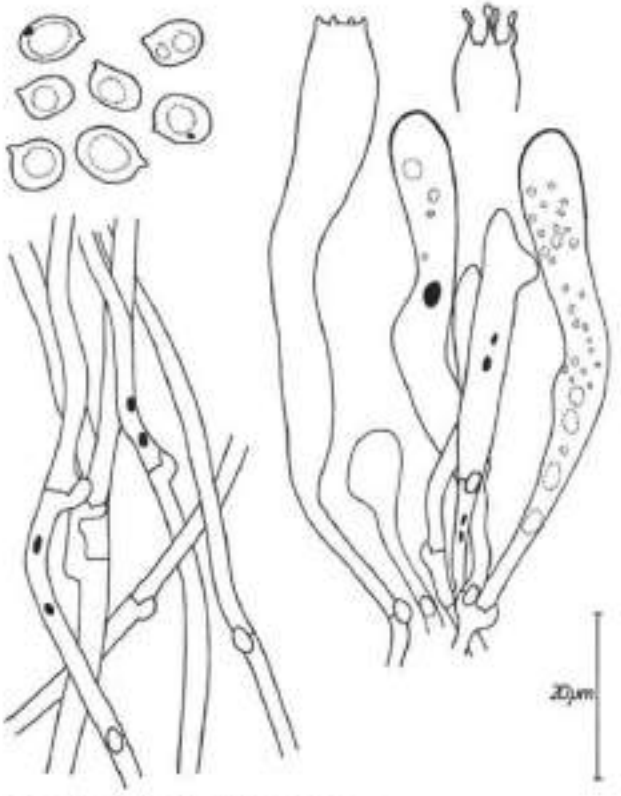

Fig. 17. *Radulomyces confluens*, Germany, *Jülich 567*.

CYTOLOGY.—Hyphae and young basidial stages 2-nucleate, spores probably 1-nucleate (this is difficult to observe because of the presence of numerous guttules of equal shape).

SUBSTRATE.—On bark and wood of frondose, rarely coniferous trees.

MATERIAL STUDIED.—S w e d e n: Lapland, Abisko, 17.7.1967, *W. Jülich* (Herb. Jülich); Västergötland, Österplana par., 11.10.1969, *K. Hjortstam* (S).

G e r m a n y: Brandenburg, Tamsel, 26.2.1915, *P. Vogel* (Sydow, Mycoth. germ. 1308; L); Lengerich, Winter 1899/1900, *W. Brinkmann* (Brinkmann, Westf. Pilze 13; L); West-Berlin, Botanischer Garten, 19.9.1967, *R. Dudat* (Herb. Jülich); West-Berlin, Forst Düppel, 25.10.1967, *W. Jülich* (Herb. Jülich).

F r a n c e: Southern France, Beive, 18.8.1967, *W. Jülich* (Herb. Jülich). "Fraize (Vosges), 24.4.1918, récolte no. 438 sur br. sapin à terre" (type of *Corticium confluens* fa. *abietis* Bourd. & L. Maire; L 931.71-13).

RADULOMYCES MOLARIS (Chaill. ex Fr.) Christ.—Fig. 18

Hydnum molare Chaill. ex Fr., Elench. **1**: 151. 1828 (*pro syn.*). — *Radulum orbiculare* var. *molaris* (Chaill. ex Fr.) Quél., Fl. mycol. Fr. 437. 1888. — *Radulomyces molaris* (Chaill. ex Fr.) Christ. *in* Dansk bot. Ark. **19**: 232. 1960.

Sistotrema rude Pers., Mycol. europ. **2**: 192. 1825.

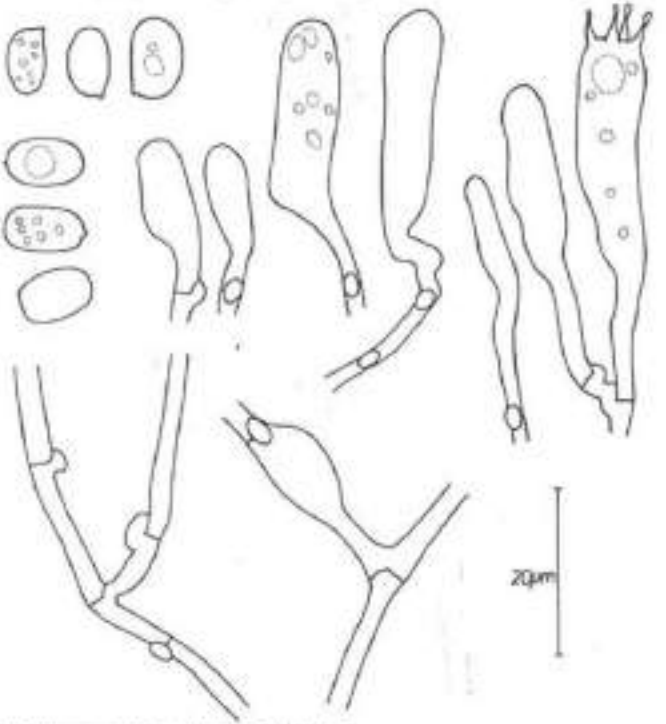

Fig. 18. *Radulomyces molaris*, France, *Jülich* 560.

Basidiocarp effused, resupinate, membranaceous, adnate; margin fimbriate; rhizomorphs lacking. Hymenial surface odontoid to hydnoid, the teeth 1–2 mm long, cream-coloured or ochraceous. Hyphae hyaline, distinct, rather thin-walled, mostly cylindrical, 1.5–3–4 μm in diameter, sometimes near the clamps swollen, up to 8–10 μm in diameter, with clamps at all septa; cystidia lacking. Basidia clavate, stalked, 35–46 × 6–8 μm, clamped at the base, often with numerous guttules in the cytoplasma, with four sterigmata *c.* 5 × 1.2 μm. Spores hyaline, broadly cylindrical to ellipsoidal, rather thin-walled, 9–11 × 5.5–7 μm, guttulate, with large apiculus, neither amyloid, dextrinoid nor cyanophilous.

CYTOLOGY.—Hyphae and young basidial stages 2-nucleate, spores probably 1-nucleate.

SUBSTRATE.—On bark of frondose trees.

MATERIAL STUDIED.—France: Pyrenees, Brive, 18.8.1967, *W. Jülich 560* (Herb. Jülich); Locality unknown (type of *Sistotrema nude* Pers.; Herb. Persoon, L 910.270-453).

SUBULICYSTIDIUM Parm.

Subulicystidium Parm., Consp. Syst. Cortic. 120. 1968. — Type species: *Hypochnus longisporus* Pat.

Basidiocarp resupinate, effused, soft-membranaceous, often very thin. Hymenial surface even, under a lens slightly hairy owing to the projecting cystidia. Hyphal system monomitic. Hyphae hyaline to slightly yellowish, thin-walled to somewhat thick-walled, always with clamps. Cystidia acuminate-cylindrical, thick-walled, with bifurcate base, covered with crystals which in polarized light seem to be short-bacilliform and arranged in 3–4 longitudinal rows, but as depicted by scanning electron microscopy they are flat-circular bodies arranged in about two rows. Basidia more or less clavate, exhibiting repetition, clamped at the base with four, rarely two sterigmata. Spores hyaline, thin-walled, long-cylindrical or ellipsoidal, non-amyloid.

SCOPE.—2–4 species.

SUBULICYSTIDIUM LONGISPORUM (Pat.) Parm.—Fig. 19

Hypochnus longisporus Pat. in J. Bot., Paris (ed. Morot) **8**: 221. 1894. — *Subulicystidium longisporum* (Pat.) Parm., Consp. Syst. Cortic. 121. 1968. — For the synonymy see Rogers & Jackson (1943).

Basidiocarp effused, adnate, hypochnoid or membranaceous, easily separable; rhizomorphs lacking. Hymenial surface even, whitish or light greyish-brownish (in older specimens). Hyphal system monomitic. Hyphae hyaline, thin-walled to slightly thick-walled (up to *c.* 0.8 μm), 2.5–4 μm in diameter, clamped at all septa. Cystidia abundant, cylindrical, acuminate, brittle, with thickened walls (*c.* 1–1.5 μm), bearing flat circular crystal-like bodies normally arranged in two longitudinal rows (although in phase-contrast there seems to be 3–4 rows of small, oblong crystals), 40–80 × 4–5 μm, up to 50 μm projecting, the base mostly bifurcate. Basidia cylindrical to narrowly clavate, somewhat flexuose, 18–25 × 4–6 μm, clamped at the base, with four subulate sterigmata *c.* 2–3 × 0.5 μm; in well developed specimens the basal half of most of the basidia is loosely surrounded by a wall (which may be slightly incrusted):

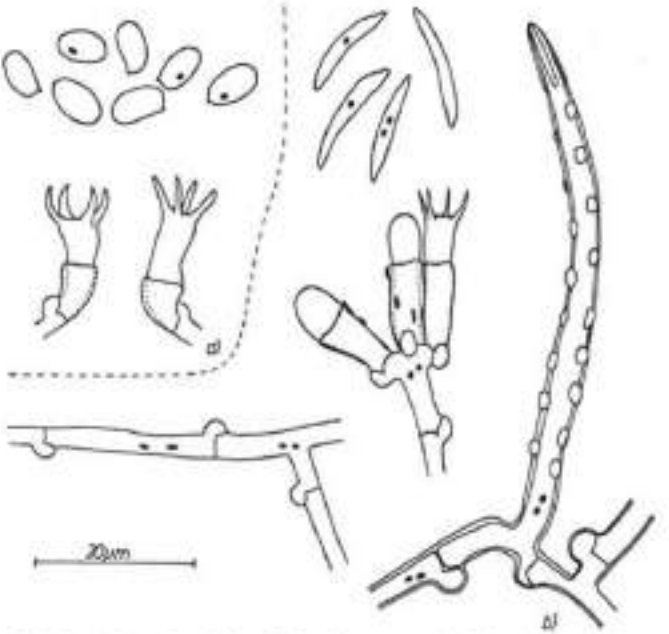

Fig. 19. a. *Subulicystidium nikau*, New Zealand, type. — b. *S. longisporum*, Germany, *Jülich 1144*.

there is strong evidence that these are the remaining walls of the former basidia, inside which a new basidium has developed (=basidial repetition: Jülich 1969). Spores hyaline, more or less cylindrical, straight or somewhat curved, slightly narrowed at both ends, thin-walled, 10–16 × 1.5–3 µm, often with several guttules, apiculus not distinctive, neither amyloid nor dextrinoid or cyanophilous.

CYTOLOGY.—Hyphae, cystidia and young basidial stages 2-nucleate, Spores 1-, rarely 2-nucleate. This has been studied in some specimens from Europe and one from Jamaica. It may be added that the two nuclei of the cystidia are either situated in the base or in the apex of the cystidia, but it is also not rare to find one nucleus in the apex and one in the base. This explains the high number of seemingly uninucleate cystidia which lack only a small part of the apex.

SUBSTRATE.—On rather rotten wood.

IMPERFECT STATE.—Small compact globules of strongly interwoven hyphal cells have been described by Bourdot & Galzin as *Aegerita tortuosa*. They are not always present but seem in fact to be connected with the perfect form.

MATERIAL STUDIED.—Netherlands: Zuid-Holland, Loosduinen, Ockenrode, 20.11.1933, *M. A. Donk 5329* (L.); Boekhorst, 10.1860, *L. H. Buse* (L 910.234–290).
Germany: West-Berlin, Pfaueninsel, 20.8.1968, *W. Jülich 1144* (Herb. Jülich).
France: Aveyron, .8.1919, *Galzin 24864* (*Bourdot 28089*; L); Aveyron, vers la Courbe, env. de St. Sernin, 9.1907, *Galzin 2230* (Herb. Donk 2433; L).
England: Surrey, Horsley, 4.8.1946, *M. A. Donk 11029* (L).

Sweden: Upland, Årby Skog near Storvreta, 14.9.1932, *M. A. Donk 5345* (L); Upland, Fundbo, 9.1932, *S. Junell* (Herb. Donk 3764; L).
U.S.A.: Michigan, St. Johns, 9.6.1932, *C. A. Brown 407* (Herb. Donk 3241; L).
Jamaica: St. Andrew Parish, St. Helen Gap to Monkey Hill, 1.9.1957, *A. L. Welden 505* (L).

Subulicystidium nikau (Cunn.) Jülich

Peniophora nikau Cunn., Thelephoraceae Austr. New Zeal. 197. 1963. — *Subulicystidium nikau* (Cunn.) Jülich *in* Ber. dt. bot. Ges. **81**: 419. 1969.

This species is almost identical with *S. longisporum*, exhibiting repetobasidia and the same peculiar type of cystidia (also with mostly bifurcate base; not mentioned in Jülich, 1969). It differs mainly in its broadly ellipsoidal (also 1-nucleate) spores of 6.5–8.5 × 3–4.5 μm, and in having basidia of somewhat smaller dimensions.

Material studied.—Type collection (K).

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