The Corticiaceae of North Europe

By
John Eriksson, Kurt Hjortstam and Leif Ryvarden
with drawings by
John Eriksson

Volume 5
Mycoaciella – Phanerochaete
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As seen from the front page, K. Hjortstam has been included as author. He has for a long time been much helpful with the flora, but has now been attached to it on a permanent basis.

New taxa and combinations proposed in this volume:

*Ceraceomyces sulphurinus* comb.nov. p. 895
*Hydrabasidium* gen. nov. p. 896
*Hydrabasidium subviolaceum* comb.nov. p. 897
*Mycoaciella* gen.nov. p. 901
*Mycoaciella bispora* comb.nov. p. 902
*Phanerochaete calotricha* comb.nov. p. 997
*Phanerochaete galactites* comb.nov. p. 1005
*Phanerochaete laevis* comb.nov. p. 1007
*Phanerochaete martelliana* comb.nov. p. 1011
*Phanerochaete ericina* comb.nov. p. 1011
*Phanerochaete raduloides* spec.nov. p. 1015
*Phanerochaete septocystidia* comb.nov. p. 1021
*Phanerochaete sordida* comb.nov. p. 1023

Fig. 447. *Amylostereum areolatum*  a) section through fruitbody showing position of b and fig. 448 a and b  b) section through hymenial part of trama  c) piece of skeletal hyphae and thinwalled generative hyphae  d) young and mature cystidia.  - Coll. L. Fagerström.

Fig. 447-449

Fruitbody on horizontal substrates more or less resupinate, on vertical ones reflexed, often seriate, about 2–3 cm in radial direction, in side direction 5–10 cm or more as fruitbodies grow together, reflexed part usually 1–3 mm thick, but central part often thicker - 1 cm or more; consistency firm leathery, when dried hard and in the reflexed pileus brittle; upperside zonate, in young parts finely velutinous (visible under the lens), ochraceous or olivaceous brown, in older parts covered with an uneven blackish crust; hymenial side lighter in colour, pale ochraceous brown and somewhat pruinose, irregularly tuberculate, when dried more or less cracked, in older fruitbodies and when water-soaked darkening to blue brown or dark violet blue; section two-layered with a dark brown upper trama or tomentum layer, separated by a dark line from a lighter brown layer, forming the true trama and the hymenial layers.

Hyphal texture dimitic, generative hyphae 2–3 μm wide, thinwalled, hyaline, richly branched and provided with clamps, which are numerous in the hymenial layers and the true trama, few or none in the tomentum; skeletal hyphae 3–4 μm wide, thickwalled with a narrow lumen, in the microscope yellow brown; hyphae of the upper trama (tomentum) pigmented, thickwalled but with wider lumen than the skeletal hyphae, with sparse septa and few clamps; hyphal direction in the tomentum turning upwards, in the true trama parallel, horizontal and turning down into the hymenial layers, in which the hyphal direction is vertical; texture dense in the hymenial layers, less dense in the other layers, except in the crust, in which the hyphae are conglutinated by brown, resinous matter.

Cystidia numerous, 30–40 μm long, from the narrowing base fusiform, acute, at first thinwalled, hyaline, then with thickening walls, pigmented yellow brown (in the microscope) and with an encrustation of small, dense crystals. The first hymenial layer contains cystidia formed by skeletal hyphae from the subicular trama, subsequent layers with cystidia produced from thinwalled generative hyphae in the subhymenium. There is some variation in the shape of the cystidia, some may be obtuse, constricted, have an extra lateral apex a.s.o. In old fruitbodies, with thickened hymenium, cystidia may be arranged in layers, corresponding to the annual growth.
Fig. 448. *Amylostereum areolatum*  a) section through upper surface of the fruit-body with pigmented, sparsely septated hyphae  b) section through the dark line, separating the two layers of the trama  c) part of hymenium  d) spores. - Coll. L. Fagerström.
Amylostereum

Basidia clavate, mostly 18–20 x 2,5–3.5 μm, with 4 slender sterigmata and with basal clamp.

Spores narrowly ellipsoid, mostly 6-8 x 2.5-3.5 μm, thinwalled, smooth, amyloid.

Habitat. On stumps and fallen logs of Picea. In Germany found also on Fagus sylvatica.

Distribution. Very rare in N. Europe. Recently found in Finland (Karelia: Vehkalahti, Pyhältö, Ammänmäki, on stump of Picea abies, 1976-06-04, L. Fagerström, very well developed specimen). It was earlier reported from Denmark by Skovsted (1965), but the only Danish specimens we have seen, are three collections determined by M.P. Christiansen. These specimens are typical A. chailletii.

For further information about ecology and distribution see H. Jahn (Westf. Pilzbr. 8 p. 98).

Remarks. Very close to A. chailletii and difficult to separate in young resupinate states. Well developed specimens are reflexed with a differentiated, velutinous upperside and have a clear duplex-structure with a more or less distinct separating layer in vertical section.

It is remarkable that Fries reports it to grow on bark of Taxus baccata, which is known to be a substrate for Amylostereum laevigatum. No authentical material has been available to us.

Fig. 449. Amylostereum areolatum. Fruitbody seen from above and from the side. -Coll. L. Fagerström. Photo T. Hallingbäck.
Fig. 450. *Ceraceomyces sulphurinus* a) schematic section through fruitbody showing position of sections b and c  b) section through hymenial part  c) section through subiculum layer, with parallel, encrusted hyphae  d) encrusted cystidia  e) young and mature basidia  f) spores. - Coll J. Eriksson and Kujala 10190.

Holotype: Jalasjärvi, on bark of Pinus sylvestris, P.A. Karsten (H).

**Fruitbody** resupinate, adnate but detachable in pieces when dry, effused and becoming quite large (2 dm in length), 0.2—0.5 mm thick, smooth, in the living state the whole fungus bright yellow, when dried the hymenium changing to dull yellow (Gilbertson: mustard yellow), sometimes with a reddish tint, when wet soft ceraceous in the hymenial part, when dried membranaceous and brittle, cracking in pieces; subiculum well developed, running out in rhizomorphs of varying length and thickness, margin irregular, white, fimbriate or not esp. differentiated.

**Hyphal system** monomitic; all hyphae with clamps; subhymenium composed of thinwalled, richly branched and densely interwoven hyphae, 2—3 μm wide; subiculum with mainly parallel hyphae, sparsely septated and branched, 4—8 μm wide, often anastomosing, with somewhat thickened walls, and forming an open context; basal hyphae often encrusted with lumps of joined crystals.

**Cystidia** few, almost cylindrical, slightly tapering, obtuse, with apical encrustation, basally thinwalled, total length 60—90 μm, encrusted part 40—60 x 10—12 μm, with basal clamp.

**Basidia** clavate, 30—35 x 5—6 μm, with 4 sterigmata and basal clamp.

**Spores** 4.5—5.5 x 2.5—3 μm, ellipsoid, thinwalled, smooth, non-amyloid, non-cyanophilous, some with oily inclusions.

**Habitat.** On decayed wood (logs etc.), in N. Europe on conifers but reported to occur also on hardwood.
Distribution. Very rare in N. Europe. Described from Finland and found there later at least once (Punkaharju). In Sweden found in Småland (Femsjö), not known from Norway or Denmark. We have seen material from N. France (Rastetter), Sibiria (Parmasto) and some specimens from N. America, where it may not be quite so rare.

Remarks. The species has been referred to Phanerochaete by recent authors, but in our opinion it is closer to species of Ceraceomyces, e.g. C. violascens and C. cystidiatus. There are clamps at the basidial bases and no clamp whorls are seen on the subicular hyphae. Also the spore shape agrees with that of these species.


Fructificatio resupinata, effusa, adnata, primo hypocnoidea, deinde submembranacea, systema hyphale monomiticum; hyphae fibulatae, tenuitunicatae, irregulariter ramosae, protoplasmate passim fuscescento; cystidia nulla, basidia ± clavata, sterigmatibus 4 elongatis; sporae ellipsoidae — globosae, tenuitunicatae, non amyloideae, non cyanophilae, repetitione germinantes.


Remarks. Parker—Rhodes has got the wrong idea that the type of Ceratobasidium Rogers, C. calosporum Rogers, was a tremellaceous fungus. He therefore chose a new type and introduced a new generic name, Hydrabasidium, based on Corticium atratum Bres. This species has later been referred to Oliveonia Donk. We are, however, of opinion that C. atratum differs too much from the type species of Oliveonia to be placed in this genus. There is a clear difference in the hyphal morphology. The hyphae are fibulate and distinct, not asfibrate and conglutinated as in Oliveonia. The basidia may vary in shape but are more elongate than in this genus and there are no cystidia. We therefore need a generic name to accommodate C. atratum which according to M. J. Larsen is a later synonym of Hypochnus subviolaceus Peck. Unfortunately the protologue of Hydrabasidium contains no other information than the choise of the type species, and the genus has therefore been looked upon as not validly published. A Latin diagnosis is given to make the name valid. The genus is so far monotypic.

Fruitbody resupinate, adnate, effuse, mostly of small dimensions, 50–100 μm thick, at first pale, then darkening and finally greyish black, to begin with hypochnoid and soft then tightening and when old becoming submembranaceous; margin not especially differentiated.

Fig. 451. Hydrabasidium subviolaceum a) basidia b) spores. — From the holotypus.
Fig. 452. *Hydrabasidium subviolaceum*  a) section through fruitbody  b) basidia, in c with fuscescent protoplasm  d) cystidioid hymenial hypha  e) spores, two with repetition. - Coll. Arvidsson & Hallenberg n. 9418.
Hydrabasidium

Hyphal system monomitic; hyphae thinwalled, richly branched from clamps, 2–3 μm wide, in young fruitbodies hyaline or partly fuscous, in old ones all hyphae more or less fuscous, irregularly intertwined into a texture, which in the young fruitbody is loose and porulose, in the old ones rather dense and firm; no clear limit between subhymenium and subiculum.

Cystidia none, but sometimes sterile hyphal ends in the hymenium, mostly obscure but in rare cases subulate and then simulating cystidial organs.

Basidia clavate or funnelshaped, 20–30 x 6 – 7.5 μm, thinwalled but in the distal part with somewhat thickening walls, sometimes pedunculately prolonged to 40 or even 50 μm; sterigmata usually 4, at first obtuse, then prolonged, divergent and subulate, 8–12(–15) μm; in young fruitbodies most basidia hyaline but some few with fuscous protoplasm, in old specimens all basidia more or less fuscous.

Spores hyaline to somewhat brownish, ellipsoid, broadly ovate or somewhat pip-shaped, smooth, thinwalled, 7–9 x 4–5.5 μm, not amyloid, not cyanophilous, germinating by repetition.

Habitat. On decayed wood and other kinds of debris, preferably in humid localities. In Göteborg a very rich collection was made on decayed boards in the cellar of an old house.

Distribution. Hitherto looked upon as very rare in N. Europe. It is not mentioned by Christiansen from Denmark. During the last few years it has, however, been found several times in SW. Sweden (Dalsland and Västergötland). Sivertsen has collected it a couple of times in Norway (Sør-Trøndelag). Its distribution in the Nordic countries seems thus to be suboceanic. Its total range is very wide, from the tropics to the mild parts of the temperate zone. In Europe it is outside Scandinavia found at least in the western part (England, France). It is evidently not very rare in N. America (e.g. in Eastern and Western Canada).

Remarks. The authentic specimen (holotype) of Hypocnhus subviolaceus Peck (Canada, on deciduous wood, 1892-08-21, Macoun NYS) is, as stated by M.J. Larsen (Mycologia Mem. 4 p. 128, 1974) identical with Corticium atratum Bres. It is well developed and agrees in all respects except that the fruitbody has a lurid brown colour instead of the normal grey colour.
Fig. 453. *Mycoaciella bispora*  a) section through fruitbody showing positions of sections b–d  b) section through the apical part of a tooth  c) section through the hymenium and subhymenium  d) section through an old subhymenium  e) generative hyphae  f) skeletal hyphae  g) spores  h) basidia and cystidium  i) basidium with two sterigmata. - Coll. Hauerslev.
Mycoaciella Erikss. & Ryv. n. gen.

Fructificatio resupinata, effusa, adnata, ceracea, hydnoidea cum aculeis densis, cylindraceis, subulatis; systema hypharum dimiticum; hyphae skeleticae rectae, parallelae, crassitunicatae, fibulatae, dense ramificatae; trama aculeorum maxime hyphis skeleticos compositum; subhymenium tenue, tramate distincte separatum; cystidia parva, tenuitunicata, apico globulo resinoso provisa; basidia clavata; sporae anguste ellipsoideae, tenuitunicatae, non-amylloideae.

Type species: Resinicium bisporum Stalpers.

Fruitbodies resupinate, effused, adnate, not detachable, when fresh of ceraceous consistency; hymenophore hydnoid with dense, cylindrical or narrow conical, subulate aculei; hyphal system dimitic; skeletal hyphae straight, parallel, thickwalled; generative hyphae thinwalled, richly branched and interwoven; trama of the aculei to the largest part composed of parallel hyphae; subhymenium thin, distinctly separate from the trama; cystidia small, cylindrical, thinwalled, with an apical globule of excreted, resinous matter; basidia clavate, normally with 4 sterigmata; spores narrowly ellipsoid, thinwalled, smooth, non-amylloid.

Remarks. The type species has earlier been described by Bourdot & Galz. under the name Acia denticulata (Pers.) Bourd. & Galz. However, this was based on a misunderstanding as Hydnum denticulatum Pers. is a synonym of Stecherinum ochraceum (Fr.) S.F. Gray (Maas Geesteranus, Persoonia 7, p. 518, 1974). Acia was later renamed Mycoacia by Donk. It differs, however, in the nature of the hyphae from all species of this genus, which are all monomitic with thinwalled hyphae. The question is then if Mycoacia can be allowed to comprise species with dimitic hyphae or if a separate genus better depicts the natural relationship. As with many other generic arrangements this is a matter of personal judgement, but as differences in the hyphal structure usually give the rank of generic criterion we have chosen to introduce a new genus. Stalpers (Persoonia 9 p. 145, 1976) referred the species to Resinicium, so far as we can see without any good reason. There is a superficial likeness in the shape of the cystidia but in Resinicium the apical globule consists of a cell with a true wall while in Mycoaciella the globule is an excreted matter like that in cystidial organs of many other species in Aphyllophorales.

Dimitic species and presence of cystidial elements in the hymenium could be criteria enough for a place in Stecherinum, but this genus has encrusted cystidia, quite different from those of Mycoaciella, and in most respects this genus is closer to Mycoacia than to Stecherinum.
Under the name *Odontia stipata* (Fr.) Quel. Bourdot & Galzin (1928 p. 424) treat another dimitic resupinate species. It is not the true *Hydnnum stipatum* Fr. but is a good species which seems to be best placed in *Schizopora*, which is a genus for dimitic relatives of *Hyphodontia*.

The genus is so far monotypic, but it is very probable that more species exist in warmer climates where dimitic fungi are more frequent than in N. Europe.

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**Fruitbody** resupinate, effused, pale yellowish when young, then ochraceous, ceraceous when fresh, hydnoid with dense aculei, which are ab. 2 mm long, cylindrical or narrowly conical, tapering to the sterile apex; margin thinning out, not esp. differentiated but in dry specimens lighter in colour than the rest of the fruitbody; subiculum thin, in old fruit-bodies cracking on drying.

**Hyphal system** dimitic; skeletal hyphae thickwalled, mostly 3—4 μm wide, parallely packed in the central part of the aculei and forming a trama well separated from the subiculum which is composed of richly intertwined, thinwalled hyphae, 2—3 μm wide and provided with clamps; rich occurrence of crystals in the texture, esp. in the subiculum of the aculei.

**Cystidial elements** present in the hymenium, almost cylindrical, 20—30 x 4—5 μm, apically slightly enlarged into a head, which when intact is covered with a globule of resinous, yellowish matter.

**Basidia** narrowly clavate, 15—20 x 3—4.5 μm, with basal clamp and 2—4 conical stigmata; numerous oildrops in the protoplasm; basidia form a dense palisade, esp. in mature hymenia.

**Spores** 4—5.5 x 2.5—3 μm, narrowly ellipsoid to subcylindrical, smooth, thinwalled, usually with oildrops in the protoplasm.

**Habitat and distribution.** On deciduous wood in herb-rich biotopes, in N. Europe hitherto found only in Denmark, where K. Hauerslev has collected it several times. We have seen some specimens from continental Europe where it probably is not too rare.
Odonticium

Remarks. The species looks very much like *Mycoacia uda* but is easily distinguished by its dimitic texture. The species epithet *bisporum* was given by Stalpers as the basidia were supposed to be bisterigate. In all specimens studied by us 4-sterigate basidia were, however, found and in the non-published good, detailed drawings by K. Hauerslev 4-sterigate basidia occur. We have made a careful study of the problem in a DIC-microscope and have been able to show 4-sterigate basidia to competent observers why we are sure that the basidia in our material normally is 4-spored but that 2-spored ones also occur. The cystidia have also been carefully investigated and we are certain that they do not agree with those of *Resinicium*. As it is a conspicuous, not too rare species, we dare hope that it will be possible to find in literature an older, more adequate specific epithet for it.


Fruitbodies resupinate, adnate, effused, confluent, light-coloured,odontiid, consisting of a very thin subiculum and small, dense aculei; hyphal system monomitic, hyphae with thickened walls, with numerous septa but no clamps; central hyphae parallel and projecting in the apices of the aculei; no cystidia; basidia subcylindrical or slightly constricted in the middle, wall thickened in the basal half of the basidium; 4 sterigate; no basal clamp; spores cylindrical to suballantoid, 4—6 μm long. Type species: *Odontia romellii* Lund.

*Odonticium* is distinguished by a combination of characteristics, which make it readily recognized. The straight, thickwalled hyphae are constricted at close intervals, thus very characteristic. The walls of old hyphae are composed of at least two distinct layers. The basidial walls are basally thickened like those of a *Tubulicrinis* species. To the naked eye the genus looks very much like *Hyphodontia* but they are evidently not very closely related. The lack of clamps might suggest affinities to *Phanerochaete* but to put it in this genus is out of question. The nature of i.a. the basidia differs too much.

The genus is so far monotypic. Parmasto described another species, *O. raitviiri* Parm., loc. cit. p. 218. We have seen type material of this species and it is identical with *Peniophora septocystidia* Burt, which we prefer to place in *Phanerochaete*. 
Fig. 454. *Odonticium romellii*  a) schematic section through fruitbody showing position of b  b) section through apical part of an aculeus  c) hyphae  d,e) basidia f) spores. - Coll. Hjortstam 16054.
Odonticium romelli (Lund.) Parm., loc. cit.
—Odontia romelli Lund. in John Erikss.,

Fruitbody resupinate, closely adnate, effused, confluent and may cover several dm² of the substrate, or even more, but mostly of small or moderate dimensions, whitish or cream-coloured, old fruitbodies pale greyish white, consistency tough (like dimitic species); hymenophore odontiod, composed of small, dense aculei, mostly 0.5–1 mm long, conical to sub-cylindrical, apically hispid under the lens, sometimes irregularly joined and with several aculei, in rare cases subporoid; margin thinning out and fertile throughout, rarely finely fibrillose and sterile; subiculum very thin and porulose.

Hyphal system monomitic; hyphae of the aculei 4–5 μm wide, straight, parallel, thickwalled, with numerous constrictions and septa but no clamps, apically thinwalled and with rounded and obtuse apices, hyphae of the subiculum besides with thinwalled, narrower (2.5–3 μm) hyphae; generative hyphal branches thinwalled, 2–3 μm wide, richly branched and in older parts of the fruitbodies forming a subhymenium of densely interwoven hyphae; on very decayed wood sometimes producing a cottony mycelium, filling cavities in the wood; all hyphae non-amyloid and non-cyanophilous.

Cystidia none.

Basidia 12–15(–20) x 4–5 μm, at first subclavate, then subcylindrical, often with a slight median constriction, walls at first thin but thickening in the basal half, the upper limit of the thicker layer sometimes visible; 4 slender sterigmata.

Spores allantoid — suballantoid, thinwalled, smooth, non-amyloid, non-cyanophilous, 4–4.5 x 1.2–1.5 μm.
Habitat. On decayed coniferous wood, in most cases decorticate, in Vaccinium-conifer forests. Fruitbodies are seen secondarily growing on wood already decayed by brown-cubical or white rot. Its own decay seems to belong to the latter type, causing a fibrous rot similar to that of Heterobasidion annosum and Phellinus ferrugineofuscus. In N. Scandinavia it seems to prefer lying logs of Pinus sylvestris but is also reported from Picea abies.

Distribution. *O. romellii* is collected several times in the northern half of Sweden, from the vicinity of Stockholm to N. Lapland but must be looked upon as a rather rare fungus. We have seen some collections from N. Finland and continental parts of Norway. It is probably one of the boreal species belonging to what has been called the taiga element in the fungus flora and widely distributed in the northern part of the north-temperate region.

Remarks. There should be no problem in recognizing *O. romellii* thanks to its tough consistency, its asfibrate, thickwalled hyphae and its allantoid spores.

**Oliveonia** Donk, Fungus 28 p. 20, 1958.

Fruitbodies resupinate, totally adnate, effused, very thin, ceraceous, watery grey when alive and wet; margin indistinctly thinning out; hyphal system monomitic with a net of basal hyphae closely glued to the substrate and densely interwoven subhymenial hyphae, clamps lacking or present at some septa (Talbot, Persoonia 3:4 p. 383 fig. 4, 1965); thinwalled cystidia present; basidia subglobose — subclavate with four voluminous sterigmata; spores oblong to suballantoid, repeating secondary spores.
Oliveonia

Type species: *Sebacina fibrillosa* Burt = *Oliveonia fibrillosa* (Burt) Donk, loc. cit.

**Remarks.** The genus *Oliveonia* is close to *Ceratobasidium* Rogers, with which it agrees in many respects. The main difference is the presence of thinwalled cystidia in *Oliveonia*, while such hymenial elements are not found in *Ceratobasidium*. The nature of the hyphae is strikingly alike. In both genera there is a basal net of straight hyphae from which basidia-bearing hyphae branch off. The resemblance is especially evident if young fruitbodies of *Oliveonia* are considered. In later stages the subhymenial hyphae become more intertwined. The spores of *Oliveonia* agree perfectly with several species of *Ceratobasidium* though not with the type species of this genus, which has long, vermiciform spores. The basidia of *Oliveonia* may be a little more clavate than in *Ceratobasidium*, but the difference is small and can hardly be used as an argument for generic separation. The remaining characteristic for *Oliveonia* is thus the cystidia. This characteristic has often been found to be of little or disputable value, but we prefer to keep *Oliveonia* separate until further studies are made. The characteristic is at least easily noticeable.

*Ceratobasidium atratum* (Bres.) Rogers has been referred to *Oliveonia* by Talbot (loc.cit. p. 381). We have found that the step between this species and the rest of *Oliveonia* is much greater than between the types of *Oliveonia* and *Ceratobasidium*, why we follow Parker-Rhodes’ arrangement and establish *Hydrabasidium* in agreement with Donk’s opinion (loc. cit. p. 19).

The basidial cell of *Oliveonia*, *Ceratobasidium* and similar genera with voluminous sterigmata is by many authors described as a hypobasidium, the sterigmata as epibasidia. We find it necessary, however, to consider the basidial cell of these genera homologous with the corresponding cell of *Botryobasidium* and related genera with more normal sterigmata. *Ceratobasidium* — as well as *Oliveonia* — has often been referred to Tulasnellaceae for the reason that the sterigmata not only are voluminous but also often septated. However, septation is a rather common phenomenon in sterigmata also in genera which are not discussed as presumptive close relatives of Tulasnellaceae, like *Hyphoderma* and *Tomentella*. In such genera the sterigmata are besides rather voluminous. Adventitious septation is a normal phenomenon in large basidia of *Aphyllophorales* and occurs in situations when the development of the basidium is retarded at a state when the protoplasm only fills the apical part of the basidium or the sterigmata. As a consequence we don’t find it motivated to put these genera in Tulasnellaceae, which is best characterized by the initially globose sterigmata.
Fig. 455. *Oliveonía paxilla*  a) section through fruitbody  b) basidia in different stages of development  c) cystidium  d) spores, three germinating with spore repetition. - Coll. K. Hauerslev.

Fruitbody resupinate, effused, closely adnate, smooth, thin, when alive ceraceous and watery white, when dry grey, pruinose — subcrustaceous; margin indistinct.

**Hyphal system** monomitic; all hyphae without clamps, basal hyphae scarce, straight, 4–5 μm wide, forming a net, glued to the substrate; basidia-bearing hyphae thinner, 2–3 μm, richly and irregularly branched and in mature fruitbodies forming a subhymenium-like texture.

Cystidia rather few, sub-cylindrical or basally widened, thinwalled, obtuse, without oily inclusions, 25–50 × 5–8 μm.

**Basidia** obovoid or broadly clavate, 13–18 × 6–7.5 μm, with 2–4 voluminous, diverging sterigmata, 6–9 μm long and 1–2 μm wide at the base.

**Spores** narrowly ellipsoid, ovoid or pyriform, adaxially almost straight or somewhat concave, 6.5–10(12) × 3–4(4.5) μm, thinwalled, smooth, non-amyloid, non-cyanophilous, germinating by repetition.

**Habitat and distribution.** Found on debris of different kinds, dead ferns, fallen leaves or small twigs (*Picea* etc.). Found in Denmark (Mols, Sønderjylland) by K. Hauerslev.

**Remarks.** To the naked eye similar to *Ceratobasidium cornigerum*, which grows on the same kind of substrate, but differs in the presence of cystidia.

Fruitbodies resupinate, closely adnate, small and very thin, often not more than a subinvisible bloom on the wood, starting as a net of hyphae on the substrate, then intertwining into a thin layer, ceraceous and perishable as wet, when dried pruinose-porulose under the lens; hyphae thinwalled, narrow, with or without clamps; no cystidia; basidia obconical — pyriform, with (4—)6—8 sterigmata; spores hyaline, thin-walled, allantoid, ellipsoid or navicular, non-amyloid, non-cyanophilous.

Generic type: Corticium pearsonii Bourd.


Remarks: A genus of small, thin, and shortlived resupinates. To be found they must purposely and carefully be looked for on wet surfaces of decayed wood. The present circumscription of the genus is preferably based on the obconical or pyriform basidia with normally 6—8 sterigmata. There is a considerable variation in some other characteristics, above all in the presence of clamps and in the shape of the spores, Clamps are missing in P. pearsonii, in P. anatum they are wide, loop-like, while the others have normal clamps. The separation towards Sistotremastrum John Erikss. is not fully clear as S. niveocremeum in the young state comes close, in some respects intermediate, being thin and having young basidia of the same shape. Mature fruitbodies are, however, thicker than in Paullicorticium and the mature basidia are subcylindrical, often even with a waist-like constriction. For the present we find it wisest to keep this species in Sistotremastrum. To merge Paullicorticium and Sistotremastrum in one genus seems less good as the types of the two genera have very little in common and hardly can be congeneric. More species will probably be found and described in the future and then a better generic arrangement may be established.

From other subinvisible Corticiaceae the genus differs preferably in the development of the basidia, which are terminal, not lateral as in e.g. Xenasmatella Oberw., nor repeating like those of Repetobasidium John Erikss.

Specimens supposed to be P. jacksonii Lib. have been collected several times in Sweden. They represent, obviously, early stages of S. niveocremeum. The type specimen of P. jacksonii has been studied and seems in our opinion also to be a form of S. niveocremeum rather than a taxon of its own.
Paullicorticium

Key to the species

1. Hyphae without clamps ........................................ 4. P. pearsonii
1. Hyphae with clamps .............................................. 2
2. Clamps large and open, loop-like ............................. 2. P. anatum
2. Clamps normal ...................................................... 3
3. Spores small, less than 4 μm long ......................... 3. P. delicatissimum
3. Spores more than 5 μm long .................................. 4
4. Spores allantoid .................................................. 1. P. allantosporum
4. Spores oblong — subcylindrical ............................. Sistotremastrum niveocremeum

1. Paullicorticium allantosporum John Erikss., Fig. 456

Fruitbody resupinate, effused, closely adnate and very thin, when young subinvisible, then forming insignificant patches on the wood; when wet and alive watery ceraceous, when dry (lens) finely porulose or reticulate; no differentiated margin.

Hyphal system monomitic; hyphae 1,5—3 μm wide, with clamps, basal hyphae sparsely branched at right angles and forming a hyphal net on the substrate, basidia-bearing branches in the mature fruitbody intertwined to a thin subhymenium, in which the structural details are difficult to discern.

Cystidia none.

Basidia narrowly obconical, tapering towards the base, 15—20 x 5—8 μm, with 6(−8) sterigmata, ab. 4 μm long, and basal clamp.

Spores allantoid, 6—7 x 2—2,5 μm, with oil-drops or in the herbarium material with irregular oily inclusions.
Habitat and distribution. On decayed decorticate wood of *Picea* and *Pinus*, in the northern part of the area collected in August, in the southern part mainly in September; in Sweden found several times from Småland and Västergötland in the South to N. Lapland, besides in Norway (Nordland, Telemark and S. Trøndelag). It is probably not rare, maybe even locally frequent at suitable localities under favourable weather conditions. Outside the Nordic countries several collections from S. Germany are reported by Oberwinkler.

Remarks. *P. allantsporum* differs from the generic type in having clamped hyphae and the subhymenial hyphae becoming more intertwined. The basally tapering basidia with more than 4 sterigmata together with the very thin fruitbodies make, however, *Paullticorticium* a proper genus for it.

Fig. 456. *Paullticorticium allantsporum*  a) section through fruitbody  b) basidia  c) spores  d) hyphae. - Coll K. Hjortstam 1783.
**2. Paulllicorticium ansatum** Liberta, Brittonia

Fruitbody resupinate, effuse, closely adnate, very thin, often almost invisible, greyish-white, when wet ceraceous, when dried porulose-reticulate; without differentiated margin.

**Hyphal system** monomitic; hyphae thinwalled, 2–3 μm wide, clamps very open, loop- or handle-like, basal hyphae with the same clamps but partly seemingly simple-septate as the loops may become so wide that they are mistaken for simple-septate hyphae; fruitbodies develop from a net of basal hyphae, with short basidia-bearing branches, which intertwine into a thin subhymenial layer with indistinct hyphal details.

Cystidia none.

**Basidia** clavate-pyriform, 12–18 x 6–8 μm, with generally 6, but some with 4 or 8 sterigmata, 4–6 μm long; basal clamp loop-like.

**Spores** 5–7 x 2.5–3.5 μm, narrowly ellipsoid, with oblique, tapering apiculus, thinwalled, smooth, hyaline.

**Habitat and distribution.** On much decayed wood of conifers (*Picea abies* and *Pinus sylvestris*) in humid to wet forests from July to October. Reported by Hjortham from Västergötland and later collected several times by him and K.H. Larsson in this province where it seems to be quite frequent in suitable biotopes. Not found in other parts of N. Europe. Reported from S. Germany (Oberwinkler) and N. America (Liberta).

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**Fig. 457.** *Paulllicorticium ansatum* a) section through fruitbody  b) basidium c) spores. - Coll K.H. Larsson 756.
3. *Paullticorticium delicatissimum* (Jacks.) Fig. 458


Fruitbody resupinate, effused, adnate, very thin, forming inconspicuous, whitish, ceraceous, irregular patches on the wood, when dried appearing as a greyish pruina; no differentiated margin.

**Hyphal system** monomitic; hyphae thinwalled, 1–3 μm wide, with clamps at all septa, from running hyphae on the wood branching off short hymenial hyphae, first with scattered basidia, then at least in spots basidia more numerous, forming small continuous hymenia on a thin dense subhymenium.

**Cystidia** none.

**Basidia** subglobose to pyriform, 7–9 x 5–6 μm, with mostly 6 sterigmata, 3–4 μm long, and with basal clamp.

**Spores** 2,5–4 x 2,5 μm, narrowly ellipsoid to subcylindrical, smooth, thinwalled, hyaline and non-amyloid.

**Habitat and distribution.** On much decayed, brown-rotted, fragile wood, mainly of conifers but found also on deciduous wood. Being very small it is easily overlooked. In Sweden it is preferably found on wood of *Pinus sylvestris*. After Hjortstam’s report of it as new to Sweden (1971), K.H. Larsson has found it 4 times in Skåne, Västergötland, and Dalsland. K. Hauerslev has sent us one specimen from Denmark, on wood of *Picea abies*. In Europe it is besides found in S. Germany and France.

**Remarks.** The small basidia and spores separate this species from the other members of this genus.

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**Fig. 458.** *Paullticorticium delicatissimum*  a) section through fruitbody b) basidium  c) spores. - Coll. K.H. Larsson 1128.
Paullicorticium


Fruitbody resupinate, closely adnate, effused, very thin, often almost invisible to the naked eye, like a greyish or whitish bloom on the wood, when wet ceraceous and perishable, in the dry state under the lens finely granular, reticulate or porulose; no differentiated margin.

Hyphal system monomitic; hyphae thinwalled, 2–3 μm wide, with simple septa, branched at right angles and forming a net on the wood from which basidia-bearing hyphae branch off.

Cystidia none.

Basidia at first obovate-claviform, than obconical, 10–15 x 5–6 μm, with usually 6, some basidia with 4 sterigmata, ab. 5 μm long, and no basal clamp. The basidia are usually born alternating on the bearing hyphae.

Spores 6–8 x 2–3 μm, navicular, adaxial side concave, smooth, thin-walled.

Habitat. On much decayed wood of conifers and occurs in N. Europe preferably after periods of rain during the warm season, less often during the autumn. Easily overlooked but probably quite frequent in suitable localities.

Distribution. In Sweden found from Småland to Torne Lappmark. In Norway found north to Mo in Rana and reported from Denmark.

Remarks. Differs from the other species of the genus in having clampless hyphae. This together with the navicular spores make the species easy to recognize.

Fig.459. Paullicorticium pearsonii  a) section through fruitbody  b) basidia c) spores. — Coll. J. Eriksson 9462.
Peniophora Cooke, Grevillea 8 p. 20, 1879.

Fruitbodies resupinate, adnate or rolling off from the margins, effused or wart-like, annual or perennial, ceraceous — coriaceous, yellow-bright red-grey-violaceous-brown in varying shades; finely fimbriate, sterile margin present at least in young fruitbodies; hyphal texture monomitic, young hyphae thinwalled, hyaline under the microscope, white or light rose to the eye, older ones often with thickened walls, in most species brown at least next to the substrate; cystidia always present as encrust-ed metuloids or as sulfocystidia; dendrohyphidia in some species; basidia normally with 4 sterigmata, in all fibulate species with basal clamp; spores generally allantoid but in some species ellipsoid, in all species smooth, non-amyloid, non-cyanophilous, spore-print pale red.

Generic type: *Peniophora quercina* (Fr.) Cke.

Remarks. In many respects uniform and well distinguished genus, even if there is a variation in many characteristics. Important characteristics are the red spore-print and the sulfoaldehyde reaction of the gloeocystidia if such are present. There is an evident xerophilic adaption, allowing growth on hanging, rapidly drying, dead branches in all species of *Peniophora* subg. *Peniophora* and to some degree also in subg. *Gloeopeniophora*. This subgenus differs, however, in having more short-lived fruitbodies of a more ceraceous consistency with restricted ability to survive dry periods. We have followed the taxonomic arrangement of Boidin (1965) keeping subg. *Gloeopeniophora* separate. Subg. *Dupertilla* (Pat.) Boid. and subg. *Dendrophora* Parm. are not represented in the Nordic flora. Being not fully convinced that *P. lilacea* is closer to *P. polygonia* than to *P. lycii*, we have left the other species together in one subg. *Peniophora*, including also subg. *Cryptochaete* (Karst.) Boid. and *Christodendrella* Boid.

Determination of species is often difficult in this genus, as the fruitbodies vary with age, growth circumstances, humidity a.s.o. The fruitbodies must be studied in vertical sections, as the texture is too hard to allow crushing under the cover-glass. The sections should not be thinner than 10–20 μm to secure the presence of all elements needed. Free basidia can be obtained if a drop of 2–5% KOH is placed on a young fertile hymenium, from which a softened piece of hymenium is taken with a needle for study under the microscope. Gentle tapping of the cover-glass may separate the basidia from each other. Presence of clamps can best be seen in young marginal hyphal tissue. For ascertaining the presence of sulfocystidia, sulfovanillin or sulfobenzaldehyde have to be used.

Generic synopsis.

*Peniophora* subg. *Gloeopeniophora*. Fruitbodies more or less orange. Hyphal texture not brown.

1. *P. incarnata*-group. *P. aurantiaca, erikssonii, incarnata, laeta, laurentii*.


1. *P. cinerea*-group. Encrusted metuloid cystidia, sulfocystidia present or not, no dendrohythidia. *P. cinerea, junipericola, limitata, nuda, piceae, pini, pithya, quercina, rufa, rufomarginata, septentrionalis, suecica, violaceolivida*.

2. *P. lycii*-group. With or without encrusted cystidia; sulfocystidia and dendrohythidia present. *P. lilacea, lycii, polygonia*.

Key to subgenera and species

1. Fruitbodies more or less orange to reddish pink, hyphal texture not brown .............. subgen. *Gloeopeniophora*

1. Fruitbodies reddish-grey, violaceous-brown, hyphal texture at least partly brown ........ subgen. *Peniophora*

Subgen. *Gloeopeniophora*

1. With clamps ................................................................. 2
1. Without clamps ............................................................. 4
2. Decorticating, on branches of *Carpinus betulus* ........... 4. *P. laeta*
2. Not decorticating .......................................................... 3
3. Spores ab. 8–10 x 4–5 μm ............................................. 3. *P. incarnata*
3. Spores ab. 15–20 x 10 μm ............................................. 1. *P. aurantiaca*
4. Spores ab. 10 x 5 μm .................................................... 5. *P. laurentii*
4. Spores ab. 15–20 x 12 μm, on *Alnus incana* and *A. glutinosa* ................................................................. 2. *P. erikssonii*
Subg. Peniophora

1. Without dendrophyidia ........................................ 2
2. With dendrophyidia ........................................... 16
3. Without or with single sulfofustidia .......................... 3
4. With regular, as a rule numerous sulfofustidia .................. 11
5. Fruitbody closely attached to the substrate .................... 4
6. Fruitbody loosening from the margin ........................... 7
9. Subiculum thin or lacking ..................................... 6. P. cinerea
10. Subiculum well developed .................................... 6
13. On deciduous trees ........................................... 8
14. On conifers .................................................. 10
16. Sterile margin light-coloured. On other substrates ................ 9
17. On Quercus and Fagus ....................................... 16. P. quercina
18. On Tilia .................................................. 18. P. rufomarginata
20. On dead branches and trunks of Juniperus 7. P. junipericola
21. Hyphae gelatinized, mainly hyaline. Sulfofustidia in both subhymenium and subiculum 12
22. Hyphae not gelatinized, more or less brown. Sulfofustidia only in subhymenium and hymenium 13
25. On coniferous trees ......................................... 14
26. On deciduous trees ......................................... 15
27. Sterile margin light-coloured. Subiculum well developed, partly only weakly pigmented 19. P. septentrionalis
Peniophora

14. Sterile margin dark if present. Subiculum thin or almost lacking, if present strongly pigmented brown ........... 14. P. pithya

15. Sulfocystidia of the first hymenial layer numerous, rounded, reaching 20 μm in width ...................... 11. P. nuda

15. Sulfocystidia fewer, narrower, as a rule ab. 10 μm, all of about the same shape and size ............ 21. P. violaceolivida

16. With rounded encrusted cystidia ....................... 10. P. lycii

16. Without encrusted cystidia ................................. 17


Peniophora subg. Gloeopeniophora

Fruitbodies resupinate, ceraceous — membranaceous, hymenium yellow to orange-red; hyphal texture hyaline.

Fruitbodies not adapted to withstand dry periods and are relatively shortlived, not surviving long dry or cold periods and therefore not perennial or stratified.
Fig. 460. *Peniophora aurantiaca*  a) schematical section through marginal part of fruitbody  b) through hymenium, see fig. 461  c) schematical section through mature fruitbody  d) through hymenial layer. - Coll. Boidin 3295.
pl. 144:2, 1892. — *Peniophora lepida* Bres.
Mycologia 17:70, 1925.

Holotype: Allescher & Schnabl. Fungi bav. n. 129.


**Fruitbody** resupinate, mostly totally adnate, only when old somewhat loosening from the substrate, at first orbicular round lenticels and other holes in the outer bark, then confluent and covering undersides of branches, more or less tuberculate esp. in the centre, ab. 0.2—0.5 mm thick, more in the tubercles, lighter or darker orange-red depending on age; consistency ceraceous in young fruitbodies, membranaceous in older ones; margin lighter, pale yellow or white, fibrilllose in young specimens.

**Hyphal system** monomitic; hyphae with thin or slightly thickened walls, with clamps; subhymenial hyphae 3—4 µm wide, richly branched, subicular hyphae 4—5 µm wide, straight, sparsely branched; section showing a stratification with a basal subicular layer, 0.1—0.2 mm thick, of dense parallel hyphae, and a subhymenial layer of mainly vertical hyphae and hymenial elements, at first about 0.1 mm thick, then increasing in thickness.

**Cystidia** of two kinds a) encrusted thickwalled *metuloids*, encrusted part 30—50 x 8—12 µm, basal, not encrusted part of varying length, often with adventitious septation; b) thinwalled *sulfocystidia*, reaching a length of 100 or 150 µm and a width of 10—15, sometimes 20 µm, with granular protoplasm with reaction to sulfovanillin, elongate, obtuse, or tapering to an apex, numerous especially in young specimens.

**Basidia** varying but mostly cylindrical, more or less sinuous and constricted, reaching a size of 60—90 x 10—15 µm, with 4 conical sterigmata, in young fruitbodies some pleurobasidia seen.
Fig. 461. *Peniophora aurantiaca*  a) section through hymenial part  b) marginal hyphae  c) encrusted cystidia  d) sulfocystidia  e) young and mature basidia  f) spores. - Coll. Boidin 3295.
Peniophora

Spores ellipsoid, smooth, thin-walled, mostly 14–16 × 8–10 μm, hyaline but in spore-print yellow or light orange, depending on the thickness of the print.

Habitat and distribution. *P. aurantiaca* is not known from N. Europe. It is a very common species in the subalpine region of C. and S. Europe, where it grows on *Alnus viridis* and hence ecologically well distinguished from the following species. In N. America, however, its distribution is wider and it grows on several species of *Alnus* (*A. rubra, rugosa, sinuata*) of which only *A. sinuata* belongs to the same subgenus as *A. viridis*. There it is not restricted to high altitudes but occurs down to sea-level. The species appears widely spread in the N. hemisphere.

Remarks. Very close to *P. erikssonii* from which it is distinguished by the presence of clamps.

A slide of the holotype of *Peniophora lepida* Bres. (Weir 16744) is studied and its identity with *P. aurantiaca* is confirmed.

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Fruitbody resupinate, adnate, orbicular around lenticels in the bark, then confluent but generally of moderate dimensions, smooth with a central tubercle, generally 0.2–0.3 mm thick, in the tubercle thicker, yellowish to orange-yellow, depending on age; when young soft, ceraeous, when older becoming membranaceous; margin pruinose or finely fimbriate, pale yellowish or white.

Hyphal system monomitic; hyphae thin-walled, without clamps, subhymenial hyphae 2–4 μm wide, richly branched and densely interwoven, subicular hyphae straight with sparser septa and ramifications; stratification with a thick subicular layer of parallel hyphae and a subhymenium, at first thin, then growing in thickness, mostly 0.1–0.2 mm thick, of mainly vertically arranged hyphae.
Fig. 462. *Peniophora erikssonii* a) section through fruitbody b) basidium c) encrusted cystidium d) sulphocystidium e) spores f) marginal hyphae.
- Coll. J. Eriksson 10174.
Peniophora

Cystidia of two kinds a) encrusted thickwalled *metuloids*, encrusted part 30–50 x 8–15 μm, total length 100 μm or more, and b) thinwalled *sulfocystidia*, cylindrical, more or less sinuous and constricted, reaching a length of 100–200 μm, with granular protoplasm with reaction to sulfovanillin. Number of cystidia varying, gloeocystidia are more numerous in young specimens, encrusted cystidia in mature fruitbodies.

**Basidia** mainly cylindrical, more or less sinuous and constricted, 60–100 x 12–15 μm, with 4 large sterigmata, ab. 8 μm long.

**Spores** ellipsoid, smooth, thinwalled, hyaline but orange-yellow in thick spore-prints, 15–20 x 10–13 μm.

**Habitat.** On dead hanging branches of *Alnus* spp., in N. Europe *A. glutinosa* and *A. incana*, esp. near waters (lakes, rivers, sea). It can be found in the late summer and grows untill it becomes killed by frost.

**Distribution.** *P. erikssonii* is a common, easily found species in the *Alnus* fringe along the Bothnian coasts and evidently also in the Finnish lake district. Besides there are collections from inland localities in Småland and Västergötland (Sweden) and several from S. Norway. Very likely it can be found in many places in Sweden but has been looked for in the West Coast region without result. The same is true for some other species, mostly found on hanging branches. An explanation may be that the humid climate of the West Coast allows other species, less specialized in their habitat, to grow and compete in this ecological niche.

*P. erikssonii* was originally described from the Pyrenean Mts. It is collected in C. France and Parmasto has distributed exsiccatcs from Sovjet. It is found in N. America (New York, Quebec, NW-territory) but is evidently rarer than *P. aurantiaca*.

**Remarks.** Very close to *P. aurantiaca* and the only reliable characteristic is the lack of clamps. The specimens appear more juvenile and less developed than those of *P. aurantiaca*. The basidia and spores are somewhat larger, which often is the case with young hymenia.
Fig. 463. *Peniophora incarnata*  a) section through fruitbody  b) young and mature basidia  c) sulfozystidium  d) encrusted cystidium  e) horizontal sections through encrusted cystidium  f) spores  g) basal hyphae. - Coll. Eliasson 9479.
Peniophora

3. Peniophora incarnata (Fr.) Karst., Hedw. Fig. 463, 464a, 528a
28 p. 27, 1889. — Thelephora incarnata

Neotype (selected here): "Cortici um incarnatum Fr. Uppsala. 1857-02-
26" scr. E.P. Fries (UPS).

Fruitbody resupinate, closely adnate, on bark orbicular and confluent,
on lignum effuse, size small to moderate but may reach considerable
dimensions, covering underside of branches, 0.1–0.3 mm thick, some-
times more, smooth or with age more or less tuberculate, finally cracking
into polygons, pale to bright orange, when young and wet watery violace-
ous red, in the herbarium fading to ochraceous; ceraceous in the youngest
state then firmer, membranaceous; margin in young specimens some-
times whitish or yellowish, finely fibrillose under the lens, older fruit-
bodies without differentiated margin.

Hyphal system monomitic, hyphae thinwalled, with clamps, 3–4 μm
wide, densely united, richly branched in the thickening hymenium, bas-
ally often a thin subiculum of straight, parallel hyphae.

Cystidia of two kinds a) numerous thinwalled sulfocystidia with granular
contents, growing to long tubes with the thickening of the fruitbody,
reaching a length of 200 μm or more and a width of 10-15 μm b) fewer
encrusted cystidia (metuloids), at first thinwalled and naked, then cov-
ered with an outer layer of encrustation, the interior filled with a crys-
talline substance, leaving only a narrow central lumen, total size of en-
crusted part 30–60 x 7–15 μm.

Basidia narrowly clavate, often somewhat sinuously constricted, thin-
walled, 35–45 x 5–7 μm, smaller in old fruitbodies than in young ones,
with 4 sterigmata and basal clamp.

Spores 8–12 x 3,5–5 μm, broadly cylindrical — narrowly ellipsoid, thin-
walled, smooth, light red in spore-print.

Habitat. On all sorts of wood, most frequently on deciduous trees; fallen
or still attached branches, lying trunks and stumps, rarer on coniferous
wood, where it is usually seen on upper surfaces of stumps and on sawn
ends of heaped wood, left too long (a couple of years or more) in the
forest. Besides in forests it is very often seen in gardens and parks
(hedges, bushes a.s.o.).
**Distribution.** Very frequent esp. in the southern parts of the area and along the coasts. Less frequent in the inner, coniferous part of the northern provinces, but occurs in the subalpine, deciduous zone in N. Lapland.

**Remarks.** Thanks to its bright colour as a rule easily recognized, but not always distinguishable with the naked eye from *P. laurentii*, which, however, lacks clamps, and from *P. erikssonii*, which besides has larger ellipsoid spores.

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![Fig. 464. Types of cystidia in *Peniophora*.](image)

*a*) encrusted cystidium from *P. incaranta*. - Coll. Ryvarden 12653.  
Fig. 465. *Peniophora laeta*  a) schematical section through part of fruitbody showing position of section b  b) section through hymenial part  c) spores d) sulfocystidium  e) young and mature basidia  f) encrusted cystidia  g) section through fruitbody decorticating a branch. - Coll S. Jacobsson 19353.
Fig. 466. *Peniophora laeta*  a) section through smooth fruitbody  b) spores.
- Coll. I. Nordin 21530.
4. Peniophora laeta (Fr.) Donk, Fungus 27 p. 17, 1957. – *Radulum laetum* Fr., Elench. p. 152, 1828. For further synonyms see Donk loc. cit.

Fruitbody resupinate, adnate, pale ochraceous red to orange, ceraceous, appearing in the primary cortex, pushing the thin layer of secondary bark with the aid of hyphal pegs, 0.5–3 mm long, 0.5–1 mm wide, between the pegs usually smooth, 0.05–0.1 mm thick, sometimes thicker; margin not differentiated.

Hyphal system monomitic, hyphae thinwalled, with clamps, subicular hyphae ab. 3 μm wide, sparsely branched, often united in a dense texture, glued together by an interhyphal matrix, or more loosely intertwined to an open context, in such cases sometimes parallelized into irregular strands, subhymenial hyphae richly branched and densely united into a close context; hyphal pegs composed of vertical hyphae, more or less swollen and irregularly widened sinuous. The inflation of the hyphae of the pegs may be seen as an adaption for their pushing ability — the swelling pegs press the secondary bark until it bursts and opens.

Cystidia of two kinds a) *encrusted cystidia*, 40–60 x 12–15 μm, to begin with naked, then covered by a crystalline layer and also filled up with the same material, leaving only a narrow lumen b) thinwalled *sulfo-cystidia*, reaching 100 μm or more in length, width 8–12 μm. Encrusted cystidia few or sometimes even lacking, while sulfo-cystidia are always numerous.

Basidia narrowly clavate, 35–45 x 5–7 μm, with 4 sterigmata and basal clamp.

Spores sub-cylindrical, adaxial side somewhat concave, thinwalled, 10–12(–16) x 3.5–4.5 μm, light red in spore-print.

Habitat. On dead hanging branches of *Carpinus betulus*, 1–2 cm thick, generally 1–3 m above the ground, or on recently fallen branches.

Distribution. Frequent in S. Scandinavia within the area of spontaneous *Carpinus betulus*, but occurring also on cultured trees and bushes outside this area. In Sweden there is a very rich occurrence on the Stenshuvud
Fig. 467. *Peniophora laurentii*  
- a) section through hymenial part of fruitbody  
- b) sulfocystidium  
- c) young cystidium  
- d) encrusted cystidium  
- e) young and mature basidia  
- f) spores.  
- Coll. Nannfeldt 2558.
Peniophora

mountain in E. Skåne (Scania). It is also found in other parts of Skåne, in Blekinge, Öland and in Gothenburg, where it reaches its northern limit so far known. E. Fries reported it as a Swedish species (1863 p. 259) without giving the locality ("in regione Carpini b."). In Denmark it is found in many places ("often abundant", M.P. Christiansen).

Remarks. Eriksson (1950) was not aware that Radulum laetum Fr. is a Peniophora, but found it in Skåne (Fyledalen) in 1957 and became convinced that it is a species of its own, separate from P. incarnata. The first collection of it in Sweden in recent times was, however, made by M.P. Christiansen (1960 p. 188) who found it in Dalby 1956.

P. laeta is very close to P. incarnata, but distinguished by its way of living and by the presence of hyphal pegs with a deviating type of hyphae.

   — Merulius lepidus Romell, Ark. bot. 11:3 p. 29, 1911. — Corticium lepidum (Romell)
   Bourd. & Galz., Hym. de Fr. p. 187, 1928.

Holotype: Romell n. 12037 (S).

Fruitbody resupinate, on smooth bark orbicular and adnate but usually confluent-effused, more or less detachable; hymenium at first smooth, then tuberculate, plicate or meruloid, bright orange-red in the fresh fungus, fading in the herbarium to ochraceous red; subiculum white and often forming a white marginal zone; no rhizomorphs.

Hyphal system monomitic; hyphae 3–5 μm wide, without clamps, subicular ones thickwalled, sparsely branched in all directions, forming a white, open texture; subhymenial hyphae thinwalled, richly branched and united into a dense texture, giving the layer a ceraceous — membranaceous structure.
Cystidia of two kinds a) *encrusted pseudocystidia*, in the first layer originating from subicular hyphae, thickwalled with the apical part 40–60 x 10–15 μm, strongly encrusted with an outer layer of grainy crystals and an inner deposit, seemingly also crystalline. Young cystidia thinwalled, subulate, its plasmatic contents with oil-drops or irregular oily inclusions. With the growth of the hymenium new cystidia are formed from subhymenial hyphae b) *sulfocystidia*, 70–150 x 8–12 μm, thinwalled with grainy plasmatic contents.

**Basidia** 50–60 x 6–8 μm, narrowly clavate, with 4 sterigmata and without basal clamp.

**Spores** 9–13 x 4–5 μm, broadly cylindrical — narrowly ellipsoid, thinwalled, smooth, pale-red in spore-print.

**Habitat.** On dead deciduous branches, preferably of *Populus tremula* and *Betula*, from late autumn till after snow-melting in the spring. Fruit-bodies are found from October to April-May in C. Sweden, in N. Sweden also in the summer (June—August). It is usually developed under snow and seems to need its protection against the cold winter drought.

**Distribution.** In Sweden found from Västergötland and northwards to Lapland, in Finland and Norway collected in different parts of the countries. Not known from Denmark.

**Remarks.** Owing to the red colour it may be mistaken for *P. incarnata*, but is easily distinguished thanks to clear microscopical characteristics. Its place in *Peniophora* is justified by the red colour of the spores and the aldehydreaction in the gloeocystidia.

The reports by R.L. Gilbertson on the occurrence of *Cort. lepidum* (Rom.) Bourd. & Galz. in Arizona is based on misdetermined material. It is rather a member of *Erytricium*, close to *E. laetum* (Karst.) Erikss. & Hjort. A slide of *P. lepida* Bres. (Weir 16744 FH) has been studied. Spores have not been found but presence of cystidia, gloeocystidia and hyphae with clamps leave no doubt about its identity with *P. aurantiaca.*
Peniophora Cooke subg. Peniophora.

Fruitbodies resupinate but often loosening from the margins, coriaceous, hard to section and brittle to break when dried, hymenium with reddish-grey, violaceous or brownish colours, not orange-red; hyphal texture at least partly brown, e.g. next to the substrate.

The species of this subgenus have long-lived fruitbodies, adapted to withstand and survive long periods of drought. Several of them are perennial, thus getting a stratified subhymenium. The strata are as a rule few (2–3), but e.g. in *P. limitata* the number may be 10 or more, the life length depending mainly on how long it takes for the mycelia to decompose the branch on which they live.


Fruitbody resupinate, closely adnate, orbicular as rounded patches round lenticels etc., then confluent, on lignum effused from the beginning, mostly thin (0.5–0.1 mm) and smooth, sometimes thicker and more or less tuberculate, often cracked in small polygons, mature specimens when dry mainly grey but with considerable variation, young specimens reddish grey, wet mature ones dark violaceous grey, old specimens mainly brown; consistency of very young fruitbodies ceraceous, then very firm, hard when dry; margin generally not differentiated, except in some young specimens, in which there may be a narrow, light-coloured, finely fimbriate sterile zone.

Hyphal system monomitic; hyphae with clamps, embryonal ones in growing marginal zone thinwalled, hyaline, 2–3 μm wide, secondary hyphae with thickened walls, more or less pigmented brown, ab. 3 μm wide; subiculum as a rule lacking or present as a very thin layer, occasionally 10–20 μm thick, composed of horizontal, densely united hyphae; subhymenium of vertical hyphae, very closely united into a pseudoparenchymatic tissue.

Cystidia of two kinds a) a few *gloeocystidia* sometimes present in young specimens, thinwalled, oblong, 20–30 x 5–10 μm, terminal or lateral on the bearing hyphae, protoplasm not darkening in sulfovanillin
Fig. 468. *Peniophora cinerea*  a) section through young fruitbody  b) section through mature fruitbody c) spores d) basidium e) pleurobasidium f) young cystidium g) cystidia, different stages of development. - Coll. Strid 394 (e and f from young marginal hymenium).
Peniophora

b) encrusted metuloid cystidia, starting in the hymenium as thinwalled cystidiols, then with thickened walls, in time strongly pigmented brown in the basal part, distal part 15–20 x 7–10 μm, not or only weakly pigmented with an outer layer of encrustation, often dissolving in old, enclosed cystidia, and an inner crystalline filling; number of cystidia varying, as a rule numerous, in young specimens often sparse.

Basidia sub-cylindrical – subclavate, somewhat sinuous, 30–40 x 5–6 μm, thinwalled, with 4 sterigmata and basal clamp; pleurobasidia observed in young fruitbodies.

Spores allantoid to subcylindrical, 7–9(–10) x 2.5–3.5 μm, thinwalled, smooth, hyaline, spore-print pale red.

Habitat. On fallen branches of deciduous trees, less often on dead, hanging branches or on fallen logs, in deciduous forests. It is quite common in the South Scandinavian Fagus forests, but is also found on many other trees and bushes, e.g. Carpinus, Corylus, Fraxinus, Populus, Prunus, Quercus, Rhamnus, Sorbus, Syringa, Tilia, but is never seen on conifers.

Distribution. Common in the southern part of Scandinavia, e.g. in Denmark, in Sweden in Götaland and Svealand, in Finland and Norway in the southern coast-provinces. Its occurrence in the coast region of N. Sweden is not fully known, but it seems to be rare.

Fig. 469. Peniophora cinerea. Hymenium with encrusted cystidia. - Coll. Ryvarden 1969-10-05. S.E.M. L. Ryvarden.
Fig. 470. *Peniophora junipericola*  a) section through unusually thick fruitbody. - Coll. S. Sunhede 9516.  b) section through normal fruitbody  c) spores. - Coll. Parmasto, Mycoth. est. III:58.
Peniophora

Remarks. Mature specimens usually easily recognized thanks to the greyish colour, the undifferentiated margin, the lack of sulfocystidia and the poorly developed subiculum. Some doubtful specimens are seen in the herbaria, which is why further sterility tests are asked for.

There is no authentic material in E. Fries’s herbarium (UPS). It has therefore been necessary to choose another specimen as a neotype, and we have chosen a Blytt specimen from Oslo, sent to E. Fries and very likely determined by him, even if the label is written by his son Th. M. Fries. It is a good collection, probably from Sorbus aucuparia. There are numerous encrusted cystidia, no visible gloecystidia, and no or extremely thin subiculum.

7. Peniophora junipericola John Erikss. Fig. 470-71

Fruitbody resupinate, adnate, but in older states loosening from the margins and rolling off together with a thin layer of bark, covering the undersides of horizontal or sloping branches as well as vertical stems, 0.1—0.3 mm thick, when young and fresh pinkish or greyish red, when old and less fertile pale brownish red when dry, violaceous when wet; hymenium smooth, more or less cracked in the dry state; sterile margin usually insignificant or lacking.

Hyphal system monomitic, subiculum well developed, 30—100 μm thick, thickening subhymenium reaching 250 μm; hyphae with clamps, 3—4 μm wide, richly branched, walls thickening and becoming pigmented brown in old texture, subicular hyphae horizontal, densely and parallely united into a close texture, those of the subhymenium vertical, together with old shrunken basidia forming a pseudoparenchymatic tissue, in old fruitbodies stratified, even if less distinct than in some other species.

Cystidia appearing in the hymenium as thinwalled, subulate cystidiols, then becoming externally encrusted and filled with a crystalline substance, leaving only a narrow lumen, basal walls much thickened and pigmented brown, total length 50—80 μm, encrusted part 25—35 x 8—12(—18) μm, largest cystidia in the first hymenial layer, encrustation often dissolving in old strata; number of cystidia variable but may be considerable.
Fig. 471. *Peniophora junipericola*  a) section through thin fruitbody  b) cystidia c) basidia  d) spores.  - Coll. I. Nordin 6055.  e) section through unusually thick fruitbody.  - Coll. J. Eriksson 21427.
**Peniophora**

**Basidia** 35–50 x 6–7 μm, narrowly clavate — subcylindrical, with thin or basally slightly thickened walls, with 4 sterigmata and basal clamp, adventitious septa in old basidia.

**Spores** 8–11 x 3–3.5 μm, allantoid, smooth, hyaline but spore print pale red.

**Habitat.** On dead, still attached branches or dead trunks of *Juniperus communis*, preferably on sites near sea and lakes, especially in sunny, periodically warm localities. The attached branches become brittle which can be taken as a sign of its presence.

Unlike *Amylostereum laevigatum*, which is a widely distributed species on *Juniperus*, it does not grow on branches lying on the ground. *A. laevigatum* seems to need a more even humidity while *P. junipericola* is favoured by a combination of dry warmth and periodic humidity. The location near sea or lakes may favour its growth due to the higher humidity at night, helping the fungus to survive dry periods. Its fruit-bodies as a rule don’t survive cold winters.

**Distribution.** Not fully known but it seems to be frequent in the E. parts of S. Sweden (to Uppland in the N). It has been collected several times along the E. coast (from Blekinge to Uppland, as well as on Öland and Gotland), and also by the big lakes of C. Sweden (Vänern, Mälaren, and Hjälmaren). It is apparently much less frequent on the W. coast of Sweden, where it has often been looked for. In Halland it has been found only twice (at Tjolöholm in N. Halland and at Hemmeslöv in the S). It was looked for, but not found, at Hovs Hallar in NW. Skåne, where *Juniperus* is abundant in an open locality near the sea. Outside Sweden it has been collected in France and Estonia.

**Remarks.** *P. junipericola* is usually easily distinguished already in the field by its growth on *Juniperus* and by its colour, which is lighter and more reddish than in i.a. *P. pithya*, which is its closest relative. This species has as a rule a dark margin. In the microscope *P. junipericola* differs in having larger spores and less pigmented texture. In rare case *P. pithya* occurs on *Juniperus*, especially on branches lying on the ground. Even if it seems to be beyond doubt that they are two well separated species, there are some specimens that may cause some trouble, e.g. specimens no doubt belonging to *P. pithya* but with larger spores than usual. Prof. Roll-Hansen, Oslo, has shown us such a specimen from the wood of living *Picea abies* received in culture, with spores reaching 8 or even 9 μm, but still a clear *P. pithya*. The small spore size, 5.5–6.5 μm, reported by Eriksson 1950 is true chiefly for N. Sweden, from where the greater part of his material originated.
Fig. 472. *Peniophora lilacea* a) schematical section through young fruitbody showing position of b  b) section through hymenial layer  c) section through fruitbody showing position of d  d) see fig. 473 on page 944  e) sulfocystidia, two with thickened walls and secondary septa  f) dendrohyphidia  g) basidia  h) marginal, thinwalled hyphae. - Coll. I. Nordin 6302.
8. *Peniophora lilacea* Bourd. & Galz.,
Fig. 472-74, 529a


**Fruitbody** adnate, on smooth secondary bark orbicular, forming rounded patches, then confluent, on primary bark more effused, of small or moderate size, 0.1–0.2 mm thick, smooth and continuous but with age, esp. on primary bark, cracking in transverse pieces; hymenium rosaceous grey to pale ochraceous, sometimes with a lilaceous or orange tint in the living fungus, margin thinning out, not esp. differentiated.

**Hyphal texture** monomitic, all hyphae with clamps; subhymenial hyphae 2–3 μm wide, forming the dense, indistinct texture of the thickening subhymenium, in old fruitbodies sometimes stratified in 2 or 3 layers; subicular hyphae 3–5 μm, parallel to the substrate, in the marginal zone thinwalled, hyaline and free from one other, in the mature part of the fruitbody somewhat thickwalled and pigmented yellowish or pale brown, densely united into a coherent texture by an interhyphal substance.

Cystidia richly present as *sulfozystidia*, thinwalled at least in the basal part, 60–100 x 10–15 μm, fusiform to sub-cylindrical, tapering to the apex or obtuse, sometimes with an apical appendix, filled with oily protoplasm, in old cystidia protoplasm retracting and producing one or more adventitious septa; in the first hymenial layer several sulfozystidia are observed being borne laterally on the bearing hyphae.

*Dendrohyphidia* present mainly in young hymenia, often difficult to find in older hymenia; richly branched, asperulate, hyaline or in older parts yellow or pale brown.

**Basidia** sub-cylindrical, often widened at the base, more or less constricted, 40–60 x 8–10 μm, in older basidia walls somewhat thickened in basal direction, 4 sterigmata. The development of the basidia from the dense subhymenial tissue has not been possible to study in detail, but clamps seem to be present.

**Spores** ellipsoid, 12–15 x 7–9 μm, smooth, thinwalled, non-amyloid, non-cyanophilous. The spore-print we received was apparently white, but according to Boidin it is "rose orange en masse".

**Habitat.** On dead brittle hanging branches of *Ulmus carpinifolia*, 1–2 cm thick, 0.5–3 m above ground.
Fig. 473. Peniophora lilacea  a) section through 2-layered fruitbody   b) sulfcystidia  c) basidia  d) spores. - Coll. I. Nordin 6302.
**Peniophora**

**Distribution.** Found four times in three localities in Gotland (Dalhem, Ekeby, and Hablingbo parishes by I. Nordin) and once in Öland (Torslunda par. by M. & J. Jeppson). Outside Sweden it has been found in Poland (Mielnik, distr. Siematyczce, on *Prunus domestica*, S. Domanski) and several times in France: Aveyron (Galzin) and le Rhône, l'Ain, l'Isère (Boidin). Boidin besides reports it as found on different substrates in Armenia.

**Remarks.** Easily recognized thanks to the large, ellipsoid spores, the presence of sulfocystidia and the lack of encrusted cystidia. It cannot as a rule be distinguished with the naked eye with certainty from other species of the genus, e.g. *P. nuda*.

Its relationship to the other species of the genus is not fully clear. In several respects it seems to be closer to *P. lycii* than to the rest of the genus but it has no encrusted cystidia.

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Fig. 474. *Peniophora lilacea*  a) dendrohyphidia  b) sulfocystidia. - Coll. Jeppson 24036. S.E.M. L. Ryvarden.
Fig. 475. *Peniophora limitata*  a) schematical section through fruitbody b) section through basal part of fruitbody showing cystidia with dissolved encrusted cystidia c) hymenial part  d) section through normal fruitbody  e) cystidia, one with dissolved encrustation  f) young cystidium with thin encrustation  g) not yet encrusted cystidium  h) young and mature basidia  i) spores. - Coll. I Nordin 9476.
Peniophora

9. Peniophora limitata (Fr.) Cooke, Grevillea 8 p. Fig. 475-76, 529b
21, 1879. – Thelephora limitata Fr., Elench.
1 p. 222, 1828. – Peniophora fraxinea (Pers.)
Lund. in Lund & Nannf., Fung. exs. suec., fasc.
I–II p. 29 n. 84, 1934.

Fruitbody resupinate, orbicular but soon confluent and covering the substrate, adnate but when old loosening from the margins, 0.1–0.5 mm thick; hymenium in young specimens smooth, continuous, greyish red, then becoming irregularly tuberculate and cracked in pieces, violaceous grey, when wet dark blue-grey, old sterile fruitbodies brown; margin in most cases dark, blackish, in rapidly growing specimens sometimes lighter, in very rare cases almost white.

Hyphal system monomitic, young hyphae thinwalled, hyaline, old hyphae thickwalled, pigmented brown; clamps present; subiculum always present but varying in thickness, 50–150 μm, composed of densely united, more or less parallel hyphae; subhymenium of dense, vertical hyphae together with enclosed cystidia, becoming stratified, in thick specimens 5 layers or sometimes more.

Cystidia numerous, thinwalled when first appearing in the hymenium, with more or less oily contents, then becoming thickwalled, in the apical part covered with a layer of encrustation and filled with a crystalline substance, basal part becoming pigmented brown, in enclosed cystidia encrustation often dissolved; size of cystidia mostly 30–50 x 8–12 μm, but sometimes larger, reaching 75 x 15 μm.

Basidia narrowly clavate, 40–55 μm long, in the apical part 6–8 μm wide, with 4 sterigmata and basal clamps; basidial walls may be slightly thickened in basal direction.

Spores allantoid, 8–12 x 3–3.5 μm, thinwalled, smooth, hyaline, sporeprint pale red.

Habitat. On dead branches, still attached to the tree or fallen to the ground as well as on smaller, fallen trunks, of Fraxinus and Syringa, reported also from Ligustrum (Oleaceae), further on Philadelphus (Hydrangeaceae). The biotope is the mixed, fertile deciduous forest of S. Scandinavia, and in hedges a.s.o. in parks and gardens.
**Distribution.** Frequent on *Fraxinus* and *Syringa* in Denmark and S. Sweden. The northernmost locality known is Östersund, on *Syringa* in garden (Sunhede pers. comm.). In Norway common in the SE part and along the coast to Tröndelag. Its occurrence in Finland is not so well known but it is probably frequent in the southern parts as soon as the host trees occur. Parmasto reports it from Estonia. It is a common species in continental Europe and in Great Britain.

**Remarks.** Like all species of the genus *P. limitata* is variable depending on age, growth rate a.s.o. but in the Nordic area there is generally no trouble in recognizing it already in the field. Younger and more rapidly growing fruitbodies are more light-coloured while mature specimens are dark, when wet blue-violaceous. Specimens on *Syringa* are as a rule lighter, more reddish, than the normal form on *Fraxinus*. The black margin is as a rule visible at least in specimens on *Fraxinus*. *P. pilatiana*

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Fig. 476. *Peniophora limitata*. Encrusted cystidia. -Coll. L. Ryvarden 7356. S.E.M. L. Ryvarden.
Peniophora

Pouzar & Svrček (Česká mykol. 7 p. 180, 1953) is reported to be very close, e.g. by D. Reid (Revista biol. 1965 p. 146) who states "virtually indistinguishable except for having a narrower basal layer"). This is however, not the whole truth. *P. pilatiana* is closely adnate, lacks the dark margin of *P. limitata*, has smaller spores, and above all, a different hyphal texture. In *P. limitata* the subhymenial hyphae have thickened walls and are conglutinated into a vertically arranged pseudoparenchymatic tissue, while in *P. pilatiana* the walls are thinner and intertwined in a more irregular way. As far as we can see from the available material (Boidin 2897) it is not especially close to *P. limitata*. *P. pilatiana* is a southern, thermophilic species, growing on different deciduous hosts and is not found in N. Europe. *P. limitata* is much more close to *P. rufomarginata*, which except in the choice of substrate differs usually in the lighter, reddish colour and white margin of young specimens.

Fig. 477. *Peniophora lycii*  a) hymenium with dendrohyphidia  b) sulfocystidium
Fig. 478. *Peniophora lycii*  a) section through young fruitbody   b) young sulfocystidia  c) dendrohyphidia  d) sulfocystidium with dendrohyphidium at the top  e) young and mature basidia  f) thickwalled cystidium  g) pleurobasidium  h) spores. - Coll. B. Eriksson 2567.  i) section through fruitbody. - Coll. I. Nordin 6828.
10. **Peniophora lycii** (Pers.) v.Höhn.& Litsch., 
Sitzb. Akad. Wiss. Wien, Math.—Nat. Kl. I, 
116 p. 747, 1907. —*Thelephora lycii* Pers., 
Myc. eur. I p. 148, 1822. —*Corticiaeum* 
caesium Bres., Fungi trid. II p. 1892.

**Fruitbody** resupinate, totally adnate, orbicular and confluent, covering 
the undersides of branches, mostly thin (ab. 50–100 μm), sometimes 
thicker (200 μm), thinning out towards the margins which as a rule are 
abrupt, not especially differentiated; hymenium smooth, generally with 
low tubercules at the initial points, colour whitish blue-grey or violace-
ous with a bluish-white pruina, less apparent in older specimens, which 
turn to grey with a reddish or brownish tint. Also younger specimens 
sometimes have less developed dendrohyphidia and then become a 
reddish-grey colour.

**Hyphal system** monomitic, hyphae 3–5 μm wide, with clamps, young 
marginal hyphae thinwalled and hyaline, older hyphae — especially in 
the basal part of the fruitbody — with thickening walls, becoming 
pigmented brown and densely united into a pseudoparenchymatic 
tissue; thickening subhymenium with mainly vertical hyphal arrangement.

**Cystidial organs** of several kinds: 1) *dendrohyphidia*, richly branched, 
hyaline, encrusted and brittle, occurring in hyphal ends but sometimes 
also at the top of the sulfocystidia or even encrusted cystidia 2) *sul-
fozystidia*, rounded or oblong, obtuse or pointed, 30–65 x 8–15 μm, 
with granular contents, at first thinwalled, then finally basally thickened 
walls 3) *encrusted cystidia*, obovate to subglobose, 25–35 x 15–25 μm, 
with thin outer crust and eventually almost completely filled with light-
refracting, hyaline, crystalline material, basal part not encrusted, thick-
walled and pigmented brown. The cystidia start as thinwalled gloeo-
cystidia. It is characteristic for the species that practically only basal, 
rounded gloecystidia develop to encrusted cystidia, while in other 
species usually acute gloecystidia develop in this way. Such acute en-
crusted cystidia are only occasionally seen in *P. lycii*. Later developed 
gloeocystidia remain smooth.

**Basidia** narrowly clavate to sub-cylindrical, 30–50 x 7–8 μm, with thin 
or in basal direction slightly thickened walls, formed from a parenchyma-
tic basal tissue, thus closely joined into a honeycomb structure when 
seen from above, very difficult to separate except for in the youngest hy-
menium near the marginal zone, where also a few pleurobasidia may be 
observed; 4 sterigmata and basal clamp.

**Spores** broadly allantoid, 9–13 x 3.5–5 μm, smooth, thinwalled, hyaline, 
but light red in spore-print.
Habitat. On dead twigs and thin stems of a number of deciduous trees and bushes, preferably in thickets, hedges a.s.o., very often on cultivated bushes. Noted from *Acer, Corylus, Crataegus, Fagus, Fraxinus, Hedera, Lonicera, Malus, Prunus, Ribes, Rubus, Sorbus, Syringa*, and *Viburnum*. In Denmark reported also on *Picea* (M.P. Christiansen).

Distribution. M.P. Christiansen reports *P. lycii* from all parts of Denmark. In Sweden it is very frequent in suitable habitats (thickets etc.) near the seashore in Skåne and Halland. It reaches its northern limit in Bohuslän (Älgön). It is not hitherto found on the Swedish East-coast, nor in Norway, where it, however, is likely to be found on the S. and W. coasts. In N. Europe it is clearly an oceanic species but in the continental part of Europe its distribution is much wider.

Remarks. As a rule recognized already in the field thanks to its bluish, pruinose hymenium. In the microscope the rounded cystidia are enough for a definite determination. The dendrohyphidia are usually seen without difficulty, best in young fruitbodies. It is closely related to the Mediterranean *P. meridionalis* and to *P. decorticans* from the Pacific coast of N. America. *P. lilacea* seems to be related, even if this species lacks encrusted cystidia.

Fig. 479. *Peniophora lycii*  a) Marginal part of fruitbody with sulfocystidia and dendrohyphidia  b) cystidium with dendrohyphidia  c-f) development of cystidia from sulfocystidia to fully encrusted cystidia. — Coll. B. & J. Eriksson 2567.
11. **Peniophora nuda** (Fr.) Bres., Rovereto

vol. III p. 114, 1897. – *Thelephora nuda*
Fr., Syst. mycol. I p. 447, 1821.


**Fruitbody** resupinate, closely adnate, orbicular and confluent, but normally of small or moderate size, mostly thin (ab. 0.1 mm), sometimes thicker (up to 0.2 mm); hymenium of the growing fungus reddish grey but variable with age and water content (more red when young, more violaceous when wet, while old, postmature specimens use to be greyish brown), mostly smooth with a low central wart, with age often cracking; margin of young fruitbodies rose-coloured or whitish, finely fimbriate under the lens, in old specimens not especially differentiated, more or less abrupt.

**Hyphal system** monomitic; hyphae with clamps, young ones hyaline, thin-walled, old hyphae with thickened walls, more or less brown; basal layer generally lacking or very thin, but may in vividly growing specimens reach a thickness of 30 μm, composed of parallel, densely united hyphae; sub-hymenium thickening and in old specimens often stratified with 2 or more layers of vertically arranged, densely united hyphae, together with basidia and cystidia forming a pseudoparenchymatic tissue.

**Cystidia** of two kinds 1) *sulfocystidia*, 30—60 x 8—20 μm, rounded or oblong to almost cylindrical, within the hymenial layer thin, then at the least basally thickened walls; protoplasm granular, with positive aldehyde reaction 2) *encrusted cystidia*, conical or subcylindrical-obtuse, basal part thickwalled and becoming brown, encrusted part 25—40 x 8—12 μm; young cystidia thinwalled, pointed, projecting from the hymenium.

**Basidia** 35—45 x 6—8 μm, thinwalled, sub-cylindrical, with 4 sterigmata and basal clamp, old basidia often with adventitious septa. The basidia are produced from a dense pseudoparenchymatic tissue and are therefore very difficult to separate, except in young hymenia.
Fig. 480. *Peniophora nuda*  

a) section through young fruitbody  
b) encrusted cystidium  
c) sulfocystidia  
d) spores  
e) young and mature basidia.  
f) section through layered fruitbody.  
Coll. B. & J. Eriksson 2576.
Peniophora

Spores 7.5–11 x 2.5–3.5 μm, cylindrical — subballantoid, thinwalled, smooth, hyaline, spore-print light red.

Habitat. On recently dead, fallen or still attached branches of deciduous trees, mostly on corticate branches, penetrating the secondary bark layer or more effuse on the primary bark, but found also on decorticate branches. It occurs most commonly in rich biotopes as mull-rich deciduous forests, thickets or hedges in gardens and parks. It is found on a great variety of deciduous substrates, only once on a conifer substrate (Juniperus communis).

Distribution. P. nuda is a common species in Denmark, S. Norway, S. Sweden and probably also in S. Finland. Its distribution northwards is not well known but in Sweden it is found at Medelpad and in Norway in the Trondheim region. P. nuda is S. of Scandinavia evidently a frequent species in all areas of Europe with deciduous forests.

Remarks. P. nuda is in most cases easily recognized thanks to the numerous, rounded sulfozystidia in the basal part of the fruitbody. Very often it can be distinguished just with the naked eye through its reddish colour and marked marginal zone, at least in young states.

There is no type material left from Fries, but as there is a definite tradition as to the use of this name, Eriksson (1950) chose to use it, without, however, designating any neotype. After study of available material the specimen cited above is chosen. It is collected by the son of Elias M. Fries, who therefore certainly determined it. It has later been studied by Bresadola, who founded his opinion of P. nuda on it. In Fries’s herbarium there is another specimen, determined by Fries and labelled by him (Corticium nudum, Uppsala) but this specimen is not even a Peniophora. Fries’s description in Systema I is rather doubtful as it contains statements not fitting P. nuda very well (e.g. "floccosocarnosa") but already in Elenchus the description is changed and fits better. The addition of a "pruina albida” in Elenchus (retained also in Hym. Eur. 1874 p. 655) is, however, another dubious character.
Fig. 481. *Peniophora piceae*  a) section through fruitbody  b) old cystidium with dissolved encrustation  c) young and mature encrusted cystidia  d) young cystidia without and with thin encrustation  e) young and mature basidia  f) spores. - Coll. H. Jahn 1968-04-11.


**Fruitbody** resupinate and confluent, at first adnate and continuous but soon loosening from the margins and cracking in irregular pieces, 0.1–0.3 mm thick, sometimes more; hymenium more or less tuberculate, when young reddish grey then pure grey or dark violaceous grey, old postmature specimens more or less brown; margins in young vividly growing fruitbodies with a narrow, white border, but soon darkening to brown, and not especially differentiated.

**Hyphal system** monomitic; hyphae with clamps, 3–4 μm wide, young hyphae thinwalled, hyaline, old ones with thickened brown walls; subiculum 40–100 μm thick, partly even more, composed of densely united, mainly horizontal and parallel hyphae with thick, brown walls; subhymenium thickening of vertically arranged hyphae together with residua of basidia and of old cystidia forming a pseudoparenchymatic tissue.

Cystidia usually numerous, at first thinwalled and hyaline, then becoming provided with an outer encrustation and an inner crystalline filling in the distal part, basally not encrusted and with thick, brown walls; cystidia larger in the first hymenial layer (encrusted part reaching 35 x 15 μm), smaller in the later layers (20–25 x 5–8 μm). Sulfocystidia not observed.

**Basidia** subclavate — subcylindrical, slightly constricted and sinuous, 30–40 x 5–7 μm, with 4 sterigmata and basal clamp.

**Spores** allantoid, more or less curved, 7–8.8 x 2.3–2.8 μm, hyaline, thinwalled, smooth.

**Habitat.** On dead, mostly still attached branches, or small fallen trunks of *Abies* ssp.

**Distribution.** In Scandinavia, where *Abies* does not grow spontaneously, only found recently (Nov. 1978) when it was collected by I. Hallingbäck on a branch of cultivated *Abies alba* on the mountain Ömberg in the Swedish province of Östergötland. One collection on *Pinus mugo* (Göte-
Fig. 482. *Peniophora pini*  a) section through fruitbody with numerous cystidia and gelatinized subicular hyphae. - Coll. J. Eriksson 3162  b) section through young fruitbody without cystidia, subicular hyphae not gelatinized  c) basidia  d) spores  e) section through encrusted cystidia  f) marginal thinwalled hyphae.  - Coll. Hjortstam 6765.
Peniophora

borg, Pävelund, 1969-09-18, I. Nordin) may be the same. It is, however, not fertile, and the encrustation of the cystidia dissolved, why the determination is not certain. The species is spread and locally abundant in the continental part of Europe and is found also in N. America.

Remarks. Related to *P. pithya*, from which it differs above all in the lack of sulfocystidia and in the loosening of the fruitbodies in the margin. It also looks very much like *P. limitata* but has smaller, more curved spores. The original collection, made by Mougeot does not seem to exist any longer, why the above mentioned collection by Chaillet is chosen as neotype.


**Fruitbody** resupinate, at first adnate, then loosening at the margin and only fixed umbonately in the middle, at first appearing orbicularly as small patches or warts, then growing bigger (1—2 cm) and finally sometimes confluent, but generally cracking in irregular pieces; hymenium more or less tuberculate, in young specimens reddish, then darkening to violaceous grey in the dry state and when wet dark bluish violaceous, surface more or less pruinose, thickness ab. 0.1—0.4 mm, thicker in the central tubercle, consistency of the wet fungus firm ceraceous to coriaceous, when dry hard and brittle; margin in young specimens distinct, fimbriate, white or light rose, finally disappearing.

**Hyphal system** monomitic; hyphae 4—5 μm wide, with clamps, subicular ones with thickened, more or less swollen and gelatinous walls, hyaline except next to the substrate, at least in the peripheral part horizontally intertwined and bending down to the hymenium, in the central part of the fruitbody more irregular; hyphae of the subhymenium denser, vertically arranged, hyaline to yellow or light brown in old specimens; in the subhymenium besides some distinct, brown, somewhat branched hyphae, often inflated and therefore differing from other hyphae; at least in mature specimens an interhyphal matrix, which is hyaline but may turn brown in old specimens.
Fig. 483. *Peniophora pini* section through fruitbody with descending brown subhymenial hyphae, subicular hyphae gelatinized. - Coll. J. Eriksson 3159.
Peniophora

Cystidia of two kinds a) *encrusted cystidia* in varying numbers, at first thinwalled, pointed or obtuse, finally strongly encrusted in the apical part, both externally and internally, encrusted part 12–20 x 5–8 μm b) *sulfocystidia* with granular contents, present both in subiculum and subhymenium, variable in shape, in the subiculum rounded to oblong, 15–25 μm wide, 30–40 μm long or more, in the subhymenium narrower, 10–15 μm wide, and in the hymenium tubelike, ab. 5 μm wide, visible only because of the aldehyde-reaction.

**Basidia** subclavate, ab. 40 μm long, 5–6 μm wide in the widest part, with 4 sterigmata and basal clamp.

**Spores** allantoid, smooth, thinwalled, 7–9 x 2.5–3 μm, hyaline, but reddish in spore-print.

**Habitat.** On still hanging, newly dead, usually 1–2 cm thick branches of *Pinus sylvestris* with fresh bark-layer. On free standing trees it can be found on low branches, 1–2 m above the ground, but in thick forests it occurs preferably high up in the crowns and therefore easily overlooked. The attacked branches are brittle, not tough, and break abruptly when bent.

**Distribution.** *P. pini* was earlier looked upon as rare in Scandinavia, but as soon as its ecology was known, it could be found everywhere when looked for in areas with cultivated or spontaneous pine. In N. Europe it follows pine everywhere.

**Remarks.** Macroscopical characters such as size, colour, a.s.o., varying with circumstances (age, time of the year) but on the whole it is a characteristic and easily recognized species. Microscopically variable as to the number of cystidia, and presence of brown hyphae in the subhymenium.

In N. America the *P. pini*-group has been carefully studied by Were-sub and Gibson (Can. Journ. Botany 38 p. 833–867, 1960). They recognize three close taxa (*P. pini* ssp. *pini* and ssp. *duplex*, and *P. pseudopini* Weres. & Gibs.). Of these only *P. pini* ssp. *pini* seems to occur in N. Europe. They differ as to the presence of brown subhymenial hyphae and to the number of sulfocystidia.
Fig. 484. *Peniophora pithya*  

a) section through young fruitbody  
b) encrusted cystidium  
c) sulfocystidium  
d) young and mature basidium  
e) spores. - Coll. Hjortstam 1254  
f) spores  
g) part of vertical tangential section through subiculum. - Coll. L. Arvidsson 1975-07-12  
h) section through fruitbody. - Coll. B. & J. Eriksson 5352.

**Typus:** Persoon n. 910.267-700 (L).

**Fruitbody** resupinate, closely adnate but through the flaking off of the outer bark layer seemingly loosening from the margins, smooth and continuous on wood, more uneven on bark, when dried more or less cracked, mostly 0.1–0.2 mm thick, reddish or violaceous grey, when wet darker, sometimes bluish violaceous; margin abrupt, in many specimens with a dark, narrow sterile zone, rarely — in rapidly growing specimens — light-coloured, but most often fertile throughout.

**Hyphal system** monomitic, all hyphae with clamps, young ones, e.g. in growing marginal zone, thinwalled and hyaline, old hyphae brown and more or less thickwalled; subiculum varying in thickness from an inconspicuous layer of horizontal hyphae to a considerable (up to 40 μm) thickness, composed of parallel, dense, dark brown hyphae; subhymenial layer of dense, vertically arranged hyphae, hyaline in young specimens, more or less pigmented in older ones but as a rule sharply contrasting against the darker subiculum, subhymenium generally not stratified but in some specimens two or three layers visible.

**Cystidia** numerous, of two kinds a) *encrusted cystidia*, generally conical, at first thinwalled and hyaline, then apically encrusted and at least in the basal part brown, total size 35–65 x 12–15 μm, encrusted part 25–35 μm long, those of the first hymenial layer biggest and basally brown, later cystidia smaller and more or less hyaline b) *sulfocystidia* oblong to sub-cylindrical, 50–70(–100) x 8–10 μm, as a rule obtuse, with thin or basally thickened walls; contents continuous, granular, or with oily droplets, aldehyde reaction weak in many herbarium specimens but strong at least in vividly growing ones.

**Basidia** subcylindrical or subclavate, somewhat constricted or sinuous, 30–40 x 5–7 μm, with 4 sterigmata and with basal clamp.

**Spores** (6)–6.5–7.5(–9) x 2.5–3 μm, allantoid, smooth, thinwalled, hyaline but reddish in spore print.
Habitat. On bark and lignum of conifers, both on logs and fallen branches, as well as on sawn wood (boards, beams etc.), preferably of *Picea abies*, less often on *Pinus sylvestris*, rare on *Juniperus communis*, and once found on a twig of *Larix*. Eriksson (1950) reported it besides from *Salix* and *Sorbus*. Its occurrence on *Salix* is confirmed. In N. Scandinavia some other fungi, normally restricted to conifer, also occur on *Salix*, which in this region grows scattered in the conifers forest. The specimen reported from *Sorbus* has, however, not been found again in the herbarium, which is why it must be looked upon as doubtful.

Distribution. A very common species in the spruce forests of N. Scandinavia. In N. Sweden (Abisko) it is found outside the spruce region (on *Pinus*) and it is also found on coniferous wood (*Picea*) on Svalbard (leg. L. Arvidsson, a well-developed specimen, but with large spores, up to 8.5 μm long). In C. and S. Sweden it is also fairly common in spruce forests, the same in Finland and Norway. In Denmark reported as rare in spruce plantations. Outside Scandinavia it is widely distributed on spruces in the north temperate zone.

Remarks. *P. pithya*, like all other *Peniophorae*, varies greatly, e.g. in colour, size and thickness of the fruitbody and under the microscope especially in the thickness of the subiculum, but is in most cases recognized without difficulty. The smaller spores usually afford good help for determination but in some specimens the spores are found to be larger and intergrade with *P. cinerea*. The spore size 5.5–6.5 μm given by Eriksson 1950 is true mainly for N. Sweden, from where most of this material originated. In 1950 Eriksson didn’t know the use of the sulfoaldehyde reaction and did not observe the presence of gloeocystidia, which now are found to occur regularly, at least in young specimens. Without this reaction the gloeocystidia are easily mistaken for young, not yet encrusted cystidia. In old fruitbodies they cannot always be found. The very dark subiculum contrasting against the lighter subhymenium and the large basal cystidia form, together with the substrate and the outer appearance, sufficient characteristics for the determination also for old, sterile fruitbodies.

*Peniophora exima* Jacks. & Deard. (Mycologia 43:1 p. 60, 1951) from Pacific N. America is close to *P. pithya* but differs in having much shorter, almost ellipsoid spores.
15. *Peniophora polygonia* (Fr.) Bourd. & Galz., Fig. 485-86, 530a


**Fruitbody** resupinate, closely adnate, appearing through holes in the outer bark and growing radially to round, orbicular patches with a wart like thickening in the centre, then often confluent to aggregated fructifications of moderate size (5–10 cm), hymenium first smooth except for the central wart, in time becoming irregularly tuberculate, pale red with a whitish pruina, when bruised dark red, consistency firm, after drying hard, margin adnate, in the young orbicular state white or reddish white, finely fimbriate, in the mature fruitbody no differentiated margin.

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**Fig. 485.** *Peniophora polygonia.* Dendrohyphidia. - Coll. I. Johansen 956/74. S.E.M. L. Ryvarden.
Fig. 486. *Peniophora polygonia*  

a) schematical section through fruitbody  
b) section through hymenial part  
c) marginal hyphae  
d) sulfocystidia  
e) dendrohyphidium  
f) pointed hymenial cystidium  
g) young and mature, old basidia  
h) spores. - Coll. K.H. Larsson 455.
Peniophora

Hyphal system monomitic, all hyphae hyaline, thinwalled, with clamps at all septa, ab. 3 μm wide, densely interwoven in an interhyphal matrix; subiculum of varying thickness, thickest in the centre of the fruitbody (often more than 1 mm).

Cystidial organs of two kinds: a) conspicuous sulfocystidia with granular contents with a strong reaction to sulfovanillin and sulfobenzaldehyde, bladder-like with a stalk-like part of varying length, total length reaching 100 μm, width 15–25 μm, hymenial sulfocystidia more or less tube-like, 5–10 μm wide, some of them pointed and then projecting beyond the dendrohyphidia, b) dendrohyphidia richly branched, 1–2 μm wide, covering the hymenium, visible to the naked eye as a white pruina.

Basidia narrowly clavate with prolonged, intertwined bases, 40–50 x 5–6 μm, with 4 sterigmata and basal clamp; old basidia sometimes with adventitious septa.

Spores cylindrical, suballantoid, slightly curved, smooth, thinwalled, 9–12 x 2.5–4 μm, hyaline but light red in spore-print.

Habitat. On dead bark of Populus tremula, especially on fallen or hanging branches, 1–3 cm thick, less often on fallen trunks. Usually seen on branches with intact outer, secondary bark, when occurring on the inner, primary bark tending to be more effuse. Ecologically it agrees with P. rufa but unlike this species it occurs also in the humid climate region of W. Scandinavia.

Distribution. Distributed in all parts of N. Europe where Populus tremula grows, but is most frequent in the southern and eastern parts (Denmark, SE. Norway, SE. Sweden, S. Finland), rare in N. Scandinavia.

Remarks. The presence of dendrohyphidia and the lack of encrusted cystidia make this species easily recognized. These characteristics make it agree with P. lilacea which has large, ellipsoid spores. It does not seem to us to be closely related to P. lilacea, rather to P. pini and P. rufa, which agree more in the nature of basidia and sulfocystidia.
Fig. 487. *Peniophora quercina*  
a) section through fruitbody  
b) spores  
c) old septated basidium  
d) young and mature basidia. - Coll. Hallenberg-Sunhede 22848.
Peniophora


Fruitbody at first resupinate, appearing through holes in the outer bark, in the beginning wart-like, then orbicular, finally confluent, 0.1–0.5 mm thick, coriaceous, when dried hard and brittle; hymenium in the young fruitbody smooth except for the tuberculate centre, mature fruitbodies rugose, old ones more less cracked, colour in the fresh state reddish, in the herbarium fading to pale ochraceous, when older turning greyish, when wet bluish or violaceous, and finally more or less brown; margin to begin with white or light rose, finely fimbriate, then fertile throughout, loosening from the substrate and more or less rolling back, underside dark brown or black.

**Hyphal system** monomitic, all hyphae with clamps; growing hyphae (e.g. in the margin) thinwalled and hyaline, older ones with somewhat thickened walls, finally yellowish or brown; context dense with hyphae united by an interhyphal matrix; subiculum always present, 100–200 μm thick, composed of more or less parallel hyphae, brown next to the substrate, but in the major part hyaline except in old fruitbodies where the whole subiculum is more or less pigmented; subhymenium thickening to 200 μm, composed of vertical hyphae with a dense texture, hyaline except in post-mature fruitbodies, where some pigmentation is seen.

**Cystidia** numerous, appearing in the hymenium as thinwalled, pointed cystidiols, then encrusted and filled with crystalline matter in the apical part and becoming thickwalled in the basal part; encrustation 20–35 x 10–15 μm. No sulfocystidia seen.

**Basidia** narrowly clavate to subcylindrical, 40–50 x 5–6 μm, with basal clamp and 4 sterigmata; mature basidia with somewhat thickened walls.

**Spores** 10–12 x 3–4 μm, allantoid, thinwalled, smooth, hyaline but in spore-print light red.

**Habitat.** On hanging or fallen dead branches of *Quercus* and *Fagus*, rarely on other substrates (*Betula, Carpinus, Fraxinus*). It causes an intense white decay and is a potent decomposer of branch wood in the *Quercus* and *Fagus* forests of S. Scandinavia.
Fig. 488. *Peniophora quercina*  

a) schematical section through fruitbody  
b) section through basal part of subiculum  
c) section of intermediate part of the same  
d) section through hymenial layer  
e) encrusted cystidia  
f) young and little encrusted cystidia.  

- Coll. Strid 408.
Peniophora

**Distribution.** A common species in S. Scandinavia, and seemingly following *Quercus robur* to its northern limit. Throughout Denmark, in Sweden north to Dalälven, in Norway from the Oslo-region along the coast to Bergen, and along the southern coast of Finland.

**Remarks.** Close to *P. rufomarginata* from which it differs in having thicker fruitbodies, larger spores and less pigmented (generally hyaline) subiculum.

17. **Peniophora rufa** (Fr.) Boid., Bull. Soc. Fig. 489-90, 532a
—*Thelephora rufa* Fr., Elench. fung.
p. 187, 1828.

**Fruitbody** resupinate, closely adnate, wart-like, round in circumscription, normally not confluent, mostly 3—10 mm in diam., ab. 1 mm thick, hymenium irregularly tuberculate, red to reddish-brown, when mature with a whitish pruina; consistency firm, when dry hard, section whitish except for the red hymenial layer; margin in most cases not differentiated, but when growing on secondary bark a white margin may be seen in fruitbodies still growing radially.

**Hyphal system** monomitic, all hyphae with clamps, densely branched and intertwined, those next to the substrate 3—4 μm wide, brown and not swelling in KOH, those of the main part of the fruitbody hyaline, swelling more or less, 5—8 μm wide or even more, often with a granary layer of crystals on the surface; hymenial hyphae 2—3 μm wide, thin-walled, not swelling.

**Cystidia** of two kinds a) numerous small, apically *encrusted cystidia,* encrusted part 10—12 x 5—6 μm, basal part thinwalled b) *sulfcystidia* of varying size, generally large, reaching a length of 200 μm and a width of 20—25 μm, with granular plasmatic contents, thick gelatinous walls and often with an outer layer of granular crystals, larger cystidia emanating like pseudocystidia from the subicular layer; with the thickening of the subhymenium, smaller sulfcystidia with thinner walls appear. All sulfcystidia show a strong aldehyde reaction.

**Basidia** clavate, 40—50 x 5—6 μm, with 4 sterigmata and basal clamp, basal part prolonged and interwoven, making it difficult to prepare single whole basidia.
Fig. 489. *Peniophora rufa*  

a) schematical section through fruitbody  
b) section through hymenial part  
c) encrusted sulfozystidium with upper part in section  
d) apically encrusted cystidia  
e) spores  
f) basidium. - Coll. S. Lundell 11808.
Penioiophora

Spores subballantoid, 7–9 x 2.5–3 µm, pale red in spore-print.

Habitat. On branches of *Populus tremula* on the ground in dry habitats.

Distribution. *P. rufa* is distributed in the drier "continental" parts of N. Europe. In Sweden not found in the humid SW. part though much searched for, but has been collected several times in the Eastern part of Central Sweden (e.g. in Uppland) and is found from N. Kvill National Park in S. Sweden (Småland) to Muddus National Park in the North (Lapland). It has been collected several times in Finland and may be frequent in S.E. Norway. Not known from Denmark.

Remarks. Characteristic and little variable species. It is close to, but easily distinguished from *P. pini*, i.a. in the shape of the spores which are more curved in *P. pini*. It may sometimes be confused with *P. polygonia* which, however, at least under the microscope, is easily distinguished, i.e. in the presence of dendrohyphidia.

*Thelephora rufa* is treated in a somewhat peculiar way by E. Fries. When describing it in Elenchus he refers to *Thelephora rufa* Pers., "Myc. eur. I p. 124, fide specim." There is, however, no such species, and what he intends to refer to is evidently *Th. rufomarginata* Pers. He also reports *Tilia* as substrate. The description seems to fit our *P. rufa* quite well, but the statement "subtus glabra" seems doubtful, as *P. rufa* doesn't show the underside. He refers to fig. 388:3 in Sowerby (Engl. Fungi and Mushrooms, 1803) which is not *P. rufa* but rather *P. quercina* or *P. rufomarginata*. In Epicrisis (1836–1838) the species is moved to *Stereum* with the same references. In Hymenomyc. succ. it is omitted but it appears again in Hymenomycetes eur. (1874) as *Corticium rufum*, now with Sowerby fig. 338:2 cited, evidently by mistake. Here, as in Epicrisis he refers to *Th. rufomarginata* Pers. in Mycol. eur. Judging from Fries's descriptions and references *Thelephora rufa* Fr. and *Th. rufomarginata* Pers. are synonyms and *Th. rufa* merely the result of an accident. On the other hand the fact remains that in herb. Fries there are specimens determined as *Th. rufa* by Fries, which are the same as the *Penioiophora rufa* here described. So far as we can see there are three possible solutions to the taxonomic problem of *Thelephora rufa* Fr.. The first is to give the name to the fungus here called *Penioiophora rufomarginata* and to find another name for *P. rufa*. The second is to coin *Th. rufa* as a nomen dubium and replace it with a later synonym (*Thelephora pezizoidea* Schw. may be one). The third is to accept the name and choose a neotype fitting the present use of the name. For all three alternatives support can be found in the Rules.
Fig. 490. *Peniophora rufa*  a) section through basal part of subiculum  b) section through intermediate part with encrusted hyphae  c) section through subhymenial layer with gelatinized thickwalled hyphae  d) schematical section through fruit-body. - Coll. S. Lundell 11808.
Peniophora

If the first way is chosen, the result will be constant confusion as to the meaning of *P. rufa*. The second is better as it leaves at least *P. rufomarginata* unchanged. We have, however, chosen the third way which leaves both names with their well known meaning. The neotype chosen by Burt (1920 p. 120,122) is determined by Fries and labelled with his own hand. It's remarkable that he did not notice that the substrate was *Populus tremula*, not *Tilia*.

Fig. 492. *Peniophora rufomarginata*  a) section through fruitbody  b) heavily encrusted cystidia. - Coll. J. Eriksson 9526.
Peniophora


**Fruitbody** resupinate, loosely attached and rolling off from the margins, at first orbicular, then confluent, 0.1—0.4 mm thick, on drying transversely cracking but more continuous than *P. limitata* and *P. quercina*; hymenium more or less tuberculate or with radial ridges when alive and wet, on drying smoother, rose-grey, rose-violaceous, greyish-brown, fading on drying; margin in the young state sterile, finely fibrillose, white or rose, often with a light rose-grey or pale brown zone within the periphery, the sterile margin gradually disappearing; underside brown-black.

**Hyphal system** monomitic; all hyphae clamped, young hyphae in the margin and at the basidial bases thinwalled, other hyphae with thickened walls, more or less pigmented brown; subiculum 0.1—0.3 mm thick, composed of densely united, mainly horizontal hyphae, those next to the substrate and to the subhymenial layer dark brown, middlepart of the subiculum lighter but with strains of dark, penetrating hyphae; inter-hyphal matrix present; subhymenial layer of dense, vertical hyphae with remains of basidia and cystidia. Especially in the first hymenial layer bladder-like, dilatated hyphae ends with thickened, brown walls.

**Cystidia** starting in the hymenium as thinwalled, acute cystidiols with somewhat oily contents, then developing to strongly encrusted metuloids, encrusted part 30–50(–70) x 10–15(–20) \(\mu m\), with thick walls in the basal part, strongly pigmented brown esp. in the first hymenial layer; sulfocystidia not observed.

**Basidia** sub-cylindrical — narrowly clavate, 40–50 x 5–6 \(\mu m\), with 4 sterigmata and basal clamp.

**Spores** 7.5—9 x 2.5—3.5 \(\mu m\), allantoid, thinwalled, smooth, pale red in spore-print.
Fig. 493. *Peniophora rufomarginata*  

a) section through stratified fruitbody  
b) young and mature basidia  
c) encrusted cystidium  
d) spores. - Coll. Nathorst-Windahl 23096.
**Peniophora**

**Habitat.** On branches of *Tilia* spp., mostly slender, still attached brittle twigs, 1–3 cm thick; fruitbodies generally appearing on the outer, secondary bark, less often on the inner, primary bark. Not found on other substrates than *Tilia.*

**Distribution.** Found many times in Denmark, SE. Norway, and S. and C. Sweden, from Skåne to Uppland, in most cases in fertile, humid biotopes; in most provinces rare or less frequent but in some areas, e.g. in the Lake Hjälmaren and Lake Mälaren region, locally abundant. Found in SW. Finland.

**Remarks.** Differs from *P. quercina* in the smaller spores and the more pigmented hyphal texture, from *P. limitata* in the light margin, which is almost black in this species and the lighter, more reddish hymenial colour.

For nomenclatural discussion see under *P. rufa.*


10:4 p. 10, 1939.

Holotypus: Laurila 1937.06.19 (H).

**Fruitbody** resupinate, adnate but loosening from the margin, orbicular, then confluent and irregularly effused, 0.1–0.4 mm thick; hymenium at first smooth, then more or less tuberculate or with irregular ridges, when young and alive rose-red to light greyish red, fading in the herbarium, when older grey-violaceous and finally grey-brown; sterile margin of growing specimens white, 1–2 mm wide, finely fimbriate, disappearing in older, rolled back specimens.
Fig. 494. *Peniophora septentrionalis*  a) section through fruitbody  b) encrusted cystidia  c) thinwalled sulfocystidium  d) spores  e) young and mature basidia.
- Coll. J. Eriksson 3704.
Peniophora

**Hyphal system** monomitic, all hyphae with clamps, young growing hyphae (i.a. in the margins) thinwalled and hyaline, older ones with thickened walls, more or less pigmented brown; *subicular layer* well developed, composed of mainly horizontal hyphae, next to the substrate and to the subhymenium with dark brown pigmentation, less in the middle part of the subiculum which in young fruitbodies is almost hyaline; thickening *subhymenium* composed of densely united, vertically arranged hyphae and cystidia, in older fruitbodies stratified.

**Cystidia** of two kinds a) thinwalled, acute hymenial cystidia, becoming encrusted and developing to strongly encrusted *metuloids* with the encrusted part 20–30 x 7–12 μm b) thinwalled *sulfocystidia*, 60–120 x 7–10 μm, varying in number but always present.

**Basidia** sub-cylindrical or subclavate, 40–50 x 5–6 μm, with 4 sterigmata and basal clamp.

**Spores** allantoid, thinwalled, smooth, 6.5–8 x 2–2.5 μm, hyaline but spore-print pale red.

**Habitat.** On bark of trunks and branches of fallen trees of *Picea abies*. Hitherto found only in virgin or first time hewn forests, preferably of *Hylocomium-Vaccinium* type.

**Distribution.** In Scandinavia collected only in N. Sweden and N. Finland. Though many times looked for in old forests, it has still been found only a few times. Eriksson (1950) expected it to have a total distribution similar to that of *Laurilia sulcata* (Burt) Pouz. and *Phlebia centrifuga* Karst., but this assumption has not hitherto been verified. Where as *Laurilia* occurs also in the continental area of Central Sweden and SE Norway and *Phlebia centrifuga* in addition also in the corresponding part of S. Sweden and in Norway north to Mo in Nordland country, *P. septentrionalis* seems to be restricted to the very continental area of inner Lapland. Outside this region it is known from boreocontinental parts of N. America and USSR.

In Scandinavia it is known only as a saprophyte in dead wood, but in N. America it is also recorded as a parasite in living trees.

**Remarks.** Easily recognized in the field thanks to its light-coloured fruitbodies with white margins, growing on bark of *Picea*. Its closest relative is *P. pithya*, which is clearly distinguished, e.g. by darker, more firmly attached fruitbodies.
Fig. 495. *Peniophora suecica*  a) section through fruitbody  b) spores  c) marginal hyphae  d) encrusted cystidia. - Coll. L. Romell 2021  e) cystidium of *P. avellanea*. From the type.
20. *Peniophora suecica* Litsch., Ann. mycol. 39:2,3 p. 131, 1941. Fig. 495

Holotypus: Romell 2021 (S, part of type in UPS).

**Fruitbody** resupinate, adnate, irregularly effused, membranaceous, 0.2—0.3 mm thick; hymenium mainly smooth, when dried partly cracked, pale ochraceous to pale hazel brown; margin partly finely fibrillose and lighter than the hymenium, partly not especially differentiated.

**Hyphal texture** monomitic; hyphae 3—4 µm wide, thin- to slightly thick-walled, hyaline to brown, with clamps; texture in section showing a well-developed subiculum of hyphae mainly parallel to the substrate, next to which it is brown and with some brown hyphae also next to the subhymenium, section otherwise hyaline; subhymenium thickening, with dense, vertically arranged hyphae.

**Cystidia** of two kinds a) **enrusted cystidia**, numerous, conical, acute or more or less obtuse, encrusted part 25—35 x 15—20 µm, basal part thick-walled b) thinwalled **gloeocystidia**, cylindrical, acute to obtuse, somewhat constricted, with partly oily contents, without aldehyde reaction.

**Basidia** (according to Litschauer) clavate, 30—40 x 6—7 µm, with 4 sterigmata. Well-developed basidia not seen in the present material.

**Spores** 8—11 x 3—3.5 µm, allantoid, smooth, hyaline, according to Litschauer with oil-drops in the protoplasm. Colour of spore-print not known.

**Habitat and distribution.** Known only from one collection (Stockholm, 1919-10-04, Romell 2021. S). Substrate probably *Quercus*.

**Remarks.** *P. suecica*, though known from only one collection, seems definitely to be a good species and should be easily recognized if recollected. It is more difficult to decide whether or not its place is in *Peniophora*. For a decision the colour of the spore-print should be known. Several characteristics clearly point towards *Peniophora*: the shape and size of the spores and the basidia, the encrusted cystidia as well as the thinwalled gloeocystidia, and especially the brown colour of the basal hyphae. The lack of aldehyde reaction in the protoplasm of the gloeocystidia speaks against it. Litschauer compared it with some corticioids, from which only *P. quercina* (under the name *P. corticalis*) really resembles this species. The structure of the hyphal texture makes it clear, however, that they are distinct. Litschauer also mentions *P.*
Fig. 496. *Peniophora violaceolivida*  a) section through fruitbody  b) marginal hyphae  c) spores  d) encrusted cystidia  e) young and mature basidia  f) sulfo-cystidia.
Peniophora

corsica v.Höhn. & Litsch. (Wien Sitzungsber. Akad. Wiss. Wien 115 p. 1601, 1906). As spores and basidia of this species are not known, it need not to be considered. *Peniophora avellanea* (Bres.) v.Höhn. & Litsch. (= *Kneiffia avellanea* Bres., Ann. mycol. 1 p. 102, 1903) has much in common with *P. suecica* (hyphal texture, spores, basidia) but differs clearly in the shape of the cystidia, which is quite different, more similar to those of *Hyphoderma puberum*. The spores agree in shape and size, but the content is in *P. avellanea* clearly oily, which could rather point to a relation to *Hyphoderma* rather than *Peniophora*.

21. *Peniophora violaceolivida* (Sommerf.)


Holotypus: Norway, Saltdalen, Chr. Sommerfeldt (O).

**Fruitbody** resupinate, totally adnate, thin (up to 0.2 mm, seldom more); hymenium sometimes quite smooth but commonly more or less tuber-culate, in dry weather cracking in small polygons, greyish with a varying tint of reddish or violaceous, in wet weather darker, more bluish, young fruitbodies fading in the herbarium to pale ochreous grey, old sterile fruitbodies brownish grey; margin indeterminate, or especially when growing on *Populus* with a narrow white, finely fimbriate (under the lens) periphery.

**Hyphal system** monomitic, all hyphae with clamps, young ones thin-walled, hyaline, older hyphae with brown thickened walls, *subicum* usually very thin or almost lacking but sometimes a distinct basal layer can be seen; thickening *subhymenium* composed of densely united, vertical hyphae and cystidia, often stratified in 2 or three layers.

**Cystidia** of two kinds a) thinwalled subulate hymenial cystidia, develop- ing to *encrusted metuloids* with the encrusted part 15–25 x 6–9 μm, varying in number — sometimes few, in other specimens quite frequent; b) thinwalled sulfocystidia, at first subclavate, then oblong, fusiform to sub-cylindrical, filled with granular protoplasm, and varying in length with the thickness of the fruitbody (up to 75 μm), width in most cases ab. 10 μm, but some wider ones (up to 15 μm may be found).
Basidia sub-cylindrical — subclavate, 30—40 x 5—6 μm, with 4 sterigmata and basal clamp. Old basidia sometimes septate.

Spores 7.5—9 x 3 μm, allantoid, thinwalled, hyaline, spore-print pale red.

Habitat. On dead, still attached or fallen branches and smaller trunks of deciduous trees, preferably of Salix and Populus. Esp. on Salix it is one of the regular species on hanging branches, while on Populus it is mainly seen on fallen branches and smaller trunks. It is found also on other deciduous trees, e.g. on the amentiferous Alnus, Betula and Quercus, but also on non-amentiferous trees and bushes: Fraxinus, Philadelphus, Syringa, Ulmus. Not found on conifers.

Distribution. Frequent, esp. on Salix in N. Scandinavia. In C. Sweden it is still quite frequent on Salix and Populus. The same seems to be true for Norway and Finland. In S. Sweden it seems to be somewhat less frequent though growing also on other substrates. According to M.P. Christiansen it is fairly common in Denmark. Total area is not known in detail but it is evidently widely distributed (S. and C. Europe, E. Europe and N. Asia, N. America).

Remarks. In N. Scandinavia, where P. violaceolivida grows mainly on Salix, there is no difficulty in distinguishing it from other species of the genus. In S. Scandinavia, however, it may sometimes be difficult to separate it in its young states, when it comes quite close to P. nuda. Size and shape of the gloecystidia usually help, as in P. nuda the first hymenial layer is provided with numerous rounded gloecystidia while in P. violaceolivida all gloecystidia are narrower and all of about the same shape.

J.A. Nannfeldt collected a specimen in England (Liverpool, Speke Hall), which has larger spores (to 12 x 4 μm). It agrees in all other respects with this species, but for the substrate (Acer pseudoplatanus) and evidently also for the biotope. In Scandinavia the species is as a rule found in poorer habitats, like coniferous forests with admixture of Salix, Betula a.s.o., not in the fertile deciduous forests where it mostly leaves room for P. nuda and P. cinerea.

The taxonomic situation of the NE. American gloecystidiate Peniophorae is not fully clear. A species which is frequent in E. Canada on hardwood but also occurs on conifers, agrees in most respects with P. violaceolivida but the gloecystidia are often wider than in European material, thus intermediate to P. nuda.
tilläg (suppl.) I p. 32, 1893. — Donk,
Persoonia 2:2 p. 223, 1962. — Grandiniella
Karst., Hedw. 34 p. 8, 1895. — Membranicium

Type species (lectotype): Corticium decolorans Karst. = Thelephora
velutina Fr. Type species of Grandiniella Karst. is G. livescens Karst.
= Phanerochaete sordida (Karst.) Erikss. & Ryv.

Fruitbodies as a rule rather large and conspicuous, resupinate, smooth
or tuberculato, closely attached to the substrate or commonly more or
less detachable, when fresh and wet watery ceraceous, when dried
membranaceous, colour varying from white to yellow, red or brown;
subiculum as a rule well developed, often visible in the margin of the
fruitbody as a fimbriate or fringy zone or continuing into rhizomorphs;
cystidia usually numerous and conspicuous, readily visible under the
lens (50 x), but may be few or none, gloeocystidia none; hyphal system
mononitic, subicular hyphae mostly 5 μm wide or more, as a rule more
or less thickwalled while subhymenial hyphae always are thinwalled;
subicular hyphae straight and parallel with sparse ramifications, sub-
hymenial ones richly branched and intertwined; clamps lacking at most
septa, always so at the basidial bases, often present on subicular hyphae,
sometimes two or more at the same septum; basidia narrowly clavate,
mostly 4-spored, without basal clamp, forming a dense palisade; spores
in most cases narrowly ellipsoid, in some species allantoid, medium-
sized (5—7 μm long, in some cases longer), smooth, thinwalled, non-
amyloid, non-cyanophilous.

Yellow, orange, or red species generally turning red or purplish in
KOH.

Remarks. Already Bourdot & Galzin (1928), being aware of their close
relationship brought most of the species, here placed in Phanerochaete,
together as Peniophora Membranaceae. They put, however, some species
in Peniophora Radicatae and one in Corticium Subceracea. Eriksson
(1958) brought all these together and wanted to mark their affinity to
each other by giving the group generic rank. Not being able to find a
name in the literature, he gave it the provisional name Membranicium.
Phanerochaete seemed at that time unadoptable and Grandiniella
should according to verbal communication from Dr. S. Lundell be
based on *Peniophora pubera (=Hyphoderma puberum)*. Both of these views now appear to be wrong. Donk (loc. cit.) gave a detailed report about the taxonomical and nomenclatorial problems and introduced the name *Phanerochaete* with *Peniophora karstenii* Mass. as the nomenclatorial type.

The genus is in most cases easily recognized and is nowadays commonly accepted as a needed generic arrangement, even if there may still be discussions and different opinions about its circumscription. We have chosen to refer to *Phanerochaete* species with no clamps in the hymenium and having other characteristics agreeing in so many respects that they seem to be a fairly homogeneous group. Clampless species occur everywhere among the Basidiomycetes, why the character is in itself not very conclusive, but we have found it useful together with others and believe that the genus forms a rather good natural taxon. Possibly there may exist fibulate species, which in other respects are so close to *Phanerochaete* that they must be included, but so far we don’t know of such species. *Tomentella sulphurina* Karst. has been placed in *Phanerochaete* e.g. by Parmasto, but this species has clamps at the bases of the basidia and in our opinion it fits *Ceraceomyces* better than *Phanerochaete*, which is why we don’t include it here. Jülich (1976) referred *Corticium fuciforme* to *Phanerochaete*. This species is a grass-parasite, producing reddish, Clavaria-like growths from grass. They are mainly sterile, but sometimes a hymenium occurs at the base. Its only characteristic in common with *Phanerochaete* is the lack of clamps and we find it difficult to accept the species as a member of the genus. Cytogenetic facts such as the number of nuclei in the cells may contribute to the limitation and so may microbiological characteristics found in culture tests. There are also protoplasmic characteristics of probable interest, e.g. the grainy protoplasm of the basidia, which reminds us of the genus *Athelia*. The limits are, however, in some respects obscure. There are, to take an example from the Nordic flora, two species, which have been discussed as presumptive members of the genus, viz. *Phlebia gigantea* (Fr.) Donk and *Ph. hydnoidea* (Cke. & Massee) Christ. which we have after careful investigation decided to exclude from *Phanerochaete*. The matter is discussed with the description of these species. We have also given special attention to non-fibulate species of *Phlebia*, e.g. *Ph. umbrata* (Bourd. & Galz.) Parm. and decided not to include them here.

As to the systematic position of the genus there is much uncertainty. The nature of the hymenial palisade reminds us of *Phlebia* and the genus could perhaps be described as *Phlebia*-like fungi without basidial clamps and with more or less rigid basal hyphae. Possibly there are some rela-
tionships to *Athelia*. Genera like the merulioid *Byssomerulius* and the hydnoid *Hyphodermella* might be considered. Parmasto (1968) placed *Phanerochaete* in the tribus Byssomeruliae of the subfam. Atheliioideae. The tribus seems to be a natural group even if we are reluctant to in-
clude *Chaetoderma* and *Crustoderma* as members of it. To this tribus we should like to refer also *Athelia andina* Jül. as a relative of *Dictyonema* Agardh, though not as an *Athelia*.

There has been some discussion about the validity of the generic name *Phanerochaete* (Bordsall, Taxon 26 p. 327–330, 1977). There can be no doubt about Karsten’s intention with the genus. Especially important is his description of the cystidia and the observation that clamps were absent. He, however, placed only two species in the genus, *Ph. alnea* (Fr.) sensu Karst. and *Ph. odorata* (Fr.) sensu Karst. The nature of the latter is uncertain but the description suggests a species of *Phanerochaete*, maybe *Ph. sordida*. Karsten himself later (Krit. Öfvers. Finl. Basidsv. tillägg II p. 32, 1893) doubted its identity with the true *Th. odorata* Fr., which nowadays is referred to *Scytinostroma*. *Ph. alnea* is thus left as a possible lectotype. *Thelephora alnea* Fr. is nowadays thought to be a species of *Scytinostroma* but Karsten’s description and preserved herbarium material make it clear that the species he intended was *Peniophora velutina* (Fr.) Cooke. Later (loc.cit.) he published a correction, introducing *velutina* instead of *alnea* as the first species of the genus. We look upon this correction as an emendation of the genus. The generic type of this emended genus could be *Peniophora velutina* but a solution better in accordance with the Rules seems to be to choose *Corticium decolorans* Karst., which is mentioned as a synonym in Karsten’s first description of the genus, as the lectotype of *Phanerochaete*. The species is according to authentic material a synonym of *P. velutina*.

There are still several species of uncertain species delimitation in *Phanerochaete*. We have had to devote much more time to this genus than necessary for the scope of this publication, but, even though we have studied a very large number of specimens, we still dare not hope that our solutions are in all respects conclusive. Further investigations, above all experimental ones, are very much needed. It is possible that the problems of species limits are connected with the fact that the species are homothallic. Thus, deviating forms are like clones without being fully constant because anastomoses allow exchange of genes be-

between different mycelia.
Species groups:


2. *Ph. septocystidia*-group. Cystidia numerous, regularly septated; spores small (less than 5 μm), suballantoid. One species.

3. *Ph. velutina*-group (= subg. *Phanerochaete*). Cystidia numerous without clamps at the basidial bases, generally with few clamps on the subicular hyphae; spores narrowly ellipsoid to allantoid, usually longer than 5 μm. The group contains the bulk of the species of the genus with several species: *Ph. calotricha, filamentosa, galactites, laevis, raduloides, sanguinea, sordida, velutina* in N. Europe and in the continental Europe further *Ph. cacaina, ericina, martelliana*. The group is probably rich in species in different parts of the world.

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**Key to species**

1. No cystidia .......................................................... 2
2. Spores 5-6,5 x 3-4 μm ........................................ 11. *Ph. tuberculata*
3. Cystidia regularly septate .................................... 9. *Ph. septocystidia*
4. Spores longer than 8 μm (species not known from N. Europe) ........................................ 5
5. Spores allantoid .................................................. 1. *Ph. cacaina*
6. Spores ellipsoid .................................................. 6. *Ph. martelliana*
7. Hymenium more or less raduloid with blunt tubercles or dents ........................................ 7. *Ph. raduloides*
8. Fruitbody white, cream, ochraceous, yellow to pink, substrate not reddish ............................. 8
9. Cystidia not or only occasionally septate .................... 4
10. Spores shorter than 8 μm ....................................... 6
8. Spores shorter than 5 μm, subiculum yellowish, hymenium purplish in KOH .......................... 3. Ph. filamentosa
8. Spores longer than 5 μm, subiculum white, hymenium reddish or not changing in KOH ......................... 9
9. Cystidia very numerous, encrusted, easily seen with a lens, strongly projecting and giving the fruitbody a velutinous appearance ........................................ 12. Ph. velutina
9. Cystidia scattered to common, smooth to encrusted, enclosed to projecting, fruitbody appearing glabrous or with some projecting cystidia when seen through a lens .... 10
10. Subicular hyphae thickwalled, randomly branched and oriented, no rhizomorphs ........................................ 11
10. Subicular hyphae thinwalled, if thickwalled, more or less parallel along the substrate, rhizomorphs usually present .. 12
11. All subicular hyphae of same type, rather straight and usually branched only at septa, cystidia numerous ...... 10. Ph. sordida
11. Some subicular hyphae straight, other ones strongly and irregularly branched, often with many short, bent branches between septa, cystidia rather few ... 7. Ph. raduloides
12. Mature cystidia apically encrusted to at least one third of their length .............................................. 13
12. Mature cystidia naked or only slightly encrusted ................. 14
13. Cystidia rather few, coarsely encrusted, cylindrical to obtuse, rhizomorphs always present, fruitbody almost athelioid and easily detachable ................. 4. Ph. galactites
13. Cystidia numerous, narrowly cylindrical and tapering to an acute apex, finely encrusted, but apex often remaining naked, with or without rhizomorphs, fruitbody adnate to slightly detachable .................. 5. Ph. laevis
14. Fruitbody white, cystidia smooth, subulate and usually shorter than 50 μm, substrate not reddish ................................. 2. Ph. calothricha
14. Fruitbody more or less reddening with age, cystidia smooth to slightly encrusted and longer than 50 μm, tapering to obtuse, substrate stained reddish .... 8. Ph. sanguinea
Fig. 497. *Phanerochaete cacaina*  a) section through fruitbody  b) spores  c) hyphae  d) cystidia  e) basidia. - Coll. Galzin 19893.

Remarks. This characteristic species is easily distinguished from the other of the genus. Fruitbodies are in the beginning pale ochraceous but turn to chocolate brown, closely adnate to the substrate, and have a narrow light-coloured margin. In the microscope it agrees with other species of the genus in the nature of the hyphae, basidia, and cystidia, but is distinguished through the shape of the spores, which are allantoid, 9–13 x 3–4.5 µm, unusually large for the genus. In the hymenium and on hyphae in all parts of the fruitbody, copious resinuous matter occurs as lumps and grains of different sizes and shapes. Some basidia are coloured by a brown oily matter in the protoplasm and so are some spores. In this respect as in the shape of the spores, the species shows resemblances to the genus Hyphoderma, and it may not be out of the question that in reality it is a species of this genus with clamp-less hyphae. It grows on fallen branches of Pinus sylvestris and so far as known hitherto found only in France, but it is possible that it can also be found on pine branches in S. Scandinavia, where it should be looked for.


Remarks. This species, described on material from Arizona, belongs to the form-complex round Ph. sordida from which it may be distinguished in the longer, thinwalled and more or less enclosed cystidia. It produces in culture a conidial state which has been referred to the imperfect genus Chrysosporium. This genus is reported from chip piles in Sweden (T. Nilsson, IUFRO symp. 14, Dept. Forest Prod. Roy. Coll. Forest. Stockholm 1973) but it has not yet been connected with a basidial state. Prof. A. Käärik has informed us that the Swedish Chrysosporium material doesn’t show the culture characteristics typical for Phanerochaete. We do not now therefore consider Ph. chrysosporium a member of the Corticiaceae flora of N. Europe.
Fig. 498. _Phanerochaete chrysosporum_  a) schematic section through fruitbody showing position of section b  b) section through hymenium  c) spores d) basidium. - From the type.
Fig. 499. *Phanerochaete calotricha*. Section through fruitbody. - Coll. S. Sunhede 8753.
Fig. 500. Phanerochaete calotricha  a) section through fruitbody  b) spores.
  - Coll. Ryvarden 8205 A.
Phanerochaete

2. Phanerochaete calotricha (Karst.) Erikss. & Ryv. n. comb. — Corticium calotrichum
Karst., Revue mycol. 10 p. 73, 1888.
Gard. 12 p. 275, 1926. — Peniophora

Holotype of Corticium calotrichum Karst.: Tammela, Mustiala in Alno.

Holotype of Peniophora burstii Rom.: Ohio. Lloyd 3823, 1898 (S,U,FH).

Holotype of Peniophora limonia Burt: N. Mexico, Sulphur Canyon,
1915-08-03, Robinia neo-mexicana, W.H. Long n. 21405 (BPI).

Fruitbody resupinate, effuse, smooth, 0.1—0.3 mm thick, more or less
detachable, membranaceous, white but turning yellowish or pale ochreous
in the herbarium, cracking on drying and showing the white
hyphae of the subiculum in the cracks, margin variable but at least
partly fibrillose and with well developed rhizomorphs.

Hyphal system monomitic; subhymenial hyphae thinwalled, 2—3 μm
wide, richly branched into a dense subhymenial context; subicular
hyphae generally 4—6 μm wide but may reach 10 or 12 μm, with thin
to somewhat thickened walls, sparsely branched and more or less parallel
with the substrate; scattered clamps as a rule present, in some cases
quite frequently, in others rare or maybe totally lacking; basal hyphae
occasionally encrusted.

Cystidia frequent, more or less subulate, thinwalled, not encrusted,
40—70 μm long, projecting 15—25 μm, not visible under the lens.

Basidia narrowly clavate, 25—30 x 4—5 μm, with 4 ster. and without
basal clamp.

Spores narrowly ellipsoid, adaxial side slightly convex, straight or slightly
concave, 4.5—5.5 x 2—2.5 μm, thinwalled, smooth, generally with one or
more oil-drops.

Habitat. On decayed wood (branches, logs, boards etc.), preferably
of deciduous trees in herb-rich biotopes.

Distribution. Rather rare but scattered in the Nordic countries.

Remarks. Similar to Ph. galactites and Ph. sanguinea, and distinguished
from the former species by the presence of numerous, thinwalled, not
encrusted cystidia, from the latter by the lack of red colour and in the
shape of the cystidia, which are more or less subulate, while in Ph. san-
guinea almost cylindrical. The species has been treated as a taxon of its
own by E. Parmasto 1968 (as Ph. burtii) but often considered as only a white form of Ph. sanguinea. We have chosen to follow Parmasto as the material we have studied differs both as to morphological characters and to ecology from what seems to be normal for Ph. sanguinea. Even if the case is not clear in all respects, we prefer to keep them separate. As to

Fig. 501. Phanerochaete calotricha  a) section through part of fruitbody  b) spores  c) cystidium and young basidia  d) basidia. - From the type of Peniophora burtii.
ecological demands there is a difference, as *Ph. calotricha* is found in more fertile biotopes, generally on deciduous wood, while *Ph. sanguinea* most frequently grows in coniferous forests. As often is the case in *Phanerochaete* there are problems as to the homogeneity of the taxon, as there is a variation in the shape of the cystidia, the width of basal hyphae and the presence of clamps. The type specimen of *Ph. burtii* has smaller and more acute cystidia than the Nordic material. It is also described as having yellow rhizomorphs, while in our material they are white. Budington and Gilbertson (SW Naturalist 17 p. 409-422, 1973) have studied living material and are of the opinion that *Ph. burtii* is a species of its own.

In herb. Karsten there are three specimens determined *Corticium calotrichum* by Karsten. One is *Ph. velutina*, one *Ph. laevis* and one is the holotype of the species. Even if this shows that Karsten did not have any definite ideas about the delimitation of the species, the name is valid and must be used, even if *Ph. burtii* is a better known name.

Two Swedish specimens (Skåne, Hallands Väderö, 1977.07.30. I and S. Sunhede) agree as to microscopical characteristics but differ in colour, which is ochraceous in young parts and turning dull greyish-violaceous when mature. If these specimens represent another taxon or not, cannot be decided as yet and are therefore provisionally included in *Ph. calotricha*.

Fig. 502. *Phanerochaete calotricha*. Basal hyphae. From type of *Ph. burtii*. 
Fig. 503. *Phanerochaete filamentososa* a) schematic section through young, marginal part of fruitbody showing positions of b and c  b) subicular hyphae  c) section through young hymenium  d) basidia  e) spores  f) cystidia. - Coll. Sunhede 1975-08-16.
3. Phanerochaete filamentosa (Berk. & Curt.)
Burds., Distrib. Hist. Biota. S. Appalach. 4
p. 278, 1976. —Corticum filamentosum
Berk. & Curt., Grev. I p. 178, 1873. —Penio-
phora filamentosa (Berk. & Curt.) Burt in
Coker, Elisha Mitchell Soc. Journ. 36
p. 162, 1921.

**Fruitbody** resupinate, effuse, of moderate size but sometimes confluent
and large, 0.1—0.4 mm thick, loosely attached and more or less detach-
able, when alive soft, when dried membranaceous and brittle, smooth,
generally not cracking, light to dark ochraceous (Burt: Isabella colour
to Buffy Citrine), in the mature state with a whitish pruina from
the encrusted, projecting cystidia; subiculum concolourous, in
KOH turning vinaceous or purplish; margin variable but mostly fimbriate,
with rhizomorphs, generally lighter in colour than the hymenium, in
typical cases consisting of two zones, an outer fimbriate, white to
yellowish one, 1—2 mm wide, and an inner, light olivaceous brown one,
ab. 10 mm wide.

**Hyphal system** monomitic; hyphae normally without clamps, but rare
ones sometimes seen in the subicular hyphae; subhymenial hyphae thin-
walled, 2—3 μm wide, richly branched and united into a dense texture,
subicular ones 4—5 μm wide, straight and mainly parallel, forming a loose
texture; esp. the subhymenial hyphae provided with a cover of amorph-
ous grains, yellowish in the microscope but dissolving in KOH.

**Cystidia** very numerous, 50—70 x 5—8 μm, narrowly conical and taper-
ing to the base, at first thinwalled and sparsely encrusted, finally thick-
walled with yellow encrustation.

**Basidia** narrowly clavate, 25—30 x 4—5 μm, 4-spored, without basal
clamp.

**Spores** ellipsoid, 4—5 x 2—3 μm, thinwalled, smooth, non-amyloid,
non-cyanophilous, with usually one oil-drop in the plasm.

**Habitat and distribution.** Often on decayed deciduous and rarely on
coniferous wood. Widely distributed but in N. Europe rare and collected
only a few times (Småland, Västergötland, Halland) in Sweden, reported
from Denmark (Sjælland) by Christiansen but to us not known from
Finland and Norway.

**Remarks.** Very characteristic species, easily recognized just by sight
because of the yellow-ochraceous colour, the pruinose hymenium, the
soft texture, presence of rhizomorphs, the purplish colour in KOH a.s.o.
In the microscope above all the small spores and the yellow encrustation
are distinctive.
Fig. 504. *Phanerochaete filamentosa*  a) schematic section through mature fruit-body showing positions of sections b and c  b) section through hymenium  c) subicular hyphae  d-f) cystidia in optical section and surface view  g) basidia  h) spores. - Coll. Sunhede 1975-08-16.
Fig. 505. *Phanerochaete galactites*  a) schematic section through fruitbody showing positions of sections b and c  b) section through hymenium  c) part of subiculum  d) old cystidia  e) basidia  f) spores. - Coll. Nannfeldt 2819.
Fig. 506. *Phanerochaete galactites*  

a) schematical section through fruitbody with position of section b  
b) section through hymenium and part of subiculum  
c) subicular hyphae  
d) basidia  
e) spores. - Coll. Romell.

Lectotype: Branches tombées de pin, Bois de Pougé, 1907-09-19. Bourdot 5108 (P). A specimen in S with the same number, substrate, and date but with St Priest as locality, and sent by Bourdot to Romell, is evidently a part of the same collection. In the original description Allier: St Priest is the first mentioned locality.

Fruitbody resupinate, effused, loosely attached to the substrate and more or less detachable, 0.1–0.2 mm thick, smooth, soft and tender when alive, when dried brittle and cracking, showing the white, fibrillose subicum; colour at first white then turning creme or finally more or less ochraceous; margin variable but usually more or less fibrillose and as a rule continuing into white rhizomorphs.

Hyphal system monomitic; hyphae without clamps except some rare ones in the subicum, the subhymenial ones thinwalled, 2–3 μm, richly branched, subicular hyphae with thin or somewhat thickened walls, 3–6 μm wide or in individual cases reaching 10 μm; in the context and esp. in the subhymenium grains and rounded drops of an amorphous, oily matter or in old specimens rich occurrence of crystals.

Cystidia in Bourdot’s specimens none, in the Scandinavian ones there are cystidia, varying in number from very few and not easily found to quite numerous, visible even under the lens. The encrusted part is generally 30–40 x 8–10 μm but may sometimes become much longer, in the microscopical preparations, however, mostly broken into pieces.

Basidia subclavate, 25–30 x 4–5 μm, with 2–4 sterigmata, without basal clamp.

Spores narrowly ellipsoid - subcylindrical with the adaxial side slightly convex, straight or somewhat concave, 4.5–5.5 (−6) x 2–2.5 μm, smooth, thinwalled, non-amyloid, non-cyanophilous.

Habitat and distribution. Judging from the very few collections in Scandinavia it is a rare species. There are specimens from Småland (Femsjö, on Pinus, Burt, 1899, det. Lundell, and on Betula, Nannfeldt, 1929, det. Litschauer) and Södermanland (vicinity of Stockholm, Romell, several collections) in Sweden. Not known from the other Nordic countries.
Fig. 507. *Phanerochaete laevis*  a) schematic section through fruitbody showing position of section b  b) section through mature hymenium and part of subiculum. - Coll. Hjortstam and Larsson 14576.
Remarks. Ph. galactites resembles Ph. calotricha in many respects - e.g. light-coloured fruitbodies and presence of rhizomorphs. The fruitbodies are, however, thinner, more atheloid and at least in young specimens there are no cystidia, while in mature specimens there may be some more or less encrusted cystidia. They are generally few and difficult to find but may be quite numerous.

The Scandinavian material has been compared with four specimens from herb. Bourdot (the lectotype and n. 5107, sur branches tombées de pin, forêt de Château-Charles, 1905-08-23, P and n. 9210, 9211, sur pin, Vinnac (Aveyron), 1912-11-29, UPS). The accordance with the Swedish material is not total but may be satisfying. No cystidia are seen in the French material but as they are young fruitbodies this difference may be of restricted importance. S. Lundell, V. Litschauer, and H. Bourdot have come to the opinion that they are identical. As the material is limited, we cannot, however, be fully sure that the French and the Swedish material belong to the same taxon. The possibility remains that there are two species, one without cystidia studied by Bourdot and one with cystidia occurring in N. Europe.


Neotype: Corticium laeve Fr., Herb. M.J. Berkley, 1879, determined and sent by E. Fries (K).

Holotype of Peniophora affinis Burt: Vermont, Middlebury, Batrell Ledge, 1900-09-14, E.A. Burt (BPI).

Fruitbody resupinate, effuse, 0.3—0.5 mm thick, adnate or at least gradually becoming detachable, when fresh more or less tuberculate or with radial ridges, smoothening on drying, membranaceous, to begin
with light-coloured, than turning darker, light to dark ochraceous, often with a greyish hue, many specimens in the herbarium more or less flesh- or orange-coloured, some even bright orange (like *Peniophora incarnata*), dried old specimens often cracked, showing the white subiculum in the cracks; margin abrupt, varying but mostly fibrillose, sometimes with distinct rhizomorphs but generally without.

**Hyphal system** monomitic; hyphae 2–5 μm wide, thinwalled or in the subiculum slightly thickened; clamps lacking in the hymenium and subhymenium but in the subiculum clamps are often found, sometimes 2 together; subhymenial hyphae richly and irregularly branched and densely united, subicular hyphae straight, sparsely ramified and mainly horizontally arranged; in mature specimens crystals richly attached to the hyphae; in the reddish or orange specimens a coloured matter (yellow in the microscope) occurs between the hyphal elements of the subhymenium, and in the hymenium.

*Fig. 508. Phanerochaete laevis*  a) subicular hyphae  b) cystidia in different stages of development  c) spores  d) basidia. - Coll. Hjortstam and Larsson 14576.
Phanerochaete

Cystidia numerous, 40–65 x 5–7 μm, projecting 15–30 μm, narrowly cylindrical and tapering to the acute apex, first thinwalled and not encrusted, walls then thickening and finally the cystidium is encrusted in the apical half but in the microscope the top often is naked as the encrustation easily falls off; very young cystidia with many oil-drops in the protoplasm.

Basidia narrowly clavate, 4-spored, 25–35 x 4–5 μm, without basal clamp.

Spores mostly 4.5–6 x 2.5 μm, narrowly ellipsoid, smooth, thinwalled, with one or more oil-drops, non-amyloid, non-cyanophilous.

Habitat. On decayed wood of all kinds, esp. often found on wood of *Alnus* and *Betula*, but also on *Corylus, Fagus, Populus, Quercus, Salix* a.o. deciduous trees. It occurs also on coniferous wood, esp. of *Picea*, less often on *Pinus*. The biotope is rather humid, generally with herbs or at least mixed with herbs and ferns. Among the communities where it often is found can be mentioned the herb-rich *Picea*-forests esp. in N. Scandinavia, the coast *Alnus*-forest along the Baltic, and the subalpine deciduous forest (on *Betula* and *Salix*). In S. Sweden it is more frequent in the mixed, not too dense, moderately mull-rich deciduous forest.

Distribution. The species occurs in all parts of the forested Scandinavia, maybe more frequently in the northern part. Christiansen reports it as rare in Denmark. In Finland it is just as frequent as in Sweden and in Norway.

Remarks. Even if there is a variation as to colour, reaction in KOH, shape of margin, presence of rhizomorphs a.s.o., *Ph. laevis* is always distinguishable. The microscopic characters are satisfyingly constant, which is why we dare look upon it as a good species. The shape and number of cystidia afford the best way of recognizing it, they are always numerous and are narrower, more tapering than in *Ph. velutina* and *Ph. sordida*, which are the species with which it can be confused.

There is, so far as we can judge, in the Scandinavian material no geographical separation, or differentiation as to substrate and biotope. We believed for some time that the orange- or flesh-coloured form was more frequent in N. Scandinavia but now we have seen a sufficient number of it from S. Sweden to be sure that it is not possible to sub-divide the species by colours. Burt used the encrustation of subicular hyphae as a characteristic to distinguish between *Peniophora affinis* and *laevis* but we are convinced that this is not possible and clearly unnatural.
Fig. 509. Phanerochaete martelliana  a) section through fruitbody  b) basidia  c) cystidium  d) spores. - From the holotype.
Phanerochaete

As to the nomenclature there are some problems. As it is a common species in Sweden and Finland it is quite certain that both Fries and Karsten had a name for it. Even if Fries had no knowledge about the microstructure of the Corticiaceae, he must have been acquainted with it and very likely he used the name Thelphora laevis for it. There is in the Kew Herbarium a specimen, so determined by Fries in his writing. Th. laevis is, however, nowadays considered synonymous with Cylindrobasidium evolvens as Fries got the name from Persoon and Persoon's Th. laevis is the same as Th. evolvens Fr. Fries's description of Th. laevis does not match that of Th. evolvens very well, esp. not the statement about size ("late effusa saepe spithamea et ultra") while his description of Th. evolvens leaves little doubt about its identity. We believe that Th. laevis Fr. is the oldest name for what has been called Peniophora affinis and the question is if the name is valid or not. If the choice of lectotype shall take into consideration also the description in the protologue and not only the name, then the Kew specimen seems to be the best choice.

Peniophora ericina Bourd., Revue sci. Bourbonn. 23 p. 14, 1910, is according to the author related to Phanerochaete laevis but is well distinguished i.a. in the nature of the cystidia, which are few, thin-walled and not encrusted. It is a good species of Phanerochaete and should be named Phanerochaete ericina (Bourd.) Erikss. & Ryv. n. comb. Basionym: Peniophora ericina Bourd., Rev. Sci. Bourbonn. 23 p. 14, 1910.


Remarks. This species is not found in N. Europe, but we want to mention it as it is not out of the question that it might be found in S. Scandinavia. It is a characteristic member of the genus, easily recognized by its large, ellipsoid spores, 9–12 x 4–5 μm. In other respects it agrees well with some other species of the genus. The hyphae are distinct, but rather thinwalled, in the subiculum forming a loose texture and bearing attached crystals, esp. in the transitional layer between the subhymenium and the subiculum. The cystidia are rather few, subulate, thinwalled, not or very little encrusted, and long projecting.
Fig. 510. *Phanerochaete martelliana*  a) section through fruitbody  b) spores c) basidium  d) cystidia. - Coll. Bourdot 4029.
Bourdot & Galzin saw the type material of *C. martellianum* but for some reason confused it with a form of *Ph. sordida* (*P. cremea*) on which their description in Hym. de France seems to be based. The type material preserved in herb. Bourdot (P) is no doubt identical with *Ph. martelliana* as it is here described. The material is, however, very scarce and it is possible that from the beginning there were more pieces of it. Bourdot has on the envelope made notes and drawings, and the spore size he there reports is too small, 5–6(7) x 3–3.5(4) μm. We have measured 7–10 x 4–5 μm. In any case the correct name for the species is *Phanerochaete martelliana*. One of the specimens in Bourdot’s herb. (Galzin 1852) is *Cylindrobasidium evolvens* (= *Cort. laeve*). The resemblances between this species and *Peniophora macrospora* reported by Bourdot & Galzin, may be a result of this incorrect determination. v. Höhnel & Litschauer (Sitzber. etc. 1908 p. 1086), who examined original material of *Corticium martellianum*, found a great difference in spore size between this species and *Peniophora laevis*, which shows that they had investigated material of the same species as the one in herb. Bourdot as well as in Stockholm.

Though found only in Italy, France and Spain (Canary Islands), and recently in Iran by N. Hallenberg, it might be possible to find it in N. Europe, e.g. in Denmark. In the Mediterranean area it is probably a fairly common species.

Type specimen of *Corticium martellianum* Bres.: Florentiae, ad ligna mucida Lauri nobilis, Aprile 1890, Martelli, herb. Bourd. 9462 (P, S).

Lectotype specimen of *Peniophora macrospora* Bres. ex Bourd. & Galz. Allier, St Priest, entre Croûtet et la Lechère, sur ronces, 1905.07.27, Bourdot n. 4029 (P).
Fig. 511. *Phanerochaete raduloides*  

a) schematic section through fruitbody showing position of section b  
b) section through hymenium  
c) basidia  
d) cystidium  
e) spores. - From the holotype.
Phanerochaete

7. Phanerochaete raduloides Erikss. & Ryv.  
   n. sp. —Radulum cumulodentatum Nikol.,  
   Fl. plant. crypt. URSS 6 p. 87, 1961, nom.  
   nudum; Phanerochaete cumulodentata  

Fructificatio resupinata, adnata, confluens et interdum late effusa, usque ad 5 mm crassa; hymenium ceraceum, irregulariter tuberculatum vel obtuse dentatum, flavidum - aurantiacoicnarnatum; margo alba, fibrillo-sa; hyphae monomiticae, non-fibulatae, hymeniales tenuitunicatae, 1.5 -2.5 μm in diam., subiculosae distinctae, crasse tunicatae, pars rectae, 4 -6 μm crassae, sparse ramificatae, pars valde inflexae, c. 3 -4 μm crassae, dense ramificatae; cystidia pauca, 60 -90 x 7 -12 μm, subcylind-raceae, tenuitunicata vel paulo crassitunicata, non-incrustata, 30 -50 μm projecta; basidia anguste clavata, 25 -35 x 5 μm, 4 sterigmatibus, non-fibulata; sporae glabres, ellipsoidae - subcylindraceae, 4.5 -5.5 x 2.5 μm, non-amyloideae, non-cyanophilae.


Fruitbody resupinate, closely adnate, effuse and may become very large and conspicuous, thickness mostly 0.2 -0.5 mm but very variable and may reach several mm; hymenium ceraceous, more or less tuberculate, with radial ridges or with raduloid knobs or aculei, colour yellowish to orange-red, sometimes even flesh-coloured; margin conspicuous, white, fibrillose.

Hyphal system monomitic; hyphae without clamps or with rare clamps on the basal hyphae; hymenial hyphae thinwalled, 1.5 -2.5 μm wide, branching off basidia and forming a thickening subhymenium, subicular hyphae 4 -6 μm wide, distinct, thckwalled, some of them straight with sparse septa and ramifications, others with dense and numerous short branches, functioning as binding hyphae, making the whole texture rather tough.

Cystidia in moderate numbers, 60 -90 x 7 -12 μm, subcylindrical or somewhat fusiform, obtuse, at first thinwalled, then somewhat thick-ened, not encrusted, projecting 30 -50 μm.

Basidia narrowly clavate, 4-spored, 25 -35 μm long and apically ab. 5 μm, in the basal part ab. 2 μm wide.
Spores 4.5–5.5 x 2.5 μm, narrowly ellipsoid to subcylindrical, adaxial side slightly convex, straight, or slightly concave, smooth, non-amyloid, non-cyanophilous.

Habitat. On deciduous wood (Betula, Corylus and probably also on others). It can be found in subalpine deciduous forests as well as in the southern deciduous region.

Distribution. The finds hitherto made in Scandinavia may indicate an eastern distribution. In Sweden it is found in Abisko (B. & J. Eriksson n. 8892, and in Södermanland, Södertörn, Tyresö, L. Romell 2135 S). We have seen four collections from Finland (Ounas-Pallastunturi, T. Niemelä 1970-08-29; Ruissala, M. Laurila 5808, Koli, V. Kujala D 232, and the type specimen). Nikolajeva reports several collections from USSR.

If Peniophora eichleri ana Bres. sensu Bourd., as it seems, is a thinner form of this species, it should be quite common in France. M.P. Christiansen reports P. eichleri ana from Denmark, but herbarium material studied does not belong to this species.

Fig. 512. Phanerochaete raduloides  a) straight subicular hyphae  b) branched "binding" hyphae  c) thinwalled hymenial hyphae. - From the holotype.
Phanerochaete

Remarks. *Ph. raduloides* agrees in several respects (e.g. in the shape of the cystidia and in the distinct basal hyphae) with *Ph. sordida*, but it is well distinguished in others. The fruitbody is much thicker with a hymenium which reminds more of *Hyphoderma radula* than of *Phanerochaete*. In the microstructure it is characterized by the narrow basidial bases and hymenial hyphae but mostly by the characteristic texture of the subiculum. It is composed partly of straight hyphae similar to those of other *Phanerochaete* and besides of strongly ramified hyphal branches, which remind to some degree of the binding hyphae of many polypores. In most species of the genus, the subicular hyphae are more or less parallel to the substrate, but in this one they are branched in all directions. The straight hyphae may be parallel and form strands which run in all directions in the subiculum, and also in rare cases continue in the shape of rhizomorphs outside the fruitbody. The specimens seen are in essential traits uniform, which is why we believe it to be a good species, distinguished from *Ph. sordida*.

*Peniophora eichleriana* Bres. sensu Bourd. & Galz., is as reported by Rogers & Jackson (Farlowia 1 p. 315) different from the true *Corticium eichlerianum* Bres., which belongs to the variable taxon here called *Phanerochaete sordida*. Judging from the descriptions *P. eichleriana* s. Bourd. (Bull. Soc. mycol. Fr. 28 p. 397, 1913) and the same in Bourdot & Galzin 1928 are the same species, even if Bourdot in 1913 referred his description to original material of *Corticium eichlerianum*, but in 1928 Bourdot & Galzin include the original material in *P. cresea* and referred their *P. eichleriana* to another specimen from Bresadola. Six specimens in herb. Bourdot agree with the Nordic material as to the nature of the subiculum as well as to the spores and cystidia, but the fruitbodies are thinner. Even if they should belong to the same species, the epithet *eichleriana* cannot be used. The reason is that Bourdot in his description of *P. eichleriana* included the holotype of *Corticium eichlerianum* Bres. which is a specimen of *Ph. sordida* as defined here.
Fig. 513. *Phanerochaete sanguinea*   a) schematic section through fruitbody with position of section b   b) section through hymenium   c) subicular hyphae   d) spores   e) cystidia   f) basidia   g) spores. Coll. a-f: Hallingbäck g: Hjortstam 11448.
Phanerochaete

8. Phanerochaete sanguinea (Fr.) Pouz., Česká
sanguinea Fr., Elench. fung. 1 p. 203, 1828.

Neotype: "Thelephora sanguinea Fries El. abunde in pinetis. Huc
omnis color sanguineus in lignis". E.

Fruitbody resupinate, effuse, of moderate size, 0.2—0.5 mm thick,
closely adnate or partly detachable, soft when alive, after drying pellli-
cular as young, membranaceous when mature; hymenium mostly
smooth, often cracking, at first white or cream-coloured, with time
turning reddish, at least in patches, finally dark red and staining also
the wood red; margin varying but mostly fibrillose and often growing
out into rhizomorphs of varying sizes, normally red coloured.

Hyphal system monomitic; hyphae without clamps except for some few
on the basal hyphae, singly, in pairs or in whorls; subhymenial hyphae
2—3 μm, thinwalled, richly branched and densely intertwined, subicular
hyphae 4—10 μm, straight, more or less parallel, with sparse septa and
ramifications, most hyphae with more or less thickened walls; in ma-
ture fruitbodies lots of crystals in the context.

Cystidia varying in number and not always easy to find, not well
visible under the lens (50 x), projecting 25—35 μm, thinwalled to some-
what thickwalled, cylindrical or tapering, mostly obtuse, not acute,
naked or with varying degree of encrustation.

Basidia 25—35 x 4—5 μm, narrowly cylindrical, 4-spored, without basal
clump.

Spores narrowly ellipsoid to subcylindrical, mostly 4.5—5.5 x 2.5—3 μm,
sometimes longer (to 7 μm), smooth, thinwalled, non-amyloid, non-
cyanophilous, with 1—2 oil-drops in the protoplasm.

Habitat. On decayed wood, preferably of conifers but sometimes on
deciduous wood in mixed forests; the biotope is all sorts of coniferous
forest with a predominance for the drier and less fertile variants (Clad-
donia-Calluna-Empetrum forest) but it can be found as well in more
fertile forests (e.g. Vaccinium-Hylocomium-Betula-conifer forest),
growing on fallen trunks, slash, branches on the ground, pieces of board
a.s.o.
Fig. 514. *Phanerochaete septocystidia*  

a) section through fruitbody  
b) cystidia  
c) subicular hyphae  
d) spores  
e) basidia. - Coll. Ryvarden 8182.
Phanerochaete

**Distribution.** In all forested parts of Scandinavia and is a common species in the conifer regions from Finnmark to South of Sweden, Finland and Norway. In Denmark rare in conifer plantations. Strid (1975 p. 73) reports some finds in the *Alnus* coast forest of N.—C. Scandinavia.

**Remarks.** Generally easily recognized thanks to the red colour, which can be seen at least in the rhizomorphs or as patches in the hymenium. Old specimens are wholly red and the wood on which they grow also. Young specimens may lack the red and then they resemble very much *Ph. calotricha*. They may be separated by the size, shape and number of the cystidia. They are fewer, larger, and less pointed than in *Ph. sanguinea*. Encrusted cystidia are often seen in this species, but never in *Ph. calotricha*. Several authors have expressed the opinion that *Ph. calotricha* is only a form of *Ph. sanguinea*. We have seen many specimens of this species and have come to the conclusion that they had better be kept separate, even if we dare not declare the matter fully unravelled.

The authentic specimen in the Edinburgh herbarium is labelled by Fries’s own hand. It is a good specimen, in all respects typical for the species, in macrocharacters as the red colour, the redstained wood, the presence of rhizomorphs, as well as in the nature of the hyphae. We therefore choose this specimen as neotype of *Thelephora sanguinea*.

9. **Phanerochaete septocystidia** (Burt) Erikss. & Ryv. n. comb. —*Peniophora septocystidia*


—*Odonticium raitviiri* Parm., Consp. syst.


**Fruitbody** resupinate, adnate but separable in pieces, ab. 0.1—0.4 mm thick, effused, smooth, pale ochraceous to brownish; hymenium smooth, under the lens velutinous from the projecting cystidia; margin varying, finely cottony or fibrillose under the lens or not especially differentiated.

**Hyphal system** monomitic; hyphae of the subhymenium thinwalled, 2—4 μm wide, united into a dense context, usually filled with grains of crystalline or resinous matter, subicular hyphae thickwalled, 5—10 μm wide, often with attached grains, in an open, loose context; no clamps observed.
Fig. 515. *Phanerochaete sordida*  a) section through part of fruitbody   b) spores.
- From the type.
Phanerochaete

Cystidia very numerous and well visible under the lens, more or less projecting, cylindrical, obtuse, rather thickwalled, septated into 4 to 7 or 8 cells, whole cystidium 70–150 μm long or even more, 12–15 μm wide including encrustation of yellowish, resinous, grainy matter.

Basidia narrowly clavate, 15–25 x 4–5 μm, 4-spored.

Spores allantoid, thinwalled, smooth, 4–5 x 1.5–2 μm, non-amyloid, non-cyanophilous.

Habitat and distribution. Very rare species, found in N. America, USSR, and recently in Norway (Aust Agder, Landvik: Skiferenes, Ryvarden 8182) on decayed deciduous wood.

Remarks. Ph. septocystidia differs from other species of the genus in the septation of the cystidia and also in the smaller, more or less allantoid spores. It agrees, however, in other respects with the genus, which we have found to be the best place for it.

The Norwegian material has been compared with collections from Dr. H.H. Burdsall and Dr. R.L. Gilbertson and we have found it to agree very well. We have also compared it with the holotype of Odonticium raitviirii Parm. (TAA).

10. Phanerochaete sordida (Karst.) Erikss. & Ryv. n. comb. –Corticium sordidum
    Karst., Medd. Soc. F.Fl. fenn 9 p. 65, 1882. –Grandiniella livescens Karst.,
    Hedw. 34 p. 8, 1895. –Corticium
    cremeum Bres., Fungi trid. 2 p. 63, 1898.
    –Corticium eichlerianum Bres., Ann.
    mycol. 1 p. 95, 1903. Non Peniophora
    eichleriana sensu Bourdot & Galzin, Hym.

Holotypus of Corticium sordidum: Fennia, Mustiala, ad lign. muc. pini,

Holotypus of Grandiniella livescens: Fennia, Mustiala, In ligno Tiliae,

Holotypus of Corticium cremeum: In ramis Sorbi aucupariae. Bresadola
Aug. (S).

Holotypus of Corticium eichlerianum: Ad ramos Quercus, Eichler (S).
Fig. 516. *Phanerochaete sordida*  a) section through part of fruitbody  b) spores.
- Coll. Eriksson 4612, yellow form, red in KOH.
Phanerochaete

**Fruitbody** resupinate, adnate, 0.2–0.5 mm thick, not or only in small pieces detachable, mostly of moderate size (ab. 1 dm) but sometimes confluent into larger ones, as a rule smooth, at first whitish, then cream-coloured, often with a slight greenish tint, in the herbarium turning into pale ochraceous, sordid buff or vividly orange red; ceraceous when alive, firm membranaceous when dried; old herbarium specimens often with more or less cracked hymenium; margin varying, abrupt, indistinct or finely fibrillate under the lens, not conspicuously fibrillose and without rhizomorphs.

**Hyphal system** monomitic; hyphae without clamps, subhymenial ones thinwalled, richly branched into a dense texture, forming a thickening subhymenium; subicular hyphae, 5–7 μm wide, in young specimens with quite thin walls, later with more or less thickened walls, mostly very distinct, branched at right angles in all directions into an open context; hyphae next to the wood more parallel to the substrate.

**Cystidia** varying in shape and number, mostly cylindrical or fusiform, tapering to the apex which usually is obtuse; walls at first thin, more or less thickening but may in some cases remain thin; size of cystidia mostly 60–70 x 6–10 μm, but may reach 120 μm or more; encrustation varying with age of the fruitbody and other factors, may be none at all but usually there are grains or crystals in the apical or middle part, in some specimens the cystidia are strongly encrusted; the encrusting matter is either hyaline crystals or yellow — red brown resinous matter, in the latter case turning red in KOH; rarely cystidia are provided with side branches which occur mostly in the apical part.

**Basidia** narrowly clavate, 25–30 x 4–5 μm, 4-spored, without basal clamp. The basidial layer is in one specimen found to be amyloid in Melzer's reagent.

**Spores** mostly 5–7 x 2.5–3 μm, some spores may be longer but in most specimens they are shorter than 6 μm, narrowly ellipsoid or subcylindrical, adaxial side almost straight, abaxial side more or less convex, walls thin, smooth, non-amyloid, non-cyanophilous.

**Habitat.** On decayed wood of all kinds (branches, trunks etc.) on deciduous trees and also even if not fully so often, on conifers, preferably *Picea*. It occurs in a variety of biotopes, from the mull-rich deciduous forest to coniferous forests of the humid *Hylocomium-Vaccinium* type. It does not seem to grow so well in the drier, poorer conifer forest (the *Cladonia-Empertrum-Calluna* type).
Fig. 517. Phanerochaete sordida  a) section through fruitbody  b) basidia
c) spores  d) subicular hyphae. - Coll. Bourdot 7263.
Phanerochaete

Distribution. In all forested parts of N. Europe from Denmark to Finnmark and is one of the important wood-decaying fungi. It is widely distributed in the N. temperate zone and is probably one of the commonest corticioids.

Remarks. Being a common and widely distributed species, it is natural that *Ph. sordida* shows a considerable variation. In fact it is so manifold and diverse, that it has been necessary to make a careful study of it before we have dared to make the taxonomical arrangement following here. Our treatment of it as a single taxon does not mean that we are fully convinced that it is one, rather that we have not been able to find separating lines clear enough for another arrangement. The constant characteristic, keeping the taxon together, is the nature of the subicular hyphae, which are more or less thickwalled, branched at right angles and running in all directions, thus forming a well intertwined

![Image of Phanerochaete sordida](image)

Fig. 518. *Phanerochaete sordida*  a) cystidium with resinous cover in the top and encrustation in the lower part  b) hymenium with smooth and partly encrusted cystidia. - Coll. Ryvarden 1967-06-21. S.E.M. L. Ryvarden.
Fig. 519. *Phanerochaete sordida*  a) section through fruitbody  b) spores  c) cystidia. - From the type of *Corticium eichleriunum* Bres.
Phanerochaete

but open context. Clamps occur only rarely on the basal hyphae. The cystidia are very variable in shape, size and number, but are usually rather thinwalled, little encrusted and fewer than in e.g. Ph. velutina and Ph. laevis. The living fruitbody is, at least when young, light-coloured (whitish, creamish, often with a greenish tint) but changes with age, generally to sordid yellowish. After some years in the herbarium many specimens change dramatically and may in extreme cases become orange-red like Peniophora incarnata. There are all degrees from pale yellow to this bright colour. Other specimens turn ochraceous, very few remain whitish. The yellow or reddish specimens appear under the lens to have an amber-coloured encrustation on the cystidia, which immediately turns vinaceous red when touched with KOH. A drop of KOH on the hymenium gives a vinaceous patch. About one half of all specimens seen of Ph. sordida gave this reaction, the other half did not. The yellow encrustation is not crystalline, rather resinous, and floats into rounded drops when heated in lactic acid, while the hyaline encrustation is crystalline, as is confirmed in the polarizing microscope. These characters, easily seen, might give reason for a separation into two taxa, one with yellow to red fruitbodies with cystidia encrusted with an amber-coloured resinous matter, and one with white-ochraceous fruitbodies with hyaline, crystalline encrustation. Unfortunately there are all degrees of reaction to KOH and a number of specimens cannot be determined as belonging to either group. Further more, it has not been possible to use the shape, size, number, and encrustation of the cystidia as a basis for specific separation. We have found it inevitable to treat it as one species, including i.a. Corticium cremeum, the type of which has a rather weak reaction to KOH, Grandiniella livescens, which shows no reaction at all and has cystidia with a thick encrustation and Corticium eichlerianum with long, sometimes branched cystidia. The type of Corticium sordidum is a rather aged specimen without reaction to KOH.

Ph. raduloides is closely related to Ph. sordida but in this case there seems to be no problem in separating the taxa. The thicker, more or less raduloid fruitbody and especially the nature of the subicular context with hyphal branches functioning as binding hyphae, make Ph. raduloides well characterized. Peniophora eichleriana sensu Bourdot & Galzin has similar hyphae and we therefore don’t want to include it in Ph. sordida, but rather in Ph. raduloides. According to Rogers & Jackson (Farlowia 1 p. 314, 1943) P. eichleriana sensu Bourd. & Galz. is a species of its own ("quite a different species"). Phanerochaete chrysosporium, another species with close relations to Ph. sordida, is separately discussed (p. 993).
Fig. 520. *Phanerochaete sordida*  a) section through fruitbody  b) spores.
- From the type of *Grandiniella livescens* Karst.
Fig. 521. Phanerochaete sordida different types of cystidia a) from form yellow in KOH b) the same heated in cotton blue c-e) white to cream forms, no reaction in KOH f) whitish form, red with KOH. - Coll. a,b: Kujala and Eriksson 4272 c,e: Hjortstam 15082, d: Hallingbäck 1976-08-28 f: Hjortstam 21410.
Fig. 522. *Phanerochaete tuberculata*  a) schematic section through fruitbody showing position of section b  b) section through part of the fruitbody c) basal hyphae with clamps  d) basidia  e) spores. - Coll. J. Eriksson 1977-05-15.
11. Phanerochaete tuberculata (Karst.) Parm.  

Fruitbody resupinate, effuse, confluent and sometimes becoming very large, covering the underside of trunks and branches, generally 0.1—0.5 mm thick, adnate, at first white then turning creamish or when old darkening to pale ochraceous, when fresh more or less tuberculate, smoothening on drying, dry old fruitbodies more or less cracked; margin varying, often at least partly fibrillose, small rhizomorphs sometimes present in the periphery and larger ones on the underside of the bark, on which it grows.

Hyphal system monomitic; hyphae with thin or slightly thickened walls; subhymenial ones 2—3 μm wide, in a dense context, subicular hyphae 3—5 μm wide, more or less parallel to the substrate and sparsely branched into an open texture; clamps sometimes present on the subicular hyphae, rarely in pairs.

Cystidia none.

Basidia clavate — subclavate, 25—35 x 4—5 μm, 4-spored, without basal clamp.

Spores 5—6.5 x 3—4 μm, ellipsoid, thinwalled, smooth, with oily plasmatic contents, non-amyloid, non-cyanophilous.

Habitat. On decayed wood, preferably on deciduous trees. The normal biotope is the humid, herb-rich forest on mull-soil, but can occasionally be found also in drier and poorer forests. Collections on coniferous wood are few. We have confirmed the observation by S. Lundell (Fung. exs. suec. 1341 a) that the species starts its development early in the season. We have seen well-developed fruitbodies already in the summer. During mild winters or winters with a permanent snow-cover, fruitbodies may survive and be fertile in the early spring (March), which is why it is possible to find it in all seasons when weather permits.

Distribution. Rather common in S. Scandinavia northwards to C. Finland. It may still be frequent along the coast of N. Scandinavia, e.g. along the Gulf of Bothnia, but there are no finds from the inner parts. It is likely to occur in fertile deciduous subalpine forests, where other southern species also are collected.
Fig. 523. *Phanerochaete velutina*  
  a) section through young fruitbody  
  b) spores.  
  - Coll. Nannfeldt 15414.
Phanerochaete

Remarks. This conspicuous fungus was with certainty seen by Fries and he very likely also had a name for it. We don’t know which name but according to tradition it should be Thelophora lactea Fr.. Fries’s description of this species as well as the position he gives it in the genus makes it very likely that Th. lactea was the name he used. He was not able, however, to distinguish it from other species, by sight similar to it, and therefore among the specimens left from Fries — collected long after Systema mycologicum was published — there is a mixture of species. Rogers & Jackson (Farl. 1 p. 295, 1943), after a penetrating study, referred Th. lactea Fr. to nomina dubia. Lundell & Nannfeldt (Fung. exs. suec. n. 1341) concur in this opinion.

Ph. tuberculata is characteristic and easily distinguished. Even if it varies with age and growth conditions, it is more uniform and constant than the other species of the genus. Though lacking cystidia altogether there seem to be good reasons for placing it in Phanerochaete.


Fruitybody resupinate, adnate or as old detachable in pieces, effused and sometimes reaching considerable size (several dm in length), when dried mostly 0.1–0.5 mm thick; hymenium mainly smooth, very varying in colour, in the beginning whitish and when wet watery greyish, then often getting a reddish colour, in all shades from very weak to clearly vinaceous red or even orange red, especially when dried; margin white or pale reddish, lighter than the hymenium, mostly fibrillose and often with some rhizomorphs.

Hyphal system monomitic; subhymenial hyphae thinwalled, 2–4 μm in diam., without clamps, forming a dense, ceraceous context; subicular hyphae in young specimens with thin, later with more or less thickened walls, straight, more or less parallel to the substrate, 5–10 μm wide, in mature specimens normally richly encrusted, sparsely branched, with some clamps, singly, in pairs or sometimes in whorls.
Fig. 524. *Phanerochaete velutina*  

a) section through fruitbody showing position of section b  
b) section through part of the fruitbody  
c) basidia  
d) spores.

- Coll. S. Jacobsson.
Phanerochaete

Cystidia very numerous, easily visible under the lens, giving the hymenium a velutinous surface and in old specimens a whitish colour from their rich encrustations, reaching a length of 100 μm or more and a width of 10–15 μm; walls of young cystidia thin but becoming finally very thick; shape of cystidia varying but normally obtuse, subcylindrical-subfusoid.

Basidia subclavate, 30–35 x 4–6 μm, normally with 4 sterigmata and without basal clamp.

Fig. 525. Phanerochaete velutina. Hymenium with encrusted cystidia. - Coll. L. Ryvarden 8262. S.E.M. L. Ryvarden.
Spores 5–7 x 2.5–3 μm, normally ellipsoid with oblique apiculus, but single spores vary to ovoid or subcylindrical, adaxial side straight or slightly concave; with oily plasmatic contents.

Habitat. Mostly in humid deciduous forests but can also be found in humid coniferous forests, on all kinds of decayed wood, generally on logs, big branches or stumps near the ground.

Distribution. A common species in the deciduous forests of S. Scandinavia and S. Finland, less common in coniferous forests. It is further rather frequent along the coast of N. Sweden and in suitable localities in N. Finland, more rare in the inner N. Sweden. It is a common species in S. Norway and is likely to occur along the coast of N. Norway, but too little is hitherto known.

Remarks. The ”typical” specimens of Ph. velutina are easily recognized, but the variation is very great and the taxonomical problems involved are far from solved. Normally the subicum, consisting of broad, more or less encrusted hyphae in an open texture, is considerably thick and easily visible in the cracks of the hymenium or as a fringe in the margin, but in many collections the layer is thin and not always clearly seen. In such fruitbodies the consistency of the fruitbody is given mainly by the subhymenium, which when it is thickened, makes the fruitbody look more ceraceous and Phlebia-like, esp. when it is wet. The difference between the extremes is very great and for some time we thought that a separation into two taxa was necessary, but investigation of a very large number of collections has shown that it is necessary to join them into one taxon. The variation in colour of the fruitbodies, from white to greyish or reddish to dark vinaceous grey and all shades of ochraceous makes it difficult to have a definite opinion about its taxonomy. We have had to give it a rather large circumscription. The most ”typical” specimens have a more or less red hymenium and a margin which in the periphery is white, then an orange-coloured zone, inwards changing to the pale vinaceous red of the hymenium.

There is usually no colour reaction to KOH except for some of the orange-coloured specimens, in which there is a weak red colour.

Lectotype of Corticium decolorans (Mustiala in Salice, Oct. 1879, P.A. Karsten, H n.1405) is in all respects a typical Ph. velutina.
Fig. 526. *Mycoaciella bispora* a) part of fruitbody — Coll. M.P. Christiansen 1956-11-01 b) fruitbody with marginal zone. — Coll. Hauerslev 758. Photo T. Hallingbäck.
Fig. 527. *Odonticum romellii* a) effused fruitbody. — Coll. Laurila 19290
b) part of fruitbody with cylindrical aculei joined in groups. — Coll. Hjortstam 16055. Photo T. Hallingbäck.
Fig. 528. a) *Peniophora incarnata*, confluent fruitbody. — Coll. Ridelius 1937-05-01
Fig. 529. a) *Peniophora lilacea*, confluent fruitbody. – Coll. Jeppson 1627
b) *Peniophora limitata*, young fruitbody with black margin. – Coll. Hjortstam 5180. Photo T. Hallingbäck.
Fig. 530. a) *Peniophora polygonia*, old fruitbodies. – Coll. Nordin 7206. b) *Peniophora quercina*, old fruitbody curled in marginally. – Coll. J. Eriksson 9521. Photo T. Hallingbäck.
Fig. 531. *Peniophora rufomarginata* a) young fruitbody with distinct marginal zone b) older fruitbody, cracking and loosening from the substratum. — Coll. a) Nordin 6912 b) Nordin 6604. Photo T. Hallingbäck.
Fig. 532. a) *Peniophora rufa*, orbicular fruitbodies. — Coll. Lundell 11808
b) *Peniophora septentrionalis*, young fruitbody with distinct white margin. —
Coll. Laurila 5815. Photo T. Hallingbäck.
Fig. 533. Phanerochaete galactites a) young part of fruitbody with distinct rhizomorphs b) older part of fruitbody. — Coll. Romell 3662. Photo T. Hallingbäck.
Fig. 534. a) *Phanerochaete calotricha*, fruitbody with rhizomorphs and white subiculum visible in the hymenial cracks. — Coll. Nathorst-Windahl 14282  