North American Polypores

by
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with drawings by
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Volume 2
Megasporoporia – Wrightoporia
New species and combinations proposed in this volume:

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Perenniporia</em></td>
<td><em>amyloextrinoidea</em></td>
<td>511</td>
</tr>
<tr>
<td><em>Perenniporia</em></td>
<td><em>fergii</em></td>
<td>517</td>
</tr>
<tr>
<td><em>Oligoporus</em></td>
<td><em>anguloporus</em></td>
<td>462</td>
</tr>
<tr>
<td><em>Oligoporus</em></td>
<td><em>minusculoides</em></td>
<td>476</td>
</tr>
<tr>
<td><em>Oligoporus</em></td>
<td><em>rancidus</em></td>
<td>482</td>
</tr>
<tr>
<td><em>Oligoporus</em></td>
<td><em>stipticus</em></td>
<td>485</td>
</tr>
<tr>
<td><em>Oligoporus</em></td>
<td><em>subpendulus</em></td>
<td>486</td>
</tr>
<tr>
<td><em>Perenniporia</em></td>
<td><em>semistipitata</em></td>
<td>530</td>
</tr>
<tr>
<td><em>Schizopora</em></td>
<td><em>apacheriensis</em></td>
<td>704</td>
</tr>
<tr>
<td><em>Trametes</em></td>
<td><em>ectypus</em></td>
<td>740</td>
</tr>
<tr>
<td><em>Trametes</em></td>
<td><em>ochracea</em></td>
<td>752</td>
</tr>
<tr>
<td><em>Trametes</em></td>
<td><em>subectypus</em></td>
<td>758</td>
</tr>
<tr>
<td><em>Antrodiella</em></td>
<td><em>fissiliformis</em></td>
<td>808</td>
</tr>
</tbody>
</table>
Descriptions of genera and species.

*Megasporoporia* Ryv. & Wright
Basidiocarps resupinate; pores generally large, angular to round, poresurface cream, greyish to pale brown or cinnamon, context usually very thin, white to cream or very pale brown; hyphal system di-trimitic, generative hyphae with clamps, skeletal hyphae thick-walled and dextrinoid, branched vegetative hyphae which may be interpreted as binding hyphae present in most species, dextrinoid; spores cylindrical, thin-walled and large, non-amyloid and non-dextrinoid; cystidia absent, dendrohyphidia present or absent; crystals usually present, often abundant in the subhymenium and the context. On deciduous wood with a white rot. Predominantly a tropical genus.

Type species: *Megasporoporia setulosa* (Henn.) Rajch.

Remarks. The genus is characterized by its large spores, resupinate basidiocarps and the dextrinoid skeletal hyphae. The closest relative seems to be *Grammothele* which however, has shallow pores with the hymenium more or less restricted to the bottom of the tubes. It seems to be derived from some corticioid genus and *Megasporoporia* may be evolved from it by developing true pores where the hymenium lines the tube walls.

**Key to species**

1. Hyphal pegs common on the tubewalls; dendrohyphidia absent from dissepiments ............................. 2. *M. setulosa*
1. Hyphal pegs absent; dendrohyphidia present along the dissepiments, but may be difficult to find .................. 1. *M. cavernulosa*

1. *Megasporoporia cavernulosa* (Berk.) Ryv.  Fig. 210
Basidiocarps resupinate, annual, adnate and coriaceous to hard, up to 2 mm thick; margin narrow, white to cream; pore surface concolorous or becoming pale woody brown in age, pores angular and shallow, 2–4 per mm, up to 1 mm deep, dissepiments finely fimbriate in actively growing specimens; context white to ochraceous, less than 1 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled and 2–4 μm wide; skeletal hyphae common, thick-walled to solid, unbranched and flexuous, 2–4 μm wide, strongly dextrinoid; binding hyphae strongly branched, solid, dextrinoid, mostly confined to the context.
Cystidia and other sterile hymenial elements absent.

Dendrohyphidia present, but difficult to find in old and dry specimens, delicately thinwalled and variably branched in the upper part, most common along the dissepiments, up to 25 μm long from the clamp at the base.

Basidia clavate, 4 sterigmate, 25–35 × 5–8 μm, with a basal clamp.

Basidiospores cylindrical, hyaline, smooth, thinwalled and IKI-, (10–)12–16 × 5–7 μm.

Type of rot. Causes a white rot of dead hard woods.

Cultural characteristics. Unknown.

Sexuality. Unknown.

Substrata. On dead hardwoods.

Distribution. In United States known only from Florida. Widespread in tropical America and Africa.

Remarks. The large spores and the dextrinoid reaction of the vegetative hyphae make this species easy to recognize.

Fig. 210. Megasporoporia cavernulosa (AZ 13232). a, contextual generative hyphae; b, contextual skeletal hyphae; c, dendrohyphidia; d, acuminate sterile hyphal elements; e, crystals; f, basidia; g, basidiospores.

Fig. 211. Megasporoporia setulosa (DES 6306). a, contextual generative hyphae; b, contextual skeletal hyphae; c, crystals; d, basidia; e, basidiospores; f, schematic drawing of hymenophore showing hyphal pegs.


Basidiocarps resupinate, annual, adnate, coriaceous, often widely effused, up to 3 mm thick; pore surface white, cream and becoming cork brown in age and drying, pores angular to round, 1–2 per mm; tube walls densely covered with hyphal pegs, context white to cream, up to 0.3 mm thick.

Hyphal system dimitic; generative hyphae with clamps, thin-walled
Melanoporia

and 1.5-3.5 μm in diam; skeletal hyphae straight, unbranched or sparingly branched, thick-walled to solid, dextrinoid, 1.5-6 μm wide.

Cystidia absent.

Hyphal pegs abundant, hyaline, 40-160 × 15-40 μm, often angular, covering the dissepiments and distributed over the hymenial surface, visible with a 10× lens.

Basidia clavate, often with oily inclusions, 18-30 × 7-10 μm, 4-sterigmate and with a basal clamp.

Basidiospores cylindrical, smooth, hyaline and IKI-, 10-14 × 4-6 μm.

Type of rot. Causes a white rot in dead hardwoods.

Cultural characteristics. Unknown.

Sexuality. Unknown.


Distribution. In Southeastern part of United States, from eastern Texas to Florida.

Remarks. The species can be identified in the field with a lens because of the conspicuous hyphal pegs. Dendrohyphidia have not been found in this species.

Melanoporia Murr.


Basidiocarps resupinate, perennial, purplish black to fuliginous, pores small; hyphal system dimitic, generative hyphae with clamps, skeletal hyphae pale to dark brown; cystidia none; spores ellipsoid, smooth and IKI-negative, causing a brown rot. Monotypic American genus.

Type species: Melanoporia nigra (Berk.) Murr.

Remarks. There is no other resupinate polypore treated in this flora which has a similar dark-colored basidiocarp. In tropical America it can be confused with Melanoporiella carbonacea (Berk. & Curt.) Murr., which however has simple septate hyphae and cylindrical spores.

Melanoporia nigra (Berk.) Murr.

op. cit. – Polyporus niger Berk., Lond. J. Bot. 4:304, 1845.

Basidiocarps resupinate, perennial, effused, purplish brown to dark fuliginous brown, woody, up to 2 cm thick; margin dark brown, narrow; pore surface dark to purplish brown, pores round, 5-6 (8) per mm; tubes concolorous with pore surface but in actively growing specimens, the hymenium along the tubes paler than the trama, the tubes normally distinctly stratified in narrow zones; context purplish black, fibrous and with a black zone next to the substrate at least in the central parts of the basidiocarp.

Hyphal system dimitic; subicular generative hyphae with clamps, hyaline to pale yellow, thin-walled, 1-4 μm wide, often difficult to observe; subicular skeletal hyphae thick-walled to solid, strongly dextrinoid, pale to dark snuff brown, 3-10 μm wide; trama hyphae similar, skeletal hyphae 2-4.5 μm in diam.

Cystidia and other sterile hymenial elements absent.

Basidia clavate, 4 sterigmate and with a clamp at the base, 10-15 × 4-6 μm.

Basidiospores ellipsoid, smooth, hyaline, IKI-, 3-4.5 × 2-3 μm.

Type of rot. – Causes a brown rot in dead hardwoods, and also a
Meripilus

heartrot in living oaks; see Davidson et al. (1942).
Cultural characteristics. – See Davidson et al. 1942; Stalpers 1978.
Sexuality. – Unknown.
Substrata. – On hardwoods, especially oak and chestnut.
Distribution. Central and Eastern United States south to Florida.

Remarks. The resupinate, perennial, purplish black basidiocarp will normally be diagnostic for a field determination.

Meripilus Karst.
Basidiocarps annual, large, pileate and composed of numerous imbricate tongue- to fanshaped or spatulate pilei from a common short stipe or base; pileus brown with radial lines, smooth and mostly with concentric zones; pore surface white, darkening when touched or dried, pores entire and small; tubes white and short; context white and fibrous; hyphal system monomitic; generative hyphae thin- to thick-walled, smooth, hyaline and simple-septate; cystidia none, spores subglobose, thin-walled, smooth, hyaline and IKI-. Growing on deciduous wood, often from buried roots or close to stumps, causes a white rot. Cosmopolitan genus. One species in North America.
Type species: Meripilus giganteus (Fr.) Karst.

Remarks. This is a characteristic genus, easily recognized in the field by the large size and the numerous fanshaped to spatulate brownish pilei arising from a common base or short stipe. It seems to be related to Grifola and the septation of the generative hyphae is the basic character separating the two genera, both having large, compound fruitbodies.

Meripilus giganteus (Fr.) Karst.
Basidiocarps annual, large and pileate with numerous imbricate, fanshaped to spatulate pilei from a common base or stem, single pilei 5–20 cm wide and long with tapering base, up to 2 cm thick, the fruitbody as a whole up to 30 cm wide and long, fleshy when fresh, pilei hard and brittle when dry; pileus glabrous, smooth, ochraceous to brown when old, often somewhat concentrically zonate, when dry the thinner parts of the pileus often become radially wrinkled, margin thin, entire to lobed and wavy, often deflexed when dry; stipe almost absent or short and stout, ochraceous and smooth, distinctly fibrous; pore surface white to wood-coloured, darkening when touched in fresh condition, pores small and entire, 3–5 per mm; tubes up to 8 mm deep, concolorous with the pore surface; context whitish to cork-coloured, lighter than the tubes, distinctly fibrous and up to 1.5 cm thick near the bases of the individual pilei.

Hyphal system monomitic; generative hyphae with simple septa, in the trama more or less parallel, thinwalled and with numerous septa, 3–5 μm wide, these hyphae make the trama distinctly more brittle than the context, in the context and stipe generative hyphae unbranched or sparingly branched, strongly thick-walled to almost solid, with scattered to almost no septa, 6–14 μm wide, to an untrained observer.

Fig. 213. Meripilus giganteus (JL 201). a, branched tramal hyphae; b, contextual hyphae; c, cystidioles; d, basidia; e, basidiospores.
Meruliporia

these hyphae may resemble skeletal hyphae, they are arranged more or less parallel, but are mixed with more twisted and branched hyphae, some very thick-walled and swollen, others more thin-walled and of even diameter, transitions occurring between all these types of hyphae, diameter variable from 3–10 \( \mu \text{m} \), in swollen parts and around points of branching up to 15 \( \mu \text{m} \) wide.

Cystidia absent, fusoid cystidioles present, 18–40 \( \times \) 5–8 \( \mu \text{m} \), simple-septate at the base.

Basidia clavate, 4-sterigmate, 22–40 \( \times \) 7–8 \( \mu \text{m} \).

Basidiospores broadly ellipsoid to subglobose, hyaline, smooth and thin-walled, IKI-, 6–7 \( \times \) 4.5–6 \( \mu \text{m} \).

Type of rot. Causes a white rot in dead and living hardwoods.

Cultural characteristics. – See Stalpers 1978.

Sexuality. – Unknown.

Substrata. – On the ground close to hardwood stumps, also reported on Douglas fir (69, 148, 153).

Distribution. Eastern and Central United States, from New York to Louisiana; Weir (1914) reports \( M. \) giganteus from Idaho. Circumglobal in the Northern Hemisphere.

Remarks. The species is easy to recognize in the field because of the large multi-pileate basidiocarp. \( Grifola \) frondosa basidiocarps are more greyish on the pileus, and have larger pores and clamps on the generative hyphae.

Meruliporia Murr.,

Mycologia 34:596, 1942.

Basidiocarps annual, resupinate, associated with extensive mycelial mats and thick rhizomorphs; pore surface pale buff to grey when fresh, darkening to nearly black on drying, meruloid, the pores 2–3 per mm; subiculum thick, soft, pale tan; tube layer darkening on drying; hyphal system monomitic; clamp connections present; cystidia absent; basidia narrowly clavate, up to 60 \( \mu \text{m} \) long; basidiospores broadly ellipsoid, brown at maturity, dextrinoid in Melzer's reagent. Causing a brown rot of structural timbers. Monotypic genus restricted to North America.

Type species: \( Meruliporia \) incrassata (Berk. & Curt.) Murr.

Remarks. There is no doubt that \( M. \) incrassata belongs in the Coniophoraceae with its brown basidiocarps, the brown, thick-walled, large and dextrinoid spores and the destructive brown rot, all characters found in other genera of the family like \( Coniophora \) and \( Serpula \). In many aspects it can be looked upon as the poroid counterpart to \( Serpula \) lacrymans.

Meruliporia incrassata (Berk. & Curt.) Murr.


Basidiocarps annual, resupinate, becoming effused over a wide area, easily separable, soft when fresh; margin fertile or narrowly sterile, then whitish or buff; pore surface appearing meruloid, whitish to buff or ochraceous-grey when fresh, becoming greyish-brown to black on drying, the pores circular to angular or slightly sinuous, 2–3 per mm, with thick, entire dissepiments that appear cartilaginous on dried specimens; subiculum buff, azonate, soft-fibrous, up to 7 mm thick; tube layer drying dark brownish or blackish, distinct from the subiculum, drying hard and brittle, up to 6 mm thick; spore print rusty brown.

Hyphal system monomitic; subicular hyphae hyaline in KOH, thin-walled, collapsing on drying, often branched, with simple septa and clamps, 2.5–9 \( \mu \text{m} \) in diam; trama pale brownish in KOH, the
Microporellus

individual hyphae hyaline, with parallel arrangement, with simple septa and clamps, thin-walled, 3.5-4.5 μm in diam.

Cystidia and other sterile hymenial elements absent.

Basidia narrowly clavate, 4-sterigmate, 30-60 × 7-9 μm, with a basal clamp.

Basidiospores broadly ellipsoid, rather variable in size and shape, smooth, pale brown in KOH, dextrinoid in Melzer's reagent, 10-16 × 5-8 μm.

Type of rot. Brown cubical rot of coniferous and hardwood structural timbers.

Cultural characteristics. See Humphrey 1923; Baxter 1940; Davidson and Lombard 1953; Nobles 1958.

Sexuality. Unknown.

Substrata. Primarily on conifer structural timbers or stored lumber but also occasional on hardwood structural timbers (138, 148, 153, 171, 187).

Distribution. Widely distributed in North America, mainly in areas where high relative humidity often occurs. Apparently unknown outside of the Americas.

Remarks. Meruliporia incrassata is one of the most important causes of decay in houses and other wooden structures in the United States, particularly in the southern states (Verrall 1968). Extensive masses of mycelium develop in walls and under floors of houses infested with this fungus. These give rise to extensive systems of coarse rhizomorphs that are able to transport water from wet areas to structural wood far removed from the source of moisture. For some accounts of the damage caused by M. incrassata see Humphrey (1923).

Microporellus Murr.


Basidiocarps annual, centrally to laterally stipitate; pilei circular, single or confluent; upper surface tomentose to glabrous, gray to pale buff, concentrically zonate; pore surface pinkish buff to pale ochraceous, the pores small, 8-10 per mm; context white to ochraceous, azonate; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae present in trama, present or absent in context, dextrinoid or negative in Melzer's reagent, walls swelling or unchanged in KOH; ventricose cystidia absent or rare, basidiospores small, subglobose to tear-drop shaped, hyaline, thin-walled, IKI-. Causing white rot of dead hardwoods. Pantropical genus.

Type species: Microporellus dealbatus (Berk. & Curt.) Murr.

Remarks. Microporellus is most closely related to Polyporus in this flora. It is differentiated by its small, subglobose to tear-drop-shaped spores and the absence of binding hyphae of the Bovista-type. The strong dextrinoid reaction of tramal tissue in M. dealbatus is also distinctive. The cystidia of the latter are often difficult to observe.


Key to species

1. Basidiocarp centrally stipitate, on the ground; basidiospores tear-drop shaped; tramal skeletal hyphae dextrinoid; tramal skeletal hyphae with walls swelling in KOH ............. 1. M. dealbatus

1. Basidiocarp laterally stipitate, on dead wood, basidiospores subglobose to ellipsoid; tramal skeletal hyphae negative in Melzer's reagent; context monomitic ............. 2. M. obovatus


Basidiocarps annual, centrally, more rarely laterally stipitate, tough when fresh, hard when dry, pileus circular to reniform, 2-10 cm broad, often somewhat depressed in the center; upper surface velutinate to unevenly tomentose, becoming glabrous with age, often strongly zonate, isabelline, grey to pale brown with age; stipe 3-7 cm long, 3-10 mm in diameter, concolorous with the pileus surface; pore surface first white, then cream to ochraceous, often wrinkled when dry, pores minute, 8-10 per mm; tubes concolorous with pore surface, up to 3 mm long; context white and dense both in pileus and stipe, up to 2 mm thick in pileus.

Hyphal system dimitic; generative hyphae with clamps, 2-4 μm wide; skeletal hyphae straight, thick-walled and with a distinct lumen, 3-7 μm wide in the context, narrower in the trama, dextrinoid.

Cystidia rare, mostly in the dissepiments, ventricose with slightly thickened walls, apically encrusted, easy to overlook and difficult to find in some specimens.

Basidia clavate, 4 sterigmate and with a clamp at the base, 15-18 × 6-8 μm.

Basidiospores ellipsoid to dropshaped with a distinct apiculus, hyaline, thin-walled, IKI- or slightly dextrinoid, 4.5-6 × 3.5-4.5 μm.

Type of rot. Causes a white rot.

Cultural characteristics. See David and Rachjenberg 1985.

Sexuality. Tetrapolar.

Substrata. On the ground from buried roots of hardwood.
**Microporellus**

Distribution. The Gulf Coast and lower Atlantic coast of United States. Also known from Central and South America.

Remarks. The centrally stipitate basidiocarp with the minute pores, the dimitic hyphal system with dextrinoid skeletal hyphae, and the dropshaped spores are diagnostic characters. The cystidia are often difficult to find.

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**Fig. 215.** Microporellus dealbatus (CMA 5762). a, contextual generative hyphae; b, trama1 skeletal hyphae; c, contextual skeletal hyphae in Melzer’s reagent; d, contextual skeletal hyphae in KOH; e, basidia; f, basidiospores.

**Fig. 216.** Microporellus obovatus (MB 815). a, contextual generative hyphae; b, trama1 skeletal hyphae; c, basidia; d, basidiospores.


Basidiocarp annual, solitary or in small groups or clusters, usually laterally stipitate or with a tapering base, more rarely sessile to centrally stipitate, round, reniform, spathulate or flabelliform to trumpet-shaped, sometimes pendent, 1–7 cm wide and broad, usually paper-thin along the margin, up to 4 mm thick close to the stipe, rather brittle and hard when dry; pileus surface first finely tomentose to velvety striate, first white, then cream, ochraceous to strawcolored often with some slightly darker grayish to umber zones, often also somewhat radially striate, with age becoming glabrous, first zonewise and then totally ochraceous, fulvous to bay; stipe 0–7 cm long, 1–5 mm wide,
Navisporus

first finely velvety then glabrous, usually concolorous with the pileus, with age somewhat wrinkled or scuprose by warts and agglutinated tufts of hyphae, at the base expanded into a mycelial disc, consistency hard; pore surface white, cream to pale straw-colored, pores angular, thin-walled, 6–8 per mm; tubes up to 3 mm deep; context white, up to 2 mm thick.

Hyphal system dimitic; generative hyphae with clamps, context with only generative hyphae, these thin to distinctly thick-walled, the latter easily mistaken for skeletal hyphae, however, a search along the hyphae will reveal large clamps, these thick-walled hyphae with a distinct lumen, 2.5–4.5 μm in diameter; trama generative hyphae more thin-walled and more densely agglutinated, mixed with very thick-walled to solid skeletal hyphae, 3–6 μm wide.

Cystidia and other sterile hymenial elements absent.

Basidia clavate, 18–20 × 6–8 μm with 4 sterigmata and a clamp at the base.

Basidiospores ellipsoid, hyaline and thin-walled, IKI –, 3.5–5 × 2–4.5 μm.

Type of rot. Causes a white rot in dead hardwoods.

Cultural characteristics. Unknown.

Sexuality. Unknown.


Remarks. The flabelliform basidiocarp, normally narrowly zonate in ochraceous to gray colors, and the minute pores are good field-characters. Sessile specimens may be confused with Antrodia species.

Navisporus Ryv.


Fruitbody pileate, sessile, dimidiate to subtuspidate; pileus smooth to finely tomentose in shades of brown; pore surface white to pale cinnamon, pores small to medium; context wood-colored to pale cinnamon, thick to thin, punky to coriaceous; hyphal system dimitic, generative hyphae with clamps, skeletal hyphae thick-walled and dextrinoid; spores navicular to oblong fusiform, hyaline with slightly thickened walls, non-amylloid, and slightly dextrinoid to non-dextrinoid. On deciduous wood, causing a white rot. Tropical Africa and America. Type species: Navisporus floccosus (Bres.) Ryv.

Navisporus sulcatus (Lloyd) Ryv.


Basidiocarps annual, effused, reflexed to sessile and broadly attached; pileus up to 3 cm wide and long, up to 4 mm thick at the base, cinnamon brown in distinct sulcate zones, ochraceous at the margin in young specimens, finely velutinate to tomentose; pores horizontal to decurrent, wood-colored to pale ochraceous when young, pale cinnamon in old specimens, thin-walled, subangular, 2–3 per mm; tubes concolorous, up to 6 mm deep, trama slightly darker than the inside of the tubes; context distinctly duplex, the lower part pale cinnamon and dense, separated from the upper part by a thin, dense and black zone; most easily seen close to the base; even if the black zone is weakly
Nigrofomes

developed, the difference between the upper and lower layer is easily observed in section, upper layer softer and dark cinnamon, up to 2 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, 2-4 μm wide, skeletal hyphae thick-walled, 2-4 μm wide; in the trama, up to 6 μm wide in the context, yellow to pale golden brown, distinctly dextrinoid. Cystidia and other sterile elements absent.

**Basidia** clavate, 4-sterigmate, 15-22 × 5-6 μm, with a basal clamp.

**Basidiospores** oblong ellipsoid to fusoid or navicular, pale yellow when mature and with slightly thickened walls, IKI-, 8-11 × 5-6 μm.

**Type of rot.** Associated with a white rot of dead hardwoods.

**Cultural characteristics.** Unknown.

**Sexuality.** Unknown.

**Substrata.** On dead hardwoods.

**Distribution.** In United States known only from Florida. Otherwise recorded from Brazil.

**Remarks.** The fusiform to navicular spores, the cinnamon context and the dextrinoid skeletal hyphae make this a distinct genus in the Polyporaceae.

**Nigrofomes Murr.**


Basidiocarps perennial, pileate, applanate and very hard when dry; pileus glabrous, sulcate in concentric zones, dark violaceous black and with a distinct black cuticle; pore surface black to dark violaceous purplish, pores very small; tubes concolorous with pore surface; context dense, purplish-black; hyphal system dimitic, generative hyphae with simple septa, hyaline to dark brownish, densely agglutinated, cystidia ventricose, scattered to very rare, umber brown, spores broadly ellipsoidal, hyaline, non-amyloid; causes a white rot on deciduous wood.

**Monotypic tropical genus.**

**Type species:** *Nigrofomes melanoporus* (Mont.) Murr.

**Remarks.** The species is easy to recognize in the field because of the blackish to dark purplish fruitbodies with minute pores and a black cuticle on the pileus.

**Nigrofomes melanoporus** (Mont.) Murr.  


**Basidiocarp** perennial, pileate, applanate, sessile to slightly dimidiate, mostly semicircular, up to 20 cm wide and long and 5 cm thick, very hard; upper surface first finely velutinate and dark brown, then

**Fig. 218.** Nigrofomes melanoporus (LR). a, contextual generative hyphae; b, trama skeletal hyphae; c, contextual skeletal hyphae; d, honeycomb-like hymenium with collapsed basidia; e, surface view of honeycomb-like hymenium; f, basidia; g, basidiospores.

Glabrous and purplish black, often with sulcate zones, becoming tuberculate and slightly cracked by age and then with a distinct dense and thick cuticle; margin thin and sharp, commonly bent in dry specimens; pore surface dark brown becoming purplish black by drying, pores small and isodiametric, 6-9 per mm, almost invisible to the naked eye; tubes concolorous, often stratified and up to 4 cm deep; context dark chestnut to purplish black, often shiny, hard and intergrading with the cuticle. 

**Hyphal system** probably dimitic; generative hyphae thin- to very thick-walled and with simple septa, hyaline to slightly tinted, 1-5 μm wide; thick-walled hyphae present, apparently without septa or with very few and they may easily be interpreted as skeletal hyphae or as very rarely septate generative hyphae, 2-5 μm wide, pale olivaceous brown in KOH.
Cystidia present, but rare, often several sections have to be made before they can be observed, ventricose, thick-walled, acute and dark fuscous brown, similar in form to those seen in many species of Hy- menochaetaceae, but distinctly more olivaceous brown, 10–30 × 5–12 μm.

Basidia clavate, 12–15 × 4–5 μm, often very difficult to observe, 4-sterigmate, with a simple septum at the base.

Basidiospores broadly ellipsoid, hyaline, IKI-, 4–5 × 3–3.5 μm.

Type of rot. Associated with a white rot.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. Dead deciduous wood.

Distribution. In United States only known from Florida (Murrill 1908:112), widespread in the tropics.

Remarks. The species is easy to recognize because of the very hard purplish black pileate basidiocarp. *Nigroporus vinosus* has a similar, but more violaceous color, has smaller basidiocarps and is microscopically different having cylindric spores and clamps at the septa.

*Nigroporus* Murr.


Basidiocarps annual to perennial, pileate to resupinate; pileus when present scrupose to glabrous, azonate to concentrically zonate, grayish-blue, vinaceous-brown to pink or violet; pore surface of same colors as pileus, pores usually small, entire, round to angular; context vinaceous-brown to pink and purplish; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae fuliginous brown, thick-walled to solid; cystidia none; spores mostly small, longest dimension usually less than 5 μm, hyaline, smooth and thin-walled, allantoid to broadly ellipsoid, non-amyloid; on deciduous wood, causing a white rot. Pantropical genus, one species in North America.

Type species: *Nigroporus vinosus* (Berk.) Murr.

Remarks. The dimitic hyphal system with the fuliginous skeletal hyphae which give the fruitbodies the pinkish, violet to dark bluish-grey colors, is the diagnostic characteristic.

*Nigroporus vinosus* (Berk.) Murr.


Basidiocarp annual, pileate, broadly attached to dimidiate, semi-circular to elongated along the substratum, up to 5 cm wide, 2–10 cm long in reflexed specimens, up to 8 mm thick, rigid and brittle when dry, coriaceous when fresh; upper surface first feltly to velutinate, pale violaceous to vinaceous brown, becoming glabrous and purplish brown to dark violet, azonate or with distinct narrow sulcate zones, margin sharp; pore surface purplish brown to dark violet, pores 7–8 per mm; tubes concolorous, up to 3 mm deep; context umber to vinaceous brown, often paler with age, up to 5 mm thick at the base.

Hyphal system dimitic; generative hyphae with clamps, 2–4 μm in diam; skeletal hyphae thick-walled to solid, fuliginous to pale pinkish brown (in KOH), 2–6 μm in diam, straight and unbranched or with rare dichotomous branching.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 6–10 × 3–4 μm with a basal clamp.

Basidiospores allantoid to cylindrical, hyaline, IKI-, 3.5–4.5 × 1–1.5 μm.

Type of rot. Associated with a white rot.

Cultural characteristics. See Westhuizen 1971; Stalpers 1978.

Sexuality. Unknown.


Distribution. Southeastern United States to east Texas, widespread in the tropics.
Oligoporus

Remarks. The small purplish to violet basidiocarps make the species distinctive in the field. The dimitic hyphal system, the colored skeletal hyphae and the allantoid to cylindrical spores separate it from *Nigrofomes* (see this genus for further remarks).

Oligoporus Bref.
Basidiocarps annual, resupinate to pileate, fleshy when fresh, brittle to hard when dry, mostly white to lightcolored, sometimes becoming darker by drying; hyphal system monomitic, generative hyphae with clamps, thin- to thick-walled; cystidia mostly absent, present in a few species; basidia 4-sterigmate and with a basal clamp; spores thin-walled, smooth, hyaline, allantoid to ellipsoid, IKI-, chlamydospores absent or present; causes a brown rot, mostly in gymnosperms, more rarely in angiosperms.

Type species: *Oligoporus farinosus* Bref., a synonym of *Oligoporus rennyii* (Berk. & Br.) Kotl.

Remarks. Previously most of the species included in the genus were put in *Tyromyces*. However, the type species of *Tyromyces* causes a white rot and the genus is restricted to species causing this type of rot. *Oligoporus* is the oldest generic name for the species causing a brown rot and having a monomitic hyphal system with clamped generative hyphae. *Postia* Fr. 1856 is according to our judgement clearly a nomen nudum as Fries himself gave no indication that he intended to publish a new genus and used the name only incidentally in the middle of a sentence. When Karsten (1881) took up *Postia*, it was illegitimate because of *Postia* Boiss & Blanch. (Saxifragaceae) (1875).

The type species *Oligoporus farinosus*, which is restricted to Europe, often produces chlamydospores along the margin of the basidiocarp. We feel that this character alone does not justify a generic splitting. Thus, both non-chlamydospore- and chlamydospore-producing species are included as we also have done in other genera like *Ganoderma* and *Inonotus*.

Key to species

1. Basidiocarp pileate ........................................... 2
2. Basidiocarp resupinate ........................................ 16
3. Basidiocarp pendent ........................................... 3
4. Basidiocarp sessile to effused-reflexed, conspicuous on surface of substratum, exceeding 1 cm in width .......................... 4

3. Pores 2–4 per mm ........................................... 13. *O. minusculus*
3. Pores 4–6 per mm ........................................... 21. *O. subpendulus*
4. Pileus and pore surface with bluish to grayish tints; spores allantoid and slightly amyloid ................................ 4. *O. caesius*
4. Pileus and pore surface white, buff to unevenly brown; spores not amyloid ........................................... 5
5. Context 1–3 cm thick, duplex, upper part soft and cottony .... 9. *O. leucospongia*
5. Context rarely more than 1 cm thick, firm, more or less homogeneous ....................................... 6
6. Basidiocarps white when fresh, becoming brownish when bruised or dried ........................................... 6. *O. fragilis*
6. Basidiocarp white, buff to yellowish, not changing color when bruised or dried ........................................... 7
7. Basidiocarps ungulate, up to 8 cm thick at the base; pileus tan to brown, tomentose to hispid; on *Libocedrus* .................. 1. *O. amarus*
7. Basidiocarp sessile to effused-reflexed, planate; upper surface white, yellowish, buff to pale unevenly brown ............. 8
8. Cystidia present in the hymenium .................................. 9
8. Cystidia absent in the hymenium ................................ 10
9. Yellow gloeocystidia present ................................ 9. *O. leucomallesius*
9. Clavate, smooth to apically encrusted and hyaline cystidia present ........................................... 3. *O. balsameus*
10. Spores allantoid, 4–6 × 1.5 μm ........................................ 11
10. Spores cylindric-ellipsoid, 1.5–2.5 μm wide ................. 14
11. Pores 1–3 per mm; margin undulating ..................... 23. *O. undosus*
11. Pores 3–7 per mm; margin flat and even .................. 12
12. Pileus cream to mouse grey, mostly strigose .................. 22. *O. tephroleucus*
12. Pileus white to cream, drying ochraceous, glabrous to adpressed tomentose ........................................... 13
13. Pores 5–7 per mm; pileus and pore surface white .......... 15. *O. perdelicatus*
13. Pores 3–4 per mm; pileus white to cream; pore surface often drying a reddish-pale brown ................ 11. *O. lowel*
14. Spores 5–6.5 μm long; basidiocarp bony hard when dry ........................................................................... 13. *O. obductus*
14. Spores 3.5–5 μm long; basidiocarp fragile to hard and brittle when dry ........................................... 15
15. Pileus scrobiculate to warted; taste very bitter ............ 20. *O. stipticus*
15. Pileus smooth to pelliculose; taste slightly bitter ......... 16
Symbols for species of *Oligoporus* and *Ceriporiopsis* in synoptic key.

**Oligoporus:**

8. *O. hibernicus*  16. *O. placentus*

**Ceriporiopsis:**

C1, *C. aneirina*  C4, *C. mucida*  C7, *C. subrufa*
C2, *C. carnegia*  C5, *C. pannocincta*  C8, *C. subvermispora*
C3, *C. gilvescens*  C6, *C. rivulosa*

**Synoptic key to species of *Oligoporus* and *Ceriporiopsis* (C)**

**Habit of basidiocarp**

a. resupinate 2, 8, 12, 16, 17, 18, 19, 22, C1-C8
b. sessile 1, 3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 20, 22
c. effused-reflexed 3, 4, 6, 9, 11, 15, 20, 22, 23
d. substipitate 5, 7, 14

**Pileus characters**

a. applanate
b. ungulate 1
b. tan to pale brown 1, 2, 3, 16, 22,
c. fibrous to corky 4, 5, 6, 7, 8
b. buff to brown 1, 2, 7,
d. bruising reddish brown 6

g. in rosettes 5
h. in imbricate clusters 3, 6, 7
i. circular to flabelliform 5, 7, 14

**Pileus surface**

a. white to cream colored 5, 6, 9, 10, 15, 20, 21, 23
d. white to cream colored 5, 6, 9, 10, 15, 20, 21, 23
e. buff to brown 1, 2, 7
f. bluish to gray 4, 14, 22
g. discoloring or bruising reddish brown 6

**Pore surface**

a. white to cream colored 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, C1, C2, C4, C6, C8
b. buff to tan, yellowish, or pink 1, 2, 3, 16, 22, C1-C7
c. bluish 4
d. bruising reddish brown 6

e. pores 1-4 per mm 1, 2, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 22, 23, C1, C2, C4, C6-C8
f. pores 5-8 per mm 3, 4, 6, 7, 15, 19, 20, 21, C3-C5

**Context or subiculum**

a. white to cream colored 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, C1, C2, C4, C7
b. tan to pale brown 1, 3, C3, C6, C7
c. fibrous to corky 4, 5, 6, 7, 8, 10, 15, 16, 18, 21, 22, 23, C1, C2, C4, C7
d. chalky and brittle or fissile 2, 20, C3, C6
e. hard and bony when dry 1, 14
Oligoporus

f. with dense resinous layers or zones C5, C8

g. less than 1 cm thick 2, 3, 4, 5, 8, 9, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 23, C1-C8

h. more than 1 cm thick 1, 6, 7, 10, 14, 22

Cystidia

a. absent 1, 2, 4, 6, 9, 10, 11, 12, 14, 15, 16, 17, 18, 20, 21, 23, C1-C4

b. present 3, 8, 19, C5

c. incrusted 8, 19

d. gloeocystidia present 9

e. fusoid cystidioles present 7, 13, 22, C6

Hyphal characters

a. thin-walled 1, 8, 9, 13, C1, C2, C4, C6-C8

b. thin- to thick-walled 2, 3, 4, 5, 6, 7, 10, 12, 14, 15, 16, 18, 19, 20, 21, 22, 23, C3, C5

c. gloeoplerous hyphae present 1, 4, 7, 16

Basidiospores

a. allantoid 4, 6, 8, 9, 10, 11, 15, 22, 23, C5, C8

b. cylindric 6, 12, 13, 14, 15, 16, 17, 22, C3

c. oblong to ellipsoid 1, 2, 3, 5, 7, 18, 19, 20, 21, C1, C2, C4, C6, C7

d. up to 5 μm long 3, 5, 6, 7, 11, 15, 18, 19, 20, 21, C2-C5, C7, C8

e. over 5 μm long 1, 2, 4, 8, 9, 10, 12, 13, 14, 16, 17, 22, 23, C1, C6

Substratum

a. heartwood of living trees 1, 3, 18, 19, C2, C6

b. dead trees, stumps, logs, slash 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, C1-C8

c. on conifers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, C4, C5-C6, C8

d. on hardwoods 4, 5, 7, 17, 19, 20, 21, 22, C1-C5, C7, C8

Geographical distribution in North America

a. known from eastern part only 11, 17, 21, C7

b. known from western part only 1, 2, 10, 15, 18, C2

c. occurring in both eastern and western parts 3, 4, 5, 6, 7, 9, 12, 13, 14, 16, 19, 20, 22, 23, C1, C3-C6, C8

d. boreal or at high elevations 3, 7, 8, 9, 10, 12, 14, 15, 16, 20, 22, C1, C5

e. wide latitudinal range 4, 6, 17, 19, 21, C1, C4, C6, C8

Fig. 220. Oligoporus amarus (H.H. Bynum). a, gloeoplerous hypha; b, contextual generative hyphae; c, basidia; d, basidiospores.


Basidiocarps sessile, solitary, ungulate, up to 18 × 13 × 25 cm; upper surface tan to dark brown, tomentose to short hispid, azonate, smooth, rugose on drying; margin concolorous; pore surface tan to brown on drying, the pores circular to angular, 1-3 per mm, with thin dissepsiments that become lacerate with age; context tan, azonate, becoming extremely hard on drying, up to 11 cm thick; tube layer concolorous with the context or slightly darker, brittle when dry, up to 2 cm thick; taste mild.

Hyphal system monomitic; contextual generative hyphae hyaline, thin-to-thick-walled, rarely branched, with clamps, 2.5–9 μm in diam; trama1 hyphae mostly thin-walled, with abundant clamps, 2.5–4 μm in diam, gloeoplerous hyphae also present.

Cystidia or other sterile hymenial elements absent.
Oligoporus

Basidia clavate, 4-sterigmate, 31–60 × 7–9 μm, with a basal clamp.

Basidiospores ellipsoid, hyaline, smooth, IKI-, 6–8.5 × 3.5–4.5 μm.

Type of rot. Brown cubical pocket rot of heartwood of living incense cedar. This is the most important cause of volume loss in that host.

Cultural characteristics. See Stalpers 1978.

Sexuality. Unknown.

Substrata. Specific to Libocedrus decurrens. Overholts (1953) reported O. amarus on Abies in Idaho but no validating specimen has been found and this report must be substantiated before it can be accepted as it is the only one of O. amarus on a host other than incense cedar outside of California and Oregon.

Distribution. Known only in the range of Libocedrus in California and Oregon.

Remarks Basidiocarps of O. amarus deteriorate rapidly in the field and are usually quite high on the trunk of older trees. Consequently, they are not often collected.


Basidiocarps annual, resupinate, effused up to 20 cm, soft and rather fragile when fresh, becoming hard and brittle on drying; pore surface cream colored to pale buff, the pores highly variable, some over 1 mm in diam and others up to 4 per mm, angular, the dissepiments thin and becoming deeply lacerate in some areas; subiculum less than 1 mm thick, white to cream colored, chalky and brittle; tube layer concolorous or becoming pale buff, up to 6 mm thick; the tubes brittle and shattering into small fragments when sectioned.

Hyphal system appearing dimitic, trama generative hyphae thin-walled, some with frequent branching, with clamps, 3–6 μm in diam; thick-walled hyphae prominent in trama tissue, firm-walled to almost solid, often contorted and lobed or branched, hyaline, mostly 3–6 μm in diam but with some inflated portions up to 10 μm in diam; in lower subiculum and in mycelial felts in decayed wood the thick-walled hyphae more uniform, most with rare branching, 2–4 μm in diam.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 25–40 × 7–10 μm, with a basal clamp.

Basidiospores broadly ellipsoid, hyaline, smooth, IKI-, 5.5–7 × 4–5 μm.

Type of rot. Brown cubical rot of dead wood of Douglas fir. Thin, cream colored mycelial felts develop in the shrinkage cracks in the decayed wood.

Fig. 221. Oligoporus anguloporus (type). a, thin-walled generative hyphae; b, contorted and swollen thick-walled subicular hyphae; c, uniform thick-walled hyphae; d, basidia; e, basidiospores.

Cultural characteristics. See Larsen and Lombard 1983.

Sexuality. Heterothallic and bipolar (Larsen & Lombard, 1983).

Substrata. Known only on dead, fallen Douglas fir (Pseudotsuga menziesii).

Distribution. Known only from the Pacific Northwest in Oregon and British Columbia.

Remarks - Oligoporus anguloporus has a macro and micromorphology rather similar to that of Antrodia vaillanti, also known to cause a brown rot in Douglas fir. It differs mainly in the distinctive contorted thick-walled hyphae in the trama and in its lack of rhizomorphs.
3. Oligoporus balsameus (Pk.) Gilbn. & Ryv.

Fig. 222


Basidiocarps sessile to effused-reflexed; pilei solitary or imbricate, dimidiate or laterally fused and elongated, up to 1 × 5 × 0.5 cm; upper surface whitish when fresh, usually becoming pale brownish on drying, faintly zonate, finely radially fibrillose, smooth or shallowly sulcate; margin concolorous, reflexed or undulate; pore surface whitish when fresh, usually becoming cream colored to pale buff on drying, the pores angular, 5–6 per mm, with thin dissepiments, these becoming lacerate; context white to buff, azonate, up to 3 mm thick; tube layer concolorous with the context or becoming darker, up to 5 mm thick; taste slightly resinous, odor pleasant, nut-like.

Hyphal system monomitic; contextual hyphae hyaline in KOH, thin-to-thick-walled, with clamps, some with frequent branching, 2–3 μm in diam, others with infrequent branching, rather long, nonseptate, thick-walled fragments frequently present, 3–7 μm in diam.

Cystidia numerous to rare, fusiform, imbedded or rarely projecting, non-incrusted to apically incrusted, 11–22 × 5–7 μm, with a basal clamp.

Basidia clavate, 4-sterigmate, 15–20 × 4–4.5 μm, with a basal clamp.

Basidiospores oblong to short cylindric, hyaline, smooth, IKI-, 3.5–4.5 μm × 2.5–3 μm.

Type of rot. – Brown cubical butt or trunk rot of living conifers and also on dead conifer wood.

Cultural characteristics. – See Fritz 1923; Hubert 1929; Bailey 1941; Davidson and Campbell 1943; Nobles 1948, 1958, 1965; Baxter 1949; Stalpers 1978.

Sexuality. – Heterothallic and tetrapolar (David, 1980).

Substrata. – Living conifers including Arizona cypress and Monterey cypress (see Bailey 1941, as *P. basilaris*), and balsam fir; rarely on hardwoods but reported by Davidson and Campbell (1943) as causing a heartrot in living black cherry. (1, 3, 97, 138, 147, 148, 190, 194).

Distribution. – Transcontinental in the northern conifer forests of North America and at high elevations in the southern Rocky Mountains and the Appalachians. Also in Europe.

Remarks. Homokaryons of *P. basilaris* from Monterey cypress in California were found to be compatible with homokaryons of *O. balsameus* from Arizona (F.F. Lombard, personal communication). A psychogastic stage with masses of brownish chlamydosporas often develops in cultures of *O. balsameus*.

4. Oligoporus caesius (Schrad.: Fr.) Gilbn. & Ryv.,

Fig. 223


Basidiocarps annual, sessile to effused-reflexed, usually solitary, dimidiate to narrow, up to 5 × 6 × 1.5 cm; upper surface whitish, often with a tint of blue, sometimes bruising intensely blue, finely tomentose to strigose, sometimes glabrous; pore surface white to bluish, dull, the pores angular, 3–6 per mm, with thin dissepiments, these becoming lacerate; context up to 1 cm thick, white to bluish, soft; tube layer white, soft, fragile when dry, up to 6 mm thick.

Hyphal system monomitic; contextual hyphae thin- to thick-walled, hyaline, often branched, with abundant clamps, 2.5–7 μm in diam; gloeoplerous hyphae also present, staining brightly in phloxine.

Cystidia and other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 16–25 × 4.5–7 μm, with a basal clamp.

Basidiospores cylindric to allantoid, hyaline, smooth, IKI-, or very weakly amyloid in masses, 5.5–7.5 × 1–2 μm; spore print bluish.

Type of rot. – Brown rot of conifer and hardwood logs and slash.


Sexuality. – Heterothallic and tetrapolar (David 1974).
Oligoporus

Substrata. — Dead conifers and hardwoods, more common in coniferous forest regions (1, 3, 8, 20, 26, 69, 97, 102, 105, 112, 130, 136, 138, 143, 145, 148, 153, 156, 165, 166, 190, 194, 195).


Remarks. — Oligoporus caesius can be recognized in the field by the bluish tints on the pileus and pore surfaces. O. perdelicatus is similar but its basidiocarps are white, lacking the bluish tints.


Basidiocarps laterally substipitate to sessile or effused-reflexed; pilei usually imbricate, dimidiate or tapering to a narrow base, petal-like, often laterally fused or in a rosette, up to 2 × 3 × 0.4 cm; upper surface white when fresh, drying straw-colored, azonate, glabrous; margin concolorous; pore surface white, drying yellowish, the pores angular, 6–8 per mm, with thick, entire dissepiments that become lacerate with age; context white, drying to ivory, azonate, firm-corky, up to 2 mm thick; tube layer white, becoming yellowish, very brittle when dry, up to 2 mm thick; taste bitter.

Hyphal system monomitic; contextual hyphae hyaline in KOH, thin- to thick-walled, occasionally branched, with clamps, 2.5–5.5 μm in diam; tramal hyphae similar, up to 3 μm in diam.

Cystidia or other sterile hymenial elements absent, hyphal pegs rare.

Basidia clavate, 4-sterigmate, 11–12 × 4–5 μm, with a basal clamp.

Basidiospores oblong to short-cylindric, often slightly curved, hyaline, smooth, negative in Melzer’s reagent, 3.5–4.5 × 2–2.5 μm.

Type of rot. — Brown cubical rot of dead hardwoods and conifers.

Cultural characteristics. — Unknown.

Sexuality. — Unknown.

Substrata. — Dead hardwoods and conifers (1, 3, 97, 138, 145, 165, 190, 194).

Distribution. — Eastern and western U.S. and southern Canada in conifer and hardwood forest regions. Also in Europe.

Remarks. — Basidiocarps of this species resemble those of Antrodiella semisupina, which differ in their dimitic hyphal system, mild taste, and slightly smaller spores.


Basidiocarps annual, sessile or effused-reflexed; pilei solitary, dimidiate or elongated, up to 4 × 6 × 1 cm; upper surface whitish to buff, turning reddish-brown on bruising or drying, tomentose to glabrous, azonate, not sulcate; margin concolorous; pore surface whitish to buff, becoming...
Oligoporus

Fig. 225. Oligoporus fragilis (RLG 7219). a, contextual hyphae; b, basidia; c, basidiospores.

reddish-brown on bruising or drying, the pores circular to angular, 5–6 per mm, with thin, entire dissepiments that become thin and lacerate with age; context white, drying brownish, fibrous, azonate, up to 1.5 cm thick; tube layer darker than the context, up to 4 mm thick.

**Hyphal system** monomitic; contextual hyphae hyaline in KOH, thin- or thick-walled, occasionally branched, with clamps, 3–7 μm in diam; trama hyphae hyaline, thin- or thick-walled, often branched, with clamps, 2.5–4 μm in diam.

Cystidia or other sterile hymenial elements lacking.

**Basidia** clavate, 4-sterigmate, 13–20 × 4.5–5.5 μm.

**Basidiospores** cylindrical, mostly curved, hyaline, smooth, IKI–, 4–5 × 1–1.5 μm.

**Type of rot.** Brown cubical rot of dead conifer logs and slash. The fruiting bodies and rot, however, give an instantaneous and strong positive oxidase reaction with gum guaiac.

**Cultural characteristics.** See Nobles 1948, 1958, 1965; Cartwright and Findlay 1958; Bakshi et al. 1969; Stalpers 1978.

**Sexuality.** Unknown.

**Substrata.** Dead conifers, rarely on *Populus* (1, 38, 97, 102, 136, 138, 145, 148, 188, 190, 194).

**Distribution.** Throughout the coniferous forests of North America except for the southern pine region where it is absent or extremely rare. Circumglobal species in boreal coniferous forests.

**Remarks.** Basidiocarps of *Oligoporus fragilis* look a lot like those of *Parmastomyces transmutans* and both show the reddish brown discoloration on bruising or drying and the strong positive reaction with gum guaiac. Microscopically however, *P. transmutans* is readily identified by its short-cylindric, dextrinoid spores. *Amylocystis lapponica* basidiocarps resemble robust specimens of *O. fragilis* and also show the reddish-brown color change on bruising. The capitately incrusted amyloid cystidia of *A. lapponica* make it distinctive microscopically.


**Basidiocarps** annual, sessile, effused-reflexed or laterally substipitate; pilei solitary or imbricate, dimidiate to flabelliform, applicate, up to 9 × 10 × 2 cm; upper surface white when fresh, drying buff or pale brown, azonate or faintly zonate, glabrous, smooth, pelliculate, often with small, shallow, circular depressions 1–3 mm in diam; margin concolorous; pore surface white to cream colored, drying pale buff, the pores circular to angular, 4–6 per mm, with thin dissepiments that become lacerate with age; context white to cream colored, azonate, firm-fibrous, up to 1.5 cm thick; tube layer with a pale greenish tint in fresh specimens, drying cream colored, continous and concolorous with the context, up to 5 mm thick; taste bitter.

**Hyphal system** monomitic; contextual hyphae with clamps, some ex-
Oligoporus
tremely thick-walled with a narrow, capillary lumen, not staining in phloxine, occasionally nodose-septate, commonly branching opposite the clamp, 4–8 (–12) μm in diam; some with thin to partially thickened walls, with abundant clamps and occasional branching, not staining in phloxine, 3–6 μm in diam; gloeoplerous hyphae also present, staining bright red in phloxine, thin-walled, with occasional distorted clamps, sinuous and with constrictions and swellings, 5–10 (–14) μm in diam; trama hyphae mostly of the thin-walled, non-staining type.
Cystidia absent; cystidiolles fusoid, not projecting beyond basidia, 13–18 × 4–5 μm, with a basal clamp.
Basidia clavate, 4-sterigmate, 15–20 × 5–6 μm, with a basal clamp. Basidiospores short-cylindric to oblong, hyaline, smooth, IKI–, 4–5 × 2–2.5 μm.
Type of rot. – Brown cubical rot of dead conifers and hardwoods, also a brown butt rot of living Picea.
Sexuality. – Unknown.
Substrata. – Primarily on dead conifer wood, but also on hardwoods (1, 3, 69, 105, 136, 138, 145, 148, 153, 154, 190, 191, 194).
Distribution. In western coniferous forests from Arizona to Alaska and forest regions of eastern North America to the southern Appalachians. Also in Europe.
Remarks. The circular depressions on the pilear surface, the thin, occasionally substipitate basidiocarps, and the bitter taste are good field characteristics for O. guttulatus. Conidia develop in abundance in cultures of O. guttulatus, and Davidson et al. (1946) suggested that Ptychogaster rubescens may be the imperfect stage. However, Stalpers (1978) states that P. rubescens is the imperfect stage of Punctularia atropurpurascens (Berk. & Br.) Petch.
8. Oligoporus hibernicus (Berk. & Br.) Gilbn. & Ryv. Fig. 227
Basidiocarps annual, resupinate, separable, in age often with a loosened margin, widely effused to small, often elongated along the woodgrain, up to 1.5 mm thick, soft when fresh, fragile to slightly tough when dry, bitter in taste; pore surface white to cream on drying; margin wide to narrow, white and finely pubescent, pores round to angular, variable in size, in parts 3–4 per mm, but also some larger and 2–3 per mm, a
few even about 1 mm wide; tubes concolorous with tube surface, up to 3 mm deep; context white and very thin. Hyphal system monomitic; generative hyphae hyaline, thin-walled, with numerous clamps, 2–4(5) μm wide.
Cystidia variably present in the hymenium, clavate to hyphoid, embedded or projecting, smooth or with a small apical crown of crystals, 10–25 × 3–5 μm, in some specimens apparently absent or very difficult to observe (not seen by Romell f. example in the lectotype of P. subsericeomollis or at least not mentioned in either the description or on any of the labels), in other specimens more abundantly present, most easily observed in Melzer’s reagent in very thin sections which should be mounted without tapping as the apical crown falls off very easily, in KOH the crystals dissolve rapidly.
Basidia clavate, 4-sterigmate, 10–15 × 4–5 μm, with a basal clamp. Basidiospores allantoid, smooth, thin-walled, hyaline, IKI–, 4–6(7) × 1–1.5 μm.
Type of rot. – Causes a brown rot in gymnosperms.
Cultural characteristics. Unknown.
Sexuality. – Unknown.
Substrata. – On dead gymnosperms, reported on Abies and Picea.
Distribution. Widespread, but not common, in the boreal conifer zone. In North America known from Arizona (Gilbertson & Lowe, 1962) and Idaho.
Remarks. The hyphoid cystidia and the allantoid spores are diagnostic. The former are sometimes difficult to observe.

Fig. 228


Basidiocarps annual, pileate, effused-reflexed to rarely resupinate, mostly with a narrow, elongated pileus along the upper edge of a decurrent tubelayer, up to 1 cm wide and 5 cm long, individual pilei may fuse laterally to form a wavy, lobed or partly imbricate basidiocarp, up to 1 cm thick at the base measured vertically, soft when fresh, tough to brittle when dry; upper surface white to cream, often discolored by drying to straw-colored or dirty brownish, often somewhat unevenly and in radial lines, first finely velutinate to finely fibrillose, in age becoming finely scrupose to smooth, mostly azonate to weakly zonate; pore surface white to dark cream, pores thin-walled and angular, mostly 3-4 per mm, in parts somewhat larger when dry and in oblique parts of the pore surface partly split, sinuous to irregular, tubes concolorous with pore surface, up to 10 mm deep; context white, 1-2 mm thick.

Hyphal system monomitic; generative hyphae with clamps, hyaline and 2-4.5 μm wide, those of the subhymenium more narrow than those of the context, thin-walled to slightly thick-walled and with conspicuous clamps.

Gloeocystidia present in the hymenium, rare to abundant, apparently in some cases lacking completely (see remarks below), hyaline and thin-walled, cylindrical to clavate and obtuse, 10-35 × 4-8 μm, mostly embedded, rarely projecting, arising in the subhymenium.

Basidia clavate, 4-sterigmate, 12-18 × 4-6.4 μm, with a basal clamp.

Gloeocystidia present in the hymenium, rare to abundant, apparently in some cases lacking completely (see remarks below), hyaline and thin-walled, cylindrical to clavate and obtuse, 10-35 × 4-8 μm, mostly embedded, rarely projecting, arising in the subhymenium.

Basidiospores allantoid, smooth, thin-walled, hyaline, IKI-, 4.5-6 × 1-1.7 μm.

Type of rot. - Causes a brown rot in gymnosperms.

Cultural characteristics. Unknown.

Sexuality. Unknown.

Substrate. On dead gymnosperms, including Larix, Picea and Pinus.

Distribution. Widespread in the boreal conifer zone, in North America widely distributed in eastern and western boreal conifer forests but not often collected.

Remarks. The gloeocystidia are diagnostic, showing up as light yellow bodies in microscopic preparations. O. fragilis is similar, but becomes far more brown when touched or dried and lacks cystidia.

10. Oligoporus leucospongia (Cke. & Harkn.) Gilbn. & Ryv.

Fig. 229


Basidiocarps annual, effused-reflexed or sessile; pilei solitary, dimidiate to elongated, up to 3 x 7 x 3.5 cm; upper surface white, azonate, smooth or rugose, tomentose to papery, soft; margin concolorous, growing down and partially enclosing pore surface, rounded, sterile below;
Oligoporus

pore surface white to pale buff, rough, the pores circular to angular, 2-4 per mm; dissepiments at first thick, becoming thin and deeply lacerate; context white, azonate, duplex, soft and cottony above, firmer near the tubes, up to 2 cm thick; tube layer hard and brittle, pale buff, up to 5 mm thick; taste mild.

Hyphal system monomitic; contextual hyphae with abundant clamps, rarely with double clamps, thin-to-thick-walled, with frequent branching, 3-7 \( \mu \text{m} \) in diam, some contorted, with short, nodular branches or swellings and appearing twisted; trama hyphae similar to the non-contorted type.

Cystidia or other sterile hymenial elements lacking; hyphal pegs present.

Basidia clavate, 4-sterigmate, 16-23 \( \times \) 4-5 \( \mu \text{m} \), with a basal clamp.

Basidiospores allantoid, hyaline, smooth, negative in Melzer's reagent, 4.5-6 \( \times \) 1-1.5 \( \mu \text{m} \).

Type of rot. - Causes a brown rot in gymnosperms.

Cultural characteristics and sexuality. - Unknown.

Substrata. - Known only from gymnosperms.

Distribution. In North America known only from the Northeastern U.S., also in Europe (Domanski et al. 1967).

Remarks. Lowe (1975) interprets the much-branched hyphae in the context of O. lowei as binding hyphae and considers it dimitic.

11. Oligoporus lowei (Pil.) Gilbn. & Ryv.

Fig. 230. Oligoporus lowei (PR 487991, type). a, thin-walled contextual hyphae; b, firm-walled contextual hyphae; c, gloeocystidia; d, basidia; e, basidiospores. 

drying pale reddish brown, pores angular, especially after drying, then often partly split in restricted areas, 3-4 per mm; tubes white, up to 4 mm deep, very thin with a denser darker zone just above the tubes; context white, fleshy, becoming friable and fragile.

Hyphal system monomitic; generative hyphae with clamps, 2-4 \( \mu \text{m} \) wide, thinwalled, partly swelling in KOH to 6 \( \mu \text{m} \), in the upper context (i.e. above the darker zone) more distinctly thick-walled.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 15-20 \( \times \) 5-7 \( \mu \text{m} \), with a basal clamp.

Basidiospores allantoid to cylindrical, hyaline, IKI-, 4-5.5 \( \times \) 1.5 \( \mu \text{m} \).

Type of rot. - Causes a brown rot in gymnosperms.

Cultural characteristics and sexuality. - Unknown.

Substrata. - Known only from gymnosperms.

Distribution. Throughout the western mountains from Arizona to Alaska. Also known from the Himalayas (Bakshi et al., 1958).

Remarks. This is one of the complex of “snow bank fungi” in the western mountains. Basidiocarps of O. leucospongia develop under snow and deteriorate rapidly with the onset of snow melt and higher temperatures. The basidiocarp morphology of O. leucospongia is very similar to that of O. fragilis, and the two are not distinguishable in culture (Stalpers 1978). In the field O. leucospongia is identified by the soft cottony pileus that partially overgrows the pore surface. However, confusing intermediates between O. fragilis and O. leucospongia occur over elevational gradients in the Rocky Mountains.

12. Oligoporus mappus (Overh. & Lowe) Gilbn. & Ryv., Fig. 231


Basidiocarps annual, resupinate, effused up to 10 cm, often extremely thin with practically no context, readily separable, soft when dry; margin white to cream colored, fertile or sterile, soft, fimbriate, up to 1 mm wide; pore surface white to pale buff, the pores circular to angular, 3-4
476

Oligoporus

Fig. 231. Oligoporus mappus (RLG 5406). a, subicular hyphae; b, basidia; c, basidiospores.

per mm, with thick, finely tomentose dissepiments that become thin with age; context white, soft, extremely thin, often not apparent in longitudinal sections; tube layer whitish to ivory or pale buff, up to 1 mm thick, often much shorter, taste mild.

Hyphal system monomitic; contextual generative hyphae hyaline in KOH, thin to thick-walled, often branched, with abundant clamps, 2.5–4 μm in diam; tramal hyphae similar, 2–2.5 μm in diam.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 16–21 × 6.5–8 μm, with a basal clamp.

Basidiospores cylindrical, hyaline, smooth, slightly curved, IKI-, 8-12 × 2–3 μm.

Type of rot. – Brown cubical rot of dead conifer wood.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Mainly on dead conifer wood, also a few records on hardwoods. Rail fences and timber bridges are likely substrates for O. mappus. (1, 136, 145).

Distribution. Widely distributed from Alaska to Newfoundland but not often collected.

Remarks. – The large narrowly cylindric spores and the abundantly clamped and branched hyphae are important features for microscopic identification of O. mappus. The context is frequently extremely thin and this character, along with the fimbriate margin, characterizes the species in the field.

13. Oligoporus minusculoides (Pil.) Gilbn. & Ryv., Fig. 232

comb. nov. – Leptoporus minusculoides Pil., in Kavina and Pil., Atlas


Basidiocarps annual, pendent, with a narrowed basal attachment or rarely sessile, in crevices and hollows of very rotten conifer logs, inconspicuous and easily overlooked unless logs are torn apart, up to 7 mm wide, cream colored to pale ochraceous; hymenophore consisting of as few as 2 to 20–30 tubes, pore surface white to cream colored; the pores circular to irregular, 2–4 mm; context thin, soft-fibrous, less than 1 mm thick; tube layer concolorous with context, up to 3 mm thick; entire basidiocarp very soft and fragile and easily shattered into fragments when dry.

Hyphal system monomitic; contextual hyphae thin-walled, hyaline, with clamps, rarely branched, 3–5 in diam; tramal hyphae similar.

Cystidia none; fusoid cystidioles present, not projecting, thin-walled, 22–35 × 5–6 μm, with a basal clamp.

Basidia narrowly clavate, 4-sterigmate, 25–36 × 5–6.5 μm, with a basal clamp.

Basidiospores oblong to short-cylindric, hyaline, smooth, IKI-, 4.5–5.5 × 2–2.5 μm.

Type of rot. – Generally associated with a brown cubical rot of conifer logs.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – On very rotten conifer logs, in North America on Tsuga and Pinus (Lowe 1957, 1975). In Europe on Picea.

Distribution. Apparently widely distributed in boreal coniferous forest.
Oligoporus

Oligoporus obductus (RLG 744). a, trama hyphae; b, contextual hyphae; c, basidia; d, basidiospores.

Fig. 299. Oligoporus obductus (RLG 744). a, trama hyphae; b, contextual hyphae; c, basidia; d, basidiospores.

ecosystems but rarely collected. In North America known from Washington and several localities in the eastern U.S. and Canada. Originally described from Europe.


Basidiocarps annual, usually laterally stipitate or substipitate with a narrowed base, rarely sessile; stipe whitish to mouse-colored or gray-brown, usually simple, glabrous, up to 5 cm long and 3 cm thick; pilei solitary to imbricate, dimidiate to flabelliform, up to 12 × 13 × 2 cm; upper surface white to dark grayish brown, mouse colored or pale buff, azonate, glabrous, smooth or rugose; margin concolorous, often reflexed or undulate; pore surface white to yellowish, the pores angular, 3–5 per mm, with entire dissepiments that become thin and lacerate with age; context white, azonate, tough when fresh, hard and brittle when dry, up to 2.5 cm thick; tube layer darker than the context, hard and horny when dry, up to 6 mm thick.

Hyphal system monomitic; contextual hyphae thick-walled, some apparently solid, with clamps, tightly interwoven, with frequent branching, 3–12 μm in diam; trama hyphae thin-walled, with clamps, 2–4 μm in diam.

Cystidia or other sterile hymenial elements absent.

Basidia narrowly clavate, 4-sterigmate, 15–32 × 5–6 μm, with a basal clamp.

Basidiospores cylindric, slightly tapered toward the apex, hyaline, smooth, IKI-, 5–6.5 × 2–2.5 μm.

Type of rot. – Brown rot of dead conifers.

Sexuality. – Unknown.

Substrata. – Dead wood of conifers, rarely on hardwoods (1, 8, 20, 97, 136, 138, 153, 194).

Distribution. Transcontinental in North America in the northern U.S. and Canada and south to Arizona and New Mexico at high elevations in the western mountains. Also known from Europe.

Remarks. Oligoporus obductus has been made the type of a monotypic genus, Ostiena by Donk (1966). The hard consistency of the dried basidiocarps is not a character of enough significance to warrant generic distinction. In western North America O. obductus is particularly common on Douglas fir and also causes decay of Douglas fir timbers. (Gilbertson and Neuhauser, 1981).

15. Oligoporus perdelicatus (Murr.) Gilbn. & Ryv., Fig. 234


Basidiocarps annual, effused-reflexed or sessile; pilei solitary, dimidiate to elongated, up to 1 × 3 × 0.2 cm; upper surface white, the pores circular to angular, 5–7 per mm, with thin dissepiments that become lacerate with age; context white, azonate, soft to firm near the tubes, up to 1 mm thick; tube layer concolorous and continuous with the context, up to 1 mm thick; taste mild.
Oligoporus

**Fig. 224.** Oligoporus perdelicatus (RLG 3416). a, contextual hyphae; b, basidia; c, basidiospores.

**Hyphal system** monomitic; contextual hyphae hyaline in KOH, thick- to thin-walled, occasionally branched, with clamps, 2.5-5 μm in diam; tramal hyphae similar:

- **Cystidia** or other sterile hymenial elements lacking.
- **Basidia** clavate, 4-sterigmate, 12-28 × 3.5-4.5 μm, with a basal clamp.
- **Basidiospores** cylindrical, straight or slightly curved, hyaline, smooth, negative in Melzer’s reagent, 3.5-5 × 1-1.5 μm.

**Type of rot.** - Brown cubical rot of dead conifers.

**Cultural characteristics.** - Unknown.

**Sexuality.** - Unknown.

**Substrata.** - Dead conifers, rarely on hardwoods (1, 97, 138, 145, 148, 194).

**Distribution.** Known only from western North America but widely distributed there from Arizona to the Northwest Territories.

**Remarks.** Basidiocarps of *O. perdelicatus* are pure white and lack the bluish tints typical of that of *O. caesius,* which otherwise is rather similar.


**Basidiocarps** annual, resupinate, effused up to 30 cm, tough when fresh, rigid when dry, not readily separable; pore surface salmon-pink, often cream-colored to pale buff on drying, the pores circular to angular, 3-4 per mm, sometimes splitting apart to form large circular depressions, with thick, entire dissepiments that finally become thin and lacerate; margin narrowly sterile, pale pinkish, fimbriate, up to 1 mm wide; context whitish or very pale salmon-pink, azonate, tough when dry, less than 1 mm thick; tube layer salmon-pink, cutting cheesy, continuous with the context, up to 3 mm thick.

**Hyphal system** monomitic; subicular hyphae hyaline in KOH, thick- to thin-walled, often branched, with clamps, 2-4.5 μm in diam; tramal hyphae similar; gloeoplerous hyphae present.

- **Cystidia** or other sterile hymenial elements absent.
- **Basidia** clavate, 4-sterigmate, 17-25 × 5-6 μm, with a basal clamp.
- **Basidiospores** cylindrical, slightly curved, hyaline, smooth, IKI-, 5.5-7 × 2-2.5 μm.

**Type of rot.** - Brown cubical rot of dead conifer wood.

**Cultural characteristics.** – See Nobles (1943, 1948 as *Poria microspora*); Stalpers 1978.

**Sexuality.** – Heterothallic and bipolar (Nobles 1943).

**Substrata.** – Dead wood of several conifer genera (136, 138, 145, 148, 190, 194), rarely on aspen.

**Distribution.** Throughout the Rocky Mountain conifer forests and the Pacific Northwest; also in the northeastern U.S. and Eastern Canada.

**Remarks.** The salmon-pink coloration of *Oligoporus placentus* basid-
Oligoporus

Fig. 236. Oligoporus rancidus (type). a, subicular hyphae; b, basidia; c, basidiospores.

ociarps is a striking character and serves to identify the species in the field. Zabel et al. (1980) report O. placentus (as Poria placent) to be one of the major causes of decay in Douglas fir transmission poles in the northeastern U.S.

17. Oligoporus rancidus (Bres.) Gilbn. & Ryv. comb. nov. Fig. 236
Basidiocarps annual, resupinate, effused, separable, up to 10 mm thick, soft when fresh, soft and brittle when dry, taste rancid; margin white to cream, matted; pore surface white to cream, slightly darker and pale yellowish brown in old specimens, pores angular, 2-4 per mm, dissepiments entire to slightly dentate; tubes up to 8 mm deep; context white, 1-2 mm thick.
Hyphal system monomitic; generative hyphae with clamps, 2-6 μm wide, in the trama and context more narrow and mostly 2-4 μm wide. Cystidia or other sterile hymenial elements absent.
Basidia clavate, 4-sterigmate, 15-20 x 4-6, μm with a basal clamp.
Basidiospores hyaline, thinwalled, cylindrical, IKI-, 6-8 x 2-3 μm.
Type of rot. – Causes a brown rot.
Cultural characteristics. – Unknown.
Sexuality. – Unknown.
Substrata. – Known from dead conifers and hardwoods.
Distribution. Eastern U.S. from New York to Arkansas, also in Eu-

Fig. 237. Oligoporus sequoiae (type). a, trama! hyphae; b, contextual hyphae with large clamps; c, basidia; d, basidiospores.

rope.
Remarks. The rather large spores and the resupinate basidiocarp should separate it from the other resupinate Oligoporus species described in this manual.

18. Oligoporus sequoiae (Fritz & Bonar) Gilbn. & Ryv., Fig. 237
Basidiocarps annual, resupinate, effused up to several cm, apparently deteriorating rapidly in nature, pore surface white to cream colored, the pores circular to angular, 3-5 per mm, with thick dissepiments that become lacerate with age; margin abrupt, fertile, concolorous with pore surface; subiculum cream colored to pale buff, tough-fibrous, up to 1 mm thick; tube layer cream colored to pale buff, up to 3 mm thick.
Hyphal system monomitic; hyphae swelling and breaking down in KOH and difficult to distinguish clearly; subicular hyphae thin- to thick-walled, some with large clamps, rarely branched, 3-10 μm in diam; trama! hyphae apparently similar, nonseptate fragments of thick-
Oligoporus

Fig. 238. Oligoporus sericeomollis (RLG 345). a, subicular hyphae; b, cystidia; c, basidia; d, basidiospores.

walled generative hyphae abundant in sections on crushed mounts, 3-6 μm in diam.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 15-18 x 4.5-6 μm, with a basal clamp.

Basidiospores oblong to ellipsoid, hyaline, smooth, IKI-, 4-5 x 2-3 μm.

Type of rot. - Brown cubical rot of heartwood. (Kimmey & Lightle, 1955).

Cultural characteristics. - See Nobles 1943, 1965.

Sexuality. - Heterothallic (Nobles 1943).

Substrata. - Known only on coast redwood, Sequoia sempervirens.

Distribution. Restricted to the range of the host in coastal California.

Remarks. Nobles carried out infertility tests with homokaryons of A. sequoiae against homokaryons of Trametes (Antrodia) serialis, Poria microspora (= Oligoporus placentus) and Polyporus (Fomitopsis) palustris. She reported no infertility in any of these matings and concluded that Poria sequoiae is a distinct species.

19. Oligoporus sericeomollis (Rom.) Pouz.


Basidiocarps annual, resupinate, diffused up to 15 cm, readily separable, corty when dry; margin fertile or very narrowly sterile, whitish, tomentose, less than 1 mm wide; pore surface white or discolored yellowish or tan, the pores circular to angular, 4-6 per mm, with thin, entire dissepiments; context whitish, azonate, less than 1 mm thick; tube layer concolorous and continuous with the context, drying brittle, up to 3 mm thick; taste bitter.

Hyphal system monomitic; subicular hyphae hyaline, thin- to thick-walled, abundantly nodose-septate, with occasional branching, 2-4 μm in diam; tramal hyphae similar.

Cystidia occasional to abundant, ventricose, very thick-walled, some apically incrusted, barely projecting, 14-26 x 6-10 μm, developing from right-angle branches from tramal hyphae or as apical portions of unbranched tramal hyphae.

Basidia clavate, 4-sterigmate, 18-20 x 5-6 μm, with a basal clamp.

Basidiospores oblong to cylindrical-ellipsoid, hyaline, smooth, IKI-, 4-5 x 2-2.5 μm.

Type of rot. - Brown cubical pocket rot of living and dead conifers.

Cultural characteristics. - See Nobles 1948, 1958, 1965; Gilbertson and Lombard 1965; and Stalpers 1978.

Sexuality. - Unknown.

Substrata. - According to Buckland (1946) O. sericeomollis is the main cause of volume loss in living western red cedar in British Columbia. It also causes a heartrot in black cherry (Davidson & Campbell 1943) and decays dead conifer wood. (1, 38, 93, 97, 136, 138, 147, 148, 190, 194).

Distribution. Apparently throughout conifer forests of eastern and western North America. Also in Europe and Asia.

Remarks. The extremely bitter taste, incrusted cystidia and monomitic hyphal system with abundant clamp connections characterize this species.


Basidiocarps annual, sessile or effused-reflexed; pilei dimidiate to elongated, solitary or in small clusters, up to 6 x 11 x 2 cm; upper surface ivory to pale buff, azonate, often rough, glabrous, often with small black spots; margin concolorous; pore surface white to ivory, the pores circular to angular, 5-6 per mm, with thin dissepiments that become lacerate with age; context white, azonate, fissile, up to 1 cm thick; tube layer concolorous and continuous with the context, up to 0.8 cm thick; taste very bitter.

Hyphal system monomitic; contextual hyphae hyaline in KOH, occa-
Fig. 289 A. Oligoporus stipticus (RLG 5214). a, contextual hyphae; b, basidia; c, basidiospores.

Oligoporus

sionally branched, thin- to thick-walled, with clamps, 2–5 μm in diam; gelatinizing and swelling to 8 μm in diam; trama hyphae rather thin-walled, with clamps, 2–2.5 μm in diam. Cystidia or other sterile hymenial elements absent. Basidia clavate, 4-sterigmate, 12–19 × 4.5–5.5 μm, with a basal clamp. Basidiospores oblong to short-cylindric, some slightly curved, hyaline, smooth, IKI-, 3.5–5 × 1.5–2 μm.

Type of rot. – Brown cubical rot of dead conifers and hardwoods.

Cultural characteristics. – See Käärik and Rennerfeldt 1957; Nobles 1958; Siepman and Zycha 1968; Stalpers 1978.

Sexuality. – Heterothallic and tetrapolar (David 1980)

Substrata. – Dead wood of several genera of conifers and hardwoods (1, 3, 20, 75, 136, 148, 153, 190, 194).

Distribution. A boreal species in eastern and western North America, south to Tennessee and Arizona at high elevations. Also in Europe.

Remarks. The small white basidiocarps with a coarse, usually rough upper surface are the principal basis of separation from *O. guttulatus*, which has similar microscopic characters. *Oligoporus tephroleucus* is also similar, but has longer, more narrow suballantoid spores. The black spotted pileus and the bitter taste are other characters that aid the field identification.


Fig. 289 B. Oligoporus subpendulus (type). a, contextual generative hyphae; b, gloeoplerous hyphae; c, cystidioles; d, basidia; e, basidiospores.

Basidiocarp annual, pendent and semistipitate with a dorsal attachment, up to 1 cm in diam and 5 mm thick, soft when fresh, brittle when dry, taste bitter; upper surface white, drying cream, finely tomentose to glabrous with a very thin pellicle in the basal parts, azonate; pore surface white to cream, pores round to angular and in parts irregular, 6–8 per mm; tubes white, fragile; context white, soft and fragile, up to 1 mm thick.

Hyphal system monomitic; generative hyphae with clamps, in the context thin-walled, sparingly branched, 3–6 μm wide, in the trama similar, but rarely above 4 μm wide; gloeoplerous hyphae present, yellowish and up to 12 μm wide.

Cystidia absent; fusoid cystidioles present, 15–19 × 3.5–4.5 μm.

Basidia clavate, 4-sterigmate, 12–18 × 5–7 μm.

Basidiospores oblong to short cylindrical, hyaline, thin-walled, IKI-, 4–5 × 2–2.5 μm.

Type of rot. Brown cubical rot. Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Known only from *Tsuga canadensis*.

Distribution. Known only from New York.

Remarks. The basidiocarp is like that of *O. minusculoides* which however has larger pores, i.e. 3–4 per mm, and lacks gloeoplerous hyphae. The obvious brown cubical rot with the substrate bearing the type specimen has apparently not been noted before. This character, along with the typical basidiocarp morphology places the species in *Oligoporus*. 
Oligoporus

Fig. 240. Oligoporus tephroleucus (RLG 7165). a, thin-walled tramal generative hyphae; b, thick-walled contextual generative hyphae; c, cystidia; d, basidia; e, basidiospores.

Type of rot. – Brown cubical rot of dead conifers and hardwoods.

Cultural characteristics. – See Lowe and Lombard (1973, as Tyromyces lacteus). The cultural description given by Stalpers (1978) is based on Tyromyces chioneus, a white rot fungus.

Sexuality. – Heterothallic and bipolar.


Distribution. Widely distributed in forest ecosystems of eastern and western North America. Also in Europe.

Remarks. The identity of this taxon has been confused in the past because of reports of the existence of two morphologically indistinguishable species, one a bitter-tasting brown rot fungus and the other a non-bitter white rot fungus. The brown rot fungus was considered by Lowe and Lombard (1973) to be Tyromyces lacteus, and the supposed white rot fungus to be T. tephroleucus. However, no substantive evidence for such a fungus causing a white rot has ever been presented. We agree with the conclusion of Redhead and Ginns (1985) and David (1980) that a single brown rot species is involved. The application of the epithet tephroleucus seems to be well founded. This is a common taxon in Arizona and has a basidiocarp with a mouse-grey, striose upper surface as originally described. It is clearly associated with a brown rot. The uncertainty with regard to these names has been further complicated by their application to a dimitic white rot fungus now recognized as Tyromyces chioneus (Fr.) Karst., also known in North America as Polyporus albellus Pk.


Basidiocarps annual, sessile or effused-reflexed; pilei up to 2 cm wide; upper surface cream-colored to mouse-grey, coarsely strigose; pore surface whitish when fresh, yellowish on drying, the pores 3-4 per mm; dissepiments thin and finely lacerate; context whitish, usually concentrically zonate, up to 1 cm thick; tube layer white to cream colored, brittle on drying, up to 8 mm thick.

Hyphal system monomitic; contextual hyphae thin- to moderately thick-walled, abundantly nodose-septate, some with frequent branching, 3-8 μm in diam, some thin-walled hyphae staining brightly in phloxine; tramal hyphae mostly thin-walled, with clamps, 2-4 μm in diam.

Cystidia or other sterile hymenial elements absent, hyphal pegs present.

Basidia clavate, 4-sterigmate, 14-16 × 4-5 μm, with a basal clamp.

Basidiospores cylindric, slightly curved, hyaline, smooth, IKI-, 4.5-6 × 1-1.5 μm.


Basidiocarps annual, effused-reflexed to resupinate; pilei usually narrow, margin of pileus characteristically undulate; upper surface white to pale buff, tomentose to glabrous, azonate, smooth to shallowly sulcate; pore surface cream colored, the pores angular to irregular, 1-3 per mm, with thin, entire to incised dissepiments; context whitish, soft, up to 4 mm thick; tube layer concolorous with the context, up to 11 mm thick.

Hyphal system monomitic; contextual hyphae rarely to frequently branched, with abundant clamps, thick-walled, walls swelling and gela-
Oligoporus

Fig. 241. Oligoporus undosus (RLG 6066). a, contextual hyphae; b, basidia; c, basidiospores.

tinizing in KOH, with an irregular, narrow and sinuous lumen, 2.5-8 μm in diam; trama1 hyphae similar, 3-5 μm in diam.

Cystidia and other sterile hymenial elements lacking; hyphal pegs present.

Basidia clavate, 4-sterigate, 15-35 × 4.5-7 μm, with a basal clamp.

Basidiospores allantoid, hyaline, smooth, IKI-, 4.5-6 × 1-1.5 μm.

Type of rot. - Brown cubical rot of dead conifer and hardwood logs and slash. White mycelial felts develop in the shrinkage cracks. Negative in gum guaiac solution.

Cultural characteristics. - See Brotzman and Gilbertson 1967.

Sexuality. - Heterothallic and bipolar (Brotzman and Gilbertson 1967). Also reported as tetrapolar (David 1980).

Substrata. - Primarily on dead conifer wood but occasionally on hardwoods associated with conifers (1, 3, 20, 69, 97, 136, 138, 148, 153, 190, 194).

Distribution. Widely distributed in coniferous forest regions of North America with exception of the southern oak-pine forest. Also known from Europe.

Remarks. Western specimens of O. undosus often have a much thicker context and tube layers than specimens from eastern North America. The undulate margin and large pores are good field characteristics.

Oxyporus Donk.


Basidiocarps annual to perennial, resupinate to pileate, in the latter case broadly attached and fibrous to woody, pileus white to deep cream, velvutinate and often covered with mosses; pore surface white to light yellowish, pores mostly small and isodiametric, rarely large and angular, tube layer single or distinctly stratified, then with layers of context between the tube layers; context white to cream, hyphal system monomitic, generative hyphae thin to thick-walled, sparingly branched and with simple septa; apically encrusted hymenial cystidia abundantly present in most species, difficult to demonstrate in others; spores globose to broadly ellipsoid, thin to thick-walled, smooth, hyaline and IKI-; on both hardwoods and conifers, causing a white rot. Cosmopolitan genus.

Type species: Oxyporus populinus (Fr.) Donk.

Key to species

1. Basidiocarps pileate ................................................................. 2
2. Basidiocarps resupinate .......................................................... 4
3. Basidiocarps large, up to 1.5 meters wide; pileus villose to hirsute; known only from Oregon and Washington; on conifers .......................... 4. O. nobilissimus
4. Basidiocarps small to medium; pileus tomentose to velutinate, sometimes with masses at the base; on either hardwoods or conifers 3
5. Basidiocarps perennial with distinctly stratified tubes; pores 5-7 per mm; on deciduous wood .......................... 6. O. populinus
6. Basidiocarps annual, tubes not stratified; pores 2-3 per mm; on gymnosperms .......................... 2. O. cuneatus
7. Spores up to 5.5 μm long ............................................................. 5
8. Spores 5-9 μm long ................................................................. 6
9. Pores 4-6 per mm; cystidia thick-walled; on hardwoods, especially P. populinus, rarely on conifers .......................... 7. O. similis
10. Pores 2-4 per mm; cystidia thinwalled; on gymnosperms, especially T. latemarginatus .......................... 2. O. cuneatus
11. Cystidia of two kinds present, some incrusted, others smooth refractive gloeocystidia; spores often glued together .......................... 1. O. corticola
12. Only apically encrusted cystidia present, sometimes difficult to observe; spores normally freefloating .......................... 7
13. Cystidia thick-walled, abundant, incrusted over the upper half; basidiocarp hard when dry .......................... 5. O. pellicula
14. Cystidia thinwalled with a small apical crown of crystals, often difficult to find; basidiocarp soft .......................... 3. O. latemarginatus

Oxyporus

Oxyporus Donk.


Basidiocarps annual to perennial, resupinate to pileate, in the latter case broadly attached and fibrous to woody, pileus white to deep cream, velvutinate and often covered with mosses; pore surface white to light yellowish, pores mostly small and isodiametric, rarely large and angular, tube layer single or distinctly stratified, then with layers of context between the tube layers; context white to cream; hyphal system monomitic, generative hyphae thin to thick-walled, sparingly branched and with simple septa; apically encrusted hymenial cystidia abundantly present in most species, difficult to demonstrate in others; spores globose to broadly ellipsoid, thin to thick-walled, smooth, hyaline and IKI-; on both hardwoods and conifers, causing a white rot. Cosmopolitan genus.

Type species: Oxyporus populinus (Fr.) Donk.

Key to species

1. Basidiocarps pileate ................................................................. 2
2. Basidiocarps resupinate .......................................................... 4
3. Basidiocarps large, up to 1.5 meters wide; pileus villose to hirsute; known only from Oregon and Washington; on conifers .......................... 4. O. nobilissimus
4. Basidiocarps small to medium; pileus tomentose to velutinate, sometimes with masses at the base; on either hardwoods or conifers 3
5. Basidiocarps perennial with distinctly stratified tubes; pores 5-7 per mm; on deciduous wood .......................... 6. O. populinus
6. Basidiocarps annual, tubes not stratified; pores 2-3 per mm; on gymnosperms .......................... 2. O. cuneatus
7. Spores up to 5.5 μm long ............................................................. 5
8. Spores 5-9 μm long ................................................................. 6
9. Pores 4-6 per mm; cystidia thick-walled; on hardwoods, especially P. populinus, rarely on conifers .......................... 7. O. similis
10. Pores 2-4 per mm; cystidia thinwalled; on gymnosperms, especially T. latemarginatus .......................... 2. O. cuneatus
11. Cystidia of two kinds present, some incrusted, others smooth refractive gloeocystidia; spores often glued together .......................... 1. O. corticola
12. Only apically encrusted cystidia present, sometimes difficult to observe; spores normally freefloating .......................... 7
13. Cystidia thick-walled, abundant, incrusted over the upper half; basidiocarp hard when dry .......................... 5. O. pellicula
14. Cystidia thinwalled with a small apical crown of crystals, often difficult to find; basidiocarp soft .......................... 3. O. latemarginatus
Oxyporus

1. Oxyporus corticola (Fr.) Ryv.


Basidiocarps annual or sometimes perennial, resupinate, effused up to 12 cm, soft and leathery when fresh, drying friable; margin fertile, or sterile and then whitish to cream colored, soft, fimbriate, up to 7 mm wide; pore surface cream colored to pale tan, the pores circular to angular, 2–4 per mm, with dissepiments that quickly become thin and deeply lacerate; context ivory, azonate, soft-fibrous, up to 1 mm thick; taste mild.

Hyphal system monomitic; subicular hyphae hyaline, simple-septate, thin- to very thick-walled, often incrusted, 2–5 μm in diam; trama hyphae similar.

Cystidia of two types; some frequent to rare, cylindrical, capitately incrusted, 17–30 × 3–6 μm, simple-septate at the base, not projecting or barely projecting from hymenium; gloeocystidia cylindrical to fusiform, thin-walled, with refractive contents, arising in hyphalhyphae and often projecting beyond hymenium, 33–45 × 6–10 μm.

Basidia clavate, 4-sterigmate, 15–18 × 5–7 μm, simple-septate at the base.

Basidiospores ovoid to broadly ellipsoid, hyaline, smooth, IKI-, 5–9 × 3.5–4.5 μm.

Type of rot. White rot of conifers and hardwoods.

Cultural characteristics. See Nobles, 1958.

Sexuality. Unknown.


Distribution. Apparently present in all forest regions of North America. Circumglobal species.

Remarks. The smaller spores and pores of O. similis will differentiate it from O. corticola. O. latemarginatus is very similar but has wider hyphae and has only the apically incrusted type of cystidia.

2. Oxyporus cuneatus (Murr.) Aoshima,


Basidiocarps annual, effused-reflexed or resupinate; pileus solitary or imbricate, dimidiate or much elongated along bark crevices, up to 1 × 6 × 1 cm; upper surface white, becoming gray or yellowish, tomentose to appressed-fibrillose, azonate, smooth; margin concolorous; pore surface
Oxyporus

494

white to ivory, the pores circular to angular, 3–4 per mm, with thick, entire dissepiments that become thin and lacerate with age; context white, soft-fibrous, azonate, up to 5 mm thick; tube layer concolorous and continuous with the context, up to 4 mm thick.

Hyphal system monomitic; hyphae hyaline in KOH, thin-walled, frequently branched, simple-septate, 2.5–6 μm in diam; tramal hyphae similar.

Cystidia of two types, some abundant, narrowly clavate to cylindric, apically incrusted, 17–40 × 4.5–6 μm; gloeocystidia imbedded, arising in subhymenial layers, with refractive contents, cylindric to clavate, 19–30 × 5.5–9 μm.

Basidia clavate, 4-sterigmate, 13–18 × 5–6 μm; simple-septate at the base.

Basidiospores broadly ellipsoid to subglobose, hyaline, IKI-, smooth, 4–5.5 × 3–4 μm.

Type of rot. White rot of the sapwood of western red cedar and bald cypress logs.

Cultural characteristics. Unknown.

Sexuality. Unknown.

Substrata. Thuja plicata is the main substrate, also reported on Sequoia, Abies, Larix, Taxodium and Tsuga.

Distribution. Western red cedar type in the Pacific Northwest, also on bald cypress in southern Illinois.

Remarks. Macroscopically, basidiocarps of O. cuneatus are similar to those of Trametes pubescens or T. hirsuta, but the thin-walled simple-septate hyphae, abundant cystidia, and broadly ellipsoid spores are not found in that group of species. Basidiocarps of O. cuneatus develop on western red cedar logs with bark still attached.


Basidiocarps annual, resupinate, becoming widely effused, rather soft when fresh, becoming firm and corky or brittle when dried, readily separable; margin usually sterile, white, fimbriate, up to 1 mm wide; pore surface white to ivory when fresh, drying white to cream colored, the pores angular, 1–3 per mm, with dissepiments that quickly become thin and lacerate; context white to ivory, azonate, soft-fibrous, up to 1 mm thick; tube layer concolorous and continuous with the context, often drying brittle, up to 7 mm thick; taste mild.

Hyphal system monomitic; subicular hyphae hyaline in KOH, thin-walled, often branched, simple-septate, 3–8 μm in diam; tramal hyphae similar.

Cystidia rare to frequent, in some specimens apparently absent, narrowly clavate to cylindric, apically incrusted, 20–28 × 4.5–6 μm, simple-septate at the base.

Basidia clavate, 4-sterigmate, 16–20 × 5–7 μm; simple-septate at the base.

Basidiospores narrowly ellipsoid, hyaline, smooth, IKI-, 5.5–7 × 3–4 μm.

Type of rot. White rot of dead hardwoods, also in living oaks, particularly following fire.

Cultural characteristics. See Lombard et al. 1960 (as Poria ambigua). Davidson et al. (1942) described cultures of O. latemarginatus under the name Fomes geotropus.

Sexuality. Unknown.

Substrata. Dead wood of numerous hardwood genera and also in living oaks. (1, 3, 26, 41, 69, 113, 145, 153, 166, 195).


Remarks. The macroscopic features of basidiocarps of this species are similar to those of O. corticola. Microscopically, however, O. corticola differs in its narrower hyphae and gloeocystidia in addition to the ordinarily conspicuous, incrusted cystidia. O. similis is similar but has smaller pores and spores and has a more restricted host and geographical range.

![Fig. 244. Oxyporus latemarginatus (RLG 7195). a., subicular hyphae; b, cystidia; c, basidia; d, basidiospores.](image)
4. Oxyporus nobilissimus W.B. Cooke


**Basidiocarps** sessile or substipitate with a tapered base, perennial, pilei single or imbricate, entire basidiocarp massive, “30–140 × 25-95 × 30-100 cm” (Cooke); upper surface with a coarse, loose, fibrous mat up to 10 cm thick, whitish to tan; margin concolorous; pore surface ivory to pale brownish, the pores circular to angular, 3–5 per mm, with thick, entire dissepiments; context below the coarse fibrous mat ivory, corky, azonate, upper mat soft, distinctly zonate; tube layers whitish at first, becoming brownish, distinctly stratified, separated by a thin layer of context tissue, single layers 3–7 mm thick.

**Hyphal system** monomitic; contextual hyphae hyaline in KOH, thin-to-thick-walled, rarely branched, simple-septate, 2.5–4.5 μm in diam; fibers of upper mat composed of thicker-walled, simple-septate hyphae in parallel arrangement; tramal hyphae similar to those of lower context.

**Cystidia** abundant, subulate, fusoid, thick-walled, with or without apical incrustation, 30–45 × 5.5–11 μm.

**Basidia** clavate, 4-sterigate, 12–16 × 4–5 μm, simple-septate at the base.

**Basidiospores** subglobose to ovoid, hyaline, IKI-, smooth, 5.5–7 × 4–5 μm.

Type of rot. Apparently not established with certainty. Cooke (1949) states that specimens seen by him were associated with a brown rot of western hemlock. However, *O. nobilissimus* is probably a white rot fungus, as are the other species of *Oxyporus*. Until cultures are obtained the rot will continue to be uncertain.

Cultural characteristics. Unknown.

Sexuality. Unknown.

Substrata. Recorded on *Tsuga heterophylla* and *Abies procera*.

Distribution. Known only from Oregon and Washington.

Remarks. This species may produce the largest known basidiocarps of any North American polypore. In the original description, Cooke states that one specimen weighed as much as 300 lbs (136 kilograms). This is presumably before drying as dried specimens are rather light in weight. *O. nobilissimus* would certainly not be confused with any other polypore in the field.

5. Oxyporus pellicula (Jungh.) Ryv.


**Basidiocarps** resupinate, annual, effused, up to 3 mm thick, somewhat coriaceous when fresh, brittle and hard when dry, adnate, margin narrow, white or pale ochraceous or brown, finely felted; pore surface cream to wood-coloured, pores angular to slightly split or incised, 2–3 per mm, on sloping substrates often more split and elongated, in older specimens almost semi-irpicoid and similar to those of *Schizopora para doza*; tubes up to 2 mm deep, tough; context white to pale cream and dense, up to 1 mm thick.

**Hyphal system** monomitic; generative hyphae with simple septa, thin-walled in subhymenium, otherwise distinctly thick-walled, 3–6 μm wide, often branched in acute angles.

**Cystidia** abundantly present, incrusted, clavate, elongated and clublike with angular crystals, up to 100 μm long from apex to the septum from which they arise, 3–7 μm wide, present throughout the basidiocarp.

**Basidia** clavate, 4-sterigate, with a simple septum at the base, 12–20 × 5–7 μm.

**Basidiospores** ellipsoid, smooth, thin-walled, IKI-, 5–8 × 3–5 μm.

Type of rot. Causing a white rot.

Cultural characteristics and sexuality. Unknown.

Substrata. On dead hardwoods.

Distribution. Rare in southeastern part of United States, widespread in tropical Africa and Asia.
Oxyporus

Fig. 446. Oxyporus pellicula (J.R. Weir 3479). a, subicular hyphae; b, cystidia; c, basidia; d, basidiospores.

Remarks. The species is easily recognized because of the clavate cystidia and the large spores. Irpex lacteus has similar cystidia, but has cylindrical spores and skeletal hyphae. Schizopora paradoxa has clamps on the generative hyphae.


Basidiocarps perennial, sessile or effused-reflexed; pilei often imbricate and laterally fused, up to 5 × 12 × 5 cm; upper surface cream colored to buff or darkening with age, finely tomentose to glabrous, often covered with mosses at the base; pore surface cream colored to buff, the pores circular to angular, 5–7 per mm; tubes concolorous, distinctly stratified, separated by a thin layer of context tissue, up to 5 cm deep; context cream colored to tawny, corky, faintly zonate to azonate, up to 2 cm thick.

Hyphal system monomitic; contextual hyphae simple-septate, thinto thick-walled, hyaline, 2.5–4.5 μm in diam; tramal hyphae similar, mostly thin-walled.

Cystidia abundant, thin-walled, cylindrical to capitate, 20–35 × 3–4.5 μm, capitately to entirely incrusted, incrustation dissolving rapidly in KOH, incrusted portion 6–12 μm in diam.

Basidia ovoid to broadly clavate, 4-sterigmate, 8–12 × 5–5.5 μm, simple-septate at the base.

Basidiospores subglobose, hyaline, smooth, IKI-, 3.5–4.5 × 2.5–4 μm.

Type of rot. White heartrot of living trees; often fruiting in stem cankers.


Sexuality. Unknown.


Distribution. Throughout the Northern Hardwoods and Central Hardwood forests; also known from British Columbia, and in the Southwest from a single collection on Platanus wrightii in Hidalgo County, New Mexico.

Remarks. Oxyporus populinus is well differentiated from the other species in the genus by its perennial, sessile basidiocarp with the tube layers separated by thin layers of context. The only other species in the genus with these characters is O. nobilissimus, which has enormous basidiocarps on conifers in the Northwest and differs in other characters.
Oxyporus

Fig. 248. Oxyporus similis (RLG 765). a, subicular hyphae; b, cystidia; c, basidia; d, basidiospores.


Basidiocarps annual, resupinate, effused up to 15 cm; margin fertile or sterile, then white, soft, finely tomentose to fimbriate, up to 2 mm wide; pore surface ivory to pale buff, pores circular to angular, 4-6 per mm, with thick, fimbriate dissepiments which become thin and slightly lacerate; subiculum cream colored to pale buff, azonate, soft, less than 1 mm thick; tube layer continuous and concolorous with context, soft, up to 1.5 mm thick; taste mild.

Hyphal system monomitic; subicular hyphae thin- to thick-walled, simple-septate, with occasional branching, 2-4 μm in diam.

Cystidia abundant, clavate, heavily incrusted over the apical portion, 25-55 x 7-8 μm, wall thickened toward the apex; simple-septate at the base.

Basidia clavate, 4-sterigmate, 12-17 x 3-5 μm, simple-septate at the base.

Basidiospores ellipsoid to ovoid, hyaline, smooth, IKI-, 4-5 x 2.5-3 μm.

Type of rot. White rot of dead hardwoods and conifers.

Cultural characteristics. Unknown.

Sexuality. Unknown.

Substrata. Dead hardwoods, rarely on conifers, most common on Populus. (1, 13, 145, 148, 194).

Distribution. Apparently throughout the western mountains, also known from Manitoba. O. similis is particularly common on Populus trichocarpa in northern Idaho and Montana.

Remarks. O. corticola is quite similar but differs in its larger spores and pores. The habit of P. similis, as well as the microscopic features, suggest resupinate basidiocarps of O. cuneatus, but the latter are found only on western red cedar and are usually definitely pileate.

Pachykytospora Kotl. & Pouz.

Basidiocarps perennial to annual, resupinate, adnate; pore surface white to wood colored, pores medium to small, frequently with a pinkish tint; hyphal system di-trimitic, generative hyphae with clamps, hyaline binding and skeletal hyphae present, very weakly dextrinoid in mass; cystidia none; spores oblong-ellipsoid, ornamented with elongated rounded ridges or echinulae, thick-walled, hyaline and IKI-; on hardwoods or conifers, causing white rots. Small cosmopolitan genus with four species, three in North America.

Type species: Pachykytospora tuberculosa (Fr.) Kotl. & Pouz.

Key to species

1. Pores 4-5 per mm; spores 8.5-12 x 4-6 μm

1. Pachykytospora alabamae (Berk. & Cke.) Ryv. Fig. 249


Basidiocarps annual, resupinate, adnate, effused up to 8 cm; pore surface oochaceous buff, the pores circular to angular, 4-6 per mm; dissepiments thin, entire; margin pale buff, soft, tomentose, sterile up to 2 cm, with cupulate developing tubes; tube layer pale buff, up to 1 mm thick; context thin, concolorous with tubes.

Hyphal system dimitic; subicular generative hyphae inconspicuous, hyaline, thin-walled, negative in Melzer's reagent, with clamps, 2-2.5 μm in diam; subicular skeletal hyphae thick-walled, nonseptate,
Pachykytospora

slender, with occasional branching, 1.5-3.5 μm in diam, weakly dextrinoid in Melzer's reagent and appearing strongly dextrinoid in mass. Cystidia and other sterile hymenial elements absent. Basidia broadly clavate, 4-sterigmate, 15-20 × 8-11 μm, with a basal clamp. Basidiospores cylindric to cylindric-ellipsoid, hyaline, minutely echinulate with echinulae tending to be in longitudinal rows, giving a striate appearance to the spores, IKI-, 9.5-12.5 × 4-5.5 μm. Type of rot. White rot of dead hardwoods and dead juniper branches. Cultural characteristics. Unknown. Sexuality. Unknown. Substrata. Particularly common on dead branches of Juniperus virginiana from Louisiana to Florida. Also on dead wood of hardwood genera. Distribution. Tropical and subtropical species, ranging north to the Gulf Coast region. Remarks. Pachykytospora alabamae has smaller pores and spores than P. papyracea, a similar species that ranges further north. Antrodia albida is also similar but has smooth spores, causes a brown rot, and has nondextrinoid tissue.

Fig. 249. Pachykytospora alabamae (MB 1726). a, generative hyphae; b, skeletal hyphae; c, basidia; d, basidiospores.

2. Pachykytospora papyracea (Schw.) Ryv.
Norw. J. Botany 19:233, 1972. — Boletus papyraceus Schw., Natur. Ges. Leipzig Schrift. 1:99, 1822. — Poria papyracea (Schw.) Cke., Grevillea 14:111, 1886. Basidiocarps annual, resupinate, adherent, effused up to 10 cm; pore surface cream colored to cinnamon buff, continous or cracking deeply into small blocks, the pores angular, 2-3 mm, with thin, entire to dentate dissepiments; margin fertile or narrowly sterile, whitish, and finely tomentose, developing tubescupulate; subiculum less than 1 mm thick, pale buff; tube layer concolorous with subiculum up to 1 mm thick Hyphal system dimitic; subicular generative hyphae thin-walled, with clamps, 2.5-4 μm in diam; subicular skeletal hyphae thick-walled, non-septate, hyaline, with frequent branching, negative to weakly dextrinoid in Melzer's reagent, 2-5 μm in diam; tramal hyphae similar.

Fig. 250. Pachykytospora papyracea (JLL 1199). a, subicular generative hyphae; b, subicular skeletal hyphae; c, basidia; d, basidiospores.
Pachykytospora

Cystidia and other sterile hymenial elements absent.
Basidia broadly clavate with a sharply narrowed base, 4-sterigmate, 22-38 x 10-14 μm, with a basal clamp.
Basidiospores cylindric to cylindric-ellipsoid, hyaline, ornamented with echinulae or tubercules that tend to be in longitudinal rows, IKI-, 14-17 x 6-8 μm.

Type of rot. White rot on dead hardwoods and conifers.

Cultural characteristics and sexuality. Unknown.

Substrata. On dead hardwoods and conifers, particularly arbor vitae (Thuja occidentalis) in the Northeastern U.S. and Vitis in the Southeast.

Distribution. Eastern North America from Ontario to Alabama, also widely distributed in the Southern Hemisphere, not known from western North America.

Remarks. P. papyracea differs from P. alabmae in having a northern distribution and morphologically in having considerably larger basidiospores. Both commonly occur on substrates in the Cupressaceae, P. papyracea on Thuja and P. alabmae on Juniperus. P. tuberculosa also has large spores, but is known in North America only on oaks in Arizona and differs from P. papyracea in its thick, robust basidiocarps and in having fusoid cystidioles.

3. Pachykytospora tuberculosa (Fr.) Kotl. & Pouz. Fig. 251

Basidiocarps annual to perennial, resupinate, effused up to 15 cm, usually appearing nodulose or irregular because of the uneven configuration of the bark on which they develop; margin fertile or narrowly sterile, concolorous with the pore surface, even; pore surface cream to light buff, the pores circular to angular, 2-3 per mm with thick, entire, finely tomentose disseminations; context cream to light buff, soft-fibrous, up to 5 mm thick; tube layer continuous and concolorous with the context, up to 3 mm thick; feltlike, light buff mycelium present in bark and decayed wood beneath basidiocarps.

Hyphal system dimitic; skeletal hyphae thick-walled, hyaline, non-septate, with occasional branching, weakly dextrinoid in Melzer’s reagent, 3-6 μm in diam; contextual generative hyphae thin-walled, with clamps, 3-4 μm in diam.

Cystidia none; fusoid cystidioles present, barely projecting or imbedded, thin-walled, 22-25 x 6-8 μm, with a basal clamp.
Basidia broadly clavate with a sharply narrowed base, 4-sterigmate, 30-43 x 11-13.5 μm, with a basal clamp.

Basidiospores narrowly ellipsoid to cylindric-ellipsoid, hyaline, IKI-, appearing minutely rough because of tuberculate exospore, 15-18 x 6-8.5 μm.

Type of rot. Uniform white rot of living or dead oaks. In the advanced stages the rot becomes chalky in consistency.

Cultural characteristics. See David 1972; Stalpers 1978.


Substrata. In North America known only on Quercus. It fruits on living trees and also on dead standing and fallen trees and stumps with bark still attached.

Distribution. In North America known only from southern Arizona.
Parmastomyces

and northern Mexico. Also in Europe.

Remarks. Although *P. tuberculosa* is quite common on oaks in some localities in southern Arizona, particularly in the Chiricahua Mountains, no substantiated records are known from elsewhere in North America. The Arizona collections have been compared to European specimens and found to agree in all respects. Cultures of Arizona specimens (Eboh 1968) are also in agreement with European isolates. This seemingly peculiar distribution is similar to that of *Phellinus torulosus*, which is also widespread in Europe but known only from southern Arizona in North America. Under the scanning electron microscope the spore wall appears coarsely tuberculate or ridged with the tubercules often confluent.

**Parmastomyces** Kati. & Pouz.

Basidiocarps annual, resupinate to effused-reflexed or sessile, white to light brown, soft when fresh, fragile when dry; pores angular, context duplex, with a dense dark gelatinous layer next to the tubes and a white, soft-fibrous layer next to the substrate; hyphal system monomitic, generative hyphae with clamps; cystidia none; basidiospores cylindrical, smooth, hyaline, slightly thickwalled and dextrinoid in Melzer's reagent, on conifers and hardwoods, causing a brown rot. Monotypic genus.

Type species: **Parmastomyces kravtzevianus** (Bond. & Parm. in Parm.) Kati. & Pouz.


Basidiocarps annual, resupinate, effused-reflexed or sessile, soft and fleshy, drying brittle; taste slightly acid; upper surface of pileus white, bruising or drying reddish brown (Russet), matted-striate, azonate; pore surface white, also turning reddish brown on drying, the pores circular, 2–3 (–4) per mm, with thin dissepiments; context gelatinous next to the tubes, otherwise white, soft, in most specimens on conifers up to 5 mm thick but in some specimens on hardwoods up to 1 cm thick, gelatinous layer darker and resinous on drying or on thicker basidiocarps darker resinous streaks scattered in context; tube layers fragile, brittle and shattering easily when dry, 1–3 mm thick.

**Hypal system** monomitic; contextual hyphae thin- to thick-walled, frequently branched, with clamps, 3–6 μm in diam.

**Cystidia** and other sterile hymenial elements lacking.

**Basidia** clavate, 4-sterigmate, 20–27 × 5–7 μm, with a basal clamp.

**Basidiospores** ellipsoid to short-cylindric, hyaline, smooth, strongly dextrinoid in Melzer's reagent, (4–)5–7 × 2.5–4 μm.

**Type of rot**. Brown cubical rot of dead conifers and hardwoods and living black cherry, positive with gum guaiac solution.

**Cultural characteristics**. See Nobles, 1948, 1958, 1965; Davidson and Campbell, 1943; David, 1972; Stalpers, 1978.

**Sexuality**. Heterothallic and tetrapolar (David, 1972).

**Substrata**. Causes a brown cubical butt rot in black cherry (Davidson & Campbell, 1943); also on dead conifers and hardwoods. (1, 27, 136, 138, 145, 148).

**Distribution**. Conifer forest ecosystems in eastern and western North America. In the western mountains from the Northwest Territories to Arizona. Also in Europe.

**Remarks**. This is a very common fungus on conifer logs in the western mountains, particularly on ponderosa pine. Basidiocarps on hardwoods, especially on black cherry, tend to have a thicker context but otherwise are indistinguishable from those on conifers in basidiocarp and cultural morphology. We prefer to consider this a single species. Interfertility tests will help resolve this question when homokaryons are available. Although *P. transmutans* is a brown rot fungus, basidiocarp tissue gives an instantaneous positive reaction with gum guaiac reagent as does *Oligoporus fragilis*, another brown rot fungus. Interestingly, basidiocarps of both of these species bruise reddish brown on handling and...
Perenniporia

on drying. Perhaps the same enzyme system is responsible for both reactions. Pouzar (1984) proposed the name Parmastomyces mollisimus (R. Maire) Pouz. for this species. However as no type material is known of this species, we prefer to use the present name.

Perenniporia Murr.
Mycologia 34:595, 1942
Basidiocarps mostly perennial, rarely annual, resupinate to pileate; pileus smooth, ochraceous to blackish by age; pore surface white to cream, pores small, isodiametric; context white to light ochraceous and fibrous to woody hard; hyphal system dimitic (trimitic), generative hyphae thin-walled, hyaline, and with clamps, often difficult to observe; skeletal hyphae dominating in the basidiocarps, solid to thick-walled, unbranched to moderately branched, non-dextrinoid to strongly dextrinoid or amyloid; cystidia none; basidiospores thin- to thick-walled, globose to ellipsoid, dropshaped to truncate, hyaline, non-dextrinoid to strongly dextrinoid, often variable within the same basidiocarp. On dead and living hardwoods and conifers. Large cosmopolitan genus.

Type species: Perenniporia medulla-panis (Fr.) Donk

Remarks. The genus is above characterized by the ellipsoid to distinctly truncate spores, usually thick-walled and with a variable dextrinoid reaction combined with a di- to trimitic hyphal system where the vegetative hyphae are dextrinoid in a variable degree.

Key to species

1. Basidiocarps pileate ........................................ 2
2. Basidiocarps resupinate ........................................ 9
3. Basidiocarps sessile, single or imbricate, pileus 0.5–5 cm thick ........................................ 4
4. Basidiocarps often effused, single, reflexed, pileus less than 5 mm thick ........................................ 5
5. Pores 2–3 mm; basidiospores truncate; on Shepherdia ........................................ 4. P. ellisiiana
6. Pores 4–6 mm, basidiospores subglobose; on other hosts ........................................ 6
7. Basidiocarps 0.5–3 cm thick, watery and soft when fresh; context white, tubes darker ........................................ 12. P. robindiophila
8. Basidiocarps 2–8 cm thick, woody; context isabelline to gray, darker than tubes ........................................ 6. P. fraxinea
9. Basidiocarps effused-reflexed, basidiospores subglobose 5–7 x 5–6.5 μm ........................................ 17. P. tepetensis
10. Basidiocarps sessile-semistipitate, basidiospores ellipsoid, truncate 5–6.5 x 3.5–4.5 μm ........................................ 13. P. semistipitata
11. Chlamydospores present; pores normally developed; context 1 mm thick, dense and friable; pores often imperfectly developed ........................................ 2. P. compacta
12. Chlamydospores absent; pores normally developed; context 1 mm thick, dense and hard ........................................ 11. P. philoiphila
13. Basidiocarps white, isabelline or lemon yellow to dirty pale brown or salmon ........................................ 10
14. Basidiocarps 5–7 μm long; chlamydospores present ........................................ 2. P. compacta
15. Basidiocarps 5–7 μm long; chlamydospores absent ........................................ 8
16. Basidiocarps 5–7 μm long; chlamydospores absent ........................................ 8
17. Tramal skeletal hyphae 3–7 μm wide, strongly dextrinoid; basidiospores ovoid ........................................ 14. P. subacida
18. Tramal skeletal hyphae 2–3.5 μm wide, variably dextrinoid or IKI-; basidiospores truncate ........................................ 18
20. Basidiocarps thin-walled; pore surface cream to chrome yellow ........................................ 19
21. Pore surface cream colored ........................................ 15. P. tenuis var. tenuis
22. Pore surface bright yellow ........................................ 16. P. tenuis var. pulchella
<table>
<thead>
<tr>
<th>Symbols for species of <em>Perenniporia</em> in synoptic key</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, <em>P. amylodextrinoidea</em></td>
</tr>
<tr>
<td>2, <em>P. compacta</em></td>
</tr>
<tr>
<td>3, <em>P. ellipsospora</em></td>
</tr>
<tr>
<td>4, <em>P. ellisiana</em></td>
</tr>
<tr>
<td>5, <em>P. fergusii</em></td>
</tr>
<tr>
<td>6, <em>P. fraxinea</em></td>
</tr>
<tr>
<td>7, <em>P. fraxinophila</em></td>
</tr>
<tr>
<td>8, <em>P. medulla-panis</em></td>
</tr>
<tr>
<td>9, <em>P. narytmtca</em></td>
</tr>
<tr>
<td>10, <em>P. ohiensis</em></td>
</tr>
</tbody>
</table>

**Synoptic key to species of *Perenniporia***

**Habit of basidiocarp**
- a. resupinate 1, 2, 3, 5, 8, 9, 11, 14, 15, 16, 18, 19
- b. sessile 4, 6, 7, 10, 12
- c. effused-reflexed 2, 7, 17
- d. substipitate 13

**Pileus characters**
- a. applanate 4, 6
- b. ungulate 4, 7, 10, 12
- c. dimidiate 10, 12
- d. elongated 17

**Pileus surface**
- a. glabrous 2, 6, 7, 10, 12
- b. tomentose 13
- c. incrusted 6
- d. becoming black and rimose 4, 7, 10

**Pore surface**
- a. white to cream colored 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 14, 15, 17, 19
- b. yellow 8, 14, 16
- c. pinkish to orange-salmon 5
- d. gray 18
- e. isabelline to tan 2, 3, 4, 6, 13, 15, 17, 19
- f. pores 1-5 per mm 1, 2, 3, 4, 5, 7, 9, 10, 11, 13, 15, 16, 17, 18, 19
- g. pores 5-10 per mm 5, 6, 8, 12, 14

**Contect or subiculum**
- a. white to cream colored 1, 4, 6, 9, 10, 11, 12, 15, 16, 17, 19
- b. yellow 16
- c. buff to pale brown 3, 4, 5, 6, 7, 10, 13, 14, 18, 19

**Hyphal characters**
- a. skeletal hyphae negative in Melzer’s reagent 2, 7, 13, 15, 16, 17
- b. skeletal hyphae dextrinoid 3, 4, 5, 6, 8, 10, 11, 12, 13, 14, 19
- c. skeletal hyphae amyloid 1, 9
- d. binding hyphae present 4, 5, 8, 10, 11, 12, 14, 19
- e. fusoid cystidioides present 3, 5, 8, 9, 11, 12, 14, 15, 16

**Basidiospores**
- a. dextrinoid 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 17, 18, 19
- b. negative in Melzer’s reagent 5, 9, 15, 16
- c. truncate 2, 4, 7, 8, 10, 11, 12, 13, 15, 17, 18, 19
- d. ellipsoid 5, 8, 9, 10, 11, 13, 14, 15, 16, 19
- e. subglobose 6, 12, 17
- f. thick-walled 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19
- g. thin-walled 14, 16
- h. up to 7 μm long 1, 3, 5, 8, 13, 14, 15, 16, 17, 18, 19
- i. over 7 μm long 2, 4, 6, 7, 10, 11, 12

**Chlamydospores present** 2

**Substratum**
- a. heartwood of living trees 2, 4, 6, 7, 10, 11, 12, 14, 17
- b. dead trees, stumps, logs, slash 1, 3, 5, 8, 9, 10, 13, 14, 15, 16, 18, 19
- c. on conifers 3, 14, 15, 16
- d. on hardwoods 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
- e. wide latitudinal range 2, 4, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16

**Geographical distribution in North America**
- a. known from eastern part only 2, 3, 5, 6, 11, 12, 17, 18, 19
- b. known from western part only 1, 4, 13
- c. occurring in both eastern and western parts 7, 8, 9, 10, 14, 15
- d. known only from the southeastern U.S. 11, 17, 18
- e. wide latitudinal range 2, 4, 6, 7, 8, 9, 10, 12, 14, 15, 16

1. *Perenniporia amylodextrinoidea* Gilbn. & Ryv., sp. nov. Fig. 253
Fructification resupinata, annua, creame vel pallido-bubalina; pori 3-5 per mm; systema hypharum dimiticum; hyphae generatoriae fibulatae; hyphae skeletonae amyloideae; cystidiola 15-19 × 5-6 μm, fusoidae; basidia 14-17 × 7-8 μm, late clavata; basidiosporae 4.5-6 × 3-4 μm, hyalinae, truncatae, crassitunicatae, dextrinoidae. Typus on *Alnus oblongifolia* Torr., Wet Canyon, Pinaleno Mountains, Coronado Nat. Forest, Graham County, Arizona, R.L. Gilbertson No. 10413, Sept. 14,
Perenniporia

Fig. 253. Perenniporia amylo-dextrinoides (type). a, subicular generative hyphae; b, subicular skeletal hyphae; c, trama-binding hyphae; d, cystidioles; e, basidia; f, basidiospores.

1971 (BPI). Basidiocarps annual, resupinate, becoming widely effused; pore surface cream-colored when fresh, drying pale buff and often splotched with pale reddish brown areas, the pores circular to angular, 3–5 per mm, with thin, entire dissepiments; subiculum white to cream-colored, soft-fibrous, azonate, up to 0.5 mm thick; tube layer concolorous with context, up to 2 mm thick; all tissues blackening instantly with Melzer's reagent.

Hyphal system dimitic; subicular generative hyphae thin-walled, with clamps, 2.5–5 μm in diam, with rare branching; subicular skeletal hyphae moderately to strongly amyloid in Melzer's reagent, thick-walled, nonseptate, with occasional to frequent branching, 1.5–4 μm in diam. Cystidia absent; fusoid cystidioles present, thin-walled, not projecting beyond basidia, 15–19 × 5–6 μm.

Basidia broadly clavate, 4-sterigmate, 14–17 × 7–8 μm, with a basal clamp.

Basidiospores ovoid to ellipsoid, truncate, hyaline, with thickened walls, moderately to strongly dextrinoid in Melzer's reagent, 4.5–5.5(–6) × 3–3.5(–4) μm.

Type of rot. — White rot of dead alder.

Cultural characteristics. — Unknown.

Sexual. — Unknown.

Substrata. — Known only on dead Arizona alder (Alnus oblongifolia).

Distribution. All specimens collected to date from Pinaleno Mountains, Graham County, Arizona.

Remarks. The amyloid reaction of the skeletal hyphae of P. dextrinoides is so strong that basidiocarp tissue instantly turns black where touched with Melzer's reagent. This character, combined with the dextrinoid reaction of the basidiospores, distinguishes this species.


Basidiocarps resupinate to effused-reflexed, often pulvinate, odor said to be disagreeable when fresh; pileus up to 1 cm wide, adnate, tough
Perenniporia
to corky when fresh, dense and partly friable when dry; upper surface white to pale wood-colored, glabrous and azonate with a rounded, obtuse margin; margin of resupinate pore surface narrow and white, often rounded; pore surface white to isabelline or cork-colored, pores often imperfectly developed, round, 3–4 per mm with thick walls; tubes up to 3 mm deep, badly developed; context dense, friable, ochraceous to cork-colored, up to 4 mm thick.

Hyphal system dimitic; generative hyphae with clamps, 2–4 μm wide; skeletal hyphae unbranched or with dichotomous branching near the outer ends, thick-walled and dextrinoid, 2–4 μm wide.

Basidiocarps resupinate, adnate, annual, effused, up to 4 mm thick, hard when dry, margin narrow and white; pore surface whitish, drying pale straw-colored or very pale yellowish brown, pores round to angular, some often partly collapsed, thinwalled, 3–4 per mm; tubes concolorous; context ochraceous and dense, about 1 mm thick.

Hyphal system dimitic; generative hyphae with clamps, 2–4 μm wide; skeletal hyphae unbranched or with dichotomous branching near the outer ends, thick-walled and dextrinoid, 2–4 μm wide.
Perenniporia

**Substrata.** Known only from *Shepherdia*.

**Distribution.** Western United States and Alberta in Canada.

**Remarks.** This species is closely related to *P. fraxinophila* but separated by the host and distinctly smaller spores. Nobles (1948) reported that homokaryons of the two species are completely incompatible. In the upper Missouri river drainage, *P. ellisiana* is invariably present on silverleaf buffalo berry (*Shepherdia argentea*) in all river bottoms where that host occurs.

5. *Perenniporia fergusii* Gilbn. & Ryv., sp. nov. [Fig. 257]

Fruticatio resupinata vel leviter reflexa, annua, vinaceo-bubalina vel avellanea; pori 4–6 μm; systema hyphae trimiticum; hyphae generatoriae fibulatae; hyphae skeletales velic dextrinoideae; cystidiola fusoidae, 18–35 × 4.5–7 μm; basidia late clavata, 15–22 × 7–9 μm; basidiosporae 4.5–6 (–7) × 3–5 μm, ellipsoidae, non-dextrinoideae.

**Type on** *Carya ovata* (Mill.) K. Koch, Trail of Tears State Park, Union County, Illinois, R. L. Gilbertson No. 16116, Oct. 22, 1986 (BPI).

**Basidiocarps** annual, resupinate or forming small, reflexed, dimidiate pilei up to 1 cm wide on vertical surfaces, tough and leathery when fresh, drying hard and rigid; upper surface of small pileate portions dark purplish brown, usually with some pinkish buff, abnormal, distorted tube development; pore surface pinkish buff to pale salmon colored, marginal tissue and sterile areas pale orange-brown to reddish brown, drying vinaceous buff to avellaneous, the pores circular to angular under reflexed portions, 4–6 per mm, with thick, entire dissepiments, on vertical surfaces elongated and distorted, the tubes often in the form of irregular ridges; subiculum pale pinkish buff, azonate, soft-fibrous, easily teased apart, up to 5 cm thick; tube layer vinaceous buff to pinkish buff, hard and horny and difficult to section when dry, up to 3 mm thick.

**Hyphal system** trimitic; generative hyphae thin-walled, IKI-, with clamps, obscure and difficult to find, 2–5 μm in diam; skeletal hyphae dominating in subiculum, thick-walled, strongly dextrinoid, with occasional branching, nonseptate, 2.5–6 μm in diam; binding hyphae conspicuous in trama, thick-walled, strongly dextrinoid, much branched, nonseptate, 2–5 μm in diam; scattered and less strongly branched in subiculum.

**Cystidia** none; fusoid cystidioles abundant, particularly near the dissepiment edges, thin-walled, 18–35 × 4.5–7 μm, with a basal clamp.

**Basidia** broadly clavate, 4-sterigmate, 15–22 × 7–9 μm, with a basal clamp.
Perenniporia

518

Perenniporia

Fig. 257. Perenniporia fergusii (RLG 16116). a, trama generative hyphae; b, contextual skeletal hyphae; c, trama binding hyphae; d, incrusted hyphal ends near dissepiment edges; e, cystidioles; f, basidia; g, basidiospores.

Basidiospores ellipsoid to slightly truncate, thick-walled, smooth, negative or weakly dextrinoid in mass in Melzer's reagent, 4.5-6 (-7) x 3-5 μm.

Type of rot. Uniform white rot of dead hardwoods.

Cultural characteristics. Unknown.

Sexuality. Unknown.

Substrata. Known only from shagbark hickory (Carya ovata) stumps.

Distribution. Known only from southern Illinois.

Remarks. The only two collections of this fungus were on shagbark hickory stumps and the basidiocarps completely surrounded the stumps to a height of about 0.5 meters. The distinctive pinkish salmon to vinaceous coloration, the large, strongly dextrinoid skeletal and binding hyphae, and the negative or weakly dextrinoid spores distinguish P. fergusii from other species in the genus.

6. Perenniporia fraxinea (Bull.:Fr.) Ryv. Fig. 258


Basidiocarps pileate, perennial, broadly attached, single or imbricate, often large, up to 12 cm wide, 16 cm long and 2-8 cm thick at the base, often triquetrous in section, woody when dry, more corky when fresh; pileus surface first velutina, but soon glabrous, slightly zonate, often with small warts or thin ridges, first ochraceous, becoming unevenly dirty brown to grey, often with reddish spots, and finally grey to black with a very thin crust, margin rounded; pore surface cork or wood-colored, pores 4-6 per mm; tubes stratified, pinkish-ochraceous to cork-colored, up to 6 cm deep in old specimens; context cottony to punky, isabelline to cream or pale cork colored, later becoming cinerous to pale brown from the pileus surface, up to 3 cm thick at the base.

Hyphal system dimitic; generative hyphae hyaline, thin-walled, rather variable in width, mostly 2-6 μm wide, with small clamps; skeletal hyphae dominating in the context, dextrinoid, straight to flexuous, only very rarely branched, 5-10 μm wide (in KOH), in the trama narrower, unbranched to sparingly branched 2.5-6 μm wide; the crust in old specimens consists of very intricately intertwined skeletal hyphae, straight or dendroid by branching or more twisted and partly strongly swollen, up to 15 μm wide in swollen parts, the whole glued together to a dense structure with a yellowish color in thin sections.

Cystidia and other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 15-22 x 5-7 μm, with a basal clamp.

Basidiospores subglobose to dropshaped, thick-walled with distinct germ pore, variably dextrinoid, 6-8 x 5-6.5 μm.

Type of rot. Causes a white root and butt rot in hardwoods.

Cultural characteristics. See Baxter 1924; Campbell 1938; Nobles 1948, 1958, 1965; Stalpers 1978.

Sexuality. Heterothallic and tetrapolar (Montgomery 1936).
Perenniporia

*Fig. 258. Perenniporia fraxinea (RLG 5086). a, contextual generative hyphae; b, contextual skeletal hyphae; c, tramal skeletal hyphae; d, narrow tramal skeletal hyphae; e, cystidiolae; f, basidia; g, basidiospores.*

Substrata. On living hardwoods, especially *Fraxinus* but known from many other hosts (3, 32, 75, 124, 153, 195).

Distribution. Eastern United States and Eastern Canada.

Remarks. The perennial, often darkcolored and very hard basidiocarp at the base of living trees, the strongly dextrinoid skeletal hyphae, and the often dropshaped spores are diagnostic.

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*Fig. 259. Perenniporia fraxinophila (ERC 71-25). a, contextual generative hyphae; b, contextual skeletal hyphae; c, basidia; d, basidiospores.*


Basidiocarps sessile to effused-reflexed or resupinate, solitary or imbricate, ungulate, up to $7 \times 9 \times 7$ cm; upper surface usually grayish-black, sometimes reddish-brown on younger specimens, incrusted, glabrous, becoming rimose and sulcate; margin even, concolorous with upper surface, also incrusted; pore surface ivory to buff, the pores circular to angular, 3–5 per mm, with thick, entire dissepiments; context buff to pale yellowish-brown, corky, azonate, up to 1 cm thick; tube layers concolorous and continuous with the context or somewhat lighter, each layer up to 5 mm thick.

Hyphal system dimitic; contextual generative hyphae thin-walled, 2–3 μm in diam, with inconspicuous clamps, these more apparent in marginal tissue; contextual skeletal hyphae hyaline, moderately thick-walled to thick-walled, with occasional branching, nonseptate or rarely with simple septa, 2.5–5 μm in diam; tramal hyphae similar, skeletal hyphae mostly 2–3 μm in diam.

Cystidia or other sterile hymenial elements absent.
Perenniporia

Basidia broadly clavate, 4-sterigate, 20–25 × 9–11 μm, with a basal clamp.

Basidiospores broadly ellipsoid to subglobose, truncate at the apex, hyaline, dextrinoid in Melzer’s reagent, 9–11 × 6.5–8 μm, thick-walled at maturity with a germ pore at the truncate apex.

Type of rot. White trunk rot of living hardwoods.


Substrata. The major cause of trunk rot in living Fraxinus, also a few records on other hardwood genera and juniper. (3, 75, 76, 93, 143, 144, 153, 165, 195).

Distribution. Virtually the whole range of ash in North America except rare in the Pacific Coast forest and apparently absent in the Gulf Coast Region. Common in the Northern and Central Hardwoods Forests and also on Fraxinus velutina in Arizona and New Mexico. Known only from North America.

Remarks. Perenniporia fraxinophila is quite similar to P. ellisiana and the two species are sympatric in the upper Missouri River watershed. They differ in micromorphology in the smaller spores of P. ellisiana. Also, P. ellisiana is very host specific and occurs only on Shepherdia. Homokaryons of the two are not interfertile (Nobles et al. 1957). P. fraxinophila grows rapidly and fruits in pure culture, the spores germinate readily, and clamps are conspicuous on dikaryotic isolates. It is an excellent organism for demonstrating tetrapolar heterothallism to students.

8. Perenniporia medulla-panis (Jacq.:Fr.) Donk


Basidiocarps annual to perennial, becoming widely effused, usually resupinate but sometimes narrowly reflexed on vertical surfaces, tough-corky; pore surface highly variable in color, cinereous, cream color to cream-buff or bright yellow, the pores circular, 5–7 per mm, with thick dissepiments; subiculum thin, cream colored to yellowish; tube layers concolorous with subiculum, distinctly stratified, each layer up to 1 mm thick.

Hyphal system trimitic; subicular generative hyphae thin-walled, with clamps, 2–4 μm in diam; subicular skeletal hyphae thick-walled, aseptate, 2.5–5 μm in diam; binding hyphae thick-walled, aseptate, much-branched, 1.5–2 μm in diam; skeletal and binding hyphae dextrinoid in Melzer’s reagent; trama hyphae similar.

Cystidia none; fusoid cystidioles present, not projecting, 15–22 × 7–8 μm, with a basal clamp; hyphal pegs present.

Basidia broadly clavate with a narrow base, 4-sterigate, 19–27 × 7–11 μm, with a basal clamp.

Basidiospores broadly ellipsoid to ovoid, usually truncate, thick-walled, smooth, hyaline, weakly to strongly dextrinoid in Melzer’s reagent, 5–6.5 × 3–4 μm.

Type of rot. White rot of dead hardwoods; positive in gum guaiac solution.

Cultural characteristics. See Stalpers 1978.

Sexuality. Heterothallic and tetrapolar (Budington, unpublished).

Substrata. Dead wood of numerous hardwood genera, rarely on conifers, (2, 8, 10, 11, 37, 39, 54, 76, 92, 127, 146, 153, 160, 165).

Distribution. Widely distributed in eastern and western forest regions; cosmopolitan species.

Remarks. Perenniporia medulla-panis is characterized by the thick-walled dextrinoid spores and dextrinoid skeletal and binding hyphae.
Perenniporia

Macroscopically, the tough, perennial or persistent basidiocarps with the highly variable, often bright yellow, pore surface are distinctive. Reflexed basidiocarps are occasionally found on vertical surfaces such as the sides of stumps.

9. Perenniporia narymica (Pil.) Pouzar


Basidiocarps annual, becoming widely effused, adnate; pore surface cream colored, drying light buff to cream buff, the pores circular to angular, 3–5 per mm, with thick dissepiments; margin white to light buff, finely fibrilllose, up to 2 mm wide; subiculum thin, cream colored; tube layer concolorous with subiculum, up to 1 mm thick.

Hyphal system dimitic; subicular generative hyphae thin-walled, with clamps, 2–4 μm in diam; subicular skeletal hyphae thick-walled, with rare branching, weakly amyloid in Melzer’s reagent, nonseptate, 3–6 μm in diam; tramal hyphae similar. Cystidia none; fusoid cystidioles present, not projecting, 14–20 × 5–7 μm, with a basal clamp.

Basidia clavate, 4-sterigmate, 18–30 × 6–9 μm, with a basal clamp.

Basidiospores ellipsoid to ovoid, hyaline, smooth, negative in Melzer’s reagent, 4.5–6 × 3–4 μm.

Type of rot. White rot of dead hardwoods; positive in gum guaiac solution.

Cultural characteristics. See Stalpers 1978.

Sexuality. Unknown.

Substrata. Dead wood of several hardwood genera (3, 8, 20, 145).

Distribution. Reported from hardwood forests of the northeastern U.S. and the Lake States, also known from Arizona, probably more widely distributed. Also in Europe.

Remarks. Perenniporia narymica is distinctive in the genus in having amyloid skeletal hyphae combined with spores that are negative in Melzer’s reagent.


Basidiocarps perennial, effused-reflexed or sessile; pilei solitary, dimidiate, up to 2.6 × 3 × 5 cm; upper surface ivory to brown or blackish, glabrous, azonate or faintly zonate, shallowly sulcate; margin ivory, glabrous, rounded; pore surface ivory, the pores circular, 5–7 per mm, with very thick, entire dissepiments; context white to tan, faintly zonate, firm-corky, up to 4 mm thick; tube layers concolorous and continuous with the context, indistinctly layered, each layer up to 4 mm thick.

Hyphal system di-trimitic; contextual generative hyphae hyaline, thin-walled, with clamps, rarely branched, 2–5 μm in diam; contextual skeletal hyphae thick-walled, rarely branched, nonseptate, 2.5–4 μm in diam, weakly dextrinoid in mass; tramal hyphae similar, some binding type hyphae present.

Cystidia or other sterile hymenial elements absent.

Basidia broadly clavate, 4-sterigmate, 28–34 × 11–16 μm, with a basal clamp.

Basidiospores ellipsoid to ovoid, truncate, hyaline, thick-walled, smooth, dextrinoid in Melzer’s reagent, 13–16 × 7–10 μm.

Type of rot. White rot of dead hardwoods.


Sexuality. Unknown.

Substrata. Dead wood of several hardwood genera, rarely on living trees; in the Southwest, particularly common on oak; in the Central Hardwood Forests often on black locust fenceposts and rails. P. ohiensis apparently has a rather wide ecological amplitude as it has been collected on Parkinsonia and Acacia in the Sonoran Desert of Arizona and on living live oak in east Texas. (2, 3, 10, 27, 37, 52, 69, 75, 129,
**Perenniporia**


**Distribution.** Northern and Central Hardwood forests, south to the Gulf Coast region and also rather common on oak in Southern Arizona and New Mexico.

**Remarks.** *Perenniporia ohiensis* has a very distinctive morphology with its small basidiocarps, large truncate, dextrinoid spores, and weakly dextrinoid context and tramal tissue. It is easily recognized in the field and not likely to be confused with any other North American polypores.

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**Fig. 262.** Perenniporia ohiensis (RLG 10829). a, tramal generative hyphae; b, tramal skeletal hyphae; c, tramal binding hyphae; d, contextual skeletal hyphae; e, basidia; f, basidiospores.

**Fig. 263.** Perenniporia phloiophila (RLG 13368). a, tramal, generative hyphae; b, subicular skeletal hyphae; c, subicular binding hyphae; d, slender tramal binding hyphae; e, cystidioles; f, immature basidia; g, mature basidia; h, basidiospores.

**11. Perenniporia phloiophila** Gilbn. & M. Blackwell


**Basidiocarps** resupinate to slightly reflexed, perennial, developing as small single units 0.7–6 cm wide or becoming confluent and up to 1 meter in largest dimension, conforming to the topography of the bark; pore surface cream-colored to pale buff, the pores circular to angular, 3–5 per mm; dissepiments thick, entire; context white to cream colored.
Perenniporia

less than 1 mm thick; tube layers indistinctly stratified, up to 2 mm thick, older layers often stuffed with white mycelium.

**Hyphal system** trimitic; trama generative hyphae 2-4 μm in diam, inconspicuous and difficult to discern, thin-walled, with clamps; binding hyphae 2-4 μm in diam, thick-walled, nonseptate, with frequent branching, negative in Melzer's reagent; skeletal hyphae mostly 2.5-5.5 μm in diam but some slender skeletals 1-2 μm in diam also present, thick-walled, with occasional branching, nonseptate, dextrinoid in Melzer's reagent.

Cystidia absent; cystidioles 16-20 x 6-8 μm, fusoid, thin-walled, not projecting.

Basidia broadly clavate, 4-sterigmate, 16-28 x 8.5-11 μm, with a basal clamp.

Basidiospores broadly ellipsoid to ovoid, smooth, thick-walled, with a thin-walled truncate apex, hyaline in KOH, dextrinoid in Melzer's reagent, 7.5-11 x 6-8 μm.

**Type of rot.** Decay of bark tissues and white rot of underlying wood of live oak where injury and death of sapwood has occurred.

**Cultural characteristics.** Gilbertson and Blackwell op.cit.

**Sexuality.** Heterothallic and tetrapolar. (Budington, unpublished).

**Substrata.** Apparently restricted to living live oak (*Quercus virginiana*).

**Distribution.** Gulf Coast region and lower Atlantic coast.

**Remarks.** *Perenniporia phloiophila* is microscopically similar to *P. fraxinophila*, but the latter species differs in producing large pileate basidiocarps and occurring mainly on *Fraxinus*. *P. medulla-panis* has smaller spores. *P. phloiophila* is genetically isolated from both of those species. It apparently utilizes bark tissue as a nutrient source as it fruits profusely over large areas of bark on large living live oaks with no decay in the underlying wood. White mycelium of *P. phloiophila* is apparent throughout the outer bark and the fungus can be isolated easily from the bark. The restriction to *Quercus virginiana* is striking, and *P. phloiophila* has never been found on any of the other species of oak commonly associated with live oak in the Gulf Coast region.


Basidiocarps pileate, sessile, single or imbricate, watery and soft when fresh, coriaceous when dry, individual pilei up to 15 cm and 20 cm long, 0.5-3 cm thick at the base, margin sharp; pileus surface white to dirty ochraceous when fresh, pale grey to unevenly dirty brown on drying, glabrous, slightly sulcate, sometimes with small warts and protuberances; pore surface white to pale gray or pale brown, pores round to angular, 5-7 per mm, sometimes slightly split or cracked when dry; tubes concolorous with pore surface or paler, up to 20 mm deep and distinctly darker than the context which is white to pale ochraceous and cottony to tough.

Hyphal system dimitic, generative hyphae thin-walled with clamps, hyaline, 2-4 μm wide, often difficult to observe; skeletal hyphae unbranched or rarely dichotomously branched, thick-walled to solid, nonseptate, 3-10 μm wide, strongly dextrinoid.

Cystidia absent, but pointed cystidioles present, smooth, up to 30 μm long.

Basidia clavate, 4-sterigmate, 25-30 x 6-9 μm, with a basal clamp.

Basidiospores subglobose to dropshaped, thick-walled, hyaline, dextrinoid, 5-8(9) x 5-7 μm.
Perenniporia

Fig. 265. Perenniporia semistipitata (type). a, subicular generative hyphae; b, subicular skeletal hyphae; c, tramal binding hyphae; d, basidia; e, basidiospores.

Type of rot. Causes a white heartrot in hardwoods.

Cultural characteristics. See Nobles 1958; Stalpers 1978.

Sexuality. - Heterothallic and tetrapolar (Sterner, unpublished).

Substrata. Hardwoods of several genera, mainly on Robinia (3, 32, 105, 119, 132, 153). Also Broussonetia.

Distribution. Eastern United States, also known from Pakistan.

Remarks. The large, light-colored and often soft basidiocarps and the dextrinoid globose spores are diagnostic characters.

13. Perenniporia semistipitata (Lloyd) Gilbn. & Ryv. Fig. 265

Comb. nov. Basionym: Polyporus semistipitatus Lloyd Mycol. Writ. 7:1271, 1924.

Basidiocarps annual, sessile to subistipitate with contracted base, 4–5 x 0.3 cm, fragile when dry; pileus surface soft, minutely velvety, azonate, white to pale isabelline, margin white and cottony; pore surface pale isabelline, pores angular, 3–4 per mm, disseminations thin and finely granular (lens); tubes concolorous; context soft and spongion in upper part, denser in the lower part, up to 2 mm thick.

Hyphal system dimitic, generative hyphae thin-walled with clamps, 2–5 µm wide; skeletal hyphae slightly to distinctly branched of the Bovista type and thus of an intermediate type, hyaline, thick-walled, non-dextrinoid to slightly dextrinoid, 2–6 µm wide.

Cystidia and other sterile hymenial elements absent.

Basidia broadly clavate, 4-sterigmate, 11–14 x 6–7.5 µm. with a basal clamp.

Basidiospores ellipsoid, slightly truncate, thick-walled and strongly dextrinoid, 5–6.5 x 3.5–4.5 µm.

Type of rot. Unknown, but probably white.

Cultural characteristics and sexuality. Unknown.

Substrata. On hardwoods.

Distribution. Known only from the type from Stockton, Kansas.

Remarks. The closest relative seems to be P. tepeitensis which however has distinctly globose and only slightly dextrinoid spores. The vegetative hyphae are also much narrower in the latter species.


Basidiocarps perennial, becoming widely effused, tough, not readily separable; margin whitish to ivory, soft, fimbriate, up to 2 mm wide; pore surface rich ivory, yellowish or tan, often glancing, the pores circular to angular, 5–6 per mm, with thick, finely fimbriate disseminations that eventually become thin and slightly lacerate; subiculum pale buff, azonate, soft, less than 1 mm thick; tube layers distinctly stratified,
Perenniporia

concolorous with the subiculum, each layer up to 2 cm thick; taste mild or slightly acid.

**Hyphal system** trimitic; subicular generative hyphae thin-walled, with clamps, inconspicuous, 2-3 μm in diam; skeletal hyphae thick-walled, nonseptate, rarely branched, 2.5-7 μm in diam; binding hyphae slender, some branched profusely, nonseptate, 1-2 μm in diam; trama hyphae similar; skeletal and binding hyphae dextrinoid in Melzer's reagent.

Cystidia none; fusoid cystidioles imbedded or slightly projecting, some lightly incrusted, 13-35 × 4.5-6 μm, with a basal clamp.

Basidia clavate, 4-sterigate, some with an attenuated base, 20-40 × 5.5-8.5 μm, with a basal clamp.

Basidiospores ovoid to broadly ellipsoid, hyaline, thin-walled, smooth, negative in Melzer's reagent, distinctly apiculate, usually with a single guttule, 4.5-7.5 × 3-5 μm.

**Type of rot.** White stringy rot of dead conifers and hardwoods and also a butt and root rot of living conifers, cream to golden yellow mycelial felts develop in the decayed wood; positive in gum guaiac solution. The rot is commonly called “feather rot”.

**Cultural characteristics.** See Nobles, 1948, 1958, 1965; Domanski 1964; Stalpers 1978.

**Sexuality.** Unknown.

**Substrata.** Mainly on conifers, causing a butt rot in fir and hemlock (Foster and Wallis 1974) and common on dead fallen trees in many areas. Also not infrequent on dead hardwoods. (1, 3, 8, 10, 20, 69, 97, 136, 138, 145, 147, 148, 153, 165, 190, 194).

**Distribution.** Widely distributed in forest regions of North America. In the West especially common in the ponderosa pine and mixed conifer forest types at elevations below the spruce-fir ecosystems.

**Remarks.** A very variable species, *P. subacida* is one of the most common and widespread polyopes in this area. The very slender, branched hyphae mixed with the larger, rarely branched skeletal, all dextrinoid, provide a good diagnostic character when considered with the broadly ellipsoid spores. *P. medulla-panis* and *P. tenuis* are similar, but have truncate spores.

15. Perenniporia tenuis (Schw.) Ryv. var. tenuis

Fig. 267. Perenniporia tenuis var. tenuis (ABB 1020). a, subicular generative hyphae; b, subicular skeletal hyphae; c, trama binding hyphae; d, cystidioles; e, basidia; f, basidiospores.


**Basidiocarps** annual, becoming widely effused, adnate; pore surface cream colored when fresh, drying warm buff, the pores 3-4 per mm, circular to angular; margin usually sterile, cream to pale buff, tomentose, up to 4 mm wide; subiculum very thin, white to cream colored, soft-fibrous; tube layer concolorous with subiculum, up to 3 mm thick.

**Hyphal system** dimitic; subicular generative hyphae thin-walled, with clamps, 2-4 μm in diam; subicular skeletal hyphae thick-walled, nonseptate, some branched, 2-3 μm in diam; trama hyphae similar.

Cystidia none; fusoid cystidioles present, imbedded or barely projecting, 18-25 × 8-9 μm, with a basal clamp.

Basidia clavate, 4-sterigate, 14-23 × 7.5-9 μm, with a basal clamp.

Basidiospores ellipsoid, some truncate, thin-walled, hyaline, smooth, IKI-, 6-7 × 4-5 μm.

**Type of rot.** – White rot of dead hardwoods and conifers.

**Cultural characteristics.** – See Nobles 1958.

**Sexuality.** – Heterothallic and tetrapolar (Lindsey and Gilbertson 1978).

**Substrata.** – Dead hardwoods and conifers. (8, 39, 75, 92, 138, 143, 145, 153).

**Distribution.** Widely distributed in forest regions of North America.

**Remarks.** *P. tenuis var. tenuis* is distinguished from *P. tenuis var. pulchella* by the bright lemon yellow color of the basidiocarps of the latter. According to F.F. Lombard (personal communication)
Perenniporia

**Fig. 268.** Perenniporia tenuis var. pulchella (RLG 8149). a, subicular generative hyphae; b, subicular skeletal hyphae; c, slender trama binding hyphae; d, cystidioltes; e, basidia; f, basidiospores. Homokaryons of the two varieties are interfertile. *P. medulla-panis* differs in its thick-walled, dextrinoid spores.

16. Perenniporia tenuis var. pulchella (Schw.) Lowe

![Diagram of Perenniporia tenuis var. pulchella](image)


**Basidiocarps** annual, becoming widely effused, adnate; pore surface bright lemon yellow, drying yellow to cream colored, the pores circular to angular, 4–5 per mm; margin usually sterile, cream colored to pale buff, tomentose, up to 4 mm wide; subiculum thin, yellowish to cream, soft-fibrous; tube layer concolorous with subiculum, up to 3 mm thick.

**Hyphal system** dimitic; subicular generative hyphae thin-walled, with clamps, 2–3 μm in diam; subicular skeletal hyphae thick-walled, non-septate, some often branched, 2–4 μm in diam.

**Cystidia** none; fusoid cystidioltes present, not projecting, 15–17 × 4–6 μm, with a basal clamp.

**Basidia** clavate, 4-sterigmate, 15–20 × 7–8 μm, with a basal clamp.

**Basidiospores** ellipsoid, some truncate, thin-walled, hyaline, smooth, IKI-, 6–7.5 × 4–5 μm.

Type of rot. – White rot of dead hardwoods and conifers.

Cultural characteristics. – See Nobles 1958.

Sexuality. – Heterothallic and tetrapolar (Nobles et al. 1957).

Substrata. – Particularly common on dead, fallen aspen, rarely on other substrata. (3, 8, 10, 12, 54, 75, 92, 113, 143, 145, 148, 153, 165).

Distribution. Widely distributed, throughout the extensive range of aspen in North America.

Remarks. See remarks under *P. tenuis* var. *tenuis*.

17. Perenniporia tepeitensis (Murr.) Ryv.

![Diagram of Perenniporia tepeitensis](image)


**Basidiocarps** pileate, annual, effused-reflexed, up to 5 mm wide and 10 cm long, 1–3 mm thick, decurrent part up to 10 cm, coriaceous; pileus surface azonate, smooth, glabrous and white to cream, margin white and narrow; pore surface white, pale isabelline or cream, pores round to angular, 4–5 per mm; tubes cream, up to 2 mm deep; context concolorous, 1 mm thick.

**Hyphal system** dimitic, generative hyphae with clamps, thin-walled,
Perenniporia

hyaline and 2-3 μm wide, skeletal hyphae flexuous, unbranched to rarely dichotomously branched, solid to thick-walled and slightly dextrinoid, 1.5-3 μm wide.

Cystidia or other sterile hymenial elements absent.

Basidia not seen.

Basidiospores globose to subglobose, hyaline, thick-walled and weakly dextrinoid, 5.5-7 × 5-6.5 μm.

Type of rot. Causing a white rot in hardwoods.

Cultural characteristics and sexuality. Unknown.

Substrata. On hardwoods.

Distribution. In United States known from Tennessee and North Carolina, also from Mexico and Costa Rica.

Remarks. The species is recognized by its pileate condition and the almost globose, thick-walled and slightly dextrinoid spores. P. semistipitata has a similar basidiocarp, but has larger pores and ellipsoid and strongly dextrinoid spores.

18. Perenniporia tephropora (Mont.) Ryv.


Basidiocarps perennial, usually more or less resupinate or with a small, obliquely reflexed dark portion up to 1 cm broad, very often on vertical or almost vertical surfaces, effused, forming irregular areas up to 20 × 8 cm, consistency woody hard; pileus, if present, slightly developed, the reflexed portion very finely tomentose to glabrous, dirty grayish to black, often somewhat cracked and sulcate, in section with a dark crust, margin thick and round; pore surface clay, buff or gray to milky coffee or pale amber, pores round to angular, 4–6 per mm, dissepiments thin to fairly thick, entire and farinose; tubes distinctly stratified, each strata 2–4 mm thick; sterile margin thinning out, up to 3 mm broad; context 0.5–2 mm thick, snuff brown to even dark brown, blackening in KOH.

Hyphal system trimitic, generative hyphae thin-walled, often collapsed, with clamps, hyaline and thin-walled, 2–4 μm in diam; skeletal hyphae abundant, thick-walled with a distinct lumen, ochraceous to pale brown, becoming pale olivaceous in KOH, straight to slightly flexuous, 3–5.5 μm in diam, wider in KOH, often with secondary simple septa; binding hyphae rather rare, thin to thick-walled, not dominating, hyaline to pale yellowish, 1.5–3.5 μm in diam, moderately branched, tapering towards the ends; both types of vegetative hyphae dextrinoid to a variable degree.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4 sterigmate, with a basal clamp, 12–15 × 4–6 μm.

Basidiospores ellipsoid to truncate, thick-walled, hyaline to slightly yellowish, dextrinoid, 4.5–6 × 3.5–4.5 μm.

Type of rot. Causes a white rot of dead hardwoods.

Cultural characteristics and sexuality. Unknown.

Substrata. Dead hardwoods in numerous genera.

Distribution. In the U.S. known only from Louisiana. Widespread in the tropical and subtropical zones.

Remarks. The grayish to ochraceous color of the pore surface immediately distinguishes this species from all other species with resupinate basidiocarps treated in this flora.

19. Perenniporia variegata Ryv. & Gilbn.

Fig. 271


Basidiocarps resupinate, annual, effused, adnate and tough when fresh, brittle and partly cartilaginous when dry; margin white to ochreous, adpressed velutinate; pore surface white to ochreous when fresh, darkening to yellowish brown when dry and old, pores round to an-
Perenniporia

Fig. 271. Perenniporia variegata (LOO 19332). a, subicular generative hyphae; b, subicular skeletal hyphae; c, slender trama! binding hyphae; d, basidia; e, basidiospores.

Perenniporia

regular, rather thin-walled, 2–3 per mm; tubes partly cartilaginous, concolorous and up to 8 mm deep; subiculum thin and dense, cream to yellowish brown in old specimens.

Hyphal system dimitic, generative hyphae thin-walled with clamps, 2–4 μm wide; skeletal hyphae thick-walled, nonseptate and dextrinoid, 2–4 μm wide.

Cystidia and other sterile hymenial elements absent.

Basidia clavate, 4-sterigate, with a basal clamp, 10–15 × 5–7 μm.

Basidiospores broadly ellipsoid to subglobose, hyaline, slightly thick-walled and dextrinoid, 4–5 × 3.5–4 μm.

Type of rot. Causes a white rot.

Cultural characteristics and sexuality. Unknown.

Substrata. On dead hardwoods.

Distribution. Eastern United States.

Remarks. The species is easy to recognize because of the pale brownish color and rather cartilaginous consistency and the relatively large pores.

Phaeolus (Pat.) Pat.

Essai Taxon. Hym., p. 86. 1900.

Basidiocarps annual, sessile to stipitate; upper surface orange at first, becoming brown, strigose to fibrillose; pore surface orange to greenish brown, pores daedaleoid to circular, up to 2 mm in diam; context orange to brown, fibrous to spongy; hyphal system monomitic; contextual hyphae simple-septate, thin- to thick-walled; cystidia cylindric, thin-walled, not incrusted; gloeoplerous hyphae also present in hymenium; basidia clavate, simple-septate at the base; basidiospores ellipsoid to cylindric, hyaline, smooth, IKI-; causes a brown cubical butt rot of living conifers. Cosmopolitan monotypic genus.

Type species: Phaeolus schweinitzii (Fr.) Pat.


Basidiocarps annual, stipitate on the ground from roots or occasionally effused-reflexed or sessile on the base of living trees, stumps or logs; stipe central or lateral, short and stout, simple or branched, up to 5 cm in diam; pilei solitary or imbricate, circular or irregularly lobed, up to 25 cm in diam; upper surface orange at first, becoming yellowish-brown at maturity, drying to clark reddish-brown, tomentose to hirsute, faintly zonate; pore surface orange at first, becoming greenish-brown, then yellowish brown to rusty brown with age, the pores angular, 1–2 per mm, dissepiments thick, becoming lacerate; context yellowish-brown, becoming dark rusty brown with age, soft-fibrous, azonate, up to 1.5 cm thick; tube layer decurrent, distinct from context, greenish to rusty brown, up to 1.5 cm thick.

Hyphal system monomitic; contextual hyphae dark brown to yellowish-brown in KOH, thin-walled, simple-septate, 3–17 μm in diam, some with frequent branching.

Cystidia frequent, yellowish, cylindric, not incrusted, 20–90 × 7–13 μm, projecting up to 75 μm; slender gloeoplerous hyphae with dark brownish contents terminating at surface of the hymenium, 3–6 μm in diam.

Basidia clavate, 4-sterigate, 20–25 × 7–8 μm, simple-septate at the base.

Basidiospores ellipsoid to ovoid, hyaline, smooth, IKI-, 6–9 × 2.5–5 μm.

Type of rot. Brown cubical rot of heartwood of butt and roots of living conifers. Thin, whitish, resinous mycelial felts are present in shrinkage cracks. P. schweinitzii is especially common in old-growth timber with
Phaeolus

**Phellinus** Quél.

*Fig. 272. Phaeolus schweinitzii (RLG 8115) a, trama hyphae; b, contextual hyphae; c, vascular element from hymenium; d, fusoid cystidia; e, cylindrical to clavate cystidia; f, basidia; g, basidiospores.*

**Phaeolus schweinitzii (RLG 8115)**

- a, trama hyphae
- b, contextual hyphae
- c, vascular element from hymenium
- d, fusoid cystidia
- e, cylindrical to clavate cystidia
- f, basidia
- g, basidiospores

**Basidiocarps** perennial, resupinate to pileate, single or imbricate with decurrent tube layer; pileus if present, yellowish, rusty brown, gray to black, tormentose, hispid, glabrous or deeply cracked, pore surface brownish, pores isodiametric, more rarely irregular and angular and slightly split, context dark reddish brown, umber or yellowish brown, mostly woody, more rarely cottony; hyphal system dimitic, generative hyphae hyaline, narrow, thin-walled and with simple septa, skeletal hyphae yellowish to rusty brown, mostly thick-walled and wider than the generative hyphae; hymenial setae and trama setae absent or present, setal hyphae absent or present in margin, context or hymenium; basidiospores globose to cylindrical, smooth, hyaline to rusty brown, thin-to thick-walled, dextrinoid to negative in Melzer’s reagent; on dead or living wood with a white rot, both in gymnosperms and angiosperms. Large, cosmopolitan genus.

**Type species:** *Phellinus torulosus* (Pers.) Bourd. & Galz.

**Remarks.** The closest relative seems to be *Inonotus*, which is separated by its monomitic hyphal system and thus more shortlived and softer basal fire scars.

**Cultural characteristics.** See Nobles, 1948, 1958, 1965; Stalpers 1978; David 1969.

**Sexuality.** Unknown.

**Substrata.** Living conifers, also continuing decay and fruiting on dead trees, stumps, and logs; rarely on hardwoods in North America. *P. schweinitzii* is generally considered to be the major cause of butt rot in Douglas fir and other commercial timber species. (1, 20, 57, 82, 97, 136, 147, 153, 188, 190, 194). In Hawaii and the South Pacific area *P. schweinitzii* commonly occurs on hardwoods (Bega 1979; Cunningham 1965).

**Distribution.** Throughout the conifer forest ecosystems of North America. Circumglobal species.

**Remarks.** *Phaeolus schweinitzii* has been placed in the Hymenochaetales by some authors because of the dark rusty brown color of mature basidiocarps and a darkening reaction in KOH. However, the fact that it is a brown rot fungus and has cystidia should exclude it from that family. It is probably phylogenetically related to the species of *Pycnoporus*, also brown rot fungi on conifers, which have orange basidiocarps and microscopic structure similar to that of *Phaeolus schweinitzii*. The bright orange color of young *P. schweinitzii* basidiocarps also suggests this relationship.
Phellinus

fruitbodies. Normally there is no difficulty to separate the two genera in the field. Murrill (1907) split Phellinus as conceived here, into several smaller genera which, however, mostly have been neglected by later mycologists. Recently, however, Fiasson & Niemelä (1984) reintroduced Murrill's genera and split the genus even further down by describing two new genera. They based their generic splitting on the European species only, neglecting the numerous tropical species. We would not be surprised if these species demonstrate transitions between the many small segregated genera and feel that Phellinus for the time being should be kept as a single genus.

Condensed key to species

1. Setal hyphae or tramal setae absent .................................................. 7
2. Spores globose and dextrinoid ............................................................ 8
3. Spores cylindrical to globose, IKI- ..................................................... 12
4. Hymenial setae absent ........................................................................ 13
5. Hymenial setae present ........................................................................ 20
6. Spores cylindrical to oblong ellipsoid ............................................... 21
7. Spores ellipsoid to globose ................................................................. 25
8. On angiosperms .................................................................................. 26
9. On gymnosperms ................................................................................. 28
10. Basidiocarps resupinate ........................................................................ 29
11. Basidiocarps pileate ............................................................................ 33
12. Basidiocarps annual or shortlived ........................................................ 15. P. gilvus
13. Basidiocarps perennial ......................................................................... 34
14. Spores rusty brown ............................................................................. 35
15. Spores hyaline to pale golden yellow ................................................ 37
16. Setae 10-25 µm long ............................................................................ 38
17. Setae in average longer than 25 µm .................................................... 42

Key to species

1. Setal hyphae or tramal setae present ..................................................... 2
2. Setal hyphae or tramal setae absent ....................................................... 7
3. Hymenial setae absent .......................................................................... 3
4. Hymenial setae present ......................................................................... 5
5. On Acer, basidiocarp fragrant, spores 2.5–3 x 1.5–2 µm .................... 14. P. fragrans
6. On gymnosperms, basidiocarp without scent, spores 4–5.5 µm in longest dimension 4
7. Spores ovoid to subglobose, context soft, setal hyphae straight, not bending into the hymenium .................................................. 48. P. weirii
8. Spores cylindrical, context hard, setal hyphae bending into the hymenium with curved tips .............................................................. 11. P. ferrugineofuscus
9. Pores 2–4 per mm .................................................................................. 5
10. Pores 5–7 per mm ................................................................................. 6
12. Hymenial setae 20–35 µm, spores 2.5–4.5 x 2–3 µm .............................. 37. P. rufitinctus
13. Spores globose, thick-walled and dextrinoid ...................................... 8
14. Spores cylindrical to globose, non-dextrinoid .................................. 12
15. On gymnosperms in the Pinaceae ...................................................... 17. P. hartigii
16. On angiosperms and juniper ............................................................... 9
17. Fruitbody ungulate-pileate .................................................................. 10
18. Fruitbody resupinate, effused-reflexed with sloping and narrow pilei .............................................................. 11
19. Setae present, spores 7–9 x 6.5–9 µm, on hosts other than oak .......... 40. P. texanus
20. Setae absent, spores 6–8 x 5.5–7 µm, on oak ..................................... 36. P. robustus
21. Setae present, spores 4.5–5 µm, in Arizona ......................................... 38. P. sonorae
22. Setae absent, spores 5.5–8 µm in diameter, widespread .................... 33. P. punctatus
23. Hymenial setae absent ........................................................................ 13
24. Hymenial setae present ...................................................................... 20
25. Basidiocarps pileate .......................................................................... 14
26. Basidiocarps resupinate ..................................................................... 18
27. Spores ellipsoid, golden brown, 4–6 x 3–4 µm, upper surface dark brown and tomentose with a thin black line which finally becomes exposed as a thin cuticle, smooth or finally becoming slightly cracked .......................................................... 16. P. grenadensis
28. Spores subglobose to globose, 5–6 x 4–5 µm, pale yellow brown to deep rusty brown, upper surface dark brown to black, persistently tomentose but without black zone in context, soon becoming black and strongly rimose .................................................. 15
29. Spores pale golden brown, upper surface reddish brown and matted tomentose, finally glabrous and black and slightly cracked, context golden lustrous brown, no granular core present 25. P. merrilli
30. Spores deep rusty brown, upper surface soon black and deeply rimose or scaly, context golden brown with granular core or reddish brown and dull .................................................. 16
Phellinus

16. Basidiocarps ungulate, pores 3–6 per mm, primarily on leguminous trees, rarely on other hardwoods, golden brown context with granular core .......................... 2. P. badius
16. Basidiocarps appplanately to slightly ungulate, pores 7–9 per mm, context without granular core .................................................. 17
17. Upper surface persistently matted brown, rarely becoming glabrous, smooth and black, on different hardwoods, tropical species ........................ 9. P. fastuosus
17. Upper surface soon becoming black and rimose or scaly, primarily on Robinia species, rarely on other hosts, subtropical to temperate species ........................................................................ 35. P. robiniiae
18. Spores hyaline to pale golden ..................... 24. P. melleoporus
18. Spores rusty brown ................................ 19
19. Spores subglobose, 4–5 μm in diam., tropical species ........................................ 43. P. umbrinellus
19. Spores oblong ellipsoid, 5–6 μm long, temperate species .............................. 19. P. inermis
20. Spores cylindrical to oblong ellipsoid, hyaline ........................................ 21
20. Spores broadly ellipsoid to globose, hyaline to colored .............................. 25
21. Context with black lines, spores subfusiform ........................................ 26. P. nigrolimitatus
21. Context without black lines, spores cylindrical to oblong ellipsoid ................... 22
22. Pores 1–2 per mm, basidiocarp soft, spores 3.5–5 μm long ....................... 28. P. palmicola
22. Pores 4–8 per mm, basidiocarp tough, spores mostly longer than 5 μm ........................................................................................................ 23
23. Setae usually longer than 25 μm, spores 5–8 μm long, widespread .............. 24
24. Spores 1.5–2 μm wide, setae usually 40–70 μm ................................ 45 P. viticola
24. Spores 2–2.5 μm wide, setae usually 25–40 μm long ............................ 10. P. ferreus
25. On gymnosperms .................................................................................... 26
25. On angiosperms .................................................................................... 28
26. Pores 5–7 per mm, regular and round, setae up to 25 μm long ............ 34. P. repandus
26. Pores 2–5 per mm, often angular to irregular, setae longer than 25 μm ........ 27
27. Basidiocarp 1–3 cm thick, resupinate, effused-reflexed, imbricate to sessile, often in large fused rows, setae 7–10 μm wide .................. 3. P. chrysoloma
27. Basidiocarp up to 8 cm thick, ungulate, mostly single, setae 10–14 μm wide ................................................................. 20. P. pini
28. Basidiocarps resupinate ........................................................................ 29
28. Basidiocarps pileate ........................................................................... 33
29. On Alnus, Betula or Prunus ................................................................ 30
29. On other hosts .................................................................................... 31
30. On Alnus or Betula ........................................................................... 21. P. laevigatus
30. On Prunus .......................................................................................... 31. P. prunicola
31. Basidiospores pale yellow, on Populus ............................................. 44. P. vaninii
31. Basidiospores hyaline, on other substrata ............................................. 32
32. Setae up to 20 μm long, spores 4–6 μm long ....................................... 39. P. spiculatus
32. Setae 20–30 μm long, spores 3–4 μm long ............................................ 12. P. ferrugineo-velutinus
33. Basidiocarp annual or shortlived, rusty brown, glabrous, warted to scarpose, spores ellipsoid to sub-cylindrical, very common species ...................................................................... 15. P. gilvus
33. Basidiocarp perennial, rusty brown to black, tomentose to glabrous, often cracked or sulcately zoned, spores ellipsoid to globose, common to rare species ...................................................... 34
34. Spores distinctly reddish brown ......................................................... 35
34. Spores hyaline to pale golden brown .................................................. 37
35. Fruitbody pendent, spores 3–4 μm in diameter ................................ 6. P. dependens
35. Fruitbody sessile, spores 4×5×3.5 μm .................................................... 36
36. Pores 3–5 per mm, setae 16–35 μm long, on oak, temperate ................. 7. P. everhartii
36. Pores 6–8 per mm, setae 12–25 μm long, on different hosts, tropical .... 22. P. linteus
37. Setae usually 10–20(–25) μm long ......................................................... 38
37. Setae usually distinctly longer than 20 μm ........................................ 42
38. Spores 3–4 μm in diameter, pileus brown, tomentose with a black zone below the tomentum, tropical species ............................................. 8. P. extensus
38. Spores longer than 4 μm, pileus glabrous, gray-black, often rimose, temperate species (P. igniarius-group) ............................................. 39
39. Basidiocarps ungulate-applanate, black, mostly smooth and sulcate, on many different hosts ............................................ 18. P. igniarius
39. Basidiocarp effused-reflexed to sessile, often with strongly sloping pileus, gray to brown, smooth to glabrous, on Populus and Prunus ................................................. 40
Phellinus

40. On *Populus* or *Prunus* .................................................. 41
40. On *Betula* or *Alnus* ..................................................... 23. *P. lundellii*
41. On *Populus*, fruitbody from old wounds in the trunk or along the lower side of branches, often radially cracked ............ 42. *P. tremuloides*
41. On *Prunus*, fruitbody resupinate-pulvinate, effused or knoblike, pileus smooth, rarely cracked .................... 30. *P. pomaceus*
42. Pores 2–5 per mm, round to angular, often slightly irregular, on *Crataegus* ................................................................. 27. *P. occidentalis*
42. Pores 4–6 per mm, round and regular, on different hosts ...... 43
43. Most setae hooked, a few straight, subtropical species .................. 40. *P. wahlbergii*
43. All setae straight, temperate-boreal species .......................... 44
44. Spores up to 4.5 μm long ................................................... 45
44. Spores 5–6 μm long ............................................................ 46
45. Spores 3.5–4.5 × 3–3.5 μm, pores 5–6 per mm, on *Juglans* in Western United States ................................................. 47. *P. weirianus*
45. Spores 2.5–4 × 2–3 μm, pores 8–10 per mm, in Central and Eastern United States ................................................... 20. *P. johnsonianus*
46. On *Arctostaphylos*, spores slightly thick-walled and cyanophilous, with a mycelial core in the context close to the attachment, setae scattered ..................................................... 1. *P. arctostaphyli*
46. On other hosts, spores thin-walled or slightly thick-walled, but acyanophilous, no mycelial core, setae abundant .................. 47
47. Basidiocarps effused-reflexed, rather thin, often with black zones in the context, pileus soon gray, black and glabrous, on different hardwoods, mostly Salix ........................................... 4. *P. conchatus*
47. Basidiocarps ungulate-aplanate, thick, no black zones in the context, pileus tomentose to glabrous, brown, in N. America known on gymnosperms ........................................ 41. *P. torulosus*

**Symbols for species of Phellinus in synoptic key**

1. *P. arctostaphyli*  
2. *P. badius*  
3. *P. chrysoloma*  
4. *P. conchatus*  
5. *P. contiguus*  
6. *P. dependens*  
7. *P. everhartii*  
8. *P. extensus*  
9. *P. fastuosus*  
10. *P. ferreus*  
11. *P. ferrugineofuscus*  
12. *P. ferrugineovulutinus*  
13. *P. ferruginosus*  
14. *P. fragrans*  
15. *P. gilvus*  
16. *P. grenadensis*  
17. *P. hartigii*  
18. *P. igniarius*  
19. *P. inermis*  
20. *P. johnsonianus*  
21. *P. laevigatus*  
22. *P. lineatus*  
23. *P. lundellii*  
24. *P. melleoportus*  
25. *P. merrillii*  
26. *P. nigrofulvus*  
27. *P. occidentalis*  
28. *P. palmicola*  
29. *P. pinicola*  
30. *P. pomaceus*  
31. *P. prunicola*  
32. *P. punctatiformis*  
33. *P. punctatus*  
34. *P. repandus*  
35. *P. robineae*  
36. *P. robustus*  
37. *P. ruftinctus*  
38. *P. sonorae*  
39. *P. spiciculosus*  
40. *P. texanus*  
41. *P. torulosus*  
42. *P. tremuloides*  
43. *P. umbrinellus*  
44. *P. vaninii*  
45. *P. viticola*  
46. *P. wahlbergii*  
47. *P. weirianus*

**Synoptic key to species of Phellinus**

**Habit of basidiocarp**

a. resupinate 5, 10, 11, 12, 13, 14, 15, 17, 19, 20, 21, 23, 24, 25, 26, 31, 32, 33, 34, 37, 38, 39, 43, 44, 45, 46.

b. sessile 1, 2, 3, 4, 7, 8, 9, 15, 16, 18, 22, 25, 27, 29, 30, 35, 36, 40, 41, 42, 45, 46, 47.

c. effused-reflexed 3, 4, 15, 17, 20, 23, 26, 27, 34, 35, 46, 47.

**Pileus characters**

a. aplanate 3, 4, 8, 9, 15, 35, 41, 46.

b. unguulate 1, 2, 6, 7, 16, 18, 25, 30, 36, 40, 41, 46.

c. dimidiate 1, 2, 3, 4, 8, 9, 15, 16, 22, 25, 27, 29, 30, 35, 36, 40, 41, 42, 45, 46.

d. elongated 3, 4, 22, 23, 26, 27, 34, 35, 45.

d. pendulous 6.

f. triquetrous 17, 42.

**Upper surface**

a. becoming blackened and rimose 1, 2, 6, 7, 18, 20, 22, 23, 25, 30, 35, 36, 40, 41, 42, 46.

b. glabrous or crust-like 1, 4, 8, 9, 15, 16, 17, 23, 29, 34.

c. hispid to tomentose 3, 4, 9, 15, 26, 27, 29, 38, 41, 45, 46.

d. sulcate 1, 3, 4, 25, 27, 34, 36, 40, 41, 45, 46, 47.
Phellinus

Pore surface
a. yellowish brown 2, 3, 4, 5, 7, 9, 10, 13, 14, 17, 19, 20, 23, 24, 26, 27, 28, 30, 32, 33, 34, 35, 36, 38, 39, 41, 45, 47, 48.
b. reddish brown 1, 6, 7, 12, 14, 16, 17, 20, 21, 23, 25, 31, 32, 32, 34, 37, 46.
c. purplish brown 8, 11, 15, 18, 24, 24, 42, 43.
d. pores 6-10 per mm 4, 6, 8, 9, 10, 11, 14, 15, 20, 21, 22, 25, 26, 30, 31, 32, 35, 36, 37, 38, 39, 41, 42, 43, 46, 47, 48.
ed. pores 1-6 per mm 1, 2, 3, 5, 7, 16, 17, 18, 19, 23, 27, 28, 29, 34, 40, 45.

Context or subiculum
a. woody 1, 2, 6, 7, 9, 17, 18, 19, 20, 21, 22, 25, 30, 31, 35, 36, 39, 40, 41, 42, 46, 47.
b. fibrous 3, 4, 5, 8, 10, 11, 12, 13, 14, 15, 16, 24, 26, 27, 28, 29, 32, 33, 34, 37, 38, 45, 48.
c. duplex 26.
d. with thin black layers 16, 24, 26, 41.
d. with granular core 1, 2, 18, 42.
f. lustrous 8, 12, 22, 38.

Hymenial setae, tramal setae, and setal hyphae
a. hymenial setae absent 2, 9, 14, 16, 17, 19, 24, 25, 33, 35, 36, 40, 43, 48.
b. hymenial setae up to 20 μm long 6, 8, 12, 18, 23, 31, 42.
c. hymenial setae 20-100 μm long 1, 3, 4, 5, 7, 10, 13, 15, 20, 21, 22, 26, 27, 28, 29, 32, 34, 36, 37, 38, 39, 40, 41, 42, 44, 45, 46, 47.
d. setal hyphae in context or marginal tissue 5, 13, 14, 37.
d. tramal setae present, not projecting 37.
f. tramal setae present, projecting into tubes 11, 14, 48.

Basidiospores
a. hyaline 1, 3, 4, 5, 10, 11, 12, 13, 14, 15, 17, 18, 21, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 44, 45, 46, 48.
b. pigmented 2, 6, 7, 8, 9, 16, 19, 20, 22, 24, 25, 35, 43, 47.
c. allantoid 11, 45.
d. cylindric to narrowly ellipsoid 5, 10, 13, 26, 28, 32.
d. obvoid to globose 1, 2, 3, 4, 6, 7, 8, 9, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48.
f. dextrinoid in Melzer’s reagent 17, 33, 36, 38, 40.

Conidia or chlamydospores present 3, 14.

Type of rot
a. white pocket rot 3, 22, 26, 28, 34, 41.
b. uniform white rot 1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 16, 17, 18, 19, 23, 24.

c. white or yellowish laminated rot 11, 13, 20, 21, 44, 48.

Substratum
a. heartwood of living trees 1, 2, 3, 7, 15, 16, 17, 18, 20, 26, 27, 29, 30, 33, 35, 36, 38, 39, 40, 42, 43, 45, 46, 47.
b. dead trees, stumps, logs, slash 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 31, 32, 33, 34, 37, 43, 44, 45, 46.
c. on conifers 3, 10, 11, 13, 17, 25, 26, 29, 34, 41, 45, 48.
d. on hardwoods 1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 27, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 42, 43, 44, 45, 46, 47.

d. southwestern a. trunk rot 1, 2, 3, 5, 7, 15, 17, 18, 20, 27, 30, 33, 35, 36, 39, 40, 42, 47.
b. root and butt rot 2, 16, 26, 38, 41, 48.

Geographical distribution in North America
a. known from eastern part only 6, 8, 9, 12, 14, 16, 19, 20, 24, 25, 28, 32, 37, 39, 43, 46.
b. known from western part only 1, 2, 26, 27, 34, 38, 40, 41, 47, 48.
c. occurring in both eastern and western parts 3, 4, 5, 7, 10, 11, 13, 15, 17, 18, 21, 22, 23, 29, 30, 31, 33, 35, 36, 42, 44, 45.
d. southwestern U.S. and Mexico only 2, 38, 40, 41, 47.
e. southeastern U.S. only 6, 8, 9, 12, 16, 24, 25, 28, 32, 37, 43, 46.
f. boreal or at high elevations 3, 4, 11, 14, 17, 23, 27, 31, 34.
g. wide latitudinal range 7, 10, 13, 15, 18, 19, 20, 21, 29, 30, 33, 35, 36, 39, 45.

1. Phellinus arctostaphyli (Long) Niemelä


Basidiocarps perennial, sessile, aplaneous to ungleate, dimidiate, 1-9 cm wide and 1-3.5 cm thick; upper surface quickly becoming glabrous and crustose, grayish, sulcate, becoming blackened and rimose with age; margin concolorous to light brown, rounded; pore surface pale grayish brown to pale rusty brown, smooth, the pores circular, 5-6 per mm, dissepiments thick, tomentose, entire; context reddish brown, azonate, fissile, firm, woody, up to 2 cm thick, with a core of tissue near the attachment that has pockets of white mycelium and dark granular masses in a mass of tough, felty mycelium, this core often poorly developed or absent in small specimens; tube layers indistinguishable, older layers becoming stuffed with pale mycelium, up to 1 cm thick.

Hyphae of fibrous context parallel, skeletal hyphae thick-walled, asep-
Phellinus arctostaphyli (RLG 7773). a, thin-walled contextual hyphae; b, thick-walled contextual hyphae; c, sclerids from core tissue; d, trama hyphae; e, schematic drawing of hymenium; f, setae; g, basidia; h, basidiospores.

Fig. 279. Phellinus arctostaphyli (RLG 7773). a, thin-walled contextual hyphae; b, thick-walled contextual hyphae; c, sclerids from core tissue; d, trama hyphae; e, schematic drawing of hymenium; f, setae; g, basidia; h, basidiospores.

Phellinus or rarely simple-septate, with rare branching, 2.5 - 5 μm in diam; generative hyphae hyaline to pale yellow, thin-walled, with simple septa and occasional branching, 2 - 4 μm in diam.

Setae infrequent, subulate, thick-walled, dark brown in KOH, 30 - 50 × 6 - 8.5 μm.

Basidia broadly clavate to ellipsoid, 4 - sterigmate, 10 - 12 × 7 - 8.5 μm, simple-septate at the base.

Basidiospores ovoid, flattened on one side, hyaline, smooth, with slightly thickened walls, IKI-, cyanophilous, 5 - 6 × 3.5 - 4.5 μm.

Type of rot. - Uniform white rot of heartwood of living manzanita, rarely in other hardwoods.

Cultural characteristics. - Unknown.

Sexuality. - Unknown.

Substrata. - Primarily on Arctostaphylos, but also on Adenostoma and rarely on Cercocarpus.

Distribution. Known only from western North America where it is rather widely distributed and locally common in some areas.

Remarks. This was considered to be a synonym of Phellinus igniarius by Overholts (1953) and Lowe (1957). Niemelä (1975) has pointed out that it is morphologically distinct with longer setae and cyanophilous spores.

2. Phellinus badius (Berk. ex Cke.) G.H. Cunn. Fig. 274


Basidiocarps perennial, sessile, ungulate, up to 16 × 11 × 9 cm; upper surface at first pale brown, tomentose, quickly becoming blackened and rimose; margin yellowish-brown, tomentose, up to 1.5 cm wide; pore surface yellowish-brown, pores circular to angular, 4 - 6 per mm, with smooth, entire dissepiments; context bright, lustrous yellowish-brown, firm, fissile, faintly zonate, up to 2 cm thick, with a granular core; granular core under 30 × lens consisting of dull yellowish-brown soft, feltly mycelium with patches of white mycelium and dark reddish brown, hard, glossy granules scattered throughout; tube layers concolorous, not distinct from context, not distinctly stratified, up to 2 cm thick.

Contextual hyphae of fibrous context compacted in parallel arrangement, simple-septate, thin- to moderately thick-walled, almost hyaline to pale brown in Melzer's reagent, dark brown in KOH, with frequent branching, 4 - 6 μm in diam, some thick-walled, dark brown, 3 - 9 μm in diam; trama hyphae mostly thick-walled, with rare branching, 2-
Phellinus

Fig. 274. Phellinus badius (RLG 7737). a, thin-walled contextual hyphae; b, thick-walled contextual hyphae; c, tramal hyphae; d, basidia; e, basidiospores.

3 μm in diam, rarely septate; hyphae of granular core a mixture of several types; some hyaline to pale yellow, much-branched, thin-to-thick-walled, 1–2 μm in diam; dark granules composed of brown swollen hyphal segments aggregated into a sclerotomy-like mass; shattering into irregular broken fragments under a cover glass. 

Setae or other sterile hymenial elements lacking. Basidia broadly clavate to ellipsoid, 4-sterigmate, 12–14 × 6–7 μm, simple-septate at the base, sterigmata 5–6 μm long. 

Basidiospores ovoid, smooth, dark reddish-brown in KOH, negative in Melzer’s reagent, thick-walled, 5–7 × 4–6 μm. 

Type of rot. — White rot of heartwood of living acacia and mesquite in the Sonoran Desert, rarely on other associated hardwoods. 

Sexuality. — Unknown. 

Substrata. — Acacia greggii, Chilopsis linearis, Prosopis juliflora. 

Distribution. In the U.S. known only from Arizona and New Mexico, where it is locally common. Also in Mexico. 

Remarks. Phellinus badius has a circumglobal distribution in the tropics and subtropical regions. It is most similar to Phellinus robineae which is found only on Robinia. 

3. Phellinus chrysoloma (Fr.) Donk. 


Basidiocarps perennial or sometimes developing for only one season, effused-reflexed to sessile, often resupinate in early stages of development, imbricate in clusters on standing trees and stumps or often in rows on fallen trees, pilei usually thin and planate, dimidiate to elongated, up to 5 cm wide; upper surface tomentose to hispid, sulcate, zonate, dull reddish brown to bright yellowish brown at the margin; margin usually undulate, slightly lobed, acute, narrowly sterile below; pore surface bright yellowish brown at first, darkening in older specimens, glancing, the pores angular to slightly daedaleoid, 1–3 per mm in most specimens but smaller (4–6 per mm) in others; dissepiments thin, entire to lacerate; context reddish brown, tough-fibrous, with a thin black layer separating the soft upper tomentum, dense lower layer up to 3 mm thick, upper tomentum up to 1 mm thick; tubes indistinctly stratified, inner surface ochraceous, paler than trama and context, entire tube layer up to 1 cm thick. 

Hyphae of fibrous context thin-walled and almost hyaline to thick-walled and bright reddish brown in Melzer’s reagent, darker brown in KOH, septate, occasionally to often branched, closely interwoven into a compact tissue, 2–4 μm in diam; hyphae of upper tomentum thin-walled and yellowish to thick-walled and bright reddish brown, septate, with rare branching, 2–5 μm in diam; dark layer between lower context and tomentum composed of dark, closely interwoven hyphae; basidiospores usually abundant on upper surface and in tomentum; tramal hyphae hyaline to yellowish brown, thin-to-slightly thick-walled, septate, with rare to occasional branching, 2–3 μm in diam. 

Setae abundant, subulate, thick-walled, bright reddish brown in KOH, 25–60 × 7–10 μm. 

Basidia clavate, 4-sterigmate, 10–12 × 5–6 μm, simple-septate at the base. 

Basidiospores ovoid to subglobose, hyaline, becoming pale yellowish brown (particularly those trapped in upper tomentum), smooth, negative in Melzer’s reagent, becoming slightly thick-walled, 4–5.5 × 4–5 μm. 

Chlamydoeospores scattered in tramal tissue of some specimens; subglose, ovoid, thick-walled, yellowish brown, 5–5.5 μm in diam. 

Type of rot. — White pocket rot of living and dead conifers. Phellinus chrysoloma also is pathogenic in true firs, killing sapwood, and causing
stem cankers in which basidiocarps develop (Owens, 1936).

Cultural characteristics. - See Owens 1936.

Sexuality. - Unknown.

Substrata. - Living and dead conifers in all genera of the Pinaceae. Most common on Picea. (1, 97, 136, 148, 194).

Distribution. Throughout western North America and in the northern coniferous forests in the eastern part. Cosmopolitan species.

Remarks. This has been considered a variety of Phellinus pini but is now recognized as a distinct species by Donk (1974), Ryvarden (1977) and others. The resupinate to effused-reflexed, thin basidiocarps, the upper tomentum separated by a thin dark layer from the lower context, and the narrower, shorter setae are diagnostic characters of P. chrysoloma.

4. Phellinus conchatus (Pers.:Fr.) Quél.


Basidiocarps sessile, effused-reflexed, or sometimes resupinate; pilei solitary to imbricate, dimidiate or irregular in shape, up to $11 \times 15 \times 4$ cm; upper surface light brown to black with age, glabrous, incrusted, azonate, sulcate, rough; margin concolorous, rounded to acute; pore surface yellowish brown, woody, azonate, with one or more thin black layers, up to 4 mm thick; tube layers concolorous with the context, indistinctly stratified, each layer up to 2 mm thick.

Contextual hyphae mostly brown in KOH, thick-walled, rarely branched, rarely simple-septate, 2.5–4 μm in diam; also some thin-walled, hyaline, simple-septate, 2–3 μm in diam; trama hyphae similar.

Setae abundant, ventricose to subulate, thick-walled, dark brown in KOH, 20–50 × 7–9 μm.

Basidia clavate, 4-sterigmate, 10–12 × 6–7 μm, simple-septate at the base.

Basidiospores ovoid to subglobose, hyaline, smooth, negative in Melzer's reagent, 5–6.5 × 4–4.5 μm.

Type of rot. - Uniform white rot of dead wood of several hardwood genera.
Phellinus


Sexuality. – Unknown.


Distribution. Common in the central hardwood forests and the northeastern U.S. and eastern Canada. Also in the northwestern U.S. and western Canada but rarely found in the West.


Basidiocarp perennial, resupinate, adnate, mostly elongated and effused, up to 20 cm long, 5 cm wide and up to 1 cm thick, smooth and even or nodulose and undulated on oblique substrates with smooth sterile areas in between fertile poroid areas, spongy when fresh, hard when dry; pore surface reddish to umber brown, often with a grayish pruina, margin mostly narrow, rusty brown and finely floccose, disappearing with age, pores angular, on average 2–3 per mm, often somewhat sinuous and irregular, especially on oblique substrates and then often split in front, up to 1 mm wide, along the margin often deeply split into a labyrinthine to irpicoid configuration, tubes indistinctly stratified, up to 10 mm deep, mostly with a grayish brown pruina; context very thin, rusty brown, up to 1 mm thick.

Hyphal system dimitic; generative hyphae thin-walled and hyaline, 2–3.5 μm, slightly thick-walled and pale yellowish in the subiculum and the floccose margin, skeletal hyphae yellowish to rusty brown, straight, thick-walled and 3–5 μm wide with a distinct lumen.

Setae of two kinds:
a) tramal setae acute, tapering from the base, thick-walled and straight, dark brown to light yellowish in the top, scattered and not always easy to find, occurring in the floccose margin and in the trama, 40–120 × 5–12 μm,
b) hymenial setae very abundant, subulate, thick-walled, dark brown and with a bent base, either terminal or more rarely lateral from generative hyphae, often with a bulbous base, projecting 15–25 μm above the hymenium, (35–)40–60(–65) × 6–10 μm.

Cystidiolae abundant, mostly as hyphal ends, partly embedded in the hymenium, partly projecting above it, but also as ventricose organs with a tubelike upper part projecting above the hymenium, hyaline and thin-walled.

Fig. 277. Phellinus contiguus (RLG 16152). a, tramal generative hyphae; b, subicular skeletal hyphae; c, tramal setae; d, hymenial setae; e, basidia; f, basidiospores.

Basidia clavate, 4-sterigmate, 10–14 × 5–7 μm.

Basidiospores oblong ellipsoid, hyaline, thin-walled, smooth, with a large oildrop, IKI –, 5–7 × 3–3.5 μm.

Type of rot. – White rot in dead deciduous wood.

Cultural characteristics. – See Stalpers 1978

Sexuality. – Unknown.

Substrata. – On dead wood of numerous hardwood genera

Distribution. Probably widespread in the southeastern parts of United
Phellinus

States, but the name has often been applied to resupinate specimens of *P. viticola* which, however, has a more rusty brown color and longer and cylindric spores. *P. contiguus* is widespread in warmer parts of Europe and throughout the tropical zone.

Remarks. This species is easy to recognize because of the moderately large pores, the tramal setae and the ellipsoid hyaline spores.

6. **Phellinus dependens** (Murr.) Imaz.


Basidiocarp perennial, more or less pendent with distinct tapering base or vertex from the pileus, ungulate, up to 10 cm wide and long. 7 cm thick at the basal part, woody hard; upper surface at first finely tomentose and dark rusty brown, but soon the upper hyphae become indurated and a black irregular crust develops, thickest in the basal parts, sulcate and in older specimens cracked and rimose, margin rounded and obtuse, umber brown to grayish; pore surface reddish brown to umber, pores round and small, 7-9 per mm; tubes concolorous, indistinctly

- **Hyphal system** dimitic; generative hyphae thin-walled and simple-septate, 2-3.5 μm wide; skeletal hyphae thick-walled, yellow to pale rusty brown, 3-5 μm wide.

- **Setae** slightly to strongly ventricose, straight, thick-walled and acute, 12–18 × 5–8 μm.

- **Basidia** broadly clavate, 4-sterigmate, 10–11 × 5–6 μm, simple-septate at the base.

- **Basidiospores** subglobose, pale reddish brown, thick-walled, about 3–4 μm in diameter.

Type of rot – White rot in dead hardwoods

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Dead hardwood in several genera

Distribution. Florida in United States, also in West Indies and south to Brazil. Imazeki (op. cit.) reports it from New Guinea.

Remarks. The pendent basidiocarp with the sulcate and rimose surface and the small spores are important characteristics. *P. rimosus* as defined here, has larger pores and spores. *P. linteus* is similar as it often has a constricted attachment to the substrate and pores and surface characteristics are similar in the two species. The latter has, however, slightly larger spores, 4–5 μm long, while they are only 3–4 μm long in *P. dependens*.

7. **Phellinus everhartii** (Ell. & Gall.) A. Ames.

Fig. 279


Basidiocarps sessile, ungulate, up to 6 × 13 × 8 cm; upper surface yellowish-brown to black, sometimes very finely tomentose, becoming glabrous and incrusted with age, usually sulcate, rimose; margin concolorous, rounded; pore surface glancing with a golden lustre, dark yellowish-red to reddish-brown (Ochraceous-Tawny, Buckthorn Brown or Cinnamon Brown), the pores circular to angular, 5–6 per mm, with thick, entire dissepiments; context reddish-brown, woody, faintly zonate, up to 5 cm thick; tube layers concolorous with the context, rather distinctly stratified, each layer up to 6 mm thick; context with masses of hard granular tissue that appear under 30 × lens as dark, solid or resinous areas in a matrix of paler brown interwoven mycelium; hyphae of dark masses agglutinated and hard to separate, tissue breaking out in small chunks.
Phellinus

**Phellinus everhartii** (RLG 7014).

**Fig. 279.** Phellinus everhartii (RLG 7014). a, skeletal and generative contextual hyphae; b, binding hyphae from core tissue; c, trama! generative hyphae; d, trama! skeletal hyphae; e, schematic drawing of hymenium; f, setae; g, basidia; h, basidiospores.

**Contextual hyphae** mostly brown in KOH solution, thin- to thick-walled, with rare branching, simple-septate, 3-6.5 μm in diam; some hyphae hyaline, thin-walled, simple-septate, 2.5-4 μm in diam; trama! hyphae similar.

**Setae** frequent to abundant, subulate to ventricose, thick-walled, dark brown in KOH, 16-36 × 5-9 μm.

**Basidia** ovoid to broadly ellipsoid or subglobose, 4-sterigmate, 8-12 × 5.5-7 μm, simple-septate at the base.

**Basidiospores** ovoid to subglobose, dark reddish-brown, smooth, negative in Melzer's reagent, 4-5 × 3-4 μm.

**Type of rot.** - White rot of heartwood of living hardwoods.

**Cultural characteristics.** - See Campbell, 1938; Davidson et al., 1942; Nobles, 1948, 1958, 1965; Stalpers, 1978.

**Sexuality.** - Unknown.

**Substrata.** - Usually on Quercus, but occasionally on other hardwood genera. (3, 20, 26, 96, 105, 130, 145, 152, 153, 195).

**Distribution.** Throughout hardwood forests of the eastern U.S., north into Canada; also in the western U.S.

**Remarks.** Phellinus everhartii is a common species in the oak forests of the southwestern U.S., but is rarely found elsewhere in the West. The dark reddish brown spores, the thin-walled septate hyphae, conspicuous setae, and thick ungulate fruiting bodies are characteristic features. It is similar to *P. weirianus* but has smaller setae. Furthermore, *P. weirianus* is restricted to walnut.

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**Basidiocarp** perennial, solitary, pileate to dimidiate, broadly attached, conchate to applanate, woody hard when dry, up to 5 cm wide, 7 cm broad and 0.7 cm thick, upper surface reddish-brown to blackish, first covered with a fine tomentum under which there is a distinct cuticle, with age more or less glabrous in concentric zones and dark brown to almost black; margin obtuse; pore surface dark brown, pores round and small, 7-10(-11) per mm, dissepiments entire and rather thick, tubes usually single-layered or indistinctly stratified up to 2 mm in each layer, totally up to 6 mm deep; context fulvous to reddish-brown with a distinct cuticle above, fibrous and shiny, up to 5 mm thick.

**Hyphal system** dimitic; generative hyphae in the tubes hyaline to pale yellow, thin- to thick-walled and simple-septate, 2-3.5(-4) μm wide, sparingly branched, darker yellow and slightly wider in the context; skeletal hyphae dominating, yellow to rusty brown, 3-5 μm thick in the dissepiments, 4-7(-9) μm in the context; tomentum completely dominated by skeletal hyphae, about 5 μm wide.

**Setae** present, strongly ventricose, thick-walled, acute, 10-20 × 5-9 μm.

**Basidia** broadly clavate, 4-sterigmate, 8-12 × 5-7 μm.

**Basidiospores** globose, pale yellow, slightly thick-walled with age, 3-4 μm in diameter.

**Type of rot.** - White rot in dead hardwoods.

**Cultural characteristics.** - Unknown.
**Phellinus**

Fig. 280. Phellinus extensus (type). a, tramal generative hyphae; b, contextual skeletal hyphae; c, setae; d, basidia; e, basidiospores.

**Sexuality.** - Unknown.

**Substrata.** - Dead wood of hardwoods.

**Distribution.** Tropical species of which occurrence in United States is doubtful (see below).

**Remarks.** As already stated by Lowe (1957 33) Overholts misapplied this name for another species, presumably *Phellinus wahlbergii* which has hooked setae of the type described by Overholts for *P. extensus*. Being tropical, there is a fair chance that *P. extensus* may occur in Florida. It is characterized by an applanate basidiocarp with a black zone below an adpressed tomentum and microscopically by very short and strongly ventricose setae and small hyaline to pale yellow spores.

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**9. Phellinus fastuosus (Lév.) Ryv.**


**Basidiocarp** perennial, solitary or imbricate, pileate, broadly attached, dimidiate, flat to convex, up to 60 cm broad, 30 cm wide and 7 cm thick; woody when dry, upper surface rusty brown, first velvety tomentose in narrow to broad concentric sulcate zones, later almost black and with a distinct black crust up to 1 mm thick and more or less glabrous; margin usually rather thick and obtuse, velutinate and golden-yellow to ferruginous; pore surface golden-yellow to cinnamon or rusty-brown, more fuscose in older specimens, pores round and regular, (6-)7-10 per mm, dissepiments entire and fairly thick; tubes concolorous or more fulvous than the pore surface, strongly stratified, each strata usually 1-3 mm thick; context golden-brown to more cinnamon or ferruginous in older specimens, up to 15 mm thick, sometimes with several thin, dark zones.

**Hyphal system** dimitic; generative hyphae simple-septate, hyaline to pale yellow, thin- to slightly thick-walled, 1.5-3 μm in diameter, skeletal hyphae yellow to bay, thick-walled with a distinct lumen, 3-7(-8) μm wide, on average wider in the context than in the tubes.

**Setae** none.

**Basidia** broadly clavate to barrel shaped, 10-12×6-8 μm, 4-sterigmate.

**Basidiospores** ellipsoid to subglobose, rusty brown, thick-walled, smooth, 4.5-6(-6.5) x 4.5-5.5 μm.

**Type of rot.** - White rot in dead hardwoods

**Cultural characteristics.** - Unknown.
Phellinus

**Fig. 282.** Phellinus ferreus (RLG 3686). a, contextual hyphae; b, tramal hyphae; c, schematic drawing of hymenium; d, setae; e, basidia; f, basidiospores.

**Sexuality.** Unknown.

**Substrata.** Dead hardwoods in many genera.

**Distribution.** Florida, widespread and common in the tropical zone.

**Remarks.** The species is recognized by its often large applanate basidiocarps and the lack of setae. Species in the so-called *Phellinus rimosus* complex have similar rusty brown spores and lack of setae, but their basidiocarps are ungle and rapidly become black and rimose.


**Basidiocarps** perennial, resupinate, effused up to 23 cm, woody, not easily separable; margin yellowish-brown (Sayal Brown) to whitish, soft tomentose, up to 7 mm wide; pore surface yellowish-brown, tomentose, up to 2 mm wide; pore surface yellowish-brown often cracking extensively, the pores circular, 6–7 per mm, with thick, entire dissepiments; context yellowish-brown, corky, azonate, up to 1 mm thick; tube layers indistinctly stratified, concolorous and continuous with the context, each layer up to 1 cm thick.

**Contextual hyphae** dark brown to almost hyaline in KOH, thick- or thin-walled, with rare branching, rarely simple-septate, 2–4.5 μm in diam; tramal hyphae similar.

**Setae** abundant, subulate to slightly ventricose, thick-walled, brown in KOH, 22–29 × 6–7 μm.

**Basidia** clavate, 4-sterigmate, 12–14 × 5–6 μm, simple-septate at the base.

**Basidiospores** cylindric, hyaline, smooth, negative in Melzer's reagent, 5–7.5 × 2–2.5 μm.

**Type of rot.** Uniform white rot of dead hardwoods and conifers.


**Sexuality.** Unknown.

**Substrata.** Dead wood of many hardwood and conifer genera.

**Distribution.** Widely distributed in forest regions of North America.

**Cosmopolitan species.**

**Remarks.** This species is similar to *P. ferruginosus*, another common hardwood-inhabiting fungus. *Phellinus ferreus* has shorter spores and usually has setal hyphae in the marginal and context tissue, features which distinguish it from *P. ferreus*.

11. Phellinus ferrugineofuscus (Karst.) Bourd.

**Contextual hyphae** of two types, some brownish to hyaline, thin- to thick-walled, simple-septate, with occasional branching, 2.5–5 μm in diam; others dark brown, thick-walled, rarely branched, rarely septate, 3.5–5 μm in diam; tramal hyphae similar, dark, thick-walled setal hyphae projecting into the tubes.

**Setae** present as ends of setal hyphae, bent abruptly and projecting into the tubes.

**Basidia** narrowly clavate, 4-sterigmate, 12–14 × 3.5–4 μm, simple-septate at the base.
Phellinus

Phellinus ferrugineofuscus (RLG 6276). a, thin-walled trama hyphae; b, thin-walled contextual hyphae; c, thick-walled contextual hyphae; d, setal hyphae; e, schematic drawing showing setal hyphae projecting from hymenium; f, ends of setal hyphae from hymenium; g, basidia; h, basidiospores.

Basidiospores cylindrical, curved, smooth, hyaline, negative in Melzer's reagent, 4-5.5 × 1.5 μm.

Type of rot. - White laminated rot of dead wood of conifers. Phellinus ferrugineofuscus was reported by Kimmey and Stevenson (1957) as causing a common heartrot of western red cedar in Alaska. However, the only Alaskan specimen in the National Fungus Collections collected by Kimmey was misidentified and should be referred to Ceriporiopsis rivulosa Baxt., a fungus known to cause heartrot in Thuja plicata. The wood decayed by P. ferrugineofuscus often has small longitudinal pits similar to those seen in wood decayed by P. weirii. The wood is also frequently mottled with transversely oriented whitish streaks and may have flecks scattered through it.


Sexuality. - Unknown.

Substrata. - On dead wood of conifers, especially common in the spruce-fir zone. (1, 97, 136, 148, 190, 194).

Distribution. Widely distributed in boreal conifer forest regions of the world.

Remarks. Other species with hyaline spores and setal hyphae known from this area are P. weirii and P. ferruginosus. These differ from P. ferrugineofuscus in the shape of their spores and the consistency and color of their basidiocarps. Inonotus glomeratus also has setal hyphae and is frequently resupinate, but occurs on hardwoods and is readily identified by its yellowish, ovoid spores.


Basidiocarp resupinate, perennial, effused, adnate, up to 6 mm thick, margin narrow to wide, first golden-yellow, with age more reddish-brown; pore surface reddish-brown, pores small, round, 7-9 per mm, tubes in older specimens stratified, up to 1 mm in each layer, concolorous with pore surface, totally up to 4 mm deep; context very thin, less than 1 mm, reddish-brown, dense and somewhat shiny.

Hyphal system dimitic; generative hyphae hyaline, simple-septate, 2-4.5 μm wide, skeletal hyphae thick-walled to almost solid in the subiculum, 2-5 μm wide, golden-yellow to rusty brown.

Setae scattered, acuminate, straight, dark brown, 12-25 × 4-8 μm.

Basidia broadly ellipsoid, 4-sterigate, 8-10 × 5-6 μm.

Basidiospores subglobose to ellipsoid, hyaline to very pale yellow, IKI-, 2.5 × 2-3(-4) μm.

Type of rot. - White rot in dead deciduous wood.

Cultural characteristics. - Unknown.

Sexuality. - Unknown.

Substrata. - Dead wood of deciduous trees.

Distribution. Florida and Georgia. West Indies, Colombia and Brazil.

Remarks. The species is recognized by its small hyaline spores.
Phellinus

Fig. 284. Phellinus ferrugineo-velutinus (IHIB 4472). a, thin-walled trama generative hyphae; b, thick-walled trama generative hyphae; c, trama skeletal hyphae; d, setae; e, basidia; f, basidiospores.


Basidiocarps annual, becoming widely effused, tough to soft-spongy, not easily separable; margin tawny, soft-spongy, often appearing setulose under a lens, up to 2 cm wide; pore surface ferruginous, the pores circular, usually 7–9 per mm, but in some unusual specimens 2–3 per mm, with thick, tomentose dissepiments; context yellowish-brown, azone, soft-fibrous, up to 1.5 mm thick; tube layer slightly darker than the context or concolorous, continuous with the context, up to 2 cm thick.

Contextual hyphae of two types, some light brown in KOH, rather thin-walled, with rare branching, 2–4 μm in diam; setal hyphae darker reddish-brown, very thick-walled, tapering to a seta-like point, unbranched, 5–8 μm in diam; trama hyphae similar to the thin-walled type.

Setae abundant, mostly subulate, thick-walled, brown in KOH, 25–65 x 6–8 μm.

Basidia clavate, 4-sterigate, 11–14 x 4.5–6.5 μm, simple-septate at the base.

Basidiospores cylindric or short-oblong, smooth, negative in Melzer’s reagent, 5–7 x 3–3.5 μm.

Type of rot. – White laminated rot of dead wood of hardwood and
Phellinus

coniferous species.
Sexuality. - Unknown.
Distribution. Widely distributed throughout forest regions of North America and into subtropical regions. Cosmopolitan species.
Remarks. Considerable variation occurs in basidiocarps of P. ferruginosus, especially in pore size. Phellinus ferreus is similar but has narrower spores and lacks setal hyphae. Other species of Phellinus with setal hyphae are P. ferrugineofuscus and P. weirii. In those two species the setal hyphae occur in the tramal tissue and project into the tubes.

Basidiocarps resupinate, annual to perennial, becoming widely effused; pore surface dull brown, rough to the touch, the pores circular to angular, 3-6 per mm, with thin, entire dissepiments; subiculum dark yellowish brown, azonate, soft-fibrous, up to 2 mm thick; tube layers distinct, up to 8 mm thick, tubes paler within, brittle; odor “pungently fragrant” when fresh.
Hyphal system dimitic; subicular skeletal hyphae thick-walled, non-septate or rarely simple-septate, yellowish brown in KOH, some with a blunt, rounded apex and resembling setal hyphae, with rare branching, 3-7 μm in diam; subicular generative hyphae thin-walled, hyaline to pale yellowish, simple-septate, occasionally branched, 3-5.5 μm in diam; tramal hyphae similar.
Setal hyphae abundant with rounded to acute apices and sometimes projecting into hymenial region, 4-6 μm in diam.
Hymenial setae absent.
Basidia clavate, 4-sterigmate, 9-11 x 4.5-5 μm, simple-septate at the base.
Conidia abundant in context or also present in trama, globose to cylindric-ellipsoid or irregular, brown, thick-walled, smooth, IKI-, 5-24 x 5-8 μm.
Basidiospores oblong, hyaline, smooth, IKI-, 2.5-3 x 1.5-2 μm.
Type of rot. - White stringy rot of dead hardwoods.
Cultural characteristics. - See Larsen & Lombard 1976.
Sexuality. - Unknown.

Basidiocarps perennial or annual, sessile to slightly effused-reflexed; pilei solitary or imbricate, dimidiate, up to 7 x 12 x 3 cm; upper
Phellinus
discolor

Surface dark yellowish brown (Yellow Ocher to Tawny-Olive), tomentose to glabrous, often rugose, zonate or azonate; margin concolorous; pore surface dark purplish brown (Natal Brown), the pores circular, 6–8 per mm, with thick, entire dissepiments; context bright yellowish brown, zonate, fibrous, up to 2 cm thick; tramal tissue concolorous and continuous with the context, tube layer white-stuffed, up to 1 cm thick.

**Contextual hyphae** of two types, some dark reddish brown in KOH, thick-walled, rarely branched, simple-septate, 3–7 μm in diam; others pale yellowish brown, thin-walled, with occasional branching, simple-septate, 3–5 μm in diam; tramal hyphae similar.

**Setae** abundant, subulate, sharp, thick-walled, dark brown in KOH, 20–30 × 5–6 μm.

**Basidia** broadly clavate, 4-sterigmate, 5–11 × 5–7 μm, simple-septate at the base.

**Basidiospores** ellipsoid to ovoid, hyaline, smooth, negative in Melzer’s reagent, 4–5 × 3–3.5 μm.

**Type of rot.** – Uniform white rot of dead wood of hardwoods and a heart rot of living trees.

**Cultural characteristics.** – See Davidson et al. 1942; Nobles 1948, 1958, 1965; and Gilbertson and Burdsall 1972.

**Sexuality.** – Unknown.


**Distribution.** Throughout the eastern United States and into southeastern Canada; in the Southwest and Pacific Coast regions, rare in the central Rocky Mountains.

**Remarks.** *Phellinus gilvus* is a common fungus on hardwoods, especially oaks, at lower elevations throughout the eastern U.S. and also in the Southwest. The purplish color of the pore surface is very characteristic. It is most similar morphologically to *P. torulosus* which occurs at higher elevations on conifers and has larger spores. The two also differ greatly in culture (Gilbertson and Burdsall 1972).

**16. Phellinus grenadensis** (Murr.) Ryv.


**Basidiocarp** perennial, sessile, aplanate with thickened base, dimidiate, up to 13 × 2 × 6 cm, hard and woody when dry; upper surface at first reddish brown, tomentose, with age the tomentum wears away and the surface becomes crustose, dark brown to blackish, rugose, the hard flinty crust up to 1 mm thick; pore surface yellowish brown at first, with a golden yellow margin, the pores circular to angular, 4–6 per mm, with thin, entire dissepiments, pore surface and margin becoming dark rusty brown with age; context dark yellowish to reddish brown, hard and woody, zonate or faintly concentrically zonate, up to 4 cm thick; tube layers distinctly stratified, often separated by a thin layer of context tissue, single layers up to 5 mm thick.

**Hyphal system** dimitic; contextual generative hyphae hyaline to pale yellow, thin-walled, simple-septate, with rare branching, 2–5 μm in diam; contextual skeletal hyphae brown in KOH, thick-walled, nonseptate or rarely simple-septate, with rare branching, 4–9.5 μm in diam; tramal generative hyphae similar, tramal skeletal hyphae 3–5 μm in diam.

**Setae** absent; fusoid cystidioid elements infrequent, 14–22 × 4–5 μm.
**Phellinus**

**Fig. 288.** Phellinus grenadensis (RLG 14769). a, contextual hyphae; b, tramal generative hyphae; c, tramal skeletal hyphae; d, basidia; e, basidiospores.

**Basidia** broadly clavate to ellipsoid, 4-sterigmate, 11–14 × 6–7 μm.

**Basidiospores** ovoid to ellipsoid, pale to clark brown in KOH, smooth, IKI−, 4.5–6 x 3–4 μm.

**Type of rot** – White butt rot in living oaks.

**Cultural characteristics** – Unknown.

**Sexuality** – Unknown.

**Substrata** – In Louisiana known from living live oak (*Quercus virginiana*). Also reported on dead hardwoods in tropical regions.

**Distribution** – Gulf Coast region, Central and South America, and Africa.

**Remarks** – The only records of *P. grenadensis* from the U.S. are two collections from the base of a live oak in Baton Rouge, Louisiana. The basidiocarps developed near the ground line. It is similar to *P. kawakamii*, described from *Acacia* and *Casuarina* by Larsen et al. (1985). According to those authors, *P. kawakamii* differs in having larger basidiocarps and chlamydospores.

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**Fig. 289.** Phellinus hartigii (FP 105577). a, contextual hyphae; b, cystidioid hymenial elements; c, basidia; d, basidiospores.

**17. Phellinus hartigii** (Allesch. & Schnabl) Bond. Fig. 289


**Basidiocarps** perennial, resupinate to effused-reflexed; when reflexed more or less triangular in longitudinal sections with upper and lower surfaces at angles of 45 degrees or greater, upper surface pale yellowish brown, tomentose near the margin, becoming glabrous and rimose; pore surface grayish-brown to purplish-brown, the pores circular, 5–7 per mm, with thick, entire dissepiments; context woody, yellowish brown to reddish brown, with darker zones, up to 2 cm thick; tube layers distinctly stratified, often with sterile tissue between the layers, tubes white within, layers up to 5 mm thick.

**Contextual hyphae** mostly pale yellowish brown in Melzer’s reagent, thick-walled, asceptate or with rare septa, 2–5 μm in diam, with rare branching; also some nearly hyaline, slender, asceptate, thick-walled, much-branched hyphae also present, these 1–1.5 μm in diam; tramal hyphae similar.

**Setae** lacking; ventricose, thin-walled cystidioid elements present.

**Basidia** broadly ellipsoid, 4-sterigmate, 12–14 × 8–9 μm, simple-septate at the base.
**Phellinus**

*Phellinus* basidiospores globose to subglobose, hyaline, smooth, slightly thick-walled, strongly dextrinoid in Melzer's reagent, 6-7.5 x 5-6.5 μm.

**Type of rot.** - Uniform white rot of heartwood of living conifers, continuing in dead trees and logs.

**Cultural characteristics.** - see Baxter 1934, 1945, as *Poria tsugina*; 1952, as *Fomes robustus tsugina*; Campbell 1938, as *Fomes robustus var. tsugina*; and Nobles 1948, 1958, 1965, as *Poria tsugina*; Stalpers 1978.

**Sexuality.** - Unknown.

**Substrata.** - Living and dead conifers of several genera, most common in *Tsuga*. (1, 148, 194).

**Distribution.** In eastern and western coniferous forest regions of North America. The distribution records are uncertain due to some workers regarding *P. hartigii* and the widely distributed *P. robustus* as the same species. *P. hartigii* also occurs in Europe and Asia.

**Remarks.** The *Phellinus robustus* complex is probably the most difficult taxonomic problem in the genus. Speciation in this complex has resulted from adaption to different substrata and vastly different environmental factors. Morphological differences, both macroscopic and microscopic, have also evolved. *Phellinus hartigii* is recognized essentially on the basis of characters detailed by Lohwag (1937), Jahn (1976), and Domanski et al. (1967). *P. hartigii* usually fruits on the underside of branches and in branch crotches.

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**18. Phellinus igniarius** (L.:Fr.) Quél. Fig. 290


*Basidiocarps* perennial, sessile or rarely effused-reflexed, ungulate or sometimes applanate, up to 11 x 20 x 8 cm; upper surface gray or blackish, glabrous, sulcate, becoming deeply rimose, incrusted; margin concolorous and glabrous or yellowish brown (Saccardo's umber or Snuff Brown); pore surface pale cinnamon brown to clark purplish brown, the pores circular, 5-6 per mm, with thick, entire dissepiments; context dark reddish brown, zonate, woody, up to 2 cm thick; core absent or present next to substratum, with white tissue intermixed; tube layers concolorous with context, the tubes white-stuffed, in distinct layers, each up to 4 mm thick.

Contextual hyphae of two types, some brown in KOH, thick-walled, distinct, with rare branching, aseptate, 2-5 μm in diam, some hyaline, thin-walled with occasional simple septa, very indistinct; trama1 hyphae similar, 2-3 μm in diam.

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**Setae** ventricose to subulate, abundant to rare, 14-17 x 4-6 μm; core setae present in some specimens, irregularly lobed and branched; thick-walled, up to 15 μm in diam.

**Basidia** broadly clavate, 4-sterigmate, 9-10 x 6-7 μm, simple-septate at the base.

**Basidiospores** broadly ovoid to subglobose, hyaline, smooth, thick-walled, negative in Melzer's reagent, acyanophilous, 5-6.5 x 4.5-6 μm.

**Type of rot.** - Uniform white rot of the heartwood of living hardwoods.


**Sexuality.** - Unknown.

**Substrata.** - Living hardwoods of many genera, continuing decay in dead trees. (3, 8, 10, 20, 25, 28, 47, 69, 75, 92, 113, 129, 145, 147, 152, 153, 154, 165, 166, 169, 177, 195, 205).

**Distribution.** Transcontinental from Newfoundland to Alaska but ab-
Phellinus

sent or rare in the southern tier of states, apparently a boreal species. Distribution records in Arizona and New Mexico given by Overholt (1953) are apparently based on *P. tremulae*, which he lumped in with *P. igniarius*.

**Remarks.** The *Phellinus igniarius* complex has been another difficult taxonomic problem. *Phellinus arctostaphyli* is segregated on the basis of characters detailed under that species. *Phellinus tremulae* occurs only on aspen and it is morphologically distinct on the basis of basidiocarp macro- and micromorphology as well as cultural characters. *Phellinus pomaceus* is most similar and is characterized mainly by small basidiocarps on *Prunus*. Niemelä (1972, 1974, 1975, 1977) should be consulted for a detailed discussion of the *P. igniarius* complex.

**19. Phellinus inermis** (Ell. & Everh.) G. H. Cunn. 

*Fig. 291. Phellinus inermis (MB 1370). a, trama i hyphae; b, contextual hyphae; c, basidia; d, basidiospores.*

Distribution records in Arizona and New Mexico given by Overholt (1953) are apparently based on *P. tremulae*, which he lumped in with *P. igniarius*.

**Remarks.** The *Phellinus igniarius* complex has been another difficult taxonomic problem. *Phellinus arctostaphyli* is segregated on the basis of characters detailed under that species. *Phellinus tremulae* occurs only on aspen and it is morphologically distinct on the basis of basidiocarp macro- and micromorphology as well as cultural characters. *Phellinus pomaceus* is most similar and is characterized mainly by small basidiocarps on *Prunus*. Niemelä (1972, 1974, 1975, 1977) should be consulted for a detailed discussion of the *P. igniarius* complex.

**20. Phellinus johnsonianus** (Murr.) Ryv. 


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**Phellinus johnsonianus** (Murr.) Ryv.


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**Hyphal system** dimitic; contextual skeletal hyphae thick-walled, brown in KOH, with rare branching, non-septate, 2.5–4.5 μm in diameter; contextual generative hyphae hyaline to pale yellow, thin-walled, with rare branching, 2.4–4 μm in diameter; trama hypha simple-septate similar but generative type with more frequent branching.

**Setae** frequent in hymenium, thick-walled, dark reddish brown in KOH, subulate to ventricose, 17–27 × 6–9 μm.

**Basidia** clavate to subellipsoid, 4-sterigmate, 11–13.5 × 5.6 μm, simple-septate at the base.

**Basidiospores** ovoid to broadly ellipsoid, dark reddish brown, thick-walled, smooth, IKI−, 5.5–6 × 4.4–5.5 μm.

**Type of rot.** White laminated rot of living and dead hardwoods.

**Cultural characteristics.** See Campbell 1938 (as *Fomes densus*),
Phellinus

Fig. 292. Phellinus johnsonianus (UA 014150). a, contextual generative hyphae; b, contextual skeletal hyphae; c, trama1 generative hyphae; d, trama1 skeletal hyphae; e, hymenium; f, setae; g, basidia; h, basidiospores.

Davidson et al. 1959.
Sexuality. - Unknown.
Substrata. - Particularly common on living and dead Fraxinus, also known on Quercus.
Distribution. Mississippi Valley and the northeastern region from Virginia to Ontario.
Remarks. Phellinus johnsonianus is readily identified by the abundant hymenial setae and small, slightly pigmented basidiospores.

21. Phellinus laevigatus (Fr.) Bourd. & Galz. Fig. 293
Basidiocarps perennial, resupinate, becoming widely effused, woody, adnate; pore surface dull reddish brown (Prout's Brown to Warm Sepia) often becoming deeply cracked into angular blocks with age or drying, the pores circular, 8-10 per mm, with thick, entire dissepi­ments; margin yellowish-brown (Ochraceous-Tawny), tomentose, up to 2 mm wide; context yellowish brown, azonate, up to 2 mm thick; tube layers indistinctly stratified, paler than context, each layer up to 1 mm thick.
Contextual hyphae of two types, some dark brown in KOH, thickwalled, rarely branched, asceptate, 2.5-5 μm in diam; others pale yellowish to hyaline in KOH, thin-walled, simple-septate, with frequent branching, 2-3.5 in diam; trama1 hyphae similar, with parallel arrange­ment.
Setae abundant, subulate to ventricose, thick-walled, dark brown in KOH, 17-30 × 6-9 μm.
Basidia subglobose to pyriform, 2-4 sterigmate, 7-11 × 4-5 μm, simple-septate at the base.
Basidiospores ovoid, hyaline to pale golden yellow in older specimens, smooth, negative in Melzer's reagent, 3-4 × 2.5-3 μm.
Type of rot. - White laminated rot of dead hardwoods, especially birch. The wood in advanced stages of decay separates readily along the annual rings.
Sexuality. - Unknown.
Phellinus

Substrata. – Dead hardwoods in numerous genera, especially common on *Betula* in northern forests; also reported on *Picea* (8, 20, 32, 69, 136, 145, 147, 153). Distribution. Widely distributed in eastern and western North America. In the West known only from the northern states and Canada.

22. *Phellinus linteus* (Berk. & Curt.) Teng. Fig. 294

Fungi of China, p. 467, 1964. – *Polyporus linteus* Berk. & Curt., Proc. Amer. Acad. (Boston) 4: 122, 1860. – *Polyporus yucatanensis* Murr., Torrey Bot. Club Bull. 30:119, 1903. **Basidiocarps** perennial, sessile, dimidiate to elongate, up to 9 × 11 × 6 cm, hard and woody; upper surface dark chestnut brown, matted-wooly to scuprose, concentrically zonate and shallowly sulcate, in age becoming blackened and deeply rimose with radial and concentric cracking into rectangular blocks; margin acute to rounded, pale brown to grayish, narrowly sterile below; pore surface dark reddish brown to fuscous, the pores circular to angular, 5-7 pm, with thin, entire dissepiments; context golden brown and lustrous to darker dull brown, faintly concentrically zonate, woody, up to 2.5 cm thick; tube layers indistinct, slightly paler than context, single layers up to 6 mm thick. **Hyphal system** dimitic; generative hyphae hyaline, simple-septate, 2-4 μm wide; skeletal hyphae dark brown and thick-walled to golden brown and moderately thick-walled in KOH, rarely branched, with occasional simple-septa, 3.5-8 μm in diam; tramal hyphae similar. **Setae** abundant to infrequent in the hymenium, thick-walled, dark brown in KOH, mostly subulate, 17-35 × 6-8 μm. **Basidia** broadly clavate, 4-sterigmate, 11-13 × 6-7 μm, simple-septate at the base. **Basidiospores** ovoid to subglobose, pale golden brown, smooth, slightly thick-walled, negative in Melzer’s reagent, 4.5-6 x 4-5 μm. **Type of rot.** – white pocket rot of dead hardwoods. Dark zone lines are prominent in the advanced stages. **Cultural characteristics.** – See Bakshi et al. 1970; Stalpers 1978. **Sexuality.** – Unknown. **Substrata.** – Dead hardwoods in many genera. In the southeastern U.S. and Mexico noted on *Quercus* and *Cassia*. **Distribution.** Apparently circumglobal in tropical and subtropical regions. In North America known from Mexico and the Gulf Coast Region of the U.S. **Remarks.** The pale golden brown, ovoid to subglobose spores and the variably abundant setae are distinctive characters of *P. linteus*.

23. *Phellinus lundellii* Niemelä

*Ann. Bot. Fenn. 9:51, 1972.* **Basidiocarps** perennial, resupinate to narrowly reflexed, more distinctly pileate on vertical surfaces; pileate portions elongated, upper surface up to 1.5 cm wide, some becoming blackish and glabrous, crust-like, shallowly sulcate, smooth to rimose, often with an undulating margin; pore surface smooth, becoming dark reddish brown, the pores circular, 5-6 per mm, very small but with thick dissepiments, context thin, usually less than 1 mm thick, dark reddish brown, tough-fibrous, fissile; tube layers indistinctly stratified, hard and woody, in aggregate up to 1.5 cm thick, older tubes becoming stuffed with whitish mycelium and old layers appear streaked. **Hyphal system** dimitic; generative hyphae thin-walled, hyaline, simple-septate, with occasional branching, 2-3 μm in diam; *contextual* skeletal hyphae thick-walled, yellowish brown, with some simple septa, rarely branched, 2-4 μm in diam; tramal hyphae similar, interwoven. **Setae** abundant in hymenium, subulate to slightly ventricose, thick-
Phellinus

Fig. 295. Phellinus lundellii (HHB 1058). a, contextual hyphae; b, contextual skeletal hyphae; c, setae; d, basidia; e, basidiospores.

walled, brown in KOH, often flexuous, 8-20 x 4-7 μm, mostly rather sharp pointed.

Basidia broadly clavate to ellipsoid, 4-sterigmate, 10-12 x 5-6 μm, simple-septate at the base.

Basidiocarps ovoid to broadly ellipsoid, hyaline, smooth, with thickened walls, IKI-, 4.5-6 x 4-5 μm.

Type of rot. — Uniform white rot of dead birches and alders.

Cultural characteristics. — See Niemelä 1972; Stalpers 1978.

Sexuality. — Unknown.

Substrata. — North American records are from dead Betula and Alnus species. Niemelä (1972) reports it on a few other hardwood genera in Europe.

Distribution. Probably transcontinental in North America in northern forest ecosystems with birches and alders. Also in Europe.


Basidiocarps perennial, resupinate, becoming widely effused; pore surface golden brown to dark purplish brown in older specimens, the pores angular, 4-6 per mm, with thin, entire dissepiments; subiculum reddish brown, tough fibrous, azonate, up to 2 mm thick, sometimes with a black crustose layer next to the substratum; tube layers indistinctly stratified, concolorous with subiculum, up to 6 mm thick.

Hyphal system dimitic; subicular skeletal hyphae thick-walled, brown in KOH, with rare branching, rarely simple-septate, 3.5-7 μm in diam, some with uneven wall thickening; subicular generative hyphae hyaline to pale yellowish, thin- to firm-walled, simple-septate, with rare branching, 2.5-3.5 μm in diam; trama composed mainly of generative hyphae.

Setae or other sterile hymenial elements absent.

Basidia broadly clavate, 4-sterigmate, 10-12 x 6-7.5 μm, simple-septate at the base.

Basidiocarps ovoid to ellipsoid, pale golden yellow in KOH, smooth, IKI-, 4-5 x 3-3.5 μm.

Type of rot. — White rot of dead hardwoods.

Cultural characteristics. — Unknown.

Sexuality. — Unknown.

Substrata. — Dead hardwoods; in the Gulf Coast Region known from Acer, Celtis and Quercus.

Distribution. Gulf Coast Region from Louisiana to Florida, also in
Phellinus

25. Phellinus merrillii (Murr.) Ryv.


Basidiocarps perennial, sessile, dimidiate to ungulate, up to 10 cm wide, 5 cm thick, and 5 cm deep; upper surface reddish brown, matted tomentose to coarsely scupose, rugose and shallowly concentrically sulcate, in age becoming blackened and rimose; margin yellowish brown, tomentose, rounded, narrowly sterile below; pore surface dull purplish brown, glancing with a golden luster when viewed obliquely, the pores circular, 7–10 per mm, with thick, entire dissepiments; context with a shiny golden luster on broken surfaces, hard and woody, up to 2 cm thick, concentrically zonate with darker zones, sometimes becoming dense and resinous, in some specimens the context is a very thin layer of dense, crustlike tissue and the basidiocarp is made up almost entirely of old tube layers; tube layers indistinctly stratified, yellowish brown, woody, trama of oldest layer merging into context, aggregate tube layers up to 4 cm thick.

Hyphal system dimitic; contextual skeletal hyphae thick-walled, yellowish brown in KOH, nonseptate or with inconspicuous secondary septa, rarely branched, 3–5.5 μm in diam; contextual generative hyphae thin-walled, hyaline to pale golden yellow, simple-septate, with occasional branching, 2.5–4.5 μm in diam; tramal hyphae similar.

Setae or other sterile hymenial elements absent.

Basidia broadly clavate, 4-sterigmate, 12–14.5 x 6.5–7.5 μm.

Basidiospores subglobose to globose, pale golden brown in KOH, IKI-, smooth, 5–6 x 4–5 μm.

Type of rot. - White rot of dead conifers and hardwoods.

Cultural characters. - Unknown.

Sexuality. - Unknown.

Substrata. - Known from Tennessee on Tsuga and from Florida on an unknown substrate.

Distribution. - Apparently in southeastern U.S. from Florida to Tennessee but rarely collected. Originally described from the Philippine Islands.

Remarks. The globose, pigmented spores, lustrous context, and lack of setae characterize P. merrillii.

26. Phellinus nigrolimitatus (Rom.) Bourd. et Galz. Fig. 298


Basidiocarps effused-reflexed or resupinate; pilei irregular in shape, more or less elongated and shelf-like, up to 5 x 10 x 4 cm; upper surface blackish brown to yellowish or reddish brown, finely tomentose to glabrous, very irregular, often soft and spongy; margin concolorous or sometimes lighter (Snuff Brown to Buckthorn Brown), up to 3 mm wide; pore surface Cinnamon, smooth, the pores circular to angular, sometimes daedaloid in parts, 5–7 per mm, with thick, entire dissepiments; context dark yellowish brown, with one or more thin black layers that appear as black lines in longitudinal sections, often zonate, corky to soft-fibrous, up to 1 cm thick; tube layers indistinct, lighter brown than context, each layer up to 2 mm thick.

Contextual hyphae brown to pale yellow or almost hyaline in KOH, thick- or thin-walled, with frequent branching, simple-septate, 2.5–6 μm in diam; black layers about 20–80 μm thick, composed of very closely interwoven and agglutinated hyphae; tramal hyphae similar to those of lower context.

Setae abundant, subulate to ventricose, straight, thick-walled, dark brown in KOH, 25–37 x 6.5–8.5 μm.

Basidia broadly clavate, 4-sterigmate, 10–12 x 5–6.5 μm, simple-septate at the base.
**Phellinus**

**Fig. 298.** Phellinus nigrollimitatus (RLG 5869). a, contextual generative and skeletal hyphae; b, slender, branching hyphae from context; c, trama! hyphae; d, schematic drawing of hymenium; e, setae; f, basidia; g, basidiospores.

Basidiospores cylindric, straight, tapering at the apex, hyaline, smooth, negative in Melzer’s reagent, 7–10 × 2–2.5 μm.

**Type of rot.**– White pocket rot of conifer logs and also a butt rot of living trees. The rot is distinctive because of the large size of the pockets, which are up to 2.5 cm long. The wood between the pockets is firm.


**Sexuality.**– Unknown.

**Substrata.**– Restricted to conifers and especially common on *Picea* (1, 97, 136, 138, 188, 190, 194).

**Distribution.** Common throughout mountains of western North America in the spruce-fir zone. Not known from eastern North America but also in Europe and Asia in spruce-fir ecosystems.

**Remarks.** In North America this species is known only from the West.

**Fig. 299.** Phellinus occidentalis (RLG 4074). a, contextual generative hyphae; b, contextual skeletal hyphae; c, schematic drawing of hymenium; d, setae; e, basidia; f, basidiospores.

where it is common in many areas, especially in higher elevations in the spruce-fir zone. When entirely resupinate, the basidiocarps are easily mistaken for those of other species of *Phellinus*, particularly those of softer consistency, such as *P. weirii* and *P. ferrugineofuscus*. The black layers in the context and the distinctive carrot-shaped spores are features which facilitate identification of resupinate specimens.

**27. Phellinus occidentalis** (Overh.) Gilbn.


**Basidiocarps** perennial, effused-reflexed or sessile, sometimes resupinate at first; pilei dimidiate or laterally fused and elongate, up to 2 × 6 × 4 cm; upper surface blackish to grayish, faintly sulcate and
**Phellinus**

zonate, incrusted, glabrous; margin light yellowish-brown (Warm Buff or Cinnamon-Buff), faintly tomentose, up to 1 mm wide, rounded; pore surface light brown (Snuff Brown or Dresden Brown), the pores angular to circular, 2–4 per mm, with thick, entire dissepiments; context light reddish-brown, azonate, corky, up to 2 mm thick; the upper incrusted layer blackish, tube layer concolorous and continuous with context, up to 1.5 cm thick, the tubes lighter within.

Contextual hyphae of two types, some dark brown in KOH, thin-to thick-walled, rarely simple-septate, with rare branching, 2–5 µm in diam, others hyaline or pale yellowish, thin-walled, simple-septate, with frequent branching, 2–3 µm in diam; trama hyphae similar.

Setae scattered, thick-walled, ventricose, 40–50 × 8–14 µm.

Basidia clavate, 4-sterigmate, 11–16 × 5–5.5 µm, simple-septate at the base.

Basidiospores ovoid to subglobose, hyaline, in old specimens distinctly brown, smooth, negative in Melzer’s reagent, 5–6 × 4–5 µm.

**Type of rot.** – Uniform white rot of heartwood of living hawthorn (Lombard et al., 1972).

**Cultural characteristics.** – see Lombard et al., 1972; Stalpers, 1978.

**Sexuality.** – Unknown.

**Substrata.** – Restricted to species of *Crataegus.*

**Distribution.** Known only from the western United States. It is rather common in western Montana and northern Idaho.

**Remarks.** *P. occidentalis* is quite similar to *P. pini.* Its restriction to hawthorn and the uniform white rot are diagnostic.

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**Phellinus palmicola** (Berk. & Curt.) Ryv. Fig. 300


**Basidiocarps** resupinate, annual to biennial, effused, rather soft and brittle, adnate or separable, up to 2 mm thick, margin narrow, bright reddish brown; pore surface reddish brown when mature or dry, more golden yellow when young and actively growing, pores round to angular, fairly wide, 1–2 per mm, tubes concolorous, up to 2 mm deep; context very thin, deep cinnamon to reddish-brown.

**Hyphal system** dimitic; generative hyphae simple-septate, 1.5–3 µm wide; skeletal hyphae yellow to reddish-brown, 2–5 µm wide.

Setae subulate, straight, often slightly constricted at the base, thick-walled, 50–70 × 5–7 µm.

Basidia not seen.

Basidiospores cylindric, hyaline, thin-walled, IKI–, 4–5 × 2–2.5 µm.

**Type of rot.** – White rot in palms (only?).

**Cultural characteristics** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Known with certainty only from palms, the substrate for the type of *Coriolopsis crocatiformis* is unknown.

**Distribution.** Known from Cuba and Mexico, but very probably it will be found in the Gulf States.

**Remarks.** The species is highly characteristic with its soft consistency, large pores and very long subulate setae. It is undoubtedly related to *P. contiguis* which however is firmer, has smaller pores, slightly longer and wider spores and shorter setae. The specimens cited from Mexico by Lowe (1966:153) seem to be this species.
**Phellinus**

**Phellinus pini** (Thore:Fr.) A. Ames


**Basidiocarps** sessile, effused-reflexed, or sometimes entirely resupinate; pilei solitary or imbricate, ungulate to planate, up to 9 x 13 x 8 cm; upper surface light reddish-brown to blackish, hirsute towards the margin, becoming glabrous and incrusted with age, zonate and sulcate; margin reddish-brown and hirsute, or sometimes yellowish-brown (Antimony Yellow) and tomentose, rounded; pore surface yellowish-brown (Tawny-Olive to Yellow Ocher), the pores circular to angular or daedaleoid, 2–3 per mm, with thick, entire dissepiments; context reddish-brown or yellowish-brown, lustrous on cut surface, corky, usually with one or more thin black layers, in younger specimens often appearing duplex because of the hirsute upper layer, up to 3 cm thick; tramal tissue continuous and concolorous with the context, tubes light colored within, indistinctly stratified, each layer up to 6 mm thick.

**Contextual hyphae** rarely branched, simple-septate, of two types, some brown in KOH, thick- or thin-walled, 3.5–7.5 µm in diam, others hyaline, thin-walled, 2–3 µm in diam; tramal hyphae similar.

**Setae** abundant, subulate to ventricose, thick-walled, 40–50 x 10–14 µm.

**Basidia** broadly clavate, 4-sterigmate, 12–14 x 5–6 µm, simple-septate at the base.

**Basidiospores** ovoid, hyaline, or becoming slightly yellowish in older hymenia, smooth, negative in Melzer’s reagent, 4.5–7 x 3.5–5 µm.

**Type of rot.** - White pocket rot of the heartwood of living conifers. The decay and fruiting at branch stubs is commonly in the middle and upper trunks but *P. pini* occasionally causes a butt rot and fruits near the base of the tree.

**Cultural characteristics.** - See Campbell 1938; Fritz 1923; Davidson et al. 1938; Nobles 1948, 1958, 1965; and Owens 1936.

**Sexuality.** - Unknown.

**Substrata.** - On living conifers, a few reports on hardwoods (1, 3, 20, 38, 52, 97, 102, 136, 138, 148, 188, 190, 194).

**Distribution.** Widespread in coniferous forest regions of North America and circumglobal.

**Remarks.** *P. chrysoloma* is closely related and has been referred to as *Fomes pini* var. *abietinus* (Karst.) Overh. *P. occidentalis* is similar and can be distinguished by its host, *Crataegus*, and the associated uniform white rot. Boyce and Wagg (1955) have reported the pathogenic relationship of *P. pini* in stands of Douglas fir and a cyclic pattern of infection and decay over a 450 year rotation.
Phellinus pomaceus (Pers.:S.F. Gray) Maire


Basidiocarps perennial, sessile or effused-reflexed; pilei ungulate, solitary or imbricate, up to 5 x 5 x 6 cm; upper surface at first light grayish-brown, smooth, lightly tomentose, becoming blackened, rimose and glabrous; margin light brown, rounded; pore surface light yellowish- to reddish-brown, the pores circular, 7-9 per mm, with thick, entire dissepiments; context yellowish-brown to reddish-brown, shining, zonate, woody, up to 1 cm thick; tube layers concolorous, distinctly stratified, tubes dull, becoming whitish within.

Contextual hyphae mostly brownish in KOH, thick-walled, with rare to frequent branching, simple-septate, 2.5-5.5 μm in diam, some hyaline, thin-walled, simple-septate, 2-3 μm in diam; tramaal hyphae usually similar, some thin-walled, pale brownish to hyaline.

Setae rare, subulate to ventricose, thick-walled, 14-17 x 4.5-7 μm.

Basidia broadly clavate, 4-sterigmate, 9-10 x 5-5.6 μm, simple-septate at the base.

Basidiospores ovoid to broadly ellipsoid, hyaline, smooth, negative in Melzer's reagent, 4-5 x 3-4.5 μm.

Type of rot. - Uniform white rot of the heartwood of living fruit trees.

Cultural characteristics. - See Campbell 1938 (as Fomes fulvus); Nobles, 1948, 1958, 1965 (as Fomes fulvus); and Niemelä 1977.

Sexuality. - Unknown.

Substrata. - Virtually restricted to Prunus, reported on Crataegus.

Distribution. Widespread in North America, probably wherever native species of Prunus occur, and where peaches, cherries and plums are cultivated as fruit trees. Also in Europe.

Remarks. Niemelä (1977) has pointed out that the arrangement of skeletal hyphae in the trama of P. pomaceus is intermediate between parallel and interwoven and refers to this as subparallel. Similar species in the Phellinus igniarius complex are P. igniarius, which has interwoven tramaal skeletal and P. laevigatus, which has parallel tramaal skeletal. Basidiospores on North American specimens are smaller than those on European specimens as stated by Niemelä (1977).

Phellinus prunicola (Murr.) Gilbn.


Basidiocarps perennial, resupinate, woody, effused up to 22 cm, not readily separable; margin at first pale yellowish-brown, becoming blackened, glabrous and rimose with age; pore surface reddish-brown (Snuff
Phellinus

Brown to Saccardo’s umber), the pores circular, 6-8 per mm, with thick, entire disseptions; context reddish-brown, woody, azonate, up to 1 mm thick; the tube layers distinctly stratified, becoming whitish within, each layer up to 2.5 mm thick.

Contextual hyphae mostly dark reddish-brown in KOH, thick-to-thin-walled, with rare branching, aseptate, 2.5-4 μm in diam, some pale brownish to hyaline, thin-walled, with frequent branching, simple-septate, 2-3 μm in diam; trama hyphae similar, arrangement of skeletal semiparallel.

Setae abundant, mostly ventricose, thick-walled, 15-18 x 5-6.5 μm.

Basidia clavate, 4-sterigmate, 11-12 x 5-6 μm, simple-septate at the base.

Basidiospores ovoid to subglobose, hyaline, smooth, negative in Melzer’s reagent, 3.5-5 x 2.5-3.5 μm.

Type of rot. – Uniform white rot of dead wood of Prunus.

Cultural characteristics. – See Baxter, 1934.

Sexuality. – Unknown.

Substrata. – Dead wood of Prunus.

Distribution. Probably throughout the northern U.S. and southern Canada but rarely reported, perhaps because of its similarity to Phellinus laevigatus.

Remarks. Phellinus laevigatus is very similar to P. prunicola but has slightly smaller spores and pores. Baxter (1934) believes the two are distinct in culture. Resupinate specimens of P. robustus differ in their larger, dextrinoid spores and in having few or no setae. Phellinus igniarius has considerably larger spores.

32. Phellinus punctatiformis (Murr.) Ryv. (Fig. 304)


Basidiocarp perennial, resupinate, effused, adnate and up to 7 mm thick; pore surface reddish-brown to cinnamon yellowish; margin reddish-brown, rather narrow, pores small, round, 6-7 per mm, tubes concolorous with pore surface, often distinctly stratified, up to 3 mm in each zone; context reddish-brown, fibrous and less than 1 mm thick.

Hyphal system dimitic; generative hyphae thin-walled and simple-septate, 2-5 μm wide, skeletal hyphae of same width, thick-walled, golden brown to rusty.

Setae acuminated, straight, 18-25(-30) x 4-8 μm.

Basidia not observed.

Basidiospores hyaline, subcylindrical with a tapering base, IKI-, 4-6 x 1.5-2 μm.

Fig. 304. Phellinus punctatiformis (KD 9895). a, trama generative hyphae; b, subicular skeletal hyphae; c, setae; d, basidia; e, basidiospores.

Type of rot. – White rot in dead, hardwoods.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – On dead, hardwoods.

Distribution. Reported from Florida by Lowe (1966:151). Also known from Brazil.

Remarks. The species is easy to recognize by its resupinate basidiocarp, its setae and the hyaline, subcylindrical spores. P. ferreus is similar, but has longer setae and spores.

33. Phellinus punctatus (Fr.) Pilát (Fig. 305)


Basidiocarps perennial, resupinate, becoming widely effused, woody, not readily separable; margin at first yellowish-brown, tomen-
Phellinus

**Fig. 505. Phellinus punctatus (HHB 7818). a, contextual generative hyphae; b, contextual skeletal hyphae; c, tramal generative hyphae; d, tramal skeletal hyphae; e, cystidioid elements; f, basidia; g, basidiospores.**

- **tose,** up to 2 cm wide, receding, becoming black and rimose in older specimens; pore surface yellowish- to grayish-brown, dull, smooth, the pores circular, 6–8 per mm, the dissepiments thick, entire, minutely tomentose; context golden brown to dark reddish brown in older specimens, up to 2 mm thick; tube layers concolorous, single layers up to 6 mm thick.

- **Contextual hyphae** clark brown in KOH, thin- to thick-walled, rare, branching, occasionally septate, 2.5–5 μm in diam, some almost hyaline, thinner walled; tramal hyphae similar.

- **Setae** lacking; thin-walled, ventricose cystidioid elements present.

- **Basidia** broadly clavate, 4-sterigmate, 11–12.5 × 7–8.5 μm, simple-septate at the base.

- **Basidiospores** broadly ovoid to subglobose, hyaline, smooth, strongly dextrinoid in Melzer’s reagent, 6.5–8.5 × 5.5–7 μm.

- **Type of rot.** – Uniform white rot of dead wood of hardwoods and conifers.

- **Cultural characteristics.** – See Nobles 1948, 1958, 1965.

- **Sexuality.** – Unknown.

- **Substrata.** – Dead hardwoods and conifers, also on living trees. Walla (1984) reports *P. punctatus* as an important cause of decay in shelterbelt trees in North Dakota. (1, 8, 9, 20, 23, 75, 136, 147, 148, 154, 165.

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- **Basidiocarps** perennial, resupinate or rarely pileate; pileus up to 3 × 8 × 3 cm upper surface reddish brown to blackish, tomentose near the margin, becoming glabrous and incrusted, sulcate, the margin bright yellowish or yellowish brown (Ochraceous Buff to Antimony Yellow), tomentose, up to 3 mm wide, rounded; pore surface light yellowish-grayish-brown (Drab) when fresh, becoming clark reddish brown (Cinnamon-Brown to Bister) when fresh, becoming dark reddish brown (Cinnamon-Brown to Bister) with age, usually rough to the touch, the pores circular to angular, 4–5 per mm, with thin, lacerate dissepiments; context bright yellowish brown, azonate, very soft and spongy to corky, up to 4 mm thick, tube layers paler than the context, each up to 4 mm thick, sometimes separated by a thin layer of context tissue.

- **Contextual hyphae** of three types, some brown in KOH, thick- to moderately thick-walled, with occasional branching, rarely simple-septate, 4–7 μm in diam; some hyaline in KOH, thin-walled, with occasional branching, simple-septate, 2–4 μm in diam; others thick-walled, much branched and contorted, pale brown in KOH, aseptate, 2.5–4.5 μm in diam; tramal hyphae similar.

- **Setae** rare, scattered or often concentrated in a small area, subulate or ventricose, thick-walled, scarcely projecting, 20–25 × 6–7 μm.

- **Basidia** clavate, 4-sterigmate, 9.5–10 × 4.5–5 μm, simple-septate at the base.

- **Basidiospores** short-ellipsoid to subglobose, hyaline, smooth, negative in Melzer’s reagent, 4–5.5 × 3.4–5 μm.

- **Type of rot.** – White pocket rot of conifer logs and slash (Lombard et al., 1972).

- **Cultural characteristics.** – See Lombard et al. 1972.

- **Sexuality.** – Unknown.

- **Substrata.** – Dead conifers, generally fruiting on fallen trees (1, 97, 136, 138, 148, 190, 194).

- **Distribution.** Northwestern U.S. and British Columbia; known only from North America.

- **Remarks.** *Phellinus repandus* is known only from western North Amer-
Phellinus repandus (RLG 6233). a., contextual generative and skeletal hyphae; b, trama; f skeletal hyphae; c, tramal generative hyphae; d, setae; e, basidia; f, basidiospores.

ica but is common in some localities such as Glacier Nat. Park, Montana and the Olympic Peninsula of Washington. J.R. Weir collected this fungus several times in Idaho and Montana and identified his specimens as Fomes putearius Weir. His type of F. putearius, however, is Phellinus nigrolimitatus. For a detailed comparison of similar species

35. Phellinus robiniae (Murr.) A. Ames

Phellinus robiniae (RLG 7049). a, tramal generative hyphae; b, tramal skeletal hyphae; c, contextual skeletal hyphae; d, basidia; e, basidiospores.

see Lombard et al. (1972).
Phellinus

woody, up to 2.5 cm thick; tube layers concolorous and continuous with the context, distinctly stratified, woody, each layer up to 3 mm thick.

Contextual hyphae brown in KOH solution, thin- to thick-walled, with rare branching, simple-septate, 2.5-5.5 μm in diam; tramal hyphae similar, 2.5-3.5 μm in diam.

Setae or other sterile hymenial elements absent

Basidia broadly clavate, 4-sterigmate, 10-12 × 5.5-6 μm, simple-septate at the base.

Basidiospores ovoid to subglobose, appearing flattened on one side, reddish-brown, smooth, negative in Melzer's reagent, 5-6 × 4.5-5 μm.

Type of rot. - White rot of heartwood of living black locust.

Cultural characteristics. - See Campbell 1938 (as Fomes rimosus); Nobles 1948, 1958, 1965.

Sexuality. - Unknown.

Substrata. - The primary host is Robinia and P. rabineae is common on R. pseudoacacia and R. neomexicana. Also reported on a few other hardwood genera (2, 27, 92, 146, 153 and Caccolobis).

Distribution. Throughout the range of Robinia pseudoacacia in the East and the range of R. neomexicana in the Southwest. Also reported on ornamental plantings of Robinia in California and Idaho outside its natural range.

Remarks. Phellinus rabineae is apparently present in the Southwest wherever Robinia neomexicana grows. Basidiocarps of P. rabineae are similar to those of Phellinus badius but have smaller pores and tend to be more applanate than those of P. badius.

36. Phellinus robustus (Karst.) Bourd. & Galz.


Basidiocarps perennial, sessile or effused-reflexed; pilei ungulate to applanate, up to 12 × 20 × 11 cm; upper surface yellowish brown to blackish, becoming incrusted and rimose, usually sulcate, glabrous; margin concolorous or yellowish brown at first, then faintly tomentose, rounded, fertile below; pore surface yellowish- or grayish-brown, the pores circular, 7-9 per mm, with thick, entire dissepiments; context shining yellowish brown, zonate, hard, woody, up to 3 cm thick, core with white radial streaks present near point of attachment; tube layers distinct, light brownish, becoming whitish within, woody, each layer up to 3 mm thick.

Contextual hyphae of two types, some brown in KOH, thick-walled, rarely branched, rarely simple-septate, 2.5-4 μm in diam; others hyaline, thin-walled, simple-septate, 2.5-5 μm in diam, inconspicuous; tra-

Fig. 308. Phellinus robustus (RLG 10827). a, contextual generative hyphae; b, contextual skeletal hyphae; c, tramal skeletal hyphae; d, rhomboid crystals; e, setae; f, basidia; g, basidiospores.

mal hyphae similar.

Setae lacking or occasional in some specimens, subulate to ventricose, thin- to thick-walled, 18-37 × 5-8 μm.

Cystidia usually abundant in hymenium, hyaline, thin-walled, ventricose with narrow, tapered apex, 15-16 μm long and 5-7 μm in diam at the base, narrow apical part 1.5-2 μm in diam.

Basidia broadly ellipsoidal, 4-sterigmate, 11-12 × 8-9.5 μm, simple-septate at the base.

Basidiospores subglobose, hyaline, smooth, thick-walled at maturity, dextrinoid in Melzer's reagent, 6.8-5 × 5.5-7 μm.
Phellinus

Type of rot. - White rot of heartwood of living hardwoods. On oaks in the Southwest the basidiocarps develop near the base of living trees and are associated with a butt and root rot.

Cultural characteristics. - See Campbell 1938; Davidson et al. 1942; and Nobles 1948, 1958, 1965.

Sexuality. - Unknown.

Substrata. - Most common on Quercus throughout the southern U.S. but also on other hardwood genera.

Distribution. Transcontinental in North America, at least in forest ecosystems with oaks. The distribution records are uncertain due to confusion of P. robustus with other species in the complex.

Remarks. The distinctive ventricose cystidia with elongated slender apices are apparently characteristic of all the species in the Phellinus robustus complex. These rarely differentiate into setae and in most specimens setae are apparently absent. The concept of P. robustus presented here is based on pileate specimens on living oaks in the Southwest. Phellinus punctatus basidiocarps are resupinate and occur on dead hardwoods and conifers. Phellinus sonorae has resupinate to slightly effused basidiocarps at the base of Dodonaea viscosa. Phellinus texanus has pileate basidiocarps on desert plants, more frequent setae and larger basidiospores.

37. Phellinus rufifinctus (Cke) Pat. Fig. 309


Basidiocarps annual to biennial, resupinate, effused, up to 5 mm thick, woody, hard and adnate; pore surface cinnamon to deep reddish-brown, margin narrow to wide; finely felted and paler than the pore surface, pores small, invisible to the naked eye, 7-9 per mm, round and entire; tubes concolorous, up to 3 mm deep; context or subiculum rusty brown to golden brown, cottony near the substrate, up to 1.5 mm thick.

Hyphal system dimitic; generative hyphae thin-walled and with simple septa, 2-4 μm wide; skeletal hyphae dominating, thick-walled and golden brown, 2.5-4 μm wide.

Setae of two kinds:

a) tramal setae acute, thick-walled and dark brown, 6-12 μm wide in the thickest part, 50-130 μm long, present both in the sterile margin, the subiculum and the tube walls, but rather rare in the latter, they do not project into the hymenium;

b) hymenial setae abundant, acute, thick-walled, dark brown and subulate with more or less evenly tapering walls, 20-35 × 6-9 μm.

Basidia broadly clavate, 4-sterigmate, 10-13 × 5-6 μm.

Basidiospores ellipsoid, hyaline, IKI-, 2.5-4.5 × 2-3 μm.

Type of rot. - White rot in dead hardwoods.

Cultural characteristics. - Unknown.

Sexuality. - Unknown.

Substrata. - Dead hardwoods.

Distribution. American species known from Florida and south to Central America.

Remarks. The two types of setae are distinctive together with the small hyaline spores. Other species with similar types of setae all have larger or cylindrical spores.
Phellinus

38. Phellinus sonorae Gilb.


**Basidiocarps** perennial, resupinate to slightly reflexed; upper surface up to 8 mm wide, golden brown, minutely tomentose, smooth, margin concolorous, rounded, sterile below; pore surface golden brown, smooth, glancing, the pores circular to angular, 5-7 per mm, with narrow, entire dissepiments; context bright golden brown, soft and fibrous near the margin, corky above the tube layers, azonate, up to 3 mm thick; tube layers indistinctly stratified, tubes becoming stuffed with lighter colored mycelium.

**Contextual hyphae** pale yellowish brown in Melzer's reagent, darker in KOH, thin-walled to thick-walled, slender, aseptate, with rare branching, 2-7 μm in diam; others very inconspicuous, thin-walled, hyaline, simple-septate, 2-3 μm in diam; tramal hyphae closely interwoven, similar to those in context.

**Setae** few, developing from cystidia, ventricose with long, slender apical portion, 35-55 x 5-8 μm.

**Cystidia** abundant, ventricose with elongated apical portion, thin-walled, hyaline, 15-100 x 3.5-6 μm, apical portion 1.5-3 μm in diam.

**Basidia** broadly ellipsoid, 4-sterigate, 10-11 x 7.5-8.5 μm, simple-septate at the base.

**Basidiospores** subglobose, hyaline, thick-walled, smooth, dextrinoid in Melzer's reagent, 5-5.5 x 4.5-5 μm.

**Type of rot.** - Uniform white rot of heartwood and sapwood at the base of hopbush (*Dodonaea viscosa*). Narrow black zone lines are conspicuous in the decayed sapwood.

**Substrata.** - Known only on *Dodonaea viscosa* (hop-bush).

**Distribution.** Known only from Santa Catalina Mtns., Pima County, Arizona.

**Remarks.** *Phellinus sonorae* is a member of the *P. robustus* complex. It differs from the other species in its bright golden brown basidiocarps, smaller basidiospores, and long, narrow setae. The fact that it fruits at the base of dead or dying hopbush plants suggests it may be a root-rot pathogen.

39. Phellinus spiculosus (Campbell & Davidson) Niem. Fig. 311


**Basidiocarps** resupinate, perennial, hard and woody, becoming widely effused; pore surface yellowish brown to purplish brown or becoming grayish brown on older specimens, the pores circular, 6-8 per mm, with thick, entire dissepiments; margin concolorous and sterile up to 10 mm or becoming blackened and rimose; subiculum yellowish brown, usually very thin, less than 1 mm thick; tube layers distinctly stratified, woody, older layers with tubes stuffed with white mycelium, tube layers together up to 1 cm thick.

**Hyphal system** dimitic; subicular generative hyphae hyaline to pale yellowish, thin-walled, simple-septate, with rare to frequent branching, 1.5-3 μm in diam; subicular skeletal hyphae brown in KOH, thick-walled, nonseptate, with rare branching, 2-3 μm in diam; tramal hyphae similar; white mycelium in old tubes composed of very slender, branched, hyaline hyphae 1-2 μm in diam.

**Setae** infrequent to abundant, brown in KOH, thick-walled, ventricose to subulate, 12-23 x 4.5-6 μm.

**Basidia** clavate, 4-sterigate, 10-12 x 5.5-6 μm.

**Basidiospores** ovoid to broadly ellipsoid, hyaline, smooth, IKI-, 4-6 x
**Phellinus**

**Fig. 311.** *Phellinus spiculatus* (RLG 13333). a, tramal generative hyphae; b, tramal skeletal hyphae; c, setae; d, basidia; e, basidiospores.

3.5-4 μm.

**Type of rot.** - White rot of living and dead hardwoods. Dark zone lines are commonly present.

**Cultural characteristics.** - See Campbell & Davidson 1942; Stalpers 1978.

**Sexuality.** - Unknown.

**Substrata.** - On living and dead hardwoods, particularly common on *Quercus* and *Carya* in which it kills and decays sapwood and causes cankers. Clinker-like masses of fungus tissue or "sterile conks" develop in association with the cankers.

**Distribution.** Widespread in eastern hardwood forests from East Texas through the Gulf Coast Region and north to Pennsylvania. Also known in Europe.

**Remarks.** *Phellinus spiculatus* is morphologically similar to *P. laevigatus* but is culturally distinct. In Stalpers (1978) *P. spiculatus* has the same species code as *Inonotus andersonii* and *I. nidus-pici*.


**Basidiocarps** perennial, sessile, ungulate, up to 15 cm wide; upper surface at first pale brown, matted tomentose, becoming blackened and deeply rimose with age and weathering, sulcate; margin rounded, pale brown and tomentose; pore surface pale brown (Buckthorn Brown to Mummy brown), smooth, the pores 4-6 per mm; dissepiments finely tomentose, entire; context hard and woody, yellowish brown, appearing mottled with streaks of paler tissue, tube layers stratified, Buckthorn brown, becoming stuffed with light-colored mycelium; sections permanently darkening in KOH solution.

**Contextual hyphae** of two types, some thin-walled and hyaline to yel-
Phellinus

lowish, with occasional septa and rare branching, 2–5 μm in diam, others thick-walled, yellowish brown, aseptate, with rare branching. 3–5 μm in diam; hyphae in the pale colored areas with a parallel arrangement, easily separated, hyphae in the darker areas intensely interwoven, contorted, difficult to separate; tramal hyphae interwoven, pale yellowish, with slightly thickened walls and occasional septa, 2–4 μm in diam.

Setae few, slightly thin- to thick-walled, with an inflated base to 10 diam and a slender apical portion, 25–60 μm long; setae apparently developing from hyaline, thin-walled, cystidioid hyphal ends similar in shape and size to the setae and common in all sections.

Basidia broadly clavate to ovoid, 4-sterigmate, 17–25 × 8.5–12 μm, simple-septate at the base, sterigmata slender, to 4 μm long.

Basidiospores subglobose, hyaline, strongly dextrinoid in Melzer’s reagent and with distinctly thickened walls when mature, 7–9 × 6.5–9 μm.

Type of rot. – Uniform white rot of heartwood of living desert hardwoods and junipers.

Cultural characteristics. – See Nakasone and Gilbertson 1978.

Sexuality. – Unknown.

Substrata. – Numerous genera of angiosperms, including cacti, in the Sonoran Desert and adjacent vegetation zones; particularly common on Canatia holocantha and Cowania stansburiana. Also on gymnosperms; rather common on Juniperus and also known on Ephedra. (22, 24, 32, 35, 41, 45, 51, 64, 73, 93, 98, 119, 126, 127, 199, 201).

Distribution. Known only from Texas, New Mexico and Arizona.

Remarks. Phellinus texanus basidiocarps are more typically ungulate than those of P. robustus and become more rimose with age. Setae are more frequent in P. texanus than in other members of the P. robustus complex and the basidiospores are larger.

41. Phellinus torulosus (Pers.) Bourd. et Galz. Fig. 313


Basidiocarps perennial, pileate, sessile, triangular in vertical sections with the upper surface horizontal and the pore surface at approximately a 45 degree angle, apllanate to thick, up to 46 cm wide, 28 cm deep, and 11 cm thick; margin obtuse, rounded, up to 2 cm thick; upper surface buff to pale brown (Cinnamon-Buff to Clay Color), glabrous to finely tomentose or slightly strigose-matted, in older portions becoming blackened, sulcate; pore surface yellowish-brown (Buckthorn Brown).

Fig. 315. Phellinus torulosus (HBB 1504). a, contextual generative hyphae; b, contextual skeletal hyphae; c, schematic drawing of hymenium; d, setae; e, basidia; f, basidiospores.

smooth, the pores 5–7 per mm, rounded, with thick, entire disseminents; context yellowish-brown, black in KOH-solution, faintly zonate, hard and woody, up to 11 cm thick, with one or more thin, black layers that appear as fine black lines on cut or broken vertical surfaces; tube layers distinctly stratified, woody, slightly paler than context tissue.

Contextual hyphae 2.5–5 μm in diam, thin-walled and hyaline to moderately thick-walled and bright yellowish brown in KOH, infrequently branched, with rare simple septa, clamp connections absent; tramal hyphae similar.

Setae infrequent, ventricose to subulate, thick-walled, yellowish-brown in KOH, up to 49 μm long and 6–11 μm in diam, projecting 10–20 μm.

Basidia clavate, 4-sterigmate, 14–16 × 5–6 μm, simple-septate at the
Phellinus

Basidiospores ovoid to ellipsoid, hyaline, smooth, negative in Melzer's reagent, 4-6 × 3-4 μm.

**Type of rot.** - White pocket rot of heartwood in roots and butt of living southwestern pine, rarely other associated conifers. The incipient stage is distinctive with bright red streaks in the normally pale heartwood.

**Cultural characteristics.** - See Gilbertson and Burdsall, 1972.

**Sexuality.** - Unknown.

**Substrata.** - *Pinus ponderosa*, *P. strobus*, *Pseudotsuga menziesii*

**Distribution.** Known in North America only from the Santa Catalina and Pinaleno Mountain Ranges in southern Arizona. In these areas it is locally common on southwestern white pine.

**Remarks.** Basidiocarps of *P. torulosus* develop at the ground line or the base of the trunk or on exposed roots. It has been confused with *Phellinus gilvus* in North America but has much different cultural characteristics, slightly larger spores, and other different characters (Gilbertson and Burdsall, 1972). Basidiocarps of *Phellinus nigrolimitatus* may be similar to those of *P. torulosus* and both have thin black layers in the context. However, *P. nigrolimitatus* basidiocarps typically develop on fallen trees and have cylindrical spores and more abundant and larger setae. Overholts (1953) reported *P. torulosus* as occurring on hardwoods in the southeastern states, but his records are based on specimens of *P. gilvus*. Lowe (1957) reached this same conclusion.


Basidiocarps perennial, sessile, developing at branch scars, up to 20 cm wide and 15 cm thick, triangular in longitudinal section with the pore surface and upper surface at angles of about 45 degrees from the horizontal, woody, attached to the host by a granular core of tissue that is continuous into the decayed branch stub; upper surface pale brown near the margin, finely tomentose, soon becoming blackened, crusty-like and rimose; pore surface purplish brown, the pores circular, 5-7 per mm, with thick, entire dissepiments; context dark reddish brown woody, with a granular core at the place of attachment; tube layers indistinctly stratified, tybes becoming stuffed with white mycelium, each tube layer up to 2 mm thick.

Contextual hyphae simple-septate, thin-walled and pale yellowish to almost hyaline, 2-3 μm in diam; or thick-walled, dark reddish brown, 4-6 μm in diam; granular core composed of densely interwoven, branching hyphae with clusters of thick-walled, dark reddish brown, irregularly shaped and contorted cells; trama hyphae with parallel arrangement.

Setae few to numerous, thick-walled, brown in KOH, ventricose to subulate, 12-30 × 6-7.5 μm, projecting to 15 μm.

Basidia broadly ovoid, 4-sterigmata, 8-10 × 6-7 μm, simple-septate at the base.

Basidiospores subglobose, hyaline, smooth, negative in Melzer's rea-
Phellinus

gent, with thickened wall at maturity, 4.5-5 x 4-4.5 μm.

Type of rot. - White trunk rot of living trees and a major decay fungus throughout the range of aspen (Lindsey & Gilbertson, 1978). It is restricted to aspen. Wikström (1976) reported that Phellinus tremulae in Populus tremula spread in the inner sapwood and inner wood of living trees in the absence of other organisms, indicating that it is a primary parasite in aspen.


Sexuality. - Unknown.

Substrata. - Populus tremuloides and P. grandidentata. Restricted to these species.

Distribution. Probably wherever aspen grows in North America.

Remarks. Phellinus tremulae has not been segregated from the Phellinus igniarius complex by some American authors (Overholts, 1953; Lowe 1957), and referred to by others as Fomes igniarius var. populinus (Campbell, 1938; Nobles, 1948, etc.). Niemelä (1974) gives a thorough account of the basidiocarp and cultural morphology of P. tremulae. Besides the macroscopic difference in basidiocarps, P. tremulae is microscopically different from other members of the P. igniarius complex included here because of the parallel arrangement of its trama skeletal hyphae. Culturally it differs in the slow growth rate and sweet wintergreen odor.

43. Phellinus umbrinellus (Bres.) Ryv.


Basidiocarps resupinate, adnate and effused, in the type about 5 mm thick along the tubes, woody; pore surface fulvous to dark cinnamon or grayish-brown, pores round and entire, 6-8 per mm, tubes concolorous, the inner ones stuffed with white mycelium; context more or less absent in the type, in other specimens less than 1 mm and dense.

Hyphal system dimitic; generative hyphae hyaline and simple-septate, 1.5-2.5 μm wide; skeletal hyphae totally dominating, thick-walled, golden to pale rusty brown, 2.5-3.5(-4) μm wide.

Setae absent.

Basidia broadly clavate, 4-sterigmate, 8-12 x 5-6 μm.

Basidiospores subglobose to globose, pale rusty brown, IKI-, 4-5 x 3.5-4 μm.

Type of rot. - White rot in dead hardwoods.

Cultural characteristics. - Unknown.

44. Phellinus vaninii Ljub.


Basidiocarps resupinate, perennial, becoming widely effused; pore surface dark dull brown when viewed directly, glancing and with a golden luster when viewed obliquely, the pores angular, 7-9 per mm, with thin, entire, minutely tomentose dissepiments; margin sterile, abrupt, bright golden yellow, finely tomentose, up to 3 mm wide, becoming blackish brown with age; subiculum thin, less than 1 mm thick, reddish brown, tough-fibrous; tube layers indistinctly stratified, hard and woody, up to 12 mm thick.

Hyphal system dimitic; subicular generative hyphae thin-walled, hyaline to pale yellowish, simple-septate, rarely branched, 2.5-4 μm in diam; subicular skeletal hyphae thick-walled, yellowish brown in KOH, simple-septate, rarely branched, 2-4 μm in diam; trama hyphae similar.
**Phellinus**

**Figure 316.** Phellinus vaninii (RLG 9729). a, trama generative hyphae; b, trama skeletal hyphae; c, setae; d, thin-walled hyphal elements; e, basidia; f, basidiospores.

Setae abundant in hymenium, thick-walled, dark reddish brown in KOH, mostly ventricose, 15–37 × 6–10 μm.

Basidia broadly clavate, 4-sterigmate, 9–11 × 5–6 μm, simple-septate at the base.

Basidiospores ovoid to ellipsoid, pale yellow in KOH, IKI-, 3.5–4.5 × 3–3.5 μm.

Type of rot. — White laminated rot of dead aspen.

Cultural characteristics. — Unknown.

Sexuality. — Unknown.

Substrata. — Known only on dead, fallen aspen (*Populus tremuloides*).

Distribution. In North America known from Minnesota. Also in the U.S.S.R. where it was originally described.

Remarks. *Phellinus vaninii* is characterized by its glancing, lustrous pore surface, abundant ventricose setae, and small, pale golden yellow spores. The Minnesota specimen studied (RLG 9729) agrees perfectly in all respects with a specimen collected in the U.S.S.R. by E. Parmasto (TAA 102315).

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**Figure 317.** Phellinus viticola (RLG 8026). a, contextual generative hyphae; b, contextual skeletal hyphae; c, schematic drawing of hymenium; d, setae; e, basidia; f, basidiospores.

**Phellinus viticola** (Schw.: Fr.) Donk.


Basidiocarps perennial, usually effused-reflexed, often sessile or entirely resupinate, often developing by fusion of two or more; pilei generally dimidiate or narrow and shelflike, up to 1.5 × 6 × 1 cm; resupinate specimens often effused up to 30 cm: upper surface reddish brown to blackish, hirsute to almost glabrous, sulcate; margin usually lighter reddish brown, tomentose to hirsute, acute or rounded; pore surface yellowish brown (Brussels Brown), the pores circular to angular, 4–7 per mm, with thick, entire dissepiments; context yellowish brown, faintly zonate, corky-fibrous, up to 3 mm thick; tube layers concolorous and continuous with the context, up to 5 mm thick, the tubes usually whitish within.
Phellinus

Contextual hyphae of two types, some brown in KOH, thick-walled, rarely simple-septate, 2-3 μm in diam; others pale yellowish brown to hyaline in KOH, thin-walled, with occasional branching, simple-septate, 2-3 μm in diam; tramal hyphae similar.

Setae abundant, narrowly subulate, thick-walled, 25-75 × 5-8 μm.

Basidia clavate, 4-sterigmate, 9-10 × 5-6 μm, simple-septate at the base.

Basidiospores cylindric, straight or curved, hyaline, smooth, negative in Melzer's reagent, frequently biguttulate, 5.5-8 × 1.5-2 μm.

Type of rot. - Uniform white rot of dead wood of conifers and hardwoods.

Cultural characteristics. - See Nobles 1948, 1958, 1965; Campbell 1938; Davidson et al. 1938; and Baxter 1937.

Sexuality. - Unknown.

Substrata. - Most commonly on conifers but also frequently collected on hardwoods (1, 3, 8, 13, 20, 83, 97, 136, 145, 148, 153, 156, 165, 187, 190, 194, 202).

Distribution. Widely distributed in western and eastern forest ecosystems in North America from Alaska to Florida. Circumglobal species.

Remarks. When entirely resupinate Ph. viticola may be distinguished from similar brown polypores by its long narrow setae and narrow cylindric spores. Shope (1931) called this fungus Trametes isabellina Fr., and the resupinate form has been called Poria isabellina Overh.

46. Phellinus wahlbergii (Fr.) Reid


Basidiocarp pileate, perennial, applanate, solitary or imbricate, rarely effused-reflexed, up to 10 cm wide, 20 cm long and 5-20 cm thick at the base, semicircular to elongated shelf-like, woody when dry; upper surface reddish-brown to umber, tomentose, narrowly banded in sulcate to flat zones, no cuticle in sections, with age some of the zones may become adpressed, but some tomentose zones will always remain; pore surface deep rusty to chestnut brown, pores small, 7-8 per mm, tubes concolorous, up to 15 mm deep; context chestnut brown, up to 5 mm thick. homogeneous.

Hyphal system dimitic; generative hyphae simple-septate and hyaline, 2-3.5 μm wide, skeletal hyphae golden to pale rusty brown, 2-4 μm wide, thick-walled.

Setae straight or hooked, thick-walled, dark brown, acuminate, 15-
Phellinus weirianus (RLG 7776). a, trama! generative hyphae; b, trama skeletal hyphae; c, contextual generative hyphae; d, contextual skeletal hyphae; e, schematic drawing of hymenium; f, setae; g, basidia; h, basidiospores.


**Basidiocarps** perennial, sessile, usually ungulate, up to 30 x 20 x 15 cm; upper surface becoming blackened and rimose, sulcate; margin golden brown, finely tomentose, rounded, up to 1 cm wide; pore surface bright golden brown, glancing, smooth, the pores circular, 5–7 per mm, with thick, entire dissepiments; context yellowish brown, lustrous and shiny on broken surfaces, faintly concentrically zonate, hard, fissile, up to 4 cm thick; tube layers concolorous, newer layers paler, not clearly distinct, up to 7 cm thick.

**Contextual hyphae** of two types; generative hyphae hyaline to pale yellowish, thin-walled, simple-septate, with occasional branching, 2.5–4.5 μm; skeletal hyphae pale to darker brown in KOH, thick-walled, rarely branched, 3.5–6 μm in diam; tramal hyphae similar.

**Setae** frequent to scattered, subulate to ventricose, dark reddish brown in KOH, thick-walled, 20–52 x 7–14 μm.

**Basidia** broadly clavate, 4-sterigmate, 12–14 x 6–7 μm, simple-septate at the base.

**Basidiospores** subglobose to ovoid, pale yellow, smooth, negative in Melzer’s reagent, 4–5.5 x 3.5–4.5 μm, spore print rusty brown.

**Type of rot.** – White heartrot of living walnut.

**Cultural characteristics.** – See Yohem 1983.

**Sexuality.** – Unknown.

**Substrata.** – Restricted to *Juglans*, mainly on *J. major*, but one collection from *J. nigra* in Oklahoma and one from *J. nigra* in Texas have been examined.

**Distribution.** Known only from the southwestern U.S. and Mexico.

**Remarks.** *Phellinus weirianus* has a limited distribution but is common in southern Arizona wherever *J. major* grows. It is similar to *P. everhartii* which is restricted to oaks. Setae of *P. weirianus* are much larger than those of *P. everhartii*.


**Basidiocarps** perennial or annual, becoming extensively effused, very light in weight, not readily separable; margin pale brown (cinnamon or sayal brown) soft, fimbriate, up to 2 cm wide; pore surface slightly darker brown (Natal Brown or Verona Brown), the pores circular to angular, 5–7 per mm, with thick, setulose dissepiments that become thin and lacerate; context yellowish brown, soft, fibrous, spongy, azonate, up to 1 cm thick; tube layer light grayish brown, brittle, each layer up to 5 mm thick.

**Contextual hyphae** of three types, some pale yellowish-brown in KOH, thin-walled, with frequent branching, simple-septate, 2.5–5.5 μm in diam; some darker brown in KOH, thick-walled, with rare branching, 3–5.5 μm in diam; setal hyphae dark reddish brown, thick-walled, aseptate, traceable to a tapering, pointed tip, 6–10 μm in diam; tramal hyphae similar, setal hyphae projecting into tubes.

**Hymenial setae** absent; projecting setal hyphae abundant, straight,
Phellinus

**Fig. 920.** Phellinus weirii (RLG 400). a, subicular hyphae; b, tramaal hyphae; c, apices of setal hyphae; d, schematic drawing showing tramaal setal hyphae in relation to hymenium; e, basidia; f, basidiospores.

pointing toward the tube opening, 6–10 μm thick, projecting up to 70 μm.

**Basidia** clavate, 4-sterigmate, 10–11 × 5–5.5 μm, simple-septate at the base.

**Basidiospores** ovoid, hyaline, smooth, negative in Melzer’s reagent.

4.5–6 × 3.5–4.5 μm.

**Type of rot.** – Yellowish laminated rot of the roots and butt of living conifers. Important as a heart rot of western red cedar and as a root rot of second growth Douglas fir and true firs. In the advanced stages of decay the wood becomes pitted and brown mycelium becomes conspicuous between the layers of wood. Setal hyphae are abundant in this mycelium.

**Cultural characteristics.** – See Baxter 1943; Davidson et al. 1938; and Nobles 1948, 1958, 1965.

**Sexuality.** – Heterothallic (Hansen 1979).

**Substrata.** – Most important on western red cedar and Douglas fir but known on several other conifer genera also (1, 38, 97, 136, 138, 190, 194).

**Distribution.** Western North America in the cedar-hemlock forest type of the northwestern U.S. and western Canada. Also reported from Europe.

**Remarks.** The light, soft context and marginal tissue, the hyaline, ovoid spores, and the conspicuous setal hyphae are important characters of *P. weirii*. *P. ferrugineofuscus* is similar but has narrow, cylindric spores and tramaal setal hyphae that project into the hymenium with the tips curved and perpendicular to the axis of the tube.

Phylloporia Murr.

*Torreya* 4:141, 1904.

**Basidiocarps** annual, resupinate to pileate, pileus cinnamon to dark brown, tomentum soft and thick over a distinct thin dark zone, pileus mostly with narrow to wide concentric zones; pore surface brown, pores entire, angular to round; tubes concolorous with pore surface; context light to dark brown, thin and distinctly delimited towards the thick tomentum on the pileus by a dark zone; fruitbody black with KOH; hyphal system monomitic; generative hyphae hyaline to light rusty brown and with simple septa; spores ellipsoid, less than 5 μm in greatest dimension, slightly thick-walled and light yellowish in maturity. On hardwoods, often on living leaves of bushes or remarkably thin dead branches on living trees. Mainly tropical genus.

**Type species:** *Phylloporia parasitica* Murr.

**Remarks.** The genus belongs in the Hymenochaetaceae and its closest relatives are *Inonotus* and *Cyclomyces*. From the former it is separated by having a thick persistent tomentum separated from the context by a thin dark zone, besides having small yellowish spores. In *Cyclomyces*, there is a similar dark zone below a tomentum, which is much thinner, besides which the genus is characterized by having long and subulate...
Phylloporia

ssetae and hyaline spores.
Most remarkable in Phylloporia is its ability to grow on living bushes and trees, often on thin branches. It seems to be adapted to invade such substrates and resist the drought often experienced in such a habitat. It may be that the soft tomentum is some sort of protection or is able to absorb and retain moisture.

Key to species

1. Pores angular, 2–4 per mm ................. 2. P. frutica
1. Pores round, 6–8 per mm .................. 2

2. Pileus persistently tomentose and spongy; context cinnamon; spores subglobose, 2.5–3.5 μm in diam. ........ 1. P. chrysea
2. Pileus tomentose, but soon glabrous and black with a thin cuticle; context rusty to dark brown; spores ellipsoid, 3.0–4.5 μm long .......... 3. P. ribis

1. Phylloporia chrysea (Berk.) Ryv.
Basidiocarps annual, pileate and sessile, single or imbricate, dimidiate to semicircular, 1–5 × 2–7 cm, up to 15 mm thick at the base, pileus surface yellowish-brown to rusty-brown, mostly azonate, or zonate with age with a few sulcate zones, covered with a thick, velvety, spongy, easily-compressed tomentum, up to 10 mm thick, below which there is a thin black layer; margin sharp to rounded; pore surface yellowish to dark cinnamon brown, with a thin light-colored sterile margin, pores round, small, almost invisible to the naked eye, 6–8 per mm; tubes 1–4 mm long, concolorous with the pore surface; context 1–2 mm thick. dense and distinctly more cinnamon than the overlying tomentum from which it is separated by a dark layer that appears as a dark line in longitudinal sections.

Hyphal system monomitic; generative hyphae simple septate, yellowish to rusty brown, in the tomentum in a loose texture, 4–8 (10) μm wide with walls 0.5–1.5 μm thick, in the subhymenium hyaline to light yellowish and richly-branched, 3–5 μm wide.
Setae absent.
Basidia clavate, 4-sterigmate, 7–10 × 3–4 μm.
Basidiospores subglobose, pale yellowish brown, IKI-, 2.5–3.5 μm in diam.

Fig. 321. Phylloporia chrysea (type). a, hyphae from lower context; b, hyphae from upper context; c, basidia; d, basidiospores.

Type of rot. Causes a white rot.

Cultural characteristics and sexuality. Unknown.

Substrata. On living deciduous bushes, often on remarkably thin branches.

Distribution. In United States known from Florida, widespread in the tropical zone.

Remarks. The species is easy to recognize because of the spongy tomentum separated by a black layer from a lighter tomentum. Microscopically, the small subglobose spores separate it from P. ribis which has ellipsoid spores.

2. Phylloporia frutica (Berk. & Curt.) Ryv.
Basidiocarps annual, solitary, broadly attached, usually around small twigs and often on living trees, semicircular to round in outline, 1–5 cm in diameter, up to 2 cm thick, soft and spongy, pileus velvety to strigose and covered with a spongy-cottony tomentum, up to 1 cm thick, azonate to zonate, golden yellow to rusty brown; in old and weathered specimens even umber brown; pore surface cinnamon to
Phylloporia

Fig. 322. Phylloporia fructica (AZ 008831). a, hyphae from upper spongy context; b, hyphae from lower corky context; c, basidia; d, basidiospores.

rusty brown, pores angular, thin-walled, 2–4 per mm; tubes up to 2 mm deep; context duplex, the lower part dense and almost like a dark zone just above the tubes, but not distinctly black as in the other species of the genus, the upper part loose and punky, dark cinnamon to rusty brown.

Hyphal system monomitic; generative hyphae with simple septa, in the tomentum thin to thick-walled, rusty brown and up to 8 μm wide, in the tubes hyaline to pale rusty, thin-walled to almost solid, 2–5 μm wide.

Setae none.

Basidia clavate, 4 sterigmate, 8–10 × 3–4 μm.

Basidiospores narrowly ellipsoid, pale yellowish-brown, often partly collapsed in microscopical preparations, 3.5–5 × 2.5–3 μm, IKI–.

Type of rot. Causes a white rot.

Cultural characteristics and sexuality. Unknown.

Substrata. On living trees and bushes.

Distribution. Georgia and Florida, widespread in the tropical zone.

Remarks. The relatively large pores and the very distinct duplex context characterize this species.

3. Phylloporia ribis (Fr.) Ryv.


Basidiocarps perennial, pileate, broadly sessile, semicircular and often enclosing the stem on which they grow, compound fruitbodies commonly arise when single basidiocarps fuse together; pileus applanate to nodular, soft when fresh, flexible to woody hard when dry; pileus surface with broad sulcate zones, in fused basidiocarps more irregular with sulcate bands, first tomentose and spongy, later more compact and smoother as the upper hyphae agglutinate, when actively growing with a yellowish margin, in age rusty brown and finally dark brown to almost black, frequently greenish in older parts because of algae, the upper soft and spongy tomentum may be up to 8 mm thick and is separated from the context by a distinct black line absent only in the marginal area; pore surface cinnamon to fulvous or rusty brown, margin lighter and in growing specimens light yellowish and finely velutinate, pores round, 6–7 per mm, almost invisible to the naked eye; tubes colorless with the pore surface, up to 5 mm deep, indistinctly stratified; context dense, shiny when broken, cinnamon to fulvous, mostly darker than the thick tomentum on the pileus from which it is separated by a distinct dark line, in compound and fused basidiocarps this dark line may reappear high up in the context, enclosing it in an irregular...
Physisporinus

fashion.

Hyphal system monomitic; generative hyphae with simple septa, thin to thickwalled and sparingly branched except in the subhyphenum, in the tomentum on the pileus 2–5 μm wide, light yellowish to light rusty brown, sparingly branched and with scattered septa, in the context and trama more thickwalled, dark rusty brown, 3–7 μm wide, in the subhyphenum hyaline and thin-walled 1.5–3 μm wide.

Setae none.

Basidiospores broadly ellipsoid, smooth, slightly thick-walled, pale yellowish, IKI-, 3–4.5 x 2.5–3 μm.

Type of rot. Causes a white heartrot of living shrubs.

Cultural characteristics. See Stalpers 1978.

Sexuality. Unknown.

Substrata. Living deciduous bushes and trees, most common on Ribes, but also known from other genera (40, 107, 111, 158, 161, 182).

Distribution. Northeastern U.S. and adjacent Canada, throughout the western U.S., also in Louisiana. Widespread in the Northern temperate zone.

Remarks. The temperate distribution, the living shrubby host, the often greyish to blackish pileus, and the dark line in the context are diagnostic characters.

Physisporinus Karst.

Basidiocarps resupinate, annual, soft to ceraceous, often changing color on bruising or drying, hyphal system monomitic; generative hyphae with simple septa; cystidia not present; spores globose to ovoid, IKI-. Causes a white rot in rotten wood.

Type species: Physisporinus vitreus (Pers.:Fr.) Karst.

Remarks: The type species and P. sanguinolentus have previously often been placed in Rigidoporus because of the similar hyphal system and spores. However, P. sanguinolentus and P. vitreus are two species with resupinate soft to waxy basidiocarps that often change color when they are bruised or dried and have hyphae that are thin to only slightly thickwalled. In Rigidoporus the basidiocarps are very hard and the hyphae are very thickwalled and can be easily taken as skeletal hyphae. Furthermore, they are bright reddish when fresh, fading to brownish or brown when dry. We feel it is more natural to exclude the two species mentioned above from Rigidoporus typified by the pileate, hard and reddish orange R. microporus (Fr.) Overeem.

Key to species

1. Pore surface white, rapidly reddish to brown when bruised, pores 8–10 per mm ........................................ 1. P. sanguinolentus

1. Pore surface bluish white, unchanged or only slowly becoming pale brown when bruised, pores 4–6 per mm ........................................ 2. P. vitreus


Basidiocarps annual or reviving a second year, effused up to 20 cm, soft to tough, cartilaginous and crisp when fresh, drying rigid, readily separable; margin fertile or narrowly sterile, then drying pale tan, fibrillate, up to 1 mm wide; pore surface white or ivory when dry, quickly showing bright rusty red blotches after collecting, eventually becoming brown, grayish to blackish on drying, the pores circular to angular, 8–10 per mm, with thick, entire dissepiments; context white when fresh, pale tan when dried, cartilaginous, less than 1 mm thick; tube layer ivory to pale tan, brittle when dry, up to 5 mm thick; taste mild.

Hyphal system monomitic; subicular hyphae hyaline in KOH, agglutinated and not easily separable on drying, rarely branched, thick- to
Physisporinus

thin-walled, simple-septate, 3.5-6.5 μm in diam; tramal hyphae similar, 2-4 μm in diam.
Cystidia none; fusoid cystidioles present, 15-19 x 5-6 μm, simple-septate at the base.
Basidia broadly clavate, 4-sterigmate, 12-14 x 6.5-8 μm, simple-septate at the base.
Basidiospores ovoid to subglobose, hyaline, smooth, IKI-, 5-6 x 4-4.5 μm.

Type of rot. - White rot of dead hardwoods and conifers.
Cultural characteristics. - See Stalpers 1978.
Sexuality. - Unknown.
Distribution. Widely distributed in North American forest regions; transcontinental species from Alaska to Arizona and Florida. Also in Europe.
Remarks. The distinctive color change after collecting facilitates ready identification of P. sanguinolentus in the field. Dried basidiocarps of Rigidoporus crocatus are sometimes similar but are much harder and not white to ivory when fresh and usually retain their pinkish coloration after drying.


Basidiocarps resupinate, annual, widely effused, up to 5 mm thick, waxy and soft when fresh, hard and cartilaginous when dry, often curled and partly shrunken; pore surface white to bluish white and translucent when fresh, ochraceous to pale pinkish brown when dry, slightly staining when touched or bruised, but reaction slow and variable, pores round to angular, 4-6 per mm, somewhat smaller in dried specimens; tubes up to 5 mm deep, concolorous with pore surface; context 2-5 mm thick, dense, pale brown when dry.
Hyphal system monomitic; subicular hyphae hyaline in KOH, agglutinated and difficult to separate in dried specimens, thick- to thin-walled, sparingly branched, simple-septate, 3-6 μm wide; tramal hyphae similar, 2-4 μm wide.
Cystidia absent; fusoid cystidioles present, 15-20 x 5-6 μm, simple-septate at the base.
Basidia broadly clavate, 4-sterigmate, 12-15 x 6-8 μm, simple-septate at the base.
Basidiospores ovoid to globose, hyaline, thin-walled, IKI-, often with an oildrop, 5-6 x 4-5 μm.

Type of rot. - White pocket rot in dead hardwoods and rarely on conifers.
Cultural characteristics. - See Stalpers 1978, who reports P. vitreus as having the same species code as P. sanguinolentus.
Sexuality. - Unknown.
Substrata. - Dead wood of several genera of hardwoods and rarely on conifers (3, 138, 194, 195).
Distribution. Widely distributed in North American forest regions, also in Europe.
Remarks. This species is related to P. sanguinolentus, which however, has a more normal whitish color when fresh and rapidly becomes reddish and then black when bruised. P. vitreus has a distinct bluish, semitranslucent basidiocarp when actively growing and does not or only slightly change color when bruised. Its pocket rot is distinctive.
Piptoporus

**Fig. 326.** Piptoporus betulinus (WGS 230). a, tramal generative hyphae; b, contextual skeletal hyphae; c, tramal binding hyphae; d, basidia; e, basidiospores.

**Piptoporus** Karst.
Medd. Soc. Fauna Flora Fenn. 6:9, 1881.
Basidiocarps annual, pileate, dimidiate to broadly attached often substipitate or with a narrowed base, light in weight when dry; pilei applanate, dimidiate or reniform; upper surface with or without a thin, papery cuticle, white to ochaceous salmon or pale brownish, azonate; pore surface white to pale buff, pores regular, 3-6 per mm; context white to pinkish buff, azonate, soft-fibrous, spongy to corky when dry; hyphal system di-trimitic; generative hyphae with clamps; skeletal hyphae sinuous or straight, persistent or dissolving in KOH; basidiospores ellipsoid; occurring on *Quercus* .... 2. *P. soloniensis*

1. Pilear surface finely tomentose to glabrous, lacking a cuticle; pore surface not convex; skeletal hyphae sinuous, dissolving in KOH; basidiospores ellipsoid; occurring on *Quercus* .... 2. *P. soloniensis*

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**Key to species**

1. Pilear surface smooth, with a thin, papery cuticle; pore surface usually convex; skeletal hyphae persistent in KOH; basidiospores cylindric-allantoid; restricted to *Betula* ......... 1. *P. betulinus*

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**Type species:** *Piptoporus betulinus* (Bull.: Fr.) Karst., Fig. 326

**Basidiocarps** dimidiate to substipitate; stipe short, stout, glabrous, often resinous, whitish to brown, up to 6 cm long and 5 cm thick; pilei often pendent, usually dimidiate or reniform, solitary, up to 15 x 25 x 6 cm; upper surface whitish to mouse-colored or brownish, usually with a pellicle that breaks up to give a pitted or scaly appearance, glabrous, azonate; margin concolorous, usually extending down below the pore surface; pore surface white at first, becoming pale brownish with age, the pores circular to angular, 3-5 per mm, with thick, entire dissepiments that split and clump together with age to give a hydnaceous appearance; context white, tough when fresh, drying soft-corky, azonate, up to 5 cm thick; tube layer easily separated from the context when fresh, up to 1 cm thick.

**Hyphal system** di-trimitic; contextual generative hyphae thin-walled, hyaline, with clamps, rarely branched, 2.5-4 μm in diam; contextual skeletal hyphae hyaline in KOH, thick-walled, nonseptate, some much branched, others with rare or occasional branching, 2.5-5 μm in diam; tramal hyphae similar.

**Cystidia** or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, with a basal clamp; 10-12 x 5-6 μm.

**Basidiospores** cylindric, slightly allantoid, hyaline, smooth, IKI-, 5-6 x 1.5-1.7 μm.

**Type of rot.** Brown cubical rot of the sapwood of dead hardwoods.

**Cultural characteristics.** See MacDonald 1937; Nobles 1948, 1958, 1965; Stalpers 1978.

**Sexuality.** Heterothallic and bipolar (MacDonald 1937).

**Substrata.** Restricted to *Betula*. In North America particularly common on *B. papyrifera* (paper birch) and *B. alleghaniensis* (yellow birch).
Piptoporus

Distribution. A true boreal fungus, *P. betulinus* is found throughout the range of paper birch in North America and south to the Great Smoky Mountains in North Carolina and Tennessee. A circumboreal species.

Remarks. This species is scarcely comparable to any other considered here. The restriction to birch, the smooth, usually pelliclose upper surface, the easily separated tube layer, and the margin extending below the pore surface are reliable field characters.

2. *Piptoporus soloniensis* (Dub.:Fr.) Pil. Fig. 327


Basidiocarps annual, centrally to laterally substipitate or sessile, circular to dimidiate, single or imbricate, up to 30 cm wide and 3 cm thick, soft and fleshy when fresh and soft-fibrous and very light in weight when dried; upper surface finely tomentose to glabrous, azonate, rugose, cream buff to light ochraceous salmon; margin acute to rounded, undulating and often incurved, concolorous, fertile below; pore surface pale buff to darker cinnamon buff, the pores circular to angular, 5-6 per mm, with thick to thin, minutely fimbriate dissepiments; context soft, fibrous-spongy, azonate, light buff to pinkish buff, up to 2 cm thick; tube layer concolorous with context or lighter cream colored, brittle when dry, up to 1 cm thick.

Hyphal system dimitic; contextual generative hyphae thin to slightly thick-walled, hyaline, with rare branching, with scattered, often distorted clamps, inconspicuous in Melzer's reagent but staining brightly and conspicuous in KOH and phloxine, 3-13 μm in diam; contextual skeletal hyphae moderately thick-walled, hyaline, with rare branching, sinuous or wavy, often with irregular swellings and constrictions, non-septate, conspicuous in Melzer's reagent but partially dissolving and disintegrating in KOH, 3-7 μm in diam; tramal hyphae similar but narrower, skeletal hyphae 2.5-4 μm in diam and generative hyphae 2-5 μm in diam.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 15-23 × 6.5-8 μm, with a basal clamp.

Basidiospores ellipsoid, hyaline, smooth, IKI-, 4.5-6 × 3-4 μm.

Type of rot. Brown cubical rot of dead hardwoods.

Cultural characteristics. See Stalpers 1978 (as *Tyromyces trichrous*). Sexuality. Unknown.

Fig. 327. Piptoporus soloniensis (RS 2225). a, narrow contextual generative hyphae; b, broad contextual generative hyphae; c, contextual skeletal hyphae; d, basidia; e, basidiospores.
Polyporoletus

Substrata. Dead hardwoods with most of the records on oak.

Distribution. Apparently restricted to the southeastern U.S. in the Gulf Coast Region and Lower Atlantic Coast.

Remarks. Although Berkeley and Curtis described this fungus from North America as *Polyporus trichrous* in 1853 and Long described it in 1917 as *Polyporus pseudosulphureus*, somehow it became associated with the name *Polyporus amygdalinus* Berk. & Rav., and it was described by Overholts (1953) under that name. Murrill identified his collections from Florida as *P. amygdalinus* and most of the specimens at BPI, NY, and PH were filed under that name. Lowe and Pegler (1973) pointed out the differences between the type of *P. amygdalinus* at Kew and the type of *P. pseudosulphureus* Long. We now know that *P. amygdalinus* is a synonym of *Polyporus virgatus* Berk. & Curt. as pointed out in the synonymy under that species. *Piptoporus soloniensis* has a wide geographical distribution (Tortic 1975, Schumacher and Ryvarden 1981). The basidiocarps resemble those of *Laetiporus sulphureus* but without the bright orange and yellow coloration. Microscopically, the clamped generative hyphae and the sinuous skeletals that dissolve in KOH are diagnostic.

**Polyporoletus Snell**


Basidiocarps terrestrial, annual, centrally to laterally stipitate; pileus circular to reniform or lobate, upper surface tomentose-fibrillose to glabrous, purplish gray to pale buff, darkening on drying; pore surface yellowish-tan to pinkish-buff, becoming pale olivaceous on dried specimens, the pores circular to angular, 1–2 per mm, tubes decurrent on stipe; context pale pinkish buff, azonate; hyphal system monomitic; hyphae with clamps and simple septa; basidia clavate, 4-spored, cystidia none; basidiospores globose to subglobose, with a double wall separated by interwall pillars or partitions, hyaline, appearing slightly rough, negative in Melzer's reagent. Monotypic genus restricted to North America. Type of rot unknown, possibly mycorrhizal.

Type species: **Polyporoletus sublividus** Snell

Remarks. *Polyporoletus* is probably phylogenetically near *Albatrellus* but is distinguished by its unique basidiospores, quite unlike those of any other polypore.

Fig. 328. *Polyporoletus sublividus* (LOO 23951). a, thin-walled contextual hyphae; b, thick-walled contextual hyphae with irregular wall thickening; c, basidia; d, basidiospores.
Polyporoletus

Polyporoletus tawny, azonate, in some specimens almost black after drying; pore surface purplish gray to avallaneous or olivaceous with age, the pores circular to angular, 1–2 per mm, with thick entire dissepiments that become thin and lacerate with age; context pinkish-buff to ochraceous salmon, soft and friable, azonate, up to 1.5 cm thick; tube layer sharply distinct from context, not separable, decurrent on stipe, up to 1 cm thick, inner surface of tubes pinkish buff, trama tissue darker; stipe up to 10 cm long and 4 cm wide, cylindric, with a bulbous base up to 5.5 cm wide, reticulate, tomentose to finely hispid, wood-brown to olivaceous.

Hyphal system monomitic; contextual hyphae mostly thin-walled, with clamps and simple septa, with occasional branching, hyaline, 5–10 μm in diam, also some larger hyphae with unevenly thickened walls, up to 15 μm in diam; trama hyphae thin-walled, 2.5–5 μm in diam, with clamps, gloeoclerous hyphae also present in trama; large globules of dark brown material exude from all tissues.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 2–4 sterigmate, 30–45 x 11–14 μm, with a basal clamp.

Basidiospores subglobose to broadly ellipsoid, hyaline, appearing slightly rough, with a double wall separated by interwall pillars or partitions, negative in Melzer’s reagent, with a large spherical guttule, 10–12 x 8–10 μm, outer walls and pillars apparently sloughing off some spores which appear smooth and single walled.

Type of rot. – Terrestrial, apparently not a wood-rotting fungus.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – On ground under hardwoods.

Distribution. Known only from the Pacific Northwest and the Great Smoky Mountains in Tennessee and North Carolina.

Remarks. Polyporoletus sublividus is a taxon morphologically similar to species of Albatrellus except for its unique spores. These are so different from those of Albatrellus that we prefer to maintain it in a monotypic genus. Anonymous notes with specimen L00 21569 were used in preparing the description.

Polyporus s.str. Fr.

Syst. Mycol. 1:341, 1821.

Fruitbodies annual, centrally to laterally stipitate, pileus smooth to scally or first finely tomentose, but soon smooth, light to deep brown or almost purplish when old, tough when fresh, hard when dry; pore surface white to cream, pores entire, round to angular, small to large; context white; stipe glabrous to finely tomentose, light to deep brown or even blackish, smooth to longitudinally wrinkled, hyphal system dimitic; generative hyphae hyaline, thin-walled and with clamps; binding hyphae arboform to dendriform with long, mostly dichotomously branched segments ending with thin, whip-like tips; cystidia none, spores cylindrical, straight to slightly bent, thin-walled, hyaline, smooth and IKI-. On dead, hardwoods, rarely on conifers, causing white rots.

Type species: Polyporus squamosus Fr.

Remarks. The genus is circumscribed here in the restricted sense in which it is almost universally accepted today. It is quite well defined by the stipitate fruitbodies and the dimitic hyphal system with binding hyphae.

The genus may be separated into the following groups which sometimes have been given rank of genera.

1. Polyporus s. str. Besides P. squamosus, P. tuberaster, P. craterellus, P. cryptopus, P. virgatus and P. radicatus belong here. The group is characterized by its large spores.

2. Dendropolyergus (Kötl.) Jü. The only species is P. umbellatus and separated from the other species by its divided basidiocarp with round and centrally stipitate pilei.

3. Melanopus Pat. with P. melanopus as type species. P. badius, P. varius, P. admirabilis and P. elegans also belong here because of their black stem.

4. Polyporellus Karst. with P. brumalis as type. P. arcularius, P. coronadensis and P. tricholoma are included, they all have centrally stipitate basidiocarps, a stipe without a black cuticle and relatively short spores.

5. Favolus Fr. which includes P. alveolaris and P. tenuiculus in North America and characterized by a laterally stipitate to sessile basidiocarp and elongated pores.
Key to species

1. Basidiocarp with several pilei from a common base .......................... 2
2. Basidiocarp with a single pileus (fused basidiocarps may occur with
   2-3 pilei) .................................................................................. 3
2. Individual pilei small, round; widely distributed in Eastern United
   States ........................................................................................ 16. P. umbellatus
3. Individual pilei large, fan-shaped to rounded; known only in Arizona   6. P. coronadensis
4. Entire or lower part of stipe with black cuticle; pores 4-8 per mm     4
5. Stipe without black cuticle, if present in lower part, then pores 1-3
   per mm ....................................................................................... 8
6. Pileus white, or tan to cream ..................................................... 5
7. Pileus dark brown to bay ........................................................... 7
8. Pileus 0.5-2 cm thick; pores 3-5 per mm; known from northeastern
   U.S. ......................................................................................... 1. P. admirabilis
9. Pileus 0.5-1 cm thick; pores 5-8 per mm; widespread species ....... 6
10. Pileus with radial striations ...................................................... 17. P. varius
11. Pileus without radial striations .................................................. 9. P. elegans
12. Pileus reddish brown, chestnut in age; generative hyphae with
    clamps; boreal species, often fruiting on the ground .................. 10. P. melanopus
13. Pileus chestnut to blackish brown; generative hyphae with simple
    septa; southern-tropical species, fruiting on dead wood 4. P. badius
14. Spores 6-9 μm long; basidiocarps usually small, up to 4 cm in diam. 9
15. Spores 9-15 μm long; basidiocarps usually rather large, rarely small,
    up to 15 cm in diam. ................................................................. 11
16. Pores 1-2 per mm ..................................................................... 3. P. arcurarius
17. Pores 3-8 per mm ..................................................................... 10
18. Pores 7-8 per mm; pileus tan to cream; tropical species .......... 14. P. tricholoma
19. Pores 3-4 per mm; pileus pale to dark brown; boreal-temperate
    species ....................................................................................... 5. P. brumalis
20. Pileus with distinct dark squamules ......................................... 12
21. Pileus smooth, scurfy or with fine fibrils or radial lines, but usually
    evenly colored ........................................................................ 14

Symbols for species of Polyporus in synoptic key

5. P. brumalis 11. P. radicatus 17. P. varius
Synoptic key to species of *Polyporus*

**Habit of basidiocarp**
- a. single 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18.
- b. clustered or imbricate 4, 6, 12, 13, 15, 16, 18.
- c. centrally stipitate 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 15, 17.
- d. excentrically stipitate 1, 2, 4, 9, 12, 17.
- e. laterally stipitate 1, 2, 4, 9, 12, 17.
- f. substipitate with narrowed base 1, 6, 13, 16.
- g. sessile 2, 6, 13.

**Pileus surface**
- a. glabrous 1, 2, 3, 4, 6, 7, 8, 9, 13, 14, 16, 17.
- b. striate or scurfy 17, 18.
- c. fibrillose to hispid 2, 5, 10, 11, 16.
- d. squamose 2, 12, 15.
- e. virgate 18.
- f. infundibuliform 1, 4, 18.
- g. white to cream or pale buff 1, 8, 9, 13, 15, 16, 17.
- h. reddish or yellowish 2, 11.
- i. brown to blackish 3, 4, 5, 6, 10, 11, 12, 14.

**Stipe characters**
- a. simple 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18.
- b. branched 12, 13, 16.
- c. black at the base 4, 9, 10, 12, 15, 17.
- d. glabrous 2, 3, 8, 14.
- e. velutinous or tomentose at the base 1, 4, 5, 7, 9, 10, 11, 12, 13, 15, 16, 17.
- f. tubes decurrent on stipe 1, 5, 6, 7, 11, 12, 13, 15, 16, 17.
- g. radicating 10, 11, 15, 16.

**Pore surface**
- a. white to cream or pale buff 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17.
- b. reddish brown 18.
- c. pores circular to angular 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17.
- d. pores hexagonal, radially aligned 2, 3, 13, 15.
- e. pores up to 1 mm or more in diam 2, 3, 12, 13, 15.
- f. pores 2-5 per mm 1, 5, 6, 7, 8, 11, 16, 18.
- g. pores 5-10 per mm 4, 9, 10, 14, 17.

**Hyphal characters**
- a. generative hyphae with clamps 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17.
- b. generative hyphae simple-septate 4.
- c. dendritic binding hyphae conspicuous 1, 2, 5, 6, 9, 11, 13, 14, 15, 16.
- d. fusoid cystidia present 4, 10, 17.
- e. hyphal pegs present 2, 4, 7, 8.

**Sterile hymenial structures**
- a. up to 15-20 µm long 12.
- b. up to 10-15 µm long 2, 7, 8, 11, 13, 15, 17, 18.
- c. less than 10 µm long 1, 3, 4, 5, 6, 9, 10, 14, 16.

**Basidiocytes**
- a. fusoid cystidioles present 4, 10, 17.
- b. hyphal pegs present 2, 4, 7, 8.

**Geographical distribution in North America**
- a. known from eastern part only 1, 7, 13, 14, 18.
- b. known from western part only 6, 8.
- c. known from both eastern and western parts 2, 3, 4, 5, 9, 10, 11, 12, 15, 16, 17.
- d. known only from the southeastern U.S. 13, 14, 18.
- e. boreal or at high elevations only 5, 8, 10, 15.
- f. wide latitudinal range 2, 3, 4, 9, 11, 12, 16, 17.

**Polyporus admirabilis** Pk.

**Polyporus**

*FIG. 329*

**Basidiocarps** annual, centrally to laterally stipitate or substipitate with a narrowed base; pileus single, circular to infundibuliform to dimidiate or lobate, 6-30 cm wide, up to 4.5 cm thick, upper surface white when fresh, becoming cream colored to pale buff on age or drying, glabrous and pelliculose, azonate, smooth or cracking concentrically on drying; margin concolorous, rounded and narrowly sterile below; pore surface white, drying cream color to pale buff, the pores circular to angular, 3-4 µm in diam, with thin, entire to lacerate dissepiments; context white to cream colored or pale buff, azonate, firm-corky, up to 4 cm thick; tube layer concolorous with the context, 2-6 µm thick, decurrent on the stipe or narrowed base; stipe central to lateral or poorly developed, with decurrent tube layer extending to half way down or nearly to the base on substipitate specimens, up to 8 cm long and 3.5 cm thick, surface of sterile portions becoming pale buff to almost black at the base, glabrous to finely tomentose.
**Polyporus admirabilis (USO 201177).** a, trama! generative hypha e; b, contextual skeletal hyphae; c, trama! skeletal hyphae, some with dendritic branching; d, basidia; e, basidiospores.

**Hyphal system** dimitic; contextual binding hyphae predominating in mature specimens, thick-walled, hyaline, with occasional branching, nonseptate, 2.5–9 μm in diam; contextual generative hyphae thin-walled, with clamps, 3–4.5 μm in diam, obscure in mature specimens; trama! hyphae similar but binding hyphae more frequently branched, often with tapering apices, 2–6 μm in diam.

Cystidia or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigate, 15–20 × 5–7 μm, with a basal clamp.

**Basidiospores** cylindric, hyaline, smooth, IKI-, 7–8 × 3–3.5 μm.

**Type of rot.** – White heart rot of living trees.

**Cultural characteristics.** – See Nobles 1948, 1958, 1965; Stalpers 1978.

**Sexuality.** – Heterothallic and tetrapolar (Nobles et al. 1957).

**Substrata.** – Living hardwoods, associated with trunk injuries or from roots, also in stumps (3, 20, 75, 92, 113, 152, 165).

**Distribution.** Apparently restricted to the Northeastern U.S.

**Remarks.** *Polyporus admirabilis* is perhaps most similar to *P. coronadensis* of Arizona, but does not produce the huge imbricate pilei typical of the latter species and it is reported to be pure white when fresh. Specimens with a black stipe base may resemble large specimens of *P. varius*.

2. *Polyporus alveolaris* (DC.:Fr.) Bond. & Sing., Fig. 330


**Basidiocarps** annual, stipitate to sessile, circular to dimidiate; stipe central to lateral, buff, glabrous, up to 1 cm long and 0.5 cm thick; upper surface pale reddish yellow; fibrillose to squamose with flattened, triangular squamules, with age becoming ivory to pale buff, azonate, glabrous, smooth; margin concolorous; pore surface white to tan, the pores diamond shaped, radially elongated, 1–2 per mm tangentially, with thin dissepiments that become lacerate with age; context pale tan to ivory, azonate, cory, up to 1 mm thick; tube layer continuous with the context, up to 5 mm thick.

**Hyphal system** di-trimitic; contextual generative hyphae hyaline in KOH, thin-walled, rarely branched, with clamps, 2.5–4 μm in diam; contextual binding hyphae thick-walled, nonseptate, much branched, with tapering apices, others with rare branching, all 3–7 μm in diam; trama! hyphae similar.

Cystidia none, hyphal pegs frequent, 40–50 × 17–40 μm.

**Basidia** clavate, 4-sterigate, 28–42 × 7–8 μm, with a basal clamp.

**Basidiospores** cylindric, hyaline, smooth, IKI-, 11–14.5 × 4–5 μm.

**Type of rot.** – White rot of dead hardwoods.

**Cultural characteristics.** – See Nobles 1948, 1958, 1965; Stalpers 1978.

**Sexuality.** – Heterothallic and tetrapolar (Nobles et al. 1957).

**Substrata.** – Dead wood of numerous hardwood genera (3, 13, 20, 25, 26, 27, 48, 69, 75, 92, 145, 147, 153, 161, 165, 177, 195).

**Distribution.** Transcontinental species, widely distributed in North America from Florida to Alaska. Also in Japan and Europe.

**Remarks.** This species has been placed in *Favolus* because of the radially aligned, diamond-shaped pores. However the other macroscopic and microscopic characters are all typical of *Polyporus*.
3. Polyporus arcularius Batsch: Fr.


Basidiocarps annual, centrally stipitate; pilei circular, solitary, up to 2.5 cm in diam and 0.3 cm thick; surface of the pileus straw-colored to dark brown, azonate, glabrous, smooth to rugose; margin ciliate, acute, sterile below; stipe central, concolorous with pileus, glabrous, up to 3.5 cm long and 0.4 cm thick; pore surface cream colored to buff, dull, rough, the pores large, hexagonal, radially aligned, 1-2 per mm, the dissepiments thin, becoming lacerate; context whitish to buff, azonate, tough, less than 1 mm thick; tube layer concolorous and continuous with context, up to 2 mm thick.

Hyphal system dimitic; generative hyphae hyaline in KOH, thin-walled, often branched, with abundant clamps, 2.5-5 μm in diam; skeletal hyphae thick-walled, aseptate, with occasional branching, 2-11 μm in diam; hyphae on pileus surface slender, thin-walled, with clamps, 1-1.5 μm in diam; tramal hyphae similar, not readily separable.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 25-35 × 5-6 μm, with a basal clamp.

Basidiospores cylindric, straight or slightly curved, hyaline, smooth, IKI-, 7-9 × 2.5-3 μm.

Type of rot. – Uniform white rot of dead hardwoods, rarely on conifer wood. Basidiocarp tissue and rot strongly positive in gum guaiac.
Polyporus

reagent.
Cultural characteristics. – See Nobles 1948, 1958, 1965; Nakasone and Gilbertson 1978.
Sexuality. – Heterothallic and tetrapolar (Vandendries, 1936; Hoffmann 1978).
Distribution. – Transcontinental species, common in eastern hardwood forests and in the Southwest. Circumglobal species.
Remarks. The large, radially elongated pores are the distinguishing feature of *P. arcularius*. This character is also found in *P. alveolaris*, which usually differs in being laterally stipitate or substipitate, and having much larger spores. *P. brumalis* also has more or less radially elongated, diamond-shaped pores, but they are much smaller than those of *P. arcularius*.

Basidiocarps annual, laterally to centrally stipitate; solitary or clustered; pileus circular or flabelliform, up to 15 cm wide; upper surface light chestnut brown to dark brown, often darker in the center, azonate, glabrous, smooth or rugose on drying; pore surface white to pale buff, pores circular to angular 5–8 per mm; context pale buff, azonate, corky, up to 1.5 cm thick; tube layer white when young, to slightly darker than context, up to 1 mm thick, decurrent on stipe; stipe black and minutely tomentose at base, chestnut brown and glabrous at apex, up to 5 cm thick.
**Hyphal system** dimitic; contextual generative hyphae thin-walled, simple-septate, 3–5 μm in diam, inconspicuous in mature specimens; contextual skeletal hyphae thick-walled, aseptate, 2–7 with occasional branching; contextual binding hyphae thick-walled, aseptate, much branched, 3–5 μm in diam; tramal hyphae similar.
Cystidia lacking; fusoid cystidioles present, 17–19 × 5–7 μm, simple-septate at the base, hyphal pegs usually present.
**Basidia** clavate with a narrow base, 4-sterigmate, 20–30 × 7–9 μm, simple-septate at the base.
**Basidiospores** cylindric, hyaline, smooth, IKI-, 7.5–9 × 3.3–5 μm.
**Type of rot.** – White rot of dead hardwoods and conifers.
Cultural characteristics. – Unknown.
Polyporus

Polyporus brumalis Pers.: Fr.


**Basidiocarps** annual, stipitate; stipe central, lighter colored than the pileus, up to 4 cm long and 0.5 cm wide; pilei usually solitary, sometimes several from a branched base, up to 6 cm in diam and 0.5 cm thick; upper surface bronze to purplish-brown, azonate, shiny, with clusters of short, stiff dark hairs; margin concolorous, becoming reflexed, often appearing finely fringed or ciliate; pore surface whitish or ivory, glancing, smooth, the pores angular, 3–4 per mm, with thin dissepiments that become lacerate; context white, azonate, corky, up to 3 mm thick; tube layer ivory, slightly decurrent on the stipe, up to 2 mm thick.

**Hyphal system** dimitic; contextual generative hyphae thin-walled, hyaline, with clamps, occasionally branched, 4–10 μm in diam; contextual binding hyphae hyaline, thick-walled, nonseptate, with swellings up to 13 μm in diam, mostly 4–10 μm in diam, with dendritic branching and branches tapering to 1–2 μm in diam; tramal hyphae similar, less frequently branched, 2.5–6 μm in diam.

Cystidia or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, 16–22 × 5–6.5 μm, with a basal clamp.

**Basidiospores** cylindric, slightly curved, hyaline, smooth, IKI-, 6–7.5 × 2–2.5 μm.

**Type of rot.** – White rot of dead hardwoods.

**Cultural characteristics.** – See Nobles 1948; Bakshi et al. 1969; Siepmann 1971; Stalpers 1978.

**Sexuality.** – Heterothallic and tetrapolar (Vandendries 1936; Terra 1953; Hoffmann 1978).


**Distribution.** Transcontinental species, common in eastern hardwood forests, rare in the West. Apparently absent in the southern tier of states in the U.S.

**Remarks.** *P. arcularius* is quite similar but has a paler pilear surface and larger pores that are more elongated radially. *P. alveolaris* also has a lighter colored pileus and larger pores and spores.

**Basidiocarps** annual, sessile from a narrowed stem-like base, with many individual imbricate pilei, entire basidiocarp up to 46 cm wide and 40 cm high, individual pilei 10–43 cm wide, applanate, dimidiate; upper surface cream-colored at first, darkening to pale brown (ochraceous-buff to cinnamon-buff or clay color), becoming mottled with dark brown to black spots, glabrous, hygrophanous when wet; margin rounded on young pilei, becoming acute and inrolled on older pilei; pore surface white to cream-colored, smooth, cracking deeply into angular blocks on drying, the pores very irregular in shape, circular to daedaleoid, 3–5 mm, with thick, entire dissepiments when young; context white, azonate but with irregular streaks with a darker hygrophanous appearance, tough-fibrous, not breaking but flexible, up to 2 cm thick; tube layer distinct from context, slightly darker, up to 5 mm thick, decurrent on branched, narrow base; odor distinctive, like almond extract; context and pore surface slowly positive in gum guaiac reagent.

**Hyphal system** dimitic; binding hyphae abundant in context, thick-walled, with occasional branching, aseptate, up to 6 μm in diam, usually tapering to a narrow tip; generative hyphae thin-walled, with conspicuous clamp connections, 3–6 μm in diam, with occasional branching; tramal tissue similar but with fewer binding hyphae and abundant generative hyphae; cuticle up to 70 μm thick, consisting of a compact layer of agglutinated, gelatinized hyphae that appear pale brownish in KOH.

*Cystidia* or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, 20–25 × 6–6.5 μm, with a basal clamp.

**Basidiospores** cylindric, hyaline, smooth, IKI-, 7–7.5 × 2.5–3 μm.

**Type of rot.** – White rot of living and dead oaks; rot slowly positive in gum guaiac solution.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Known only on *Quercus hypoleucoides* (silver leaf oak). The type was collected from a living tree, and other collections have been on dead, fallen trees.

**Distribution.** Known only from southern Arizona in the Chiricahua Mountains, Cochise County, and the Santa Catalina Mountains, Pima County.

**Remarks.** The type specimen (KJM 110, BPI) weighed 8.4 kg (18.5 lbs) when fresh. Fruiting of *P. coronadensis* is apparently infrequent, as collecting in southern Arizona over the last 20 years has yielded only four specimens.
Polyporus craterellus Berk. & Curt.

The basidiocarps are annual, stipitate; pileus up to 12 cm in diameter, 2-8 mm thick, flat or slightly depressed in the center, fleshy when fresh, light of weight and brittle when dry, upper surface ochraceous to deep tan, glabrous or with some scattered small tufts of hairs, smooth when fresh, distinctly wrinkled when dry and then the hair-tufts disappear; stipe central to eccentric, up to 6 cm long and 3-8 mm in diameter, ochraceous to pale brown, slightly hispid by tufts of hyphae and incompletely developed pores, no dark base seen in any specimen examined; pore surface whitish when fresh, drying pale straw-colored to yellowish brown, pores angular and decurrent on stipe, 1-3 per mm; tubes up to 5 mm deep, tough and fleshy when fresh, drying cartilaginous and brittle when dry, then pores in part collapsing or becoming angular with wavy openings; context white and remaining so, strongly contrasting with the tubes in dry condition, 1-4 mm thick.

Hyphal system dimitic; generative hyphae with clamps, in the trama thin-walled and rather regular, 2-6 μm in diameter, in the context, especially close to the pileus surface irregular with swollen parts, often contorted and twisted and clamps scattered and difficult to find, 4-15 μm wide; binding hyphae dichotomously branched, thick-walled and mostly 3-8 μm wide; more distinct in the trama, in the context often unbranched for long segments with variable wall thickness and diameter and long segments have to be examined before a branching can be detected and often these hyphae are difficult to separate from the generative hyphae proper, 3-15 μm in diameter.

Cystidia or other sterile elements absent from the hymenium, but hyphal pegs observed in some specimens.

Basidia clavate, 25-35 × 4-6 μm, 4-sterigmate, with a basal clamp.

Basidiospores cylindric to oblong ellipsoid, smooth, hyaline, IKI-.

Type of rot. - White rot of dead hardwoods.

Cultural characteristics and sexuality. - Unknown.

Substrata. - On dead hardwoods (3, 69, 143).

Distribution. Eastern United States and Canada.

Remarks. The species is undoubtedly related to *P. squamosus*, but may be separated by the smaller basidiocarps with a smooth, tan and when dry, a wrinkled pileus surface. The pores and the spores are also smaller than in *P. squamosus*. *P. tubaster* is normally scaly on the pileus and has larger pores.

**Basidiocarps** annual, stipitate; stipe central, concolorous or darker than the pileus, brown or blackish, usually simple, up to 0.5 cm in diam and 2 cm long; pilei circular, up to 3 cm in diam and 0.4 cm thick; upper surface ivory to grayish, azonate, glabrous, rugose; margin concolorous; pore surface ivory to tan, the pores angular, 2–3 per mm, with thin, entire or slightly lacerate dissepiments; context whitish, azonate, soft-corky, up to 2 mm thick; tube layer concolorous with the context, up to 2 mm thick.

**Hyphal system** dimitic; contextual generative hyphae thin-walled, hyaline, with clamps, occasionally branched, 3–7 μm in diam; contextual binding hyphae hyaline, thick-walled, nonseptate, 2–5 μm in diam, some with frequent branching; tramal hyphae similar.  
**Cystidia** or other sterile hymenial elements absent; hyphal pegs rare.

**Basidia** clavate, 4-sterigmate, 25–38 × 7–8.5 μm, with a basal clamp.

**Basidiospores** cylindric, fusiform, hyaline, smooth, IKI−, 8–11 × 3.5 μm.

**Type of rot.** – Unknown, fruits on soil in open fields.  
**Cultural characteristics.** – Unknown.  
**Sexuality.** – Unknown.  
**Substrata.** – Terrestrial, fruiting on the ground in pastures or prairie habitats. According to Overholts (1953) it is attached to dead grass roots. Weir (1917) reports a specimen attached to the bark at the base of a dead lodgepole pine.  
**Distribution.** The few records of this species indicate that it is likely to be found in the Great Plains region in grassland ecosystems. It is not known elsewhere in the world.  
**Remarks.** The peculiar habitat, the small, grayish basidiocarps, and the large fusiform spores are the distinguishing features of this species.
Polyporus


**Fig. 337**


**Basidiocarps** annual, centrally to laterally stipitate, usually solitary; pileus circular to reniform or flabelliform, up to 6 cm wide and 1 cm thick, usually 2–3 mm thick, upper surface tan to chestnut brown, azonate, glabrous; margin concolorous; stipe up to 7 cm long and 5 mm thick, black at the base, upper part concolorous with pileus, glabrous; pore surface pale buff, the pores circular to angular, 5–7 per mm; dissepiments entire; context pale buff, corky, azonate, up to 7 mm thick; tube layer concolorous with context or slightly darker, up to 2 mm thick.

**Hyphal system** dimitic; contextual generative hyphae thin-walled, with clamps, 2.5–4 μm in diam; contextual binding hyphae thick-walled, nonseptate, much branched, 2.5–5 μm in diam; tramal hyphae similar.

**Cystidia** or other sterile hymenial elements lacking.

**Basidia** broadly clavate, 4-sterigmate, 15–20 × 6–7 μm, with a basal clamp.

**Basidiospores** cylindric, slightly curved, hyaline, smooth, IKI–, 7.5–10 × 2.5–3 μm.

**Type of rot.** – White rot of dead hardwoods, positive in gum guaiac solution.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Dead hardwoods, occasionally on conifers (1, 3, 8, 9, 20, 25, 48, 69, 136, 138, 145, 147, 148, 153, 158, 162, 165, 166, 182, 190, 191, 194).

**Distribution.** Widely distributed throughout forest regions of North America.

**Remarks.** Although they occasionally are up to 9 cm in diameter, basidiocarps of *P. elegans* usually range from 1–4 cm wide, and are usually smaller than those of *P. melanopus* and *P. badius*. In addition, *P. melanopus* differs in its terrestrial habit and a black, velvety stipe, *P. badius* in the dark brown or blackish-brown upper surface and lack of clamps, and *P. varius* in the radially striate pileus.

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Fig. 337. *Polyporus elegans* (RLG 7727). a, tramal generative hyphae; b, contextual skeletal hyphae; c, basidia; d, basidiospores.
Polyporus melanopus Fr.
Syst. Mycol. 1:347, 1821.

Basidiocarps annual, stipitate, terrestrial; stipe central, simple, blackish and velvety above, dark brownish-black and glabrous below, underground portion rootlike, up to 11 cm long and 2 cm thick; pileus circular, solitary, up to 10 cm in diam and 5 cm thick; upper surface reddish-brown to smoky blackish-brown, azonate, smooth, finely scurfy; margin concolorous, often undulating or reflexed; pore surface whitish, the pores circular to angular, 6-8 per mm, with thick, entire dissepiments; context white, azonate, firm, rather friable when dry, up to 5 mm thick, tube layer slightly darker, distinct from the context and separated by a faint brownish layer, up to 0.5 mm thick.

Hyphal system dimitic; contextual generative hyphae hyaline in KOH, thin-walled, with clamps, rarely branched, 3-5 μm in diam; contextual binding hyphae hyaline, thick-walled, nonseptate, with occasional branching, 2-7 μm in diam; traumal hyphae similar.

Cystidia none; fusoid cystidioles present, 16-21 x 4-5 μm with a basal clamp.

Basidia clavate, 4-sterigmate, 18-28 x 6-8 μm, with a basal clamp.

Basidiospores cylindric, hyaline, smooth, IKI-, 7-9 x 3-3.5 μm.

Type of rot. – Polyporus melanopus has terrestrial basidiocarps, presumably developing from buried wood.

Cultural characteristics. – See Nobles 1958; Siepmann 1971; Stalpers 1978.

Sexuality. – Unknown.


Distribution. Transcontinental in North America in boreal forest regions or at high elevations in western mountains.

Remarks. The terrestrial habit and velvety stipe of basidiocarps of P. melanopus differentiate them from those of P. badius and P. varius, which are found on wood and have a glabrous stipe. Basidiocarps of the latter species also differ in their radially striate upper surface. P. elegans usually has much smaller basidiocarps that become whitish with age. Interfertility tests are needed to clarify the specific relationships in this complex.
11. Polyporus radicatus Schw.

Basidiocarps annual, stipitate, fleshy when fresh, rigid and brittle when dry; pileus circular, flat to depressed, 3–20 cm in diameter, 3–10 mm thick, upper surface yellowish to sooty brown, fibrillose to finely scaly or scurfy, becoming glabrous with maturity; stipe central, scurfy to squamulose, concolorous or darker than the pileus, 5–15 cm long, 0.5–2 cm in diameter, elongated below the ground to a black root; pore surface white when fresh, drying ochraceous to pale yellowish brown; tubes decurrent on the stipe, pores angular, 2–3 per mm, tubes cartilaginous and brittle when dry, darker than the white and dense context which may be 10 mm thick.

Hyphal system dimitic, generative hyphae thin-walled and hyaline, with clamps which may be difficult to observe; binding hyphae sparingly branched and of variable thickness and diameter and may in segments be collapsed while other parts are thick-walled, in the trama 2–6 μm wide, in the context up to 12 μm wide in the main stem; context composed almost entirely of binding hyphae, so sparingly branched that they easily may be taken as segments of skeletal hyphae.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigate, 25–35 × 8–12 μm, with a basal clamp.

Basidiospores oblong ellipsoid to fusiform, hyaline, smooth, IKI–, 12–15 × 6–8 μm.

Type of rot. – Probably causing a white rot in hardwoods.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – On the ground, but probably from buried roots.

Distribution. American species, known from Central and Eastern part of United States and Canada.

Remarks. P. radicatus is recognized by the scurfy to squamulose stipe elongated to a tap-like, black root. Microscopically it is very similar to P. tuberaster.
Fig. 340. Polyporus squamosus (PH 2922). a, contextual generative hyphae; b, contextual skeletal hyphae; c, trama skeletal hyphae; d, basidia; e, basidiospores.
**Polyporus tenuiculus** (Beauv.) Fr.


**Basidiocarps** annual, solitary, imbricate or in small clusters with several fruitbodies arising from the same point of attachment, flabelliform, spatulate to dimidiate and semicircular, 2-10 cm wide and long, up to 6 mm thick at the base, thinner towards the margin, soft when fresh, light and brittle when dry, more rarely the fruitbodies may become distinctly stipitate with a central to lateral, short and stout stipe with strongly decurrent pores; upper surface white when fresh, cream to alutaceous or pale ochraceous when dry, glabrous except for basal part of pileus which may be covered by a short, inconspicuous tomentum, often irregular in tufts, surface smooth or distinctly tessulate reflecting the pores below, if smooth, usually without any noticeable radial lines or striae, margin thin, entire or lobed; pore surface concolorous with the pileus, pores variably hexagonal to radially elongated, pore-walls thin, often undulating and finely incised, in circular fruitbodies the pores have a tendency to be hexagonal, in flabellate specimens they tend to be radially elongated, 1-3 per mm, in some specimens up to 2 mm wide, pores rather shallow, rarely more than 3 mm deep; context white to very pale ochraceous, thin, up to 2 mm thick at the base.

**Hyphal system** dimitic; generative hyphae hyaline, 2–4.5 μm wide, thin-walled and with clamps; vegetative hyphae partly like skeletal hyphae, partly intermediate between skeletal and binding hyphae, rather thick-walled, hyaline, flexuous, unbranched or more uncommonly dichotomously branched and tapering down to 1–2 μm in width, the main trunks may vary from 3–10 μm in diameter.

**Cystidia** and other sterile hymenial elements absent.

**Basidia** clavate, with 4 sterigmata and with oil-drops in the protoplasm and a basal clamp, 20–30 × 4–7 μm.

**Basidiospores** cylindrical to subnaviculart with tapering ends, 9–12 × 2–3.5 μm, hyaline, thin-walled, IKI–, often with 2–3 oildrops.

**Type of rot.** – White rot in dead hardwoods.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Numerous genera of hardwoods.

**Distribution.** Common in the Gulf States, widespread and very com-
Polyporus

mon throughout the tropics.

Remarks. P. tenuiculus is a rather common and variable species being described numerous times as new based on differently shaped basidiocarps. The pores have a tendency to increase in size and become elongated with age. The white to cream, often tessulate surface, and the large angular pores are important field-characters. The information in Ryvarden & Johansen (1980:329) that clamps are absent from the septa, was based on adventitious septa. Clamps are easily observed in fresh specimens, almost impossible to find in dried ones.

14. Polyporus tricholoma Mont. Fig. 342
Basidiocarps annual, solitary, centrally stipitate; pilei 1-4 cm in diameter, flat to centrally depressed, 0.5-2 mm thick, margin flat when fresh, deflexed-curved when dry, upper surface cream, pale tan to pale brown, smooth, glabrous or with scattered hairs, along the margin filbriate with projecting cilia, up to 3-4 mm long, with age the pileus becomes finely veined and the cilia agglutinate or disappear and the color changes to brown; stipe up to 4 cm long, 1-3 mm wide, more or less glabrous, pale tan to dirty brownish or pale reddish-brown, often somewhat longitudinally wrinkled in dry condition; pore surface ochraceous to pale brown in old specimens, pores round to angular and thin-walled, (5)7-9 per mm; tubes concolorous with pore surface, up to 1 mm deep; context whitish to tan, about 0.5 mm thick.

Hyphal system dimitic; generative hyphae with clamps, hyaline and 2-5 μm wide; fruitbody dominated by binding hyphae of the Boivista-type, most moderately branched, thick-walled to almost solid in old specimens, up to 20 μm thick in the main trunk.

Cystidia or other sterile hymenial elements absent.
Basidia clavate, 4 sterigmate, 15-20 x 6-7.5 μm, with a basal clamp.
Basidiospores cylindric, hyaline, thin-walled and IKI-, 6-7 x 2-3 μm.

Type of rot. – White rot of dead hardwoods.

Cultural characteristics. – See David and Rajchenberg 1985.
Sexuality. – Heterothallic and tetrapolar.
Substrata. – On dead wood of hardwoods.
Distribution. In United States known only from Texas and Louisiana, widespread and common in the neotropical zone, rare in the paleotropics.

Remarks. The species is normally easy to recognize because of the whitish to pale straw-colored pileus with distinct cilia along the margin. P. arcularius may also have cilia along the margin but has a brown pileus and much larger pores.

Fig. 342. Polyporus tricholoma (DES 13385). a, tramal generative hyphae; b, inflated skeletal hyphae; c, slender skeletal hyphae; d, basidia; e, basidiospores.
**Polyporus**


**Basidiocarps** annual, stipitate, simple when growing on wood, often more compound when growing on the ground; pileus fleshy when fresh, circular to semicircular or even fan-shaped in compound basidiocarps, depressed in center, up to 15 cm wide, 0.5 to 1.5 cm thick, margin thin; upper surface whitish, ochraceous to pale yellowish brown and covered with small tan to dark brown scales with a broad base and especially towards the margin, split and fibrillose, in pale specimens the scales are pale and thus not especially distinct, with age becoming more glabrous from the centre as the scales partly wear away, partly are glued to the surface; margin thin and mostly finely ciliate or lacerate, flat in fresh specimens, curved in dried specimens; stipe central to lateral, straight or curved at the base, 0.5–6 cm long, 0.5–1.5 cm in diameter with decurrent tubes, at the base with white hairs under which there is a thin black cuticle which may extend a short distance above the tomentum, above that, the stipe is white to ochraceous; pore surface white to pale tan, pores often lacerate to dentate, angular, often somewhat radially elongated, 1–2 mm long and 0.5–1 mm wide; tubes concolorous, up to 5 mm deep, context white, up to 10 mm thick, fleshy-tough when fresh, drying rigid and brittle.

**Sclerotium** normally present in the ground, round to oval or irregular, heavy, up to 30 lbs, but normally far less than that, fleshy and tough when fresh, shrinking considerably on drying and becoming hard and brittle, surface ochraceous to dark dirty brown, densely mixed with sand, stones and roots, often in considerable quantities so it looks like ground material has been penetrated by mycelial strands and white spots of hyphae.

**Hyphal system** dimitic; generative hyphae with clamps, 3–9 μm in diam; hairs at the base of stipe and the scales consist mostly of wide, generative hyphae; binding hyphae of the Bovista type with tapering sidebranches, thick-walled to solid, sparingly branched, up to 12 μm wide in the main stem; sclerotium mainly with binding hyphae, in parts very finely branched and very thin, in most parts sparingly branched, thick-walled and variable in diameter, 3–10 μm wide, in some cases with apical swellings.

**Cystidia** or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, 25–40 × 6–10 μm, with a basal clamp.

**Basidiospores** cylindric to oblong ellipsoid, hyaline, IKI−, 10–16 × 4–
Polyporus

7 µm.

Type of rot. – Causing a white rot of hardwoods.


Sexuality. – Heterothallic and tetrapolar (Stalpers 1978).

Substrata. – On hardwoods or on the ground from a large blackish sclerotium. When growing on wood, there is often a connection through the wood to an underground sclerotium.

Distribution. Western United States south to Arizona in the aspen zone and Southern Canada, widespread in the Northern boreal zone.

Remarks. The species can be confused with *P. squamosus* which has similar scales on the pileus, but has no sclerotium and normally has thicker and more robust basidiocarps. The scales of *P. squamosus* are normally rounded and more agglutinated and not raised and tufted as in *P. tuberaster*.

16. Polyporus umbellatus Fr. Fig. 344


**Basidiocarps** annual, stipitate with numerous, more or less circular, centrally stipitate pilei arising from a common, strongly branched stipe, total width and height up to 50 cm; the individual pilei partly imbricate, 1–3(4) cm in diameter, flat, margin thin and entire, deflexed in dry specimens, in center up to 3 mm thick, fleshy when fresh, hard and brittle when dry; upper surface smooth, glabrous or with very minute adpressed squamules giving the surface a fine spotty appearance (lens), ochraceous to light brown, smooth when fresh, wrinkled when dry, stipe thick at the base, up to 3 cm in diameter, thinner towards the pilei and richly branched, white to cream or pale straw-colored, in the upper parts covered with strongly decurrent pores which in the lower parts are visible only as shallow pits, smoother towards the base; pore surface white, cream or strawcolored, pores on the pileus angular, elongated towards the stipe, 1–3 per mm, on the stipe more irregular, split and partly sinusus, up to 2 mm wide; tubes concolorous, up to 2 mm deep; context white to cream, dense, up to 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, in the context thin- to slightly thick-walled, diameter very variable, partly narrow, partly large and wide with conspicuous clamps, up to 12 µm wide, in the trama more narrow and rarely above 6 µm; dendrinoïd binding hyphae scattered and restricted to the trama, solid, hyaline and up to 17 µm wide, tapering down to about 2 µm in the tips. 

Cyistidia or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, 18–25 × 5–8 µm, with a basal clamp.

**Basidiospores** cylindric, hyaline, smooth, IKI–, 7.5–10 × 3–4 µm.

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*Fig. 344.* Polyporus umbellatus (JLL 15340). a, trama l generative hyphae; b, con textual generative hyphae; c, gloeoplerous hypha from context; d, con te r 1 skeletal hyphae; e, basidia; f, basidiospores.
Polyporus

Type of rot. - Causing a white rot in hardwoods.
Sexuality. - Unknown.
Substrata. - On the ground, close to stumps of hardwoods, reported on *Picea* by Weir (1917).
Distribution. Central and Eastern United States, also Montana and Washington. Widespread, but rare in the Northern hemisphere.
Remarks. The multiple pilei arising from a common stem make this a very distinct species.

11. Polyporus varius Fr. Fig. 345
Syst. Mycol. 1:352, 1821.
Basidiocarps annual, centrally to laterally stipitate; pilei dimidiate to circular, sometimes flabelliform or infundibuliform, up to 8 cm wide and 4 mm thick, solitary or several from a branched base; upper surface pale buff with radially aligned darker striations, azonate, glabrous, margin concolorous; pore surface pale buff, the pores circular to angular, 7-9 per mm, dissepiments entire; context buff, corky, azonate, up to 2 mm thick; tube layer concolorous with context, up to 55 thick, usually decurrent to black portion of stipe; stipe black and minutely tomentose at base, upper portion usually covered by decurrent tubes, up to 2 cm long and 7 mm thick.
Hyphal system dimitic; contextual generative hyphae thin-walled, with clamps, 2.5-4 µm in diam, difficult to find in mature specimens; contextual skeletal hyphae thick-walled, nonseptate, 4-5 µm in diam; contextual binding hyphae thick-walled, nonseptate, much branched, 1.5-4 µm in diam; trama! hyphae similar.
Cystidia absent, fusoid cystidioles present, 18-23 x 5-7 µm.
Basidia clavate, 4-sterigmate, 18-30 x 7-9 µm, with a basal clamp.
Basidiospores cylindric, slightly curved, hyaline, smooth, IKI-, 9-12 x 2.5-3 µm.

Type of rot. - White rot of dead hardwoods and conifers.
Cultural characteristics. - See Nobles 1958.
Sexuality. - Unknown.
Substrata. - Dead wood of several genera of hardwoods and conifers (1, 3, 69, 75, 113, 136, 145, 147, 148, 153, 162, 165, 194).
Distribution. Transcontinental species in North America, especially in boreal habitats. Also in Europe.
Remarks. Basidiocarps of *P. varius* are most similar to those of *P. elegans* but can be recognized in the field by their striate upper surfaces.

Fig. 345. Polyporus varius (ABB 1448). a, contextual skeletal hyphae; b, trama! generative hyphae; c, trama! skeletal hyphae; d, cystidioles; e, basidia; f, basidiospores.
Polyporus virgatus Berk. & Curt.


**Basidiocarps** annual, pileate, centrally to laterally attached, depressed to infundibuliform, up to 10 cm wide and 2-5 mm thick, consistency brittle to hard when dry; pileus circular to seldom spatulate, upper surface fulvous, umber to almost chestnut, first very finely velvety tomentose, soon glabrous and smooth, but the surface is broken or separated by radially elongated depressed fibrillose lines partly exposing the paler context below, giving the surface a very characteristic radiate striate appearance; margin slightly incised or lobed; stipe up to 3 cm long and 10 mm in diameter, dark brown, covered with a very fine adpressed dark brown tomentum (lens) soon disappearing leaving a more glabrous, very thin crust, in dry condition slightly wrinkled longitudinally; pore surface umber to dark brown when dry, in sharp contrast to the context, pores thin-walled, circular to angular or irregular, entire, 3-4 per mm, often somewhat elongated downwards on the stipe; tube-layer up to 3 mm thick; context hard, 1-3 mm thick, pale luteous to ochraceous, distinctly paler than the tube layer.

**Hyphal system** dimitic; generative hyphae more or less collapsed, hyaline, thin-walled and with clamps, 3-5 μm in diameter; binding hyphae abundant, with short branches, up to 9 μm in diameter in the main stem, tapering down to about 2 μm at apex, thick-walled to more or less solid.

**Cystidia** or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, with a basal clamp, 20-25 × 6-10 μm.

**Basidiospores** cylindrical, hyaline, thin-walled, IKI-, 9-12.5 × 4-5 μm.

**Type of rot.** - White rot of dead deciduous wood.

**Cultural characteristics and sexuality.** - Unknown.

**Substrata.** - Dead hardwoods.

**Distribution.** Southeastern part of United States. Widespread, but rare throughout the tropical zone.

**Remarks.** The basidiocarps of this species are more infundibuliform than for the other species with brownish basidiocarps described in *Polyporus*. This gives a strongly decurrent tube layer which together with the dark brown, distinctly striate pileus is a good field character. The large pores separate it from the *P. badius* group which has smaller pores.
Porodisculus

Porodisculus Murr.
Basidiocarps pileate, pendent from a stalk-like base, 1–3 mm wide; upper surface and dissepiments farinaceous, ashy white to pale brown; pore surface concave, pores 8–10 per mm; hyphal system monomitic, hyphae simple-septate; much branched trichocyst hyphae on pilear surface and dissepiments; basidia in a compact palisade, 3–4 μm in diam, 4-sterigate; cystidia absent; basidiospores allantoid, 3–4 × 1 μm. Associated with a white rot of dead hardwoods. Monotypic, cosmopolitan genus.

Type species: Porodisculus pendulus (Schw.) Murr.

Remarks. This genus has no apparent close relatives among the other polypores in this flora. The small pendent basidiocarps and the distinctive coralloid trichocyst hyphae suggest relationships with the pleurotoid agarics or perhaps cyphellaceous fungi.

Porodisculus pendulus (Schw.) Murr. Fig. 347

Basidiocarps annual, pileate, single but usually fruiting in large numbers, usually pendent from a dorsal or lateral narrowed stalk-like base developing from a lenticel, or a mass of mycelium that ruptures the bark, circular to elliptical in outline, 1–3 mm in diam; upper surface ashy-white, farinaceous, azonate, margin pale brown, also farinaceous, rounded, fertile below; pore surface convex, the pores 8–10 per mm, almost obscured by the thick, farinaceous and sugary looking dissepiments; context cream colored with a pale brown upper layer composed of the surface tomentum, azonate, up to 1.5 mm thick, firm-corky; tube layer distinct and appearing cartilaginous in dried specimens, pinkish buff, up to 1 mm thick; dorsal or lateral stalk-like part with surface characters like pileus surface.

Hyphal system monomitic; contextual hyphae hyaline, thin-walled, simple-septate, 2–3 μm in diam, hyphal walls swelling greatly in KOH and lumen staining brightly in phloxine; tramal hyphae similar; vesicular, chlamydosporule-like structures present in trama, ellipsoid to spherical, moderately thick-walled, 15–20 × 12–15 μm; pilear surface and dissepiments with much branched trichocyst hyphae, branching heads covered with minute dichotomously branched projections and often with coarse crystalline material, those on the pilear surface strongly amyloid so that the entire layer turns blue-black in Melzer's reagent.
Pseudofavolus

Cystidia or other sterile hymenial elements absent.
Basidia packed in a dense palisade, difficult to separate, narrowly clavate to cylindrical, 4-sterigate, 12-17 x 3-4 μm, simple-septate at the base.
Basidiospores allantoid, hyaline, smooth, IKI-, 3.5-4.5 x 1 μm.

**Type of rot.** Associated with a white rot.

**Cultural characteristics.** Unknown.

**Sexuality.** Unknown.

**Substrata.** Dead branches of trees in several hardwood genera, most common on oak and chestnut (26, 27, 92, 138, 147, 153, 157).

**Distribution.** Hardwood forests of the eastern U.S. from Florida to New York. Not known from western North America but reported from Japan and widely distributed in the southern hemisphere.

**Remarks.** This species has the smallest basidiocarps of any of the poly­pores in this flora. They commonly develop in large numbers on recently killed branches or logging slash. Cunningham (1965) reports clamp connections on hyphae of *P. pendulus*, but we have been unable to confirm this. Simple septa are readily visible, especially at the base of the trichocysts on the pileus and dissepiment edges.

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**Pseudofavolus cucullatus** (Mont.) Pat.  
*Fig. 348*  

**Basidiocarps** annual, pileate, up to 8 cm wide and 3-4 mm thick, laterally attached with a small disc or a diminutive stipe, dimidiate to flabelliform, consistency rigid when dry; upper surface glabrous and smooth, sometimes finely radiate-striate, whitish, ochraceous to pale dirty umber, often with a dark reddish tint along the margin, which is entire to weakly incised, often wavy and depressed in dried specimens; stipe reduced, a few mm long, often attached to the substrate with a small disc up to 1 cm in diameter; pore surface dark ochraceous to umber or dirty fuscous, pores angular to hexagonal, regular to irregular, (1)2–3 per mm, dissepiments moderately thick, often white to gray or granular, entire to weakly incised; tubes about 2 mm long, concolorous with the pore surface, hymenium as a fine white lining both on the bottom and along the walls; context straw-colored to pale ochraceous, 1-2 mm thick.

**Hyphal system** dimitic, generative hyphae thin-walled, hyaline and clamped, 2–4 μm in diameter, often collapsed in dried specimens; binding hyphae thick-walled and hyaline, 3–5 μm wide, dominating in the context and the trama, moderately branched to strongly arboriform with tapering branches, usually dextrinoid, usually strongest dextrinoid reaction in the dissepiments.

**Cystidia** none, but with numerous cystidioles or moderately branched dendrohyphidia, these hyaline, unbranched or with a few lateral protuberances, often difficult to observe, most common towards the dissepiments.

**Basidia** clavate, 60–100 x 12–20 μm, with 4 large and stout sterigmata, lining the tubes both on the bottom and along the walls.

**Basidiospores** cylindrical, hyaline, smooth, often with a grainy content, IKI-, (11.5-)13–16 x 4–6 μm.

**Type of rot.** – White rot in dead hardwoods.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Hardwoods of many genera

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**Pseudofavolus squamosus.** The branched hyphidia seen in the dissepiments and partly in the hymenium are not observed in *Polyporus* neither is the slight dextrinoid reaction in the binding hyphae. The basidiocarps are in general much smaller than seen in *Polyporus* and the pores often only shallow depressions. Only one species is known from United States.
Pseudofavolus

Fig. 9. Pseudofavolus cucullatus (CMA 5729). a, contextual generative hyphae; b, slender contextual skeletal hyphae; c, broad skeletal hyphae; d, basidia; e, basidiospores.

Distribution. In United States from the southern tier of states along the Gulf of Mexico and the Atlantic Ocean. Widespread in the tropics throughout the world.

Remarks. Superficially the basidiocarps resemble small ones of some Polyporus species, but are separated by the shallow, large and hexagonal pores and thin basidiocarp. There is no other Polyporus species with such a small and dimidiate to almost substipitate basidiocarp.


Basidiocarps annual, pileate or resupinate, when pileate, broadly attached and semicircular or somewhat elongated; pileus tomentose and azonate, bright orange to rust colored; pore surface orange, pores medium to large, angular; tubes concolorous with pore surface, context orange to orange-buff, soft and fibrous; all tissues deep red in KOH; hyphal system monomitic; generative hyphae thin-walled to thick-walled, mostly incrusted, simple-septate; cystidia present in the hymenium, not incrusted, mostly thin-walled, tubular and projecting; spores cylindric to oblong-ellipsoid, thin-walled, smooth, hyaline and non-amyloid. On dead conifers and hardwoods; causes a brown rot; small genus with two species.

Type species: Pycnoporellus fibrillosus (Karst.) Murr. (=P.fulgens (Fr.) Donk).

Key to species

1. Basidiocarps sessile; pores 2–3 per mm; basidiospores ellipsoid, 5–6 μm long ........................................ 2 P. fulgens

1. Basidiocarps resupinate to slightly reflexed; pores 1–3 mm wide; basidiospores cylindric, 6–9 μm long ............ 1 P. alboluteus


Basidiocarps annual, often effused for 1 m or more, resupinate or slightly reflexed, bright orange when fresh; upper surface soft and spongy, loosely strigose; pore surface orange, pores angular, mostly larger than 1 mm in diam, dissepiments splitting to form a hydnaceous hymenophore; context soft, pale orange, soft-felty, up to 2 mm thick, azonate; tube layer concolorous and continuous with context, up to 2 cm thick, the tubes slightly paler within; all tissues quickly turning cherry red in KOH.

Hyphal system monomitic; contextual hyphae bright reddish, then hyaline in KOH, simple-septate, thin- to thick-walled, 2–10 μm in diam, with frequent branching, appearing rough because of a thin incrustation; trama hyphae similar, 3–5 μm in diam.

Cystidia frequent in hymenium, cylindric, thin- to moderate-walled, hyaline, not incrusted, 60–120 x 5–10 μm, simple-septate to the base.
**Pycnoporellus**

**Basidia** clavate, 4-sterigmate, 30–45 × 6–7 μm, simple-septate at the base.

**Basidiospores** cylindric, hyaline, smooth, IKI-, 9–14 × 3–3.5 μm.

**Type of rot.** Brown cubical rot of conifer and aspen logs covered by snow in winter.

**Cultural characteristics.** See Nobles 1958; David 1969; Stalpers 1978.

**Substrata.** On dead conifers, especially *Picea*; occasionally on aspen. (1, 97, 136, 138, 145, 148, 194).

**Distribution.** Throughout the western mountains from Alaska to southern Arizona; also a few records from the northeastern U.S. and eastern Canada.

**Remarks.** *Pycnoporellus alboluteus* is a conspicuous fungus in the spruce-fir zone of the western mountains. The basidiocarps develop under snow in the spring and persist until midsummer when they are finally deteriorated by insects and weathering. From an ecological standpoint this is one of the important decomposers and producers of brown rot residues in alpine conifer forest ecosystems.


**Basidiocarps** annual, sessile or effused-reflexed; pilei solitary or imbricate, dimidiate to long and narrow, up to 6 × 9 × 2.5 cm; upper surface pale orange to rust-colored, tomentose or glabrous on young specimens to hispid or radially fibrillose with age, often zonate, pore surface pale orange, the pores circular to angular, 2–3 per mm, dissepiments thin, becoming lacerate with age; context light orange, up to 5 mm thick, sometimes duplex; lower layer firm, corky, upper layer soft, fibrous; tube layer concolorous with the context or sometimes paler orange, up to 6 mm thick; tissue of context and tubes red in KOH solution.

**Hyphal system** monomitic; contextual hyphae pale reddish to brownish in KOH, mostly very thick-walled, with occasional branching, simple-septate, 4–9 μm in diam, with a very narrow, sinuous lumen; others thin- to moderately thick-walled, hyaline in KOH, with frequent branching, simple-septate, 2.5–4 μm in diam.

**Cystidia** frequent, narrowly cylindric, 45–60 × 4–6 μm, projecting up to 35 μm, simple-septate at the base.

**Basidia** clavate, 4-sterigmate, 25–30 × 5–5.5 μm, simple-septate at the base.

**Basidiospores** short-cylindric to oblong, hyaline, smooth, IKI-, 6–7 (–9) × 2.5–4 μm.
**Pycnoporellus**

**Type of rot.** Brown cubical rot of dead conifers and hardwoods.

**Cultural characteristics.** See Nobles 1948, 1958, 1965; David 1969; Stalpers 1978.

**Sexuality.** Unknown.

**Substrata.** Mainly on conifer logs and slash but also occasionally on hardwoods. (1, 3, 20, 69, 97, 136, 138, 148, 190, 194).

**Distribution.** Transcontinental in the northern U.S. and Canada from Newfoundland to Alaska. Apparently absent in the southern states, even in high mountains of Arizona and New Mexico.

**Remarks.** *Pycnoporellus fulgens* differs from *P. alboluteus* in having smaller pores, spores, and cystidia, and in being commonly sessile or effused-reflexed. The orange color is similar in the two species.

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**Pycnoporus**

**Type species:** *Pycnoporus cinnabarinus* (Fr.) Karst.

**Remarks** *Pycnoporus* is very similar to *Trametes* in all characters except the bright reddish-orange color.

**Key to the species**

1. Basidiocarps up to 1.5 cm thick; red pigments fading readily on weathering; widely distributed into boreal regions .................................................. 1. *P. cinnabarinus*

1. Basidiocarps typically thin, less than 0.5 mm thick; red pigments not fading readily; subtropical to the central hardwoods region ........................................ 2. *P. sanguineus*

1. *Pycnoporus cinnabarinus* (Jacq.: Fr) Karst., Fig. 351


**Basidiocarps** annual, sessile to effused-reflexed, leathery when fresh, dimidiate to elongated, up to $7 \times 13 \times 4$ cm; upper surface of pileus ochreous salmon to apricot orange, becoming pale with age or blackening, glabrous, azonate, pore surface English red to coral red, retaining

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*Fig. 350. Pycnoporellus fulgens (RLG 713). a, thin-walled contextual hyphae; b, thick-walled contextual hyphae; c, tramal hyphae; d, cystidia; e, basidia; f, basidiospores; g, small scale drawing of hymenium.*
Pycnoporus cinnabarinus (RLG 5958). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.

the red colors longer than the pileus surface, the pores 3–4 per mm, circular to angular, with thick, tomentose dissepiments that may become thin and lacerate, context red to pale orange, soft, fibrous to corky, zonate, up to 1.5 cm thick, becoming yellowish and then colorless in KOH.

Hyphal system trimitic, contextual generative hyphae thin-walled, with clamps, rarely branched, 3–5 μm wide; contextual skeletal hyphae thick-walled, rarely branched, nonseptate, 2.5–10 μm wide; contextual binding hyphae much branched, thick-walled, nonseptate, 1.5–5 μm in diam; trama hyphae similar; hyphal contents in some areas of trama tissue with strongly dextrinoid contents.

Cystidia absent, hyphal pegs frequent.

Basidia clavate, 4-sterigmate, 18–25 × 5–7.5 μm with a basal clamp.

Basidiospores cylindric, slightly curved, hyaline, smooth, negative in Melzer's reagent, 6–8 × 2.5–3 μm.

Type of rot. White rot of dead hardwoods and rarely on conifers.


Frew 1962; Stalpers 1978.

Sexuality. Heterothallic and tetrapolar (Vandendries 1934; Fries 1936; Nobles and Frew 1962).

Substrate. Reported from dead wood of numerous genera of hardwoods, also rarely on dead conifers (1, 3, 8, 20, 26, 27, 69, 75, 92, 105, 124, 136, 138, 145, 147, 148, 152, 165, 190, 194).


Remarks. Pycnoporus cinnabarinus and P. sanguineus are rather well differentiated by morphological differences and are genetically isolated (McKay 1959 and Nobles and Frew 1962). The two species are sympatric in the eastern U.S.

2. Pycnoporus sanguineus (L. :Fr.) Murr. Fig. 352


Basidiocarps annual, sessile to effused-reflexed, single or in imbricate clusters, dimidiate, thin and planate, up to 8 × 5.5 × 0.4 cm, pileus surface orange-red, color quite persistent but fading to salmon-buff in some old specimens, finely tomentose at the growing margin, becoming scuprous to glabrous on older portions, azonate, pore surface dark red, the pores circular, 5–6 per mm, with thick dissepiments, context tough-fibrous, orange buff and azonate in some specimens, strongly concentrically zonate in others with alternating zones of pale buff and pale orange, up to 3 mm thick, tube layer orange-red, up to 2 mm thick.

Hyphal system trimitic, contextual skeletal hyphae thick-walled, hyaline, non-septate, with infrequent branching, 2–7 μm in diam; contextual binding hyphae thick-walled, non-septate, much branched, 2–4 μm in diam; contextual generative hyphae thin-walled, hyaline, with frequent clamps, rarely branched, 2.5–4 μm in diam; trama hyphae similar, trama binding hyphae more conspicuous, mostly 1.5–2.5 μm; hyphal contents in some areas of trama tissue strongly dextrinoid in Melzer's reagent.

Cystidia absent, hyphal pegs present and usually conspicuous.

Basidia clavate, 4-sterigmate, 11–16 × 5–6 μm, with a basal clamp.

Basidiospores cylindric, slightly curved, hyaline, smooth, negative in Melzer's reagent, 5–6 × 2–2.5 μm.

Type of rot. - White rot of dead hardwoods.

Cultural characteristics. See Nobles and Frew 1962; Nobles 1965; Stalpers 1978.
Pycnoporus

**Fig. 952.** Pycnoporus sanguineus (RLG 9973). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.


Substrata. Dead wood of numerous hardwood genera (2, 69, 92, 104, 124, 143, 153).

Distribution. Throughout the southeastern U. S. and in the Central Hardwoods region north to New York, also in Arizona. Widely distributed throughout the subtropical and tropical regions of the world.

Remarks. *Pycnoporus sanguineus* differs morphologically from *P. cin- narinus* in its thin basidiocarps with intense, more persistent orange-red pigmentation, and smaller spores and basidia.

**Pyrofomes** Kotl. & Pouz.

Feddes Rep. 69:140, 1964. Basidiocarps perennial to annual, pileate to resupinate, pileus smooth to pubescent, ochraceous pink to brick-colored, pore surface orange pink to red, context concolorous. Hyphal system dimitic, generative hyphae with clamps, skeletal hyphae slightly tinted, thick-walled to solid, rarely branched, spores smooth, thickwalled, truncate and slightly dextrinoid to non-dextrinoid. On both living and dead conifers and hardwoods with a white rot. Cosmopolitan genus with one species in North America.

Type species: *Pyrofomes demidoffii* (Lév.) Kotl. & Pouz.

Remarks. The genus is easy to recognize by its colored basidiocarps and the truncate spores. It is undoubtedly closely related to *Perenniporia*, separated mainly by its reddish colored basidiocarps.


Basidiocarps perennial, sessile, solitary, ungulate, often becoming columnar, to 15 cm wide, 7 cm thick and 10 cm high; upper surface brownish and tomentose in young specimens, becoming blackened and rimose with age, concentrically sulcate, margin rounded, warm buff to ochraceous buff, finely tomentose to blackened and rimose in older specimens; pore surface light ochraceous buff to ochraceous buff smooth, the pores rounded, 2–3 per mm, dissepiments thick, entire; context orange cinnamon, woody, azonate; tube layers ochraceous buff to yellow at first, eventually becoming filled with mycelium and concolorous with context, indistinctly stratified, each layer to 7 mm thick.

Hyphal system dimitic, contextual generative hyphae difficult to discern, thin-walled, hyaline in KOH and Melzer's reagent, with clamp connections, 2.5–4 µm in diam; contextual skeletal hyphae moderately thick-walled, rarely septate, with rare branching, pale brownish in KOH and dextrinoid in mass in Melzer's reagent, 3–5.5 µm in diam; trama! tissue similar but with much-branched skeletal hyphae 2–5 µm wide; trama! tissue distinctly dextrinoid in Melzer's reagent, hyphae of mycelial felts in wood frequently branched, some thick-walled, simple-septate or with occasional clamp connections, 1.5–3.5 µm in diam.
Pyrofomes

**Fig. 353.** Pyrofomes demidoffii (RLG 10600). a, contextual generative hyphae; b, contextual skeletal hyphae; c, trama1 generative hyphae; d, trama1 skeletal hyphae; e, hyphae from mycelial felts in decayed wood; f, cystidioles; g, basidia; h, basidiospores.

**Rigidoporus**

*Cystidia*es in hymenium, inconspicuous, fusoid, thin-walled, not incrusted, 20–30 × 3–5 µm.

*Basidia* broadly clavate from a narrow base, 4-sterigmate, with a basal clamp, 22–35 × 8–10 µm.

*Basidiospores* pale brownish, slightly dextrinoid in Melzer’s reagent, ovoid to broadly ellipsoid or more elongated, angular, thick-walled, usually truncate at apex, with an inconspicuous germ pore, 6–12 × 5–7 µm.

**Type of rot.** – White trunk rot of living junipers and a major decay fungus in junipers in western North America. Abundant buff-colored mycelial felts develop in cavities in the decayed wood.

**Cultural characteristics.** – See Campbell 1938; Nobles 1958, 1965; Stalpers 1978.

**Sexuality.** – Unknown.

**Substrats.** - *Juniperus* spp. in North America.

**Distribution.** – Common throughout the western U.S. in pinyon-juniper ecosystems, rarely found east of the Mississippi River. Apparently not ranging North into Canada. Also known from East Europe and Central Africa.

**Remarks.** – The truncate, thick-walled, slightly dextrinoid spores and dextrinoid skeletal hyphae are also typical of the genus *Perenniporia*. In the field, *Pyrofomes demidoffii* is readily distinguished by the bright rusty red color of context tissue and its restriction to junipers.

**Rigidoporus** Murr.


*Basidiocarps* annual to perennial, coriaceous to bony hard when dry, resupinate to pileate, reddish orange to pinkish, isabelline or ochraceous; pileus tomentose to glabrous, usually zonate; pore surface concolorous, in some species becoming gray to almost black on drying; context dense and fibrous; hyphal system monomitic to apparently dimitic; generative hyphae with simple septa, variable in width and wall thickness, in some species skeletal or strongly sclerified; generative hyphae present, thick-walled to solid and without septa; encrusted cystidia absent or present, mammillate, smooth cystidioles present among basidia in most species; spores ovoid to globose, thinwalled and IKI-. Causes a white rot in hardwoods, rarely in coniferous wood. Cosmopolitan genus.

**Type species:** *Polyporus micromegas* Mont. – a synonym of *R. microporus* (Fr.) Overeem.

**Remarks.** Microscopically the genus comes close to *Oxyporus* Donk which has the same type of generative hyphae and cystidia in most species. However, all species in *Oxyporus* have lightcolored basidio-
Rigidoporus
carps, and the cystidia are hymenial and not tramal as in *Rigidoporus*. Furthermore, the mammillate cystidioles of the latter genus are unknown in *Oxyporus*.

**Key to species**

1. Basidiocarp pileate ............................................. 2
1. Basidiocarp resupinate ........................................... 4
2. Basidiocarp usually large, up to 6 cm thick; pileus buff to cream; spores 7–10 × 6.5–10 μm .......................... 4. *R. ulmarius*
2. Basidiocarp thin, rarely above 1 cm thick; pileus reddish to orange in fresh specimens; spores 3.5–6 μm .......................... 3
3. Cystidia present; spores 4.5–6 μm in diam. ........ 2. *R. lineatus*
3. Cystidia absent; spores 3.5–5 μm in diam. .... 3. *R. microporus*
4. Cystidia present; subtropical to tropical species ...... 5. *R. vinctus*
4. Cystidia absent; temperate species .............. 1. *R. crocatus*

Basidiocarps annual to perennial, effused up to 10 cm, tough, crisp when fresh, drying rigid and horny, easily separable; margin fertile or sterile, then buff, finely tomentose, up to 2 mm wide; pore surface flesh-colored or very light pinkish or pinkish-brown, drying pinkish brown to smoky gray, the pores circular to angular, 5–7 per mm, with thin, entire dissepiments; context pinkish-buff, azonate, corky to rigid, up to 1 mm thick; tube layer darker, distinct, pinkish tan, hard, horny, up to 3 mm thick; taste mild.  
**Hyphal system** monomitic; subicular hyphae simple-septate, thin- to thick-walled, 3–8.5 μm in diam, gelatinizing on drying and difficult to separate; tramal hyphae similar, 3–4 μm in diam.  
Cystidia or other sterile hymenial elements absent.  
**Basidia** broadly clavate, 4-sterigate, 17–20 × 10–12 μm, simple-septate at the base.  
**Basidiospores** ovoid to subglobose, hyaline, smooth, IKI-, 3.5–5.5 × 3.5–5 μm.  
Type of rot. - White rot of dead hardwoods and conifers; positive in gum guaiac solution.  
**Cultural characteristics.** - Unknown.  
**Sexuality.** - Unknown.  
**Substrata.** - Dead conifers and hardwoods in several genera (1, 20, 136, 138, 148, 187, 190, 194).

Distribution. Widely distributed in North American forest regions; also in Europe.  
Remarks. The horny consistency of dried basidiocarps and the pinkish or flesh-colored pore surface that darkens on drying characterize this species.

Basidiocarps annual, pileate, more seldom resupinate, solitary to imbricate, sessile, substipitate or narrowing behind to a distinct stipe, consistency brittle and hard when dry; pileus dimidiate, flabelliform to spatulate, up to 7 cm wide and broad and 0.1 to 0.5 cm thick, concentrically zonate-sulcate, pinkish buff to reddish-brown and velutinate, later wood-colored, darker brown and glabrous, often radially striate; margin thin, often decurved; stipe, if present, concolorous with the...
Rigidoporus

**Fig. 955.** Rigidoporus lineatus (MB 920). a, contextual hyphae; b, tramal hyphae; c, imbedded cystidal hyphae; d, cystidioles; e, broad hymenial cystidia near dissepiment edges; f, basidia; g, basidiospores.

**Pileus,** up to 7 mm long and 3 mm thick; pore surface bright orange-red when fresh, drying ochraceous to dirty grayish-brown, sometimes with a pink tint, pores round to angular, 6–9 per mm, dissepiments thin; tubes 1–4 mm long, concolorous with the context, but often slightly darker; context up to 4 mm thick, white to wood-colored, radially fibrous.

**Hyphal system** pseudodimitic; generative hyphae with simple septa, in the hymenium and subhymenium thin-walled, moderately branched, 3–6 μm wide, in the trama, and especially in the context up to 8 μm wide, thick-walled to almost solid and strongly reminiscent of true skeletal hyphae as simple septa are often very difficult to observe.

**Basidia** short-clavate with 4 sterigmata and a basal simple septum, 12–15 × 6–8 μm.

**Cystidia** present, rare to abundant, clublike, thick-walled with slightly widened apical part, smooth to strongly encrusted, partly embedded in the trama, partly projecting obliquely into the hymenium, 6–15 μm wide, up to 200 μm long from apex to the simple septum from which they arise; cystidioles pointed, smooth, thin-walled, present among the basidia, up to 20 μm long, simple septe at the base, very difficult to observe unless basidia are developed, they may represent aborted basidia.

**Basidiospores** subglobose to globose, thin-walled, hyaline, IKI-, often with an oil drop, 4.5–6 × 4–5 μm.

**Type of rot.** – White pocket rot in dead hardwood trees.

**Cultural characteristics.** – See Davidson et al. 1942; Bakshi et al. 1963; Wright and Deschamps 1975.

**Sexuality.** – Unknown.

**Substrata.** – Numerous genera of hardwood trees such as *Quercus*, *Magnolia* and *Liriodendron*, also on *Taxodium*.

**Distribution.** Gulf Coast region of U.S. Rather common in Louisiana. Widespread in the subtropical and tropical zones.

**Remarks.** Overholts had a confused concept of this species as he described *Polyporus rigidus* Lév. and *P. zonalis* Berk. (both synonyms of *R. lineatus*) as two separate species with the remark that cystidia were not present in either of them. The types of both species are cystidiate, and it is unclear whether Overholts overlooked the cystidia, which sometimes are difficult to observe, or he actually had specimens in his hand of the similar *R. microporus*. A careful examination of specimens filed under either of the names mentioned above, reveals that *R. lineatus* does occur in the United States. It is separated by its cystidia and slightly larger spores from *R. microporus*. 
Rigidoporus

Fig. 356. Rigidoporus microporus (MB 2248). a, contextual hyphae; b, cystidioles; c, basidia; d, basidiospores.

3. Rigidoporus microporus (Fr.) Overeem. Fig. 356
Basidiocarps annual, more seldom perennial, occasionally resupinate but mostly pileate, sessile or broadly attached, often imbricate or growing together in clusters, consistency brittle and hard when dry; pileus dimidiate to flabelliform, up to 22 cm long and 10 cm from margin to attachment and 0.2–1.5 cm thick, upper surface first orange-reddish-brown and slightly velutinate, later glabrous and fading to wood-color, concentrically zonate-sulcate, dull to slightly shining; margin thin and often decurrent; pore surface first bright orange to reddish-brown, fading to ochraceous, pale brown or grey, pores round to angular, 6–9 per mm, dissepiments very thin; tubes single-layered but sometimes stratified and up to 1 cm long, tubes reddish-brown near the pore mouth at least; context white, cream to wood-colored, radially fibrous, up to 1 cm thick.
Hyphal system pseudodimitic; generative hyphae with simple septa, thin- to slightly thick-walled, 3–5 μm wide; also present are thick-walled hyphae, especially in the context where septa are difficult to observe and which are reminiscent of ordinary skeletal hyphae, up to 8 μm wide.
Cystidia not present, but smooth, pointed, thin-walled cystidioles present among the basidia, 20–25 × 10–12 μm.
Basidia 12–15 × 7–10 μm 4-sterigmate, with a simple septum at the base.
Basidiospores subglobose, hyaline, thin-walled, IKI-, 3.5–5 × 3.5–4 μm.
Type of rot. – White root-rot in dead and living hardwoods. A serious problem in the tropics on crop plants of rubber, cacao, coconut, coffee, tea and bamboo.
Cultural characteristics. – Unknown.
Sexuality. – Unknown.
Substrata. – Numerous genera of hardwoods, on Magnolia and Quercus in Louisiana.
Distribution. In the Gulf-States from Texas to Florida, widely distributed in the tropical zone.
Remarks. In fresh condition the reddish color and the minute pores will be rather diagnostic, when dry it becomes paler and more dark ochraceous. A microscopical examination is necessary to separate it from the cystidiate, but otherwise similar R. lineatus.

4. Rigidoporus ulmarius (Sow.:Fr.) Imazeki Fig. 357
Basidiocarps perennial, sessile, effused-reflexed, up to 6 cm thick and 30 cm long, reflected portion up to 9 cm wide; upper surface pale buff to cream (pinkish-buff to light buff), glabrous to finely tomentose, smooth or tuberculately and with incorporated litter where development occurs under roots below the surface; margin pale buff, rounded, usually slightly recurved and sterile below; pore surface pinkish buff when fresh, drying pale brownish pink (avellaneous to viaceous buff) or discoloring darker brownish, the pores angular, 5–6 per mm, with thin, entire dissepiments; context pale buff when dried (cartridge buff) firm, corky-fibrous, azonate, up to 5 cm thick; tube layer pinkish brown when dried (avellaneous) indistinctly stratified, up to 1 cm thick.
Hyphal system monomitic; contextual hyphae thin- to moderately thick-walled, with rare branching, simple-septate, 2–4(5) μm in diam; trama hyphae similar, trama tissue compact and difficult to separate.
Cystidia none; fusoid cystidioles present, barely surpassing the basidia,
Rigidoporus

Fig. 951. Rigidopus ulmarius (RLG 8448). a., contextual hyphae; b, cystidia; c, basidia; d, basidiospores.

18-28 × 8-9 μm, simple-septate at the base.

Basidia clavate, 4-sterigmate, 15-21 × 10-11 μm, simple-septate at the base.

Basidiospores globose to subglobose, hyaline, smooth, IKI-, becoming thick-walled, 7-11 × 6.5-10 μm.

Type of rot. - Yellowish, stringy root and butt rot of living trees.

Cultural characteristics. - See Campbell, 1938 (as Fomes geotropus); Lombard et al. 1960; Bakshi et al. 1970; Stalpers 1978.

Sexuality. - Unknown.

Substrata. - Fruiting at the base of living hardwoods and continuing decay in dead trees and stumps, also reported on bald cypress. In Arizona R. ulmarius is common on large Fremont cottonwoods (Populus fremontii).

Distribution. Southeastern U.S. and Arizona, also in Central America. Circumglobal species.

Remarks. Long (1914) reported R. ulmarius (as F. geotropus) to be the cause of the common defect in bald cypress known as pecky cypress. However Davidson et al. (1960) proved that Stereum tazodit Lentz & McKay is the cause of pecky cypress.
**Rigidoporus**

*Fig. S58.* Rigidoporus vinctus (AN 9026). a, subicular hyphae; b, cystidia; c, cystidioles; d, basidia; e, basidiospores.

**Schisopora**

**Distribution.** Gulf Coast Region and Hawaii, widespread throughout the tropical zone.

**Remarks.** The resupinate basidiocarp and the large encrusted cystidia are diagnostic. The color is remarkably variable, in the field pinkish to ochraceous basidiocarps can be observed becoming gray to almost black when dry, in other cases the ochraceous to buff color seems to change little.

**Schisopora** Velen.


Basidiocarps annual, resupinate or rarely with narrow, inbricate pilei over a decurrent tube layer; pore surface and subiculum cream to pale buff, the pores angular to daedaleoid or hymenophore irregularly hydnaceous from splitting of disseptions; hyphal system monomitic; generative hyphae moderately thick-walled, with clamps, often giving rise to long, nonseptate terminal segments that may be interpreted as skeletal hyphae or imbedded cystidial elements; cystidia none, fusoid or capitate cystidioles present; hyphae at dissepiment edges incrusted; basidiospores ellipsoid to subglobose, hyaline, IKI-.

Causes a white rot of dead hardwoods and conifers, or fruiting at the base of living plants. Small cosmopolitan genus with three species in North America.

**Type species:** *Schizopora paradoxa* (Schrad.: Fr.) Donk.

**Remarks.** The microstructure of *Schizopora* species is like that in *Hyphodontia* of the Corticiaceae and the true phylogenetic position of *Schizopora* would be in that family. The morphological variation in the genus is great and specific entities are not clearly understood.

**Key to species.**

1. Basidiospores subglobose, 5–6.5 × 4–5.5 μm; often fruiting at base of living or recently dead trees and shrubs. . . . 1. *S. apacheriensis*

1. Basidiospores ellipsoid, 2.5–4 μm wide; on dead substrates . . . . 2

2. Basidiospores 5–6(6.5) × 3.5–4 μm, pores usually angular, labyrin-thine to irpicoid, 1–3 per mm. 3. *S. paradoxa.*

2. Basidiospores 3.5–5 × 2.5–3.5 μm, pores round to angular, 3–5 per mm. 2. *S. flavipora*
Schizopora

Fig. 359. Schizopora apacheriensis (ERC 180, type). a, subicular hyphae; b, tramal hyphae; c, incrusted hyphal ends from dissepiment edges; d, cystidia; e, tramal hyphae with swollen apices; f, basidia; g, basidiospores.

1. Schizopora apacheriensis (Gilbn. & Canf.) Fig. 359
Basidiocarps annual, resupinate, effused up to 10 cm, adnate, soft fibrous; pore surface white to cream color or pale buff, margin fertile or sterile up to 2 mm, sterile margin loosely tomentose; pores irregular in shape, daedaleoid in some areas, up to 1 mm in diam but mostly 2-3 per mm; dissepiments thin and finely tomentose at first but becoming thin and deeply lacerate; tube layer soft-fibrous, white to cream colored, up to 2 mm thick; subiculum white, soft, azonate, less than 5 mm thick.
Hyphal system monomitic; subicular generative hyphae hyaline in KOH, thin- to moderately thick-walled, with abundant small clamps, 2-6 μm in diam., with some thick-walled, nonseptate segments resembling skeletal hyphae; tramal hyphae similar, incrusted at dissepiment edges, some with globose or irregularly swollen or distorted apices.
Cystidioles of two types, some acicular or cylindric, thin-walled, smooth or lightly incrusted, 3-5 μm in diam and projecting up to 10 μm in diam, projecting to 45 μm.
Basidia clavate, with a median constriction, 4-sterigmate, 18-21 × 6-7 μm, with a basal clamp.
Basidiospores broadly ellipsoid to subglobose, hyaline, thin-walled, IKI-, smooth, 5-6.5 × 4-5.5 μm.
Type of rot. — Uniform white rot of dead and living desert plants.
Cultural characteristics. — See Gilbertson and Canfield (1973).
Sexuality. — Unknown.
Substrata. — Dead or living hardwood trees or shrubs, junipers, often fruiting at the base of living or recently dead trees. (21, 24, 32, 39, 51, 70, 84, 92, 93, 118, 125, 143, 153, also on Agave).
Distribution. Common in southern Arizona and also known from the Gulf Coast region.
Remarks. The subglobose basidiospores of S. apacheriensis distinguish it from the otherwise similar S. paradoxa. The fruiting of S. apacheriensis at the base of living or recently dead trees and shrubs in Arizona suggests it may be pathogenic.

2. Schizopora flavipora (Cke.) Ryv. Fig. 360
Basidiocarps annual, resupinate, usually developing by the fusion of a number of smaller ones, becoming widely effused, leathery when fresh, becoming corky or tough-fibrous when dried, not readily separable; margin usually sterile, whitish, fimbriate, up to 2 mm wide; pore surface whitish to cream when fresh, discoloring to buff on drying, the pores angular to daedaleoid, 3-5 per mm, with thin dissepiments that often split to form an irpiciform hymenophore; context cream to buff, azonate, corky when dry, less than 1 mm thick; tube layer concolorous and continuous with the context, up to 3 mm thick; taste mild.
Hyphal system monomitic; subicular generative hyphae hyaline in KOH, thin- to thick-walled, often branched, with abundant small clamps, 2-6 μm in diam., with some thick-walled, nonseptate terminal segments that resemble skeletal hyphae; these with wall often thinning toward the apex; tramal hyphae similar.
Cystidia absent; fusoid cystidioles present, scarcely projecting, 3-4 μm in diam.
Basidia clavate, with a median constriction, 4-sterigmate, 12-15 × 5-6 μm, with a basal clamp.
**Schizopora**

Fig. 360. Schizopora flavipora (RLG 13696). a, subicular generative hyphae; b, tramal skeletal-like hyphal segments; c, tramal hyphal ends with spherical swellings; d, basidia; e, basidiospores. **Basidiospores** ellipsoid, hyaline, smooth, IKI-, 3.5–5 x 2.5–3.5 μm.

**Type of rot.** – White rot of dead hardwoods.

**Cultural characteristics.** – See Domanski 1969; Stalpers 1978.

**Sexuality.** – Heterothallic and tetrapolar (Domanski, 1969; David and Rajchenberg 1985).


**Distribution.** Probably widely distributed in southern part of United States. Circumglobal species in warm temperate-tropical zones.

**Remarks.** The abundant, small clamp connections, the small pores and the terminal inflations on some hyphae are features which usually aid in identification. **Schizopora flavipora** is perhaps the most common and conspicuous polypore in the Gulf Coast region and plays a major role in decomposition of many substrates in that area.

The geographical distribution of this species is unclear as it often has been confused with *S. paradoxa*, and some intermediate specimens occur, especially as to the hymenophore. A detailed study of this genus in North America is highly desirable. We have used the European concept for these studies. Murrill described several new species from Mexico and West Indies based on the taxon described here, see Ryvarden 1985.

3. **Schizopora paradoxa** (Fr.) Donk


**Basidiocarps** resupinate, often large, on vertical substrata often with small nodules with fertile undersides but no real pilei, tough, white-cream-colored or darkening with age (grayish-ochraceous-brownish), 1–5 mm thick; hymenophore usually poroid with lacerate-denticulate dissepiments, tubes of varying sizes, often irregular or somewhat labyrinthine, on sloping substrata more or less prolonged, or split into irregular teeth in an irpicoid way; near the margin the tubes are shallow or net-like; margin normally not differentiated.

Fig. 361. Schizopora paradoxa (JPL 410). a, subicular generative hyphae; b, tramal skeletal-like hyphal segments; c, cystidia and tramal hyphal ends with spherical swellings; d, fusiform hymenial elements; e, basidia; f, basidiospores.
Sistotrema

**Hyphal system** dimitic, but skeletal hyphae may be few; most hyphae with thin or somewhat thickened walls, more or less branched, 2–3 μm wide, with clamps at all septa; skeletal hyphae 3–4 (~5) μm wide, straight or sinuous, hyaline or yellow, reaching a length of 100–350 μm; hyphal ends on the edges of the dissepiments incrusted with granular crystals.

**Cystidioles** present in variable numbers, usually capitate and provided with a rounded cap of a crystalline or resinoid substance.

**Basidia** suburniform, 15–20 × 4–5 μm, with 4 sterigmata and a basal clamp.

**Basidiospores** ellipsoid, smooth, thin-walled, usually with 1 oil-drop, 5–6 (~6.5) × 3.5–4 μm.

**Type of rot.** – Causes a white rot.

**Cultural characteristics.** – See Domanski 1969; Stalpers 1978.

**Sexuality.** – Heterothallic and tetrapolar (Domanski 1969).

**Substrata.** – On decayed deciduous wood in all kinds of forests.

**Distribution.** Widely distributed in North America. A common and cosmopolitan species.

**Remarks.** The concept used here conforms with the European one, but there are some confusing collections from the East United States. A more extensive investigation is necessary to solve the delimitation of species in this genus. The cream colored irregular pore surface will normally be diagnostic for a field determination, and the basidiocarps are often found in exposed positions, such as the underside of still attached branches etc. Microscopically the slightly thick-walled hyphae, often rather coarsely incrusted in the dissepiments, and the bulbous cystidioles will be diagnostic.

**Sistotrema Fr.**

Syst. Mycol. 1:246, 1821.

Basidiocarps resupinate or in one species stipitate, arachnoid, pelliculose, or waxy; hyphal system monomitic; generative hyphae nodose-septate, often ampullate; basidia urniform, 6–8 sterigmate in most species; basidiospores small, smooth, hyaline, negative in Melzer's reagent. Associated with white rots.

**Type species:** *Sistotrema confluens* Pers.:Fr.

**Sistotrema** is a genus in the family Corticiaceae, and most of the species have basidiocarps with smooth to hydnaceous hymenial surface. The two species included here may be distinctly poroid. Important literature: Rogers, 1944; Eriksson et al., 1984.
Fig. 363. *Sistotrema muscicola* (RLG 7666). a, subicular hyphae; b, basidia; c, basidiospores.

in North America, *S. muscicola*, has resupinate basidiocarps. It also differs in having ellipsoid to subglobose basidiospores.


**Basidiocarps** resupinate; hymenial surface ivory yellow to light buff, hydnaceous or poroid, with tubes splitting to form spines, fragile, easily separated, usually effused in small patches; margin white, cottony to fimbriate.

**Hyphal system** monomitic; subicular hyphae thin-walled, with conspicuous clamp connections, some ampullate, commonly lightly incrusted with coarse crystals; 2–4 μm in diam.

**Cystidia** and other sterile hymenial elements lacking.

**Basidia** urniform, mostly 6-sterigmate, globose to ovate when immature, 15–25 x 4–8 μm, with a basal clamp.

**Basidiospores** smooth, hyaline, subglobose to ellipsoid or broadly ovate, IKI–, 3.5–5.5 x 2.5–3.5 μm.

**Type of rot.** White rot of dead conifers and hardwoods.

**Cultural characteristics.** Unknown.

**Sexuality.** Unknown.

**Substrata.** Dead wood of conifers and hardwoods, also fruiting among mosses and leaf litter on the soil surface. (8, 145).

**Distribution.** Widely distributed in North American forest regions. Circumglobal in the North Temperate Zone.

**Remarks.** *Sistotrema muscicola* is distinguished from the other poly- poroid species in the genus by its resupinate basidiocarps and globose to broadly ovoid spores.

**Skeletocutis** Kotl. & Pouz.


**Basidiocarps** annual to perennial, resupinate to pileate, white, cream pink to lilac, often slightly discolored when dry; pores usually small; many species with a dense cartilaginous zone above the tube layer; hyphal system di- to trimitic; generative hyphae with clamps, often incrusted, especially in the dissepiments; skeletal hyphae hyaline; cystidia absent, cystidioles present in most species; spores hyaline, cylindrical to ellipsoid, IKI–; causes a white rot.

**Type species:** *Skeletocutis amorpha* (Fr.) Kotl. & Pouz.

**Remarks.** The important generic character is the encrustation of the hyphae, especially the generative ones. David (1982) includes also monomitic species and there are some difficult questions as to how far a single character as the encrustation should be decisive for a proper generic assignment. The reader is referred to Niemelä (1985) and David (1982) for further comments.

**Key to species**

1. Pore surface lilac, pinkish, pale orange to grayish pink .......... 2
2. Pore surface white, cream to discolored pale brown, often unevenly
   white, to brown, to lilac, to pinkish buff. .......... 4
3. Pore surface pale orange to pinkish buff; often pileate; spores 1.3–1.8 μm wide .......... 2. *S. amorpha*
4. Pore surface pinkish gray to buff; rarely pileate; spores 1.1–1.3 μm wide .......... 3. *S. carneogrisea*
5. Rhizomorphs present along the margin; basidiocarps soft and easily separable .......... 1. *S. alutacea*
6. Rhizomorphs absent; basidiocarps coriaceous to hard, adnate and not easily lifted from the substrate .......... 5
7. Spores 1–1.5 μm wide .......... 8. *S. subincarnata*
8. Spores up to 1 μm wide .......... 6
9. Hyphal system trimitic; basidiocarps effused-reflexed, rarely resupinate, on hardwoods; temperate-southern species ..... 5. *S. nivea*
10. Hyphal system dimitic; basidiocarps resupinate, on coniferous wood; boreal species .......... 7
Skeletocutis

Fig. 364. Skeletocutis alutacea (RLG 3991). a, subicular generative hyphae; b, subicular skeletal hyphae; c, incrusted hyphae from dissepiment edge; d, cystidioles; e, basidia; f, basidiospores.

7. Basidiocarps perennial; pore surface cream to tan; spores 4.5–6 μm long ................................................. 7. S. stellae
7. Basidiocarp annual; pore surface cream to honey colored; spores 3.5–4 μm long ................................................. 6. S. ochroalba

1. Skeletocutis alutacea (Lowe) Keller

Basidiocarps annual, resupinate, effused up to 20 cm, soft, easily separated from substratum; sterile margin white to cream-colored, cottony to fimbriate or with conspicuous, white to cream-colored rhizomorphs up to 1 mm in diam; pore surface white to pale ochraceous buff, glancing, the pores circular to angular, 4–8 per mm, with thin, entire dissepiments that appear finely granulose; subiculum white to cream-colored, soft-fibrous, less than 1 mm thick; tube layer cream-colored, drying brittle and shattering when cut, up to 1 mm thick.
Hyphal system dimitic; subicular skeletal hyphae thick-walled, hyaline, nonseptate, rarely branched, 2–3 μm in diam; subicular generative hyphae thin-walled, hyaline, with clamps, rarely branched, 2.5–4.5 μm in diam; tramaal hyphae similar, incrusted in dissepiment edges.
Cystidia none; fusoid cystidioles present, 11–15 × 4–4.5 mm, with a basal clamp.
Basidia clavate, 4-sterigate, 11–16.5 × 4.5–6 μm, with a basal clamp.
Basidiospores cyllindric, slightly curved, hyaline, smooth, IKI-, 3.5–5 × 1–1.5 μm
Type of rot. — White rot of dead conifers and hardwoods.
Cultural characteristics. — See David 1982.
Sexuality. — Heterothallic and tetrapolar (David 1982).
Substrata. — Dead wood of several conifer and hardwood genera (3, 20, 75, 97, 138, 148, 153).
Distribution. Throughout the eastern US and Ontario; in the Pacific Northwest and California. Also in Europe and New Zealand.
Remarks. The rather soft separable basidiocarps and the conspicuous white rhizomorphs are good field characteristics for S. alutacea.

2. Skeletocutis amorpha (Fr.) Kotl. & Pouz.

Fig. 365 Česka Mykol. 12:103, 1958. — Polyporus amorphus Fr., Syst. Mycol. 1:364, 1821.
Basidiocarps annual, effused-reflexed to resupinate; pilei solitary or imbricate, dimidiate to elongated, often laterally fused, up to 2 × 4 × 0.3 cm, thin and coriaceous, upper surface whitish to gray or pale buff, zonate or azonate, tomentose to adpressed-hirsute, smooth to deeply sulcate; margin concolorous; pore surface cartilaginous in appearance, pinkish buff to reddish-orange, the pores circular to angular, 6–8 per mm, with thin, entire dissepiments; context consisting of a soft, fibrous upper layer and a firm, cartilaginous lower layer, the whole up to 1 mm thick; tube layer concolorous and continuous with the lower layer of the context, up to 1 mm thick; sections pale yellowish or reddish in KOH; taste slightly bitter.
Hyphal system dimitic; generative hyphae hyaline, becoming thick-walled, with clamps, 2–6 μm in diam; skeletal hyphae hyaline, thick-walled, aseptate, with rare branching, 3–6 μm in diam; tramaal hyphae similar.
Cystidia none; fusoid cystidioles present, not incrusted, thin-walled, 12–18.5 × 3.5–4.5 μm, with a basal clamp.
Basidia clavate, 4-sterigate, 14–16 × 4–5 μm in diam, with a basal clamp.
Basidiospores allantoid, hyaline, smooth, negative in Melzer’s reagent, 3–4.5 × 1.3–1.8 μm.
Type of rot. — White rot of dead conifer wood.
Sexuality. — Heterothallic and tetrapolar (Stalpers 1978).
Substrata. — Dead wood of numerous genera of the Pinaceae (1, 97, 136, 138, 148, 194).
Distribution. Widely distributed in North American conifer forests
Skeletocutis

Fig. 365. Skeletocutis amorpha (RLG 6045). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, cystidioles; e, basidia; f, basidiospores.

from the Gulf Coast and the Southwest to eastern and western Canada. Circumglobal species in North temperate zone.

Remarks. Skeletocutis amorpha may be easily overlooked in the field because of the casual resemblance of its basidiocarps to those of the more common Trichaptum abietinum. The cartilaginous appearing, pinkish to orange pore surface and tube layer of S. amorpha is a distinctive character. Skeletocutis carneogrisea is similar but has a beige to grayish pore surface and more strongly curved, lunate spores.

3. Skeletocutis carneogrisea David


Basidiocarps annual, resupinate to effused-reflexed, coriaceous when fresh, rigid when dry; pileus up to 2 cm wide and long, upper surface white and finely tomentose, azonate or with few zones which may become glabrous with age and then pale brown; margin white and

floccose; pore surface pinkish-gray, becoming slightly pinkish brown when dry, pores angular, 4–6 per mm; tubes cartilaginous and dense, concolorous with the pore surface and separated from the context by a dense cartilaginous zone above the tubes; context very thin, white and adpressed cottony.

Hyphal system dimitic; generative hyphae hyaline, 2–4 μm wide, becoming thick-walled, with clamps; skeletal hyphae thick-walled to solid, 3–5 μm in diam, mostly present in the trama, both types of hyphae finely incrusted in the dissepiments.

Cystidia not present, but cystidioles numerous, fusoid, smooth, thin-walled and up to 15 μm long.

Basidia clavate, 4-sterigate, 12–15 × 4–5 μm, with a basal clamp.

Basidiospores cylindric, hyaline, IKI-, 3.5–4 × 1–1.3 μm.

Type of rot. – White rot of dead coniferous wood.

Cultural characteristics. – See David 1982.
Skeletocutis

**Fig. 367.** Skeletocutis lilacina (TN 2728). a, contextual generative hyphae; b, contextual skeletal hyphae; c, cystidioles; d, basidia; e, basidiospores.

**Sexuality.** - Heterothallic and tetrapolar (David 1982).

**Substrata.** - Coniferous wood, in North America observed on *Picea*, in Europe only on *Pinus*.

**Distribution.** Known only from two localities in Canada in North America. Widespread in Europe.

**Remarks.** The species is closely related to *S. amorpha* but separated by having almost always resupinate basidiocarps, a more beige to grayish pore surface and more lunate spores than in *S. amorpha*.

4. **Skeletocutis lilacina** David & Keller


**Basidiocarps** resupinate, annual, round to orbicular, up to 6 cm in diameter, up to 1.5 mm thick; margin white, pore surface lilac with a grayish tint, pores angular, 5–6 per mm; tubes concolorous with pore surface, subiculum dense and cartilaginous in lower part and with a thin cottony white layer next to the substrate.

**Hyphal system** dimitic; generative hyphae with clamps, 2.5–4 μm wide, in both the subiculum and in the dissepiments strongly covered with fine grainy crystals; skeletal hyphae only in the trama, hyaline, thick-walled, nonseptate, 2–3 μm wide.

**Cystidia** absent, but cystidioles present in the hymenium, fusiform, smooth and thin-walled, 10–14 × 3–4 μm.

**Basidia** clavate to subcylindric, 11–15 × 5–5.5 μm, with 4 sterigmata and a basal clamp.

**Basidiospores** lunate to allantoid, hyaline, thin-walled, 3–4 × 0.8–1 μm.

**Type of rot.** - Causes a white rot in coniferous wood.

**Cultural characteristics.** - See David and Keller 1984.

**Sexuality.** - Heterothallic and tetrapolar (David and Keller 1984).

**Substrata.** - Only observed on *Picea*.

**Distribution.** Known in North America only from the Hudson Bay area, Quebec Prov. in Canada. (See Niemelä 1985). Described from Switzerland in Europe.

**Remarks.** The bright lilac color should be sufficient for a field determination. Microscopically it comes very close to *S. carneogrisea* but with less skeletal hyphae in the trama.

5. **Skeletocutis nivea** (Jungh.) Keller.


**Basidiocarps** annual, effused-reflexed or often resupinate, rarely sessile, pilei solitary or imbricate, dimidiate to elongate, sometimes laterally fused, up to 3 cm wide; upper surface white to cream colored, azonate, finely tomentose to glabrous, pore surface white to cream, glancing, the pores circular to angular, 8–10 per mm, with thin, entire dissepiments; context white, azonate, up to 5 mm thick; tube layer white to pale buff, distinct from context, easily sectioned, up to 2 mm thick.

**Hyphal system** trimitic; contextual generative hyphae thin-walled, nodose-septate, with occasional branching, 2–3.5 μm in diam; contextual skeletal hyphae thick-walled, aseptate, with rare branching, 3–5 μm in diam; contextual binding hyphae developing from lateral branches on generative hyphae, thick-walled, much branched, nonseptate, 1.5–2 μm in diam; tramaial hyphae generative, nodose-septate, 2–2.5 μm in diam, compactly arranged and difficult to separate.

**Cystidia** none; fusoid cystidioles rare and inconspicuous; hyphal pegs present, usually abundant.

**Basidia** clavate, 4-sterigmate, 11–17 × 3.5–5 μm, with a basal clamp.
**Skeletocutis**

Fig. 368. *Skeletocutis nivea* (RLG 10067). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.

**Basidiospores** allantoid, hyaline, smooth, negative in Melzer's reagent, 3–5 × 0.5–1 μm.

**Type of rot.** – White rot of dead hardwoods.

**Cultural characteristics.** – see Nobles 1948, 1958 and 1965; Bakshi et al. 1969; Stalpers 1978.

**Sexuality.** – Heterothallic and tetrapolar (David 1982).

**Substrata.** – Dead wood of numerous genera of hardwoods, rarely on conifers (1, 3, 6, 8, 9, 20, 26, 47, 48, 69, 75, 77, 79, 97, 104, 105, 136, 138, 145, 147, 148, 153, 165, 166, 190, 195).

**Distribution.** In eastern and western forest regions of North America from the southern states into Canada. Circumglobal in temperate forest regions.

**Remarks.** The small pores, glancing pore surface, and narrow spores are distinctive characters of *S. nivea*.

6. **Skeletocutis ochroalba** Niem.  

Fig. 369. *Skeletocutis ochroalba* (TN 2695). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, incrusted hyphal ends from dissepiment edges; e, cystidioles; f, basidia; g, basidiospores.

**Basidiocarps** annual or perennial, pileate to resupinate, coriaceous to hard, up to 15 mm wide, 2 to 4 mm thick; upper surface cream-colored or becoming more ochraceous, matted, azonate or with a few narrow and darker gelatinous bands; margin of pore surface dense and cottony, cream, becoming honey yellow when bruised; pore surface cream, becoming darker with pinkish tints, pores 6–7(9) per mm, angular; tubes concolorous; context and subiculum coriaceous, white, lower part becoming denser, more gelatinous and yellow with age, resulting in a duplex consistency.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled in the subhymenium, more thick-walled in the context and subiculum; skeletal hyphae dominating, solid, unbranched, hyaline, 4–6 μm wide; binding hyphae strongly branched with tapering ends arising as sidebranches on generative hyphae, 2–3 μm wide, occurring only in the context and subiculum; dissepiments strongly incrusted with fine grainy crystals.

Cystidia absent from the hymenium.
**Skeletocutis**

720

Fig. 370. Skeletocutis stellae (RLG 8357). a, subicular generative hyphae; b, subicular skeletal hyphae; c, incrusted hyphae from dissepiment edge; d, cystidiolae; e, basidia; f, basidiospores.

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**Basidia** clavate, 4-sterigmate, with a basal clamp, 12-15 × 3-4 μm.

**Basidiospores** allantoid, hyaline, IKI-, 3.5-4 × 0.7-0.8 μm.

**Type of rot.** - Causing a white rot in *Picea.*

**Cultural characteristics and sexuality.** - Unknown.

**Substrata.** - Known only from *Picea glauca,* possibly also *P. mariana.* Seemingly restricted to worked timber.

**Distribution.** Known only from the coast of Hudson Bay in Quebec province.

**Remarks.** The species will probably be found over a larger range in North Canada when more collecting has been done in these areas. Microscopically it reminds of *S. nivea* which however is a southern species restricted to deciduous wood.

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**7. Skeletocutis stellae (Pilat) Keller.**


**Basidiocarps** perennial, resupinate, adnate, up to 8 mm thick, taste mild; sterile margin cream colored, floccose to fimbriate, often rather wide; pore surface cream to tan, glancing, the pores 5-7 per mm; subiculum firm-fibrous, white, azonate, up to 5 mm thick; tubes rigid, indistinctly layered, each layer up to 3 mm thick.

**Hyphal system** dimitic; subicular skeletal hyphae thick-walled, hyaline, aseptate, rarely branched; 2-6 μm in diam; subicular generative hyphae thin-walled, nodose-septate, with occasional branching, 2-4 μm in diam; trama1 hyphae similar, projecting hyphae at dissepiment edges heavily incrusted.

**Cystidia** none; inconspicuous fusoid cystidiolae present, 12.5-18 × 3-4.5 μm in diam, with a basal clamp, hyphal pegs present.

**Basidia** clavate, 4-sterigmate, 10-16 × 4-5 μm, with a basal clamp.

**Basidiospores** allantoid, hyaline, smooth, negative in Melzer's reagent, 4.6-6 × 0.7-1 μm.

**Type of rot.** - White mottled rot of dead conifers. Positive in gum guaiac solution.

**Cultural characteristics.** - See David 1982.

**Sexuality.** - Heterothallic (David 1982).

**Substrata.** - Dead wood of several genera of conifers, especially common on *Picea* (1, 97, 136, 138).

**Distribution.** A boreal fungus, in the Northeastern U.S. and eastern Canada; in western conifer forests south to Arizona at high elevations. Also in Europe.

**Remarks.** *S. stellae* is very close to *S. subincarnata* but differs in having perennial basidiocarps and slightly narrower spores.

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**8. Skeletocutis subincarnata (Pk.) Keller** Fig. 371


**Basidiocarps** annual, resupinate or rarely reflexed, separable or somewhat adnate, often cracking upon drying; margin narrow, white, tomentose to fimbriate or rarely with white rhizomorphs; pore surface creamy-white or with a pinkish cast when fresh, drying cream to buff, the pores 5-7 per mm; subiculum soft, fibrous, thin, whitish; taste mild; tube layer soft-waxy to coriaceous, up to 4 mm thick.

**Hyphal system** dimitic; subicular skeletal hyphae thick-walled, aseptate, hyaline, rarely branched, 2-4 μm in diam; subicular generative hyphae thin-walled, nodose-septate, with occasional branching, 2-3 μm in diam; trama1 hyphae similar, heavily incrusted at the dissepiment edges.

**Cystidia** none; conspicuous hyphal pegs and small fusoid cystidiolae present, the latter 9.5-16 × 3-5.5 μm, with a basal clamp.

**Basidia** clavate, 4-sterigmate, 12-15 × 4-5.5 μm, with a basal clamp.

**Basidiospores** allantoid, hyaline, smooth, negative in Melzer's reagent, 4.6-5 × 1.5-1.5 μm.

**Type of rot.** - White rot of dead conifers and hardwoods. Positive in gum guaiac solution.

**Cultural characteristics.** - See David 1982.
Spongipellis

Fig. 371. Skeletocutis subincarnata (RLG 7576). a, subicular generative hyphae; b, subicular skeletal hyphae; c, incrusted hyphae from dissepiment edge; d, cystidioles; e, basidia; f, basidiospores.

Sexuality. – Heterothallic and tetrapolar (David 1982).

Substrata. – Dead wood of conifers, especially Picea and Pinus, rarely on hardwoods (1, 8, 136, 138, 146, 148, 194).

Distribution. Widely distributed in coniferous forest regions of North America from Newfoundland to California and Arizona to Alaska. Also in Europe.

Remarks. S. subincarnata may form white rhizomorphs in the bark and between bark and wood under basidiocarps. It differs from S. stellae in having annual basidiocarps and slightly wider spores. Fruitings with slightly reflexed basidiocarps have been collected in Arizona.

Spongipellis Pat.


Basidiocarps annual, pileate, broadly attached, semicircular, reflected to semiresupinate; pileus tomentose to smooth, white to ochraceous; hymenophore poroid to dentate, pores circular to sinuous; tubes concolorous with pore surface; context white to cream, mostly duplex, lower part fibrous and dense, upper part looser and more cottony; hyphal system monomitic; generative hyphae with clamps; cystidia or other sterile elements absent; spores ellipsoid to globose, smooth, hyaline, thick-walled and IKI- on living and dead hardwoods, causing a white rot.

Type species: Spongipellis spumeus (Fr.) Pat.

Remarks. The genus is close to Tyromyces but is distinguished by the distinct duplex consistency, but above all by the thick-walled subglo-bose to ellipsoid spores which are cyanophilous in cotton blue.

Key to species

1. Hymenophore distinctly hydnoid; basidiocarps small, often effused, rarely above 8 mm thick; spores globose, 5–6.5 μm in diam .......................... 2. S. pachyodon

1. Hymenophore poroid, regular, pores sinuous to daedaleoid or dissepiments slightly dentate or lacerate; spores broadly ellipsoid to subglobose; basidiocarps often 1–4 cm thick ..................... 2

2. Pores 1–2 mm wide, regular to slightly split and becoming daedaleoid; hyphae of context distinctly thick-walled to subsolid .................. 4. S. unicolor

2. Pores 1–3 mm per mm, regular or dentate to lacerate with age; hyphae of context thin-walled to slightly thick-walled ..................... 3

3. Pores round to angular, regular .................. 3. S. spumeus

3. Pores sinuous, dissepiments becoming lacerate to dentate or hydnoid 1. S. delectans

1. Spongipellis delectans (Pk.) Murr. Fig. 372


Basidiocarps sessile or slightly effused, pilei solitary or imbricate, dimidiate, planate to ungulate, up to 7 × 15 × 4.5 cm; upper surface white, discoloring to pale brownish and often streaked with light reddish-brown after drying, azonate, tomentose or short-hispid to glabrous; margin concolorous; pore surface white when fresh, becoming pale buff to ochraceous, the pores large, circular to angular, sometimes daedaleoid, 1–2 per mm; with thin dissepiments that soon become lacerate; context white to ochraceous, very faintly zonate, corky below, soft, spongy above, up to 2 cm thick; tube layer concolorous and continuous with the context, up to 1 cm thick.

Hyphal system monomitic; contextual hyphae hyaline in KOH, thin to thick-walled, occasionally branched, with clamps, 4–7 μm in diam, tramaal hyphae similar.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 20–30 × 7–9 μm, with a basal clamp.

Basidiospores broadly ellipsoid to subglobose, hyaline, smooth, IKI-, 7–9 × 5–7 μm.

Type of rot. – White mottled rot of living or dead hardwoods.

Cultural characteristics. – See David 1969; Stalpers 1978.

Sexuality. – Heterothallic and tetrapolar (David 1969).
**Spongipellis**

**Substrata.** – Dead standing or fallen hardwoods in several genera, also causing a heartrot in living trees, particularly species of *Populus*.  
**Distribution.** Throughout eastern hardwood forests from Canada to the southern oak-pine forest; also in the Pacific Northwest and Alaska. Also in Europe.  
**Remarks.** Basidiocarps of *S. delectans* resemble those of *S. unicolor*, which differ in having narrower spores, and usually, larger pores. *Trametes cervina* also has macroscopically similar basidiocarps but has cylindrical spores and a dimitic hyphal system.

2. **Spongipellis pachydon** (Pers.) Kotl. & Pouz.  


**Basidiocarps** annual, pileate to resupinate, semicircular to broadly attached, single or imbricate with partly incised or lobed pilei, up to 5 cm wide and broad and about 1 cm thick at the base, frequently with a decurrent hymenophore, coriaceous when fresh, dense and hard when dry; pileus white, then ochraceous, azonate, first finely tomentose, soon glabrous, smooth or with fine radial lines or sharp ridges; hymenophore white to ochraceous, light brown in older parts, along the margin with dentate, flattened, short lamellae which soon are split to flattened teeth which in the top become more or less cylindrical and tapering, thus, the inner parts close to the base are distinctly hydnoid while more peripheral parts are irpicioid, teeth up to 10 mm long at the base; context white to pale cream, up to 8 mm thick, weakly duplex with a lower, rather dense and friable part and an upper looser part with more or less vertical hyphal direction, but no sharp and distinct borderline between the two parts; trama in the teeth dense and agglutinated, in old teeth as soaked with a resinous substance.  
**Hyphal system** monomitic; generative hyphae with clamps, in the context hyaline, slightly thick-walled and with a rather dense protoplasm, 3–6 μm wide, in the trama densely agglutinated, 2.5 μm wide and with numerous oily drops in the protoplasm.
Cystidia or other sterile hymenial elements lacking.

**Basidiospores** globose, smooth, thick-walled, IKI-, 5–6.5 μm in diam, with a large oil drop.

**Type of rot.** Causes a white trunk rot in living hardwoods.

**Cultural characteristics.** See David 1969; Stalpers 1978.

**Sexuality.** Heterothallic and bipolar (David 1969).

**Substrata.** Living hardwoods, commonly on oak in the Southeast.

**Distribution.** Eastern United States, rather common in the Gulf Coast Region; also known from Europe.

**Remarks.** This species is easy to recognize because of the distinctly hydnoid hymenophore and the small, globose spores.

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3. **Spongipellis spumeus.** (Sow.:Fr.) Pat.  
   Ess. tax. p. 84, 1900. – *Boletus spumeus* Sow., Col. Fig. Brit. Fungi, p. 211, 1799. – *Polyporus spumeus* Sow.:Fr., Syst. Mycol. 1:358, 1821.

**Basidiocarps** annual, pileate, applanate, broadly attached or dimidiate with a contracted base, small to large, up to 10 cm wide, 20 cm broad and 2–6 cm thick at the base, fleshy and soft when fresh, hard and brittle when dry; pileus whitish to cream when fresh, pale, straw colored to ochraceous when dry, finely hisrute to tomentose, in old specimens often tufted and with small pits and areas with flattened agglutinated hairs, azonate; margin round and velutinate to almost glabrous; pore surface white when fresh, straw colored to ochraceous when dry, pores round and entire, 1–2(3) per mm; tubes concolorous, up to 15 mm deep, non-stratified; context white when fresh, straw colored to ochraceous when dry, 3–10 mm thick, looser with a predominantly vertical fiber direction.

**Hyphal system** monomitic; generative hyphae with clamps, in the trama 2–4.5 μm wide, in the context with slightly thickened walls (rarely more than ca. 0.5 μm thick) and numerous, large conspicuous clamps, hyaline and intertwined, 4–9 μm wide, on the pileus 3–7 μm wide and with a dense and partly grainy protoplasm.

Cystidia or other sterile hymenial elements lacking.

**Basidia** clavate, 4-sterigmate, 25–30 × 7–9 μm, with a basal clamp.

**Basidiospores** globose to broadly ellipsoid, hyaline, smooth and thick-walled, IKI-, 6–8.5 × 4.5–6 μm.

**Type of rot.** White rot of living and dead hardwoods.

**Cultural characteristics.** Unknown.

**Sexuality.** Unknown.

**Substrata.** Living and dead hardwoods (3, 5, 26, 32, 69, 145, 165, 191, 195).

**Distribution.** Eastern and Central United States and Canada. Cir-
Spongipellis

Fig. 575. Spongipellis unicolor (RLG 7701). a, contextual hyphae; b, tramal hyphae; c, basidia; d, basidiospores.

gulate to applanate, up to 10 x 18 x 13 cm; upper surface cream colored to pale buff when fresh, darkening to cinnamon buff or ochraceous tawny with age and drying, finely hispid to tomentose or finally glabrous, azonate, smooth; margin concolorous, rounded, fertile below; pore surface pale buff to ochraceous, the pores circular to angular, often becoming somewhat daedaleoid by splitting of dissepiments, sometimes arranged in more or less concentric rows, with thick to thin, finely tomentose dissepiments, mostly 1–2 mm in diam; context pale buff, con-

centrically zonate, upper part soft-spongy, firm-fibrous below, up to 8 cm thick; tube layer concolorous and continuous with the context, up to 2 cm thick.

Hyphal system monomitic; contextual hyphae hyaline, thin- to thick-walled, with clamps and frequent branching, 5–8 μm in diam; tramal hyphae similar, 3–6 μm in diam.

Cyistidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigate, 25–32 x 8–9 μm, with a basal clamp.

Basidiospores ovoid to ellipsoid, hyaline, smooth, IKI-, 7–9 x 6–7 μm.

Type of rot. – White trunkrot of living hardwoods.

Cultural characteristics. – See Davidson et al. 1942; Nobles 1948, 1958, 1965; David 1969.

Sexuality. – Heterothallic and tetrapolar (Eggertson 1953; David 1969).

Substrata. – Commonly on living oaks but occasionally on hosts in other genera (3, 26, 69, 104, 145, 152, 153, 160, 195).

Distribution. To be expected throughout the range of oaks in North America. Common in Arizona and New Mexico. Known only in North America.

Remarks. Spongipellis unicolor is readily recognized in the field by the thick, pale brownish, sessile basidiocarps with large pores. Microscopically the monomitic hyphal system with thick-walled generative hyphae with abundant clamps and ellipsoid spores are distinctive.

Tinctoporellus

Ryv.


Basidiocarp resupinate, pore surface bluish gray to pale violet, pores angular, 7–9 per mm, hyphal system dimitic, generative hyphae with clamps at the septa, skeletal hyphae thick-walled, hyaline to light golden yellow in KOH, weakly dextrinoid in Melzer’s reagent, basidia clavate, 10–15 x 4–6 μm with 4 sterigmata, spores ellipsoid to subglobose, smooth, hyaline and IKI-, 4.5–5 x 2.5–3 μm, causes a white rot, substratum reddish in zones. On hardwoods.

Type species: Tinctoporellus epimiltinus (Berk. & Br.) Ryv.

Tinctoporellus epimiltinus (Berk. & Br.) Ryv.


Basidiocarps resupinate, adnate and widely effused, woody hard, up to 3 mm thick, distinctly delimited towards the wood which is colored in red zones; pore surface bluish gray, glaucous to light beige or violet,
Tinctoporellus

Fig. 916. Tinctoporellus epimilitinus (MB 1410). a, tramal generative hyphae; b, tramal skeletal hyphae; c, cystidioles; d, basidia; e, basidiospores.

Figures 776. Tinctoporellus epimilitinus (MB 1410). a, tramal generative hyphae; b, tramal skeletal hyphae; c, cystidioles; d, basidia; e, basidiospores.

pores angular to round, 7-9 per mm, almost invisible to the naked eye, in more mature and thicker fruitbodies a few larger and somewhat elongated, on sloping substrates the pores become split in front and more irregular; margin lacking or very narrow, bluish white and mostly consisting of a thin web of hyphae; tubes up to 3 mm thick, whitish inside due to a cover of excreted crystals and old tubes stuffed with white mycelium seen in dry specimens.

Hyphal system dimitic; generative hyphae thin-walled, 1.5-2.5 μm in diameter, with clamps, often difficult to find and apparently restricted to the thin subhymenium along the tubes; skeletal hyphae 2-4 μm in diameter, hyaline to golden yellow, weakly dextrinoid, nonseptate, solid to semi-solid.

Cystidia absent, fusoid cystidios present, 8-14 × 4-7 μm.

Basidia clavate, 4-sterigmate, 10-15 × 4-6 μm.

Basidiospores hyaline, smooth, broadly ellipsoid to subglobose, IKI-.

Type of rot. - Causes a white rot in dead hardwoods

Cultural characteristics. - See Rachjenberg 1983.

Sexuality. - Unknown.

Substrata. - Dead standing and fallen hardwoods, in the Gulf Coast Region particularly common on oak.

Distribution. - Panropical, in America known from the Gulf Coast Region to Northern Argentina.

Remarks. - The species is usually easy to identify because it is the only true polypore described in this flora that reddens the substrate. Porogramme albocincta (for a description see Ryvarden & Johansen 1980) also gives a reddish substrate, but in this species the pores are very shallow and small, and the pore surface is bluish black. Although they have similar cultural characters, the two species are grossly different macroscopically and should be kept apart as pointed out by David & Rachjenberg (1985).

Trametes Fr.


Basidiocarps annual to perennial, pileate, sessile, dimidiate to fan-shaped, single or imbricate, flexible to hard; upper surface hispid to glabrous, often zonate; pore surface white, cream to pale gray; context white to isabelline, homogeneous or duplex, in some species with a dark line; hyphal system trimitic; generative hyphae hyaline and with clamps, skeletal hyphae straight, thick-walled to solid, hyaline, in some species swelling in KOH, binding hyphae tortuous, solid, hyaline; cystidia lacking, in some species pointed hyphal ends may penetrate the hymenium; spores ellipsoid to allantoid, hyaline, thin-walled and IKI-; causes a white rot in hardwoods, rarely on conifers, cosmopolitan genus with many common and widespread species.

Type species: Trametes suaveolens (Fr.) Fr.

Remarks. - The generic concept used here is mainly based on the pileate basidiocarps, the trimitic hyphal system and the thin-wall, IKI-spores. Coriolus typified with T. versicolor is included as we find the thin basidiocarps with a black thin line between the tomentum and the context of no taxonomic significance on generic level. Such duplex basidiocarps may be found in many species, and in the genus there are all transitions between thin and thick basidiocarps. Lenzites is very closely related, in principle separated only by a distinctly lamellate hymenophore. The pointed hyphal ends seen in L. betulina, the type species, are also seen in T. cubensis, a species with small regular pores. As to spores and hyphal system, L. betulina comes very close to T. hiruta, and both have the same hispid pileus. Coriolopsis Murr. is mainly based on distinctly colored context, a character which may be of dubious value on a generic level.

As so many species in Trametes have similar spores or mostly are found sterile, some specimens are difficult to determine, and considerable field experience is necessary to establish a good species concept in this genus. The basidiocarps are often strongly susceptible to attack from insects and should be treated in a deep-freezer as soon as possible after collecting.
Key to species

1. Pores regular, 1–3 per mm, or lamellate, daedaleoid, semilabyrinthine or lacerate to almost hydnoid .......... 2
1. Pores regular, 3–8 per mm, round to angular, more or less entire 7
2. Basidiocarps up to 3.5 cm thick, with anise odor 14. T. suaveolens
2. Basidiocarps rarely above 1.5 cm thick, without anise odor ...... 3
3. Upper surface more or less glabrous; hymenophore often lamellate .......... 6. T. elegans
3. Upper surface hirsute to hispid; hymenophore not lamellate ...... 4
4. Basidiocarp thin and flexible, rarely above 3 mm thick 18. T. villosa
4. Basidiocarp hard and rigid, up to 1.5 cm thick .......... 5
5. Context duplex with a distinct black zone, at least close to the base; hymenophore split and almost hydnoid .......... 8. T. maxima
5. Context homogeneous to duplex, but without a black zone; hymenophore regular, labyrinthine or semilabyrinthine with age ...... 6
6. Pileus coarsely hispid; basidiocarp up to 5 cm wide; context duplex; spores 10–12 μm long .......... 16. T. trogii
6. Pileus hirsute to tomentose; basidiocarp up to 1.5 cm wide; context homogeneous; spores 7–9 μm long .......... 1. T. cervina
7. Pileus hirsute to tomentose; context duplex, often with a black line between tomentum and context, at least close to the base ...... 8
7. Pileus adpressed velutinate and dull to subshiny or soon becoming glabrous except for margin; context homogeneous although a cuticle may develop from the base with age .......... 11
8. Pileus hirsute, white to gray; pore surface becoming gray with age .......... 7. T. hirsuta
8. Pileus tomentose to velutinate or radially strigose; pore surface white, yellowish or pale tan with age ...... 9
9. Pileus azonate or with almost unicolorous zones, finely tomentose or strigose with fine radial lines; pore surface becoming yellowish with age .......... 13. T. pubescens
9. Pileus usually strongly multizonate, often in different colors as tomentose and glabrous zones are alternating; pore surface white becoming pale tan with age .......... 10
10. Basidiocarps thin and flexible, often with strongly contrasting colors; pores 4–5 per mm, spores 5–6 × 1.5–2 μm ...... 17. T. versicolor
10. Basidiocarps rigid to hard; pileus usually in white to brown shades; pores 3–4 per mm; spores 6–8.5 × 2–2.5 μm ...... 11. T. ochracea

11. Basidiocarp usually with sterile cup- to disc-shaped structures at or close to the base; pores 2–4 per mm .......... 2. T. conchifer
11. Basidiocarp never with sterile structures at the base; pores 5–7 per mm .......... 12
12. Pileus more or less glabrous, often with a thin reddish cuticle spreading from the base; basidiocarps usually rigid, semicircular to dimidiate; context white to cream .......... 13
12. Pileus tomentose to adpressed velutinate and dull, sometimes with a thin pad of tomentum spreading from the base; basidio carps thin and flexible, usually fanned to flabelliform; context white, if more rigid then pink to isabelline .......... 15
13. Pileus usually azonate, pale strawcolored to tan with a reddish cuticle spreading from the base; hymenium with numerous pointed cystidia-like hyphal ends; spores 7–9.5 μm long ...... 3. T. cubensis
13. Pileus usually zonate, whitish, tan to reddish brown or with a bay cuticle spreading from the base, cystidial-like hyphal ends lacking, spores 3.5–6 μm long .......... 14
14. Pileus tan to pale brown, often with a reddish cuticle spreading from the base, spores 4.5–6 μm long .......... 5. T. ectypus
14. Pileus white to pale tan, cuticle absent; spores 3.5–5 μm long ........ 11. T. subectypus
15. Pileus pale pink or isabelline to cocoa-colored, often with a thin pad of hyphae spreading from the base, finely velutinate, becoming almost glabrous; context isabelline with lilac shades reddish in KOH, but fading; pores 6–10 per mm, almost invisible to the naked eye .......... 10. T. modesta
15. Pileus white, tan to pale brown with age, tomentose to adpressed velutinate to glabrous and dull; context white to pale brown, discolored but not red in KOH; pores 5–6 per mm, usually visible to the naked eye .......... 16
16. Pileus tomentose in zones, white to buff or pale brown; pores angular, often slightly elongated radially; spores ellipsoid, 5–6 × 3–4 μm .......... 12. T. pavonia
16. Pileus finely adpressed velutinate, becoming almost glabrous with age, white, pale tan or pale cinnamon; pores round to regular; spores cylindric, 2–2.5 μm wide .......... 17
17. Pileus white, cream to pale tan; on many hosts; spores 4.5–6 μm long .......... 9. T. membranacea
17. Pileus tan to pale cinnamon brown; known only from Taxodium; spores 3–5 μm long .......... 4. T. drummondi
Symbols for species of *Trametes* in synoptic key

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td><em>T. cervina</em></td>
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<td><em>T. conchifer</em></td>
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<td><em>T. cubensis</em></td>
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<td><em>T. drummondii</em></td>
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<td><em>T. ectypus</em></td>
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<td><em>T. elegans</em></td>
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<td><em>T. hirsuta</em></td>
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<td><em>T. maxima</em></td>
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<td><em>T. versicolor</em></td>
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<td>19</td>
<td><em>T. villosa</em></td>
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Synoptic key to species of *Trametes*

Habit of basidiocarp

a. resupinate 15.
b. sessile 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18.
c. effused-reflexed 1, 7, 9, 11, 13, 16, 17, 18.
d. substipitate 5, 6.
e. accompanied by sterile structures 2.

Pileus characters

a. dimidiate 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18.
b. elongated 1, 3, 16, 17.
c. flabelliform 2, 4, 6, 8, 9, 12, 18.
d. solitary 6, 10, 14, 15, 16.
e. in imbricate clusters 1, 4, 7, 10, 11, 12, 13, 17.
f. in rosettes 17.
g. fused laterally 1, 7, 8, 10, 12, 13, 16, 17, 18.

Pileus surface

a. glabrous 2, 3, 5, 6, 9, 14, 15.
b. pubescent or tomentose 2, 3, 4, 5, 9, 10, 11, 12, 13, 14, 15, 17.
c. hirsute or strigose 1, 7, 8, 17, 18.
d. hispid 16.
e. concentrically zonate 1, 2, 5, 7, 8, 10, 11, 12, 16, 17, 18.
f. radially zonate 4, 9, 10.
g. sulcate 6, 7, 8.
h. pinkish buff to cinnamon buff 1, 4, 6, 8, 10, 11, 12, 16, 17.
i. gray or bluish colors 7, 17, 18.
j. white to cream 2, 3, 6, 9, 12, 13, 14, 15.
k. reddish at the base 3, 5.

Pore surface

a. white to cream 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 15, 17, 18.
b. buff to pale brown or pinkish 1, 4, 8, 10, 16, 18.
c. cinereous 7, 13, 17.
d. pores 1-5 per mm 1, 2, 6, 7, 8, 11, 14, 16, 17, 18.
e. pores 5-10 per mm 3, 4, 5, 9, 10, 12, 13, 15.
f. pores circular to angular, regular 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 14, 15, 17, 18.
g. pores irregular, elongated to daedaleoid 1, 6, 8, 16.

Context

a. white to cream 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 17, 18.
b. buff to cinnamon or pinkish 1, 10, 16.
c. duplex 7, 8, 16, 17.
d. with black layer 7, 8, 17.
e. fibrous 2, 3, 4, 10, 11, 12, 13, 15, 17, 18.
f. tough corky 1, 5, 6, 7, 8, 9, 14, 16.
g. up to 1 cm or more thick 1, 3, 6, 7, 14.
h. less than 1 cm thick 2, 4, 5, 8, 9, 10, 12, 13, 15, 16, 17, 18.

Sterile hymenial structures

a. fusoid cystidioles or pointed hyphal ends present 3, 6.
b. hyphal pegs present 7, 8, 12, 13, 18.

Basidiocarp colors

a. gray or bluish colors 7, 17, 18.
b. white to cream 2, 3, 5, 7, 8, 11, 12, 13, 14, 15, 16.
c. pinkish buff to cinnamon buff 1, 4, 6, 8, 10, 11, 12, 16, 17.
d. pores 5-10 per mm 3, 4, 5, 9, 10, 12, 13, 15.
e. pores circular to angular, regular 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 14, 15, 17, 18.
f. pores irregular, elongated to daedaleoid 1, 6, 8, 16.

g. pores irregular, elongated to daedaleoid 1, 6, 8, 16.

Substratum

a. heartwood of living trees 4, 14.
b. dead trees, stumps, logs, slash 1, 2, 3, 5, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18.
c. on conifers 4, 6, 9, 10, 17.
d. on hardwoods 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18.

Geographical distribution in North America

a. in eastern part only 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18.
b. in both eastern and western parts 1, 2, 7, 11, 13, 14, 16, 17, 18.
c. in southeastern U.S. only 3, 4, 5, 8, 9, 10, 12, 15, 18.
d. wide latitudinal range 1, 2, 6, 7, 13, 14, 16, 17, 18.

1. *Trametes cervina* (Schw.) Bres. Fig. 377
Ann. Mycol. 1:81, 1903. - *Boletus cervinus* Schw., Syn. Fung. Carol., p.70, 1822. - *Polyporus biformis* Fr. sensu Overholts, (1953) non. Fr. *Basidiocarps* annual, sessile to effused-reflexed or occasionally resupinate, up to 5 x 21 x 1.5 cm, often in large imbricate clusters; upper surface hirsute to strigose, pinkish buff to cinnamon-buff or clay color; faintly zonate to azonate; pore surface cinnamon-buff or becoming darker brown with age, the pores irregular, up to 1 mm in diam, dissepiments becoming thin and lacerate and hymenophore becoming...
Trametes
daedaloid or almost hydnaceous; tube layer concolorous, continuous with the context, up to 1 cm thick; context pale buff, azonate, up to 1 cm thick.

Hyphal system dimitic; contextual generative hyphae thin-walled, with clamps, rarely branched, 2–4 μm in diam; contextual skeletal hyphae thick-walled, with rare branching, nonseptate, 3–5.5 μm in diam; trama1 hyphae similar.

Cystidia or other sterile hymenial elements lacking.

Basidia clavate, 4-sterigmate, 10–15 × 4–6 μm, with a basal clamp.

Basidiospores cylindrical, hyaline, IKI-, 5–7 × 1.5–2.5 μm.

Type of rot. – White rot in dead branches of hardwoods.


Sexuality. – Heterothallic and tetrapolar (Stalpers 1978).

Substrata. – Dead hardwood branches (3, 20, 129, 147, 153, 165, 195) especially Ulmus.

Distribution. Hardwood forest regions of Eastern and Central North America to eastern Montana.

Remarks. The species is easy to recognize in the field when the sterile cup-shaped or disc-like structures are present as no other polypores have similar structures. Brodie (1951) showed these to be splash cups which disseminate oidia during rainy periods. When sterile cups are not present, the species may be recognized by the white dimidiate basidiocarp with a glabrous surface while the basidiocarps of T. pubescens normally will have a fine tomentum, yellowish pore surface and sessile.
Trametes

**Fig. 378.** Trametes conchifer (KDB 232). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.

basidiocarps. Microscopically the two species are similar.


**Basidiocarps** annual, sessile, broadly attached to dimidiate, applanate, flexible when fresh, rigid to coryck when dry, up to 8 cm long, 12 cm wide and 1.5 cm thick at the base; upper surface at first finely velutinate, becoming glabrous except for an actively growing margin, white, cream to tan, becoming reddish to bay from the base, often slightly radially streaked, azonate or irregularly sulcate, margin sharp to slightly rounded; pore surface white to cream, becoming tan by age, pores small and regular, almost invisible to the naked eye, 5–7 per mm; tubes concolorous with pore surface; context white to pale cream, dense to cottony, up to 1 cm thick.

**Hyphal system** trimitic; generative hyphae hyaline and with clamps, 1–3 µm wide; skeletal hyphae abundant, thick-walled, hyaline to slightly tinted, 3–7 µm wide; binding hyphae tortuous, solid, 2–5 µm wide, in the hymenium present as sharply pointed hyphal ends in a candelabra-like fashion, and we interpret these as binding hyphae more than true cystidia.

**Cystidia** not present, but sharply pointed hyphal ends abundantly present in the hymenium strongly simulating cystidia.

**Basidia** clavate, 4-sterigmate, 12–15 × 4–6 µm, with a basal clamp.

**Basidiospores** cylindric, slightly bent, hyaline, IKI–, 7–9.5 × 3–3.5 µm, often very difficult to find.

**Type of rot.** – White rot in dead hardwoods.

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**Fig. 379.** Trametes cubensis (VEN 1493). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, hymenial binding hyphae with pointed apices; e, basidia; f, basidiospores.
Trametes

Cultural characteristics and sexuality. — Unknown.

Substrata. — Dead hardwoods in numerous genera

Distribution. In United States known from Florida and Louisiana, widespread in tropical America south to Brazil.

Remarks. Old specimens are easy to recognize by the cream to tan pileus with a reddish layer spreading from the base and the very tiny pores separating it from purely poroid specimens of *T. elegans* which have 2–3 pores per mm. Microscopically the strongly branched and sharply pointed binding hyphae in the hymenium will be diagnostic.

4. *Trametes drummondii* (Kl.) Ryv. Fig. 380


**Basidiocarps** annual, flabelliform to fanshaped, often imbricate, flexible, up to 6 cm wide and long and 1 mm thick; upper surface finely velutinate, usually multizonate with numerous radial striae or streaks, first white, but soon buff to café-au-lait coffee brown and then cinnamon, margin thin, wavy and lobed; pore surface at first white, soon becoming tan to pale cinnamon, pores angular, 5–6 per mm; dissepiments dentate to finely lacerate; tubes concolorous; context white becoming pale brown towards the pileus, up to 1 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, 2–3 μm wide; skeletal hyphae hyaline to pale brown in dark tomentum, thick-walled, 3–9 μm wide; binding hyphae tortuous, solid, 2–4 μm thick in the main stems.

**Cystidia** and other sterile hymenial elements lacking.

**Basidia** clavate, 4-sterigmate, 8–10 × 4–5 μm, with a basal clamp.

**Basidiospores** cylindric to ellipsoid, hyaline, IKI−, 3.5–4.5 × 2–2.5 μm.

**Type of rot.** — White rot in *Taxodium*

**Cultural characteristics and sexuality.** — Unknown.

**Substrata.** — Noted only on *Taxodium*

**Distribution.** Known only from Florida and Louisiana.

**Remarks.** The species may be recognized by the small petaloid basidiocarps with a pale cinnamon pileus, the radially striate upper surface, and the slightly smaller spores than those seen in *T. membranacea*. It may be that it is only a variety of the latter and more spore-prints should be made to verify the differences observed.


Trametes

Fig. 381. Trametes ectypus (R. Thaxter). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.

context, strongly tortuous and twisted, solid, up to 5 µm wide in the main stems.

Cystidia or other sterile hymenial elements lacking.

Basidia clavate.

Basidiospores cylindric, hyaline, IKI-, 4.5–6 × 2–2.5 µm.

Type of rot. — White rot in dead hardwoods.

Cultural characteristics and sexuality. — Unknown.

Substrata. — Dead hardwoods.

Distribution. Southeastern United States, Cuba.

Remarks. In their typical aspect with a multizonate glabrous surface in bay to brown colors and a pale tan pore surface, basidiocarps of this species are easy to recognize. Paler specimens may be confused with those of T. subectypus which however, has almost white basidiocarps

6. Trametes elegans (Spreng.:Fr.) Fr. Fig. 382


Basidiocarps annual to perennial, flabelliform, dimidiate or circular, sessile or with a short stipelike base, 1–35 cm wide and long and 0.2–3 cm thick, corky and flexible when fresh, more rigid when dry; upper surface white, cream, gray, buff ochraceous or even blackish from the base in older specimens, surface very finely tomentose, soon glabrous, smooth or concentrically sulcate, often warted or with slightly uneven elevated areas, margin thin and often deflexed, even or lobed; stipe absent or up to 3 cm long, 1.5 cm in diameter, glabrous, solid, attached to the substrate with a disc up to 3 cm wide, white to pale cream; pore surface very variable, partly poroid, pores round to angular, 1–2 per mm, partly sinuous-daedaroid and radially split, up to 2 mm wide, partly purely lamellate with straight to sinuous lamellae, 4–7 per cm measured tangentially, this variation may occur in a single specimen, even in poroid specimens some parts of the hymenophore will usually have a few lamellae or sinuous pores, tubes or lamellae up to 6 mm deep; context white to pale cream, up to 15 mm thick near the base, woody hard when dry.

Hyphal system trimitic; generative hyphae hyaline, thin-walled, with clamps, 2–4 µm wide; skeletal hyphae dominating, yellow to golden, thick-walled to solid, 3–7 µm in diameter; binding hyphae hyaline to pale yellow, thick-walled, up to 5 µm wide, irregularly branched.

Cystidia not present, but binding hyphae project into the hymenium and may easily be interpreted as acute cystidia until a section is squashed and their hyphal nature is revealed.

Basidia clavate, 4-sterigmate, 8–15 × 4–6 µm, with a basal clamp.

Basidiospores cylindric to oblong ellipsoid, hyaline, IKI-, 5–7 × 2–3 µm.

Type of rot. — White rot in dead hardwoods.

Cultural characteristics. — See van der Westhuizen 1958; Stalpers 1978.
**Sexuality.** - Unknown.

**Substrata.** - Hardwoods of many genera (3, 6, 25, 26, 32, 61, 92, 104, 112, 124, 145, 153, 165, 195).

**Distribution.** Common in southeastern United States, widespread and very common in all tropical areas.

**Remarks.** In their typical aspect, basidiocarps of this species are easy to recognize because of the irregular hymenophore, often changing from the base to the margin. The color and shape are very variable and have caused descriptions of numerous new species.

7. *Trametes hirsuta* (Wulf.:Fr.) Pil. Fig. 383


**Basidiocarps** annual, sessile, effused-reflexed or rarely resupinate, coriaceous when fresh; pilei dimidiate, planate to thick, upper surface hirsute, gray, zonate or concentrically sulcate; margin often yellowish-brown, tomentose; pore surface white to tan or cinereous, the pores circular to angular, (1–)3–4 per mm, with thick, entire dissepiments that become thin with age; context duplex, the upper layer gray, soft-fibrous, up to 3 mm thick, at least at the base separated by a thin black line from the lower part, the latter ivory white, corky, up to 15 mm thick; tube layer concolorous with lower context, up to 6 mm thick.

**Hyphal system** trimitic; contextual generative hyphae thin-walled, with clamps, 2.5–6 μm in diam; contextual skeletal hyphae thick-walled, often sinuous, hyaline, nonseptate, with rare branching, 3–7 μm in diam; contextual binding hyphae thick-walled, nonseptate, much branched, 2–4 μm in diam; tramal hyphae similar.

**Cystidia** and other sterile hymenial elements absent; hyphal pegs occasionally present.

**Basidia** clavate, 4-sterigmate, 15–19.5 × 5–7 μm, with a basal clamp.

**Basidiospores** cylindric; hyaline, smooth, IKI–, 6–9 × 2–2.5 μm.

**Type of rot.** - White rot of dead hardwoods; positive in gum guaiac solution.

**Cultural characteristics.** - See Nobles, 1948, 1958 and 1965; Bakshi et al. 1969; Stalpers 1978.

**Sexuality.** - Heterothallic and tetrapolar (Nobles et al., 1957), also reported as heterothallic and bipolar (Bose, 1934).

**Substrata.** - Dead wood of numerous genera of hardwoods, rarely on conifers (1, 3, 5, 8, 9, 20, 25, 26, 27, 28, 30, 32, 37, 41, 47, 48, 52, 69, 75, 78, 79, 88, 89, 92, 104, 105, 112, 113, 123, 124, 129, 133, 136, 138, 148, 145, 147, 148, 152, 153, 156, 157, 158, 160, 165, 166, 169, 173, 177, 190, 191, 194, 195, 205, also *Philadelphus* and *Sideroxylon*).
Trametes

Fig. 383. Trametes hirsuta (RLG 7956). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.

Distribution. Throughout forest regions of North America.
Remarks. The gray, hirsute upper surface and brown margin are characteristic of basidiocarps of *T. hirsuta*. *Trametes versicolor* basidiocarps differ in being markedly zonate; those of *T. ochracea* and *T. pubescens* have a tomentose upper surface with a pale margin.

8. *Trametes maxima* (Mont.) David & Rajchenberg


Basidiocarps annual to biennial, pileate, dimidiate to semicircular or fanshaped or broadly sessile and often fused with adjacent basidiocarps to compound structures, coriaceous and flexible when fresh, slightly tougher when dry, up to 15 cm wide, 20 cm long and 2–6 mm thick at the base; upper surface first white to pale ochraceous, but with age pale tan or dark ochraceous, first tomentose to hirsute in narrow to white and sulcate zones and in some specimens persistently so, then often with green shades in the basal tomentum because of algal growth, in other specimens the tomentum wears away, mostly zonewise to expose a dark brown to bay, glabrous and dense cuticle, often slightly warted and zonate, margin thin, often deflexed, wavy or incised in rounded lobes; pore surface first white, soon pale yellowish brown to tan, pores angular to slightly daedaloid, 2–3 per mm, dissepiments usually dentate or incised to form an irregular hydnoid surface as they develop unevenly; tubes concolorous with pore surface, up to 5 mm deep; context dense, white to ochraceous, 2–4 mm thick, separated from the upper distinctly darker and softer upper tomentum by a distinct black zone.

Hyphal system trimitic; generative hyphae hyaline, thin-walled, with clamps, 2–4.5 μm wide; skeletal hyphae 3–8 μm wide, thick-walled, straight, unbranched and hyaline, totally dominating in the upper tomentum and the context, mixed with binding hyphae in the trama; binding hyphae intricately branched, solid, 1–4.5 μm wide.

Cystidia none, hyphal pegs hyaline and very abundant.
Basidia clavate, 18–25 × 5–7 μm.
Basidiospores cylindrical, hyaline, thin-walled, smooth, IKI-, 4.5–5.5 × 2–2.5 μm.

Type of rot. – Causes a white rot of dead hardwoods.
Cultural characteristics. – Unknown.
Sexuality. – Unknown.
Substrata. – Deciduous trees of different kinds, Overholts (1953) reports *Ulmus* as one host. One collection from Mexico was collected on *Quercus*.

Distribution. Subtropical species and known from Louisiana and Florida in United States. Throughout the Caribbean area and south to Venezuela and Colombia.

Remarks. This species has previously been placed in *Cerrena* because of the hydnoid or incised pore surface and the wooly tomentum under which there is a distinct black zone. It is important to note that such a zone is known also from *Trametes hirsuta* and *T. versicolor*. More important are the spores, being cylindrical in both the *Trametes* species mentioned above and in *T. maxima*, while they are cylindric-ellipsoid in *Cerrena unicolor*, the type species of *Cerrena*. Further, as shown by David & Rajchenberg, the nuclear behaviour of *T. maxima* is as in *Trametes* and is different from that of *Cerrena*.
9. *Trametes membranacea* (Sw.:Fr.) Kreisel


**Basidiocarps** annual, rarely effused-reflexed to sessile, commonly dimidiate to flabelliform with contracted base, flexible, up to 6 cm long, 8 cm wide and 2 mm thick, upper surface dull, finely adpressed velutinate, soon becoming glabrous but not shiny, first white, soon cream to pale tan, often becoming pale brown with age, more or less distinctly multizonate and when dry with some radial lines or ridges, margin thin, often incised to lobed and wavy; pore surface white, soon becoming cream to pale tan, pores angular, usually with dentate to lacerate dissepiments, 5–6 per mm; tubes concolorous with pore surface, up to 1 mm deep; context white to pale cream, dense, homogeneous, up to 1 mm thick at the base.

**Hyphal system** trimitic; generative hyphae with clamps, 2–3 μm wide; skeletal hyphae abundant, thick-walled, 3–9 μm wide; binding hyphae tortuous, strongly branched, solid to very thick-walled, 2–4 μm thick in the main stem.

**Cystidia** or other sterile hymenial elements lacking.

**Basidia** clavate, 4-sterigmate, 8–12 × 4–5 μm, with a basal clamp.

**Basidiospores** cylindric to oblong, hyaline, IKI–, 4.5–6 × 2–2.5 μm.

**Type of rot.** – White rot in dead hardwoods.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Dead hardwoods, rarely on conifers.

**Distribution.** Widespread and common in the southern states, wide-
**Trametes**

*Trametes modesta* (Fr.) Ryv. Fig. 386

**Basidiocarps** annual, pileate, applanate to slightly concave or bent downwards, single or frequently in clusters or fused laterally to compound fruitbodies, semicircular to flabelliform with a contracted base, occasionally more broadly attached, up to 6 cm wide and 7 cm long, very rarely above 3-4 mm thick, flexible and glabrous when fresh or dry; upper surface variable with age and development, first finely velutinette and soft to velvety to glabrous and then dull, very finely concentrically zonate, pale pinkish brown to buff with pink to lilac shades or café au lait, becoming paler tan to pale brown and usually more radially wrinkled and with radial wrinkled spots or streaks, sometimes becoming whitish, azonate, frequently covered with irregular pale ochraceous outgrowths spreading from the base, these, lacking in many specimens; pore surface pale pinkish-beige, buff to pale grayish-pink, when viewed obliquely paler and even whitish with a faint pink shade, pores round and small, 6-10 per mm and almost invisible to the naked eye; tubes more or less concolorous with the pore surface, tan to pale brown, non-stratified and up to 2 mm deep; context whitish to pink, beige or pale cocoa, becoming pale cinnamon-pink or very pale tan with age, fibrous, up to 2 mm thick, red in KOH, fading after 2-5 seconds, but persistent as a pale cherry red spot when dry.

**Hyphal system** trimitic; generative hyphae thin-walled, hyaline, with clamps, 2-4 μm wide; skeletal hyphae straight, pale pink to yellow, thick-walled, but usually with a distinct lumen, 2-5 μm in diam, not swelling in KOH; binding hyphae scarce in the context, sparingly branched, more common and more densely branched in the dissepiments, thick-walled to solid, 2-3 μm wide.

**Cystidia** or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, 10-15 × 3-5 μm, with a basal clamp.

**Basidiospores** cylindrical, thin-walled, smooth, hyaline, IKI-, 4.5-6 × 1.5-2 (2.5) μm.

**Type of rot.** - White rot in dead hardwoods.

**Cultural characteristics.** - Unknown.

**Sexuality.** - Unknown.

**Substrata.** - Dead deciduous trees of many genera.

**Distribution.** In United States known only from Florida, widespread in the tropics.

**Remarks.** Specimens of *T. modesta* may be confused with those of *Fomitopsis feici* which however have a more distinct pink color and cause a brown rot. It is very difficult to find spores in specimens of *T. modesta* and numerous specimens have to be examined before a reliable spore measurement can be made. The pale isabelline color with a lilac tint and the outgrowth from the base are good field characteristics.
Fig. 387. Trametes ochracea (RLG 34). a, tramal generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.

11. Trametes ochracea (Pers.) Gilbn. & Ryv. comb. nov. Fig. 387


Basidiocarps annual or reviving, sessile or effused-reflexed, dimidiate to flabelliform, often to elongated, tough-fibrous; upper surface finely tomentose to almost glabrous, vinaceous-buff with zones of reddish brown (ferruginous) or pale buff with faint darker zones; pore surface cream colored to cinereous, the pores circular, 3-4 per mm, with thick dissepiments; context cream colored, tough-fibrous, azonate, up to 5 mm thick; tube layer concolorous and continuous with the context, up to 4 mm thick.

**Trametes**

**Hyphal system** trimitic; contextual generative hyphae thin-walled, with clamps, 2-3.5 μm in diam; contextual skeletal hyphae thick-walled, nonseptate, 4-8 μm in diam; binding hyphae thick-walled, nonseptate, much branched, 2.5-5 μm in diam; tramal hyphae similar.

**Cystidia** or other sterile hymenial elements lacking.

**Basidia** clavate, 4-sterigmate, 15-20 × 4-5 μm, with a basal clamp.

**Basidiospores** cylindric, slightly curved, smooth, IKI-, 6-8 × 2.5 μm.

**Type of rot.** - White rot of dead hardwoods.

**Cultural characteristics.** - See Nobles 1948, 1958, 1960; Stalpers 1978.

**Sexuality.** Heterothallic and tetrapolar (Vandendries 1933).

**Substrata.** - Dead wood of numerous genera of hardwoods, rarely on conifers (3, 8, 20, 69, 75, 113, 145, 152, 165, 190, 194).

**Distribution.** Widely distributed in boreal forest regions of North America, south in the Rocky Mountain forests to Arizona. Also in Europe.

**Remarks.** Basidiocarps of *T. ochracea* are usually much paler in color than those of *T. versicolor*, less strongly zonate, and they lack the black layer seen in the upper context of the latter species. *T. pubescens* basidiocarps may also be similar but have an azonate or very faintly zonate upper surface.

The taxon described here was named *Polyporus zonatus* by Fries in his Systema Mycologicum (Fries 1821). Unfortunately the specific epithet cannot be used in *Trametes* as it already exists in *Trametes zonata* Wetstein from 1885. Ryvarden (1978) introduced *T. zonatella* looking that the taxon already had been described several times earlier. Jülich (1982) was aware of the problem and introduced *Trametes multicolor* (Schaeff.) Jülich for the species. However, he overlooked that Schaeffer himself (1774) indicated that this species was a synonym for *Boletus versicolor* L. 1753 and thus, he introduced an invalid name having of course no ideas about priority and other nomenclatural questions. The earliest validly published basionym for *Polyporus zonatus* is the name given in the heading and it was indicated to be a synonym already by Fries himself (1821). If the taxon described here is transferred to a genus different from *Trametes* then be aware that the name in the new genus has to be based on *Polyporus zonatus* Fr. It is only in *Trametes* that the specific epithet *zonatus* is blocked.

12. Trametes pavonia (Hook) Ryv.


Basidiocarps annual, pileate, sessile, dimidiate to flabelliform, often...
Trametes

Cystidia or other sterile hymenial elements lacking; but hyphal pegs present.

**Basidia** clavate, 4-sterigmate, 8–12 × 4–5 μm, with a basal clamp.

**Basidiospores** ellipsoid, hyaline, IKI-, 5–6 × 3–4 μm.

**Type of rot.** – White rot in dead hardwoods.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Hardwoods of many genera.

**Distribution.** In United States along the Gulf of Mexico, widespread and common in tropical America to northern Argentina.

**Remarks.** The basidiocarp is thin and flexible and the pore surface remains light, while in *T. hirsuta* the basidiocarp is thick and robust and the pore surface becomes grayish with age and drying. The pores of the two species are also different. The pores of *T. pavonia* are hardly visible to the naked eye, while they are easily seen and larger in the otherwise similar *T. villosa*.

13. **Trametes pubescens** (Schum.: Fr.) Pilát

Fig. 389


**Basidiocarps** annual, sessile or effused-reflexed, up to 6 cm wide, di-midiate, often in imbricate clusters, thin, coriaceous; upper surface tomentose to finely pubescent or almost glabrous, cream color to warm buff, azonate or faintly zonate; pore surface cream color to light ochraceous buff or sometimes becoming cinereous with age, the pores angular, 3–5 per mm; dissepiments becoming thin; context white to cream, tough-fibrous, up to 5 mm thick; tube layer cream colored to pale buff, up to 4 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, 2–6 μm wide, dominating in the surface tomentum; skeletal hyphae thick-walled to solid, hyaline to slightly tinted, 2–5 μm wide, most common in lower part of context and trama; binding hyphae tortuous, solid, hyaline, 1–2 μm wide, most common close to the base of the basidiocarp.

**Hyphal system** trimitic; generative hyphae with clamps, 2–6 μm wide, dominating in the surface tomentum; skeletal hyphae thick-walled to solid, hyaline to slightly tinted, 2–5 μm wide, most common in lower part of context and trama; binding hyphae tortuous, solid, hyaline, 1–2 μm wide, most common close to the base of the basidiocarp.
Trametes


Distribution. Transcontinental species from the Arctic to the southern states.

Remarks. The uniformly cream to buff, azonate and tomentose pileus distinguishes basidiocarps of *T. pubescens* from those of other species in the so-called *Coriolus* group. The microscopic characters of all these are virtually identical.

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Fig. 389. *Trametes pubescens* (RLG 5682). a, contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.


Basidiocarps annual, sessile, with a pleasant anise odor when fresh, usually solitary, dimidiate or elongate, up to 14 cm wide; pileus surface cream colored to buff, finely tomentose to glabrous, azonate, smooth, margin rounded; pore surface cream colored to pale buff, the pores circular to angular, 2–3 per mm, dissepiments thick and entire; context white to cream colored, soft-corky, zonate, up to 3.5 mm thick; tube layer concolorous with or slightly darker than the context, up to 1 cm thick.

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Fig. 390. *Trametes suaveolens* (J. Hine 7). a, Contextual generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.
Trametes

**Hyphal system** trinitic; contextual generative hyphae thin-walled, rarely branched, with clamps, 3–5 μm in diam; contextual skeletal hyphae thick-walled, nonseptate, rarely branched, 4–7.5 μm in diam; contextual binding hyphae thick-walled, much branched, 2.5–5 μm in diam; tramal hyphae similar.

Cystidia and other sterile hymenial elements lacking.

Basidia clavate, 4-sterigmate, 22–40 × 6–7 μm, with a basal clamp.

Basidiospores cylindrical, thin-walled, hyaline, smooth, negative in Melzer's reagent, 9–12 × 4–4.5 μm.

**Type of rot.** – White heartrot of living hardwoods and also on stumps.

**Cultural characteristics.** – See Nobles, 1948, 1958, 1965; Stalpers 1978.

**Sexuality.** Heterothallic and tetrapolar (Nobles, 1965).

**Substrata.** – Most common on Salix and Populus, also reported on Betula and Abies.

**Distribution.** Widely distributed in eastern and western forests over a wide range of latitude. Cosmopolitan species.

**Remarks.** The pleasant anise odor of fresh basidiocarps is very characteristic of this plant. The relatively large spores also provide a reliable character for identification. Little trouble should be experienced in distinguishing *T. suaveolens* from other *Trametes* with light-colored context, as their basidiocarps rarely attain the width and thickness typical of those of *T. suaveolens*.

15. *Trametes subectypus* (Murr.) Gilbn. & Ryv. 1923


Basidiocarps annual, pileate, sessile to dimidiate, applanate, flexible when fresh, rigid when dry, up to 10 cm wide and long, up to 5 mm thick at the base, margin thin; upper surface white to straw-colored, azonate to faintly zonate in almost unicolored zones, first adpressed velutinate, occasionally tomentose in a few narrow bands, soon becoming glabrous except for the margin; pore surface white, drying cream to straw-colored, pores angular, 5–7 per mm, dissepiments entire; tubes concolorous, up to 4 mm deep; context white, very thin, up to 1 mm thick.

**Hyphal system** trinitic; generative hyphae with clamps, 2–4 μm wide; skeletal hyphae abundant, straight, thick-walled, swelling in KOH to 11 μm wide, in Melzer's solution, 2–7 μm wide in the context, more narrow in the tramal; binding hyphae tortuous and strongly branched, solid, up to 5 μm in the main stems. Cystidia or other sterile hymenial elements lacking.

**Basidia** clavate, 4-sterigmate, 10–12 × 4–5 μm, with a basal clamp.

**Basidiospores** cylindrical, hyaline, 3.5–5 × 1–2 μm (test of Overholts 1953:371).

**Type of rot.** – White rot in dead hardwoods.

**Cultural characteristics and sexuality.** – Unknown.

**Substrata.** – Dead hardwoods in several genera.

**Distribution.** Known from a few southeastern states.

**Remarks.** It may be that *T. subectypus* ultimately must be merged with *T. ectypus* as a color-variety. The only spore measurement known is that of Overholts, and it may be that he was right in assuming that he measured young and unripe spores. If not so, they are smaller than those of *T. ectypus* and should be a reliable separating character between otherwise rather similar species.
16. Trametes trogii Berk. in Trog. Fig. 392

**Basidiocarps** annual, sessile, effused-reflexed or rarely resupinate, tough-corky, pilei up to 4 cm wide; upper surface of pileus coarsely hispid, cream-buff to ochraceous-buff, azonate or faintly zonate; pore surface ochraceous buff, the pores angular to labyrinthiform, up to 11 mm in diam; dissepiments thin and lacerate; context cream-buff, duplex, up to 2 mm thick, with a firm lower layer and soft spongy upper layer; tube layer concolorous and continuous with lower layer of context, up to 9 mm thick.

**Hyphal system** trimitic; contextual generative hyphae with clamps, thin-walled, with rare branching, 2-4 μm in diam; contextual skeletal hyphae thick-walled, with occasional branching, nonseptate, 3-4 μm in diam; contextual binding hyphae thick-walled, nonseptate, much branched, 2-3.5 μm in diam; tramal hyphae similar.

**Cystidia** or other sterile hymenial elements lacking.

**Basidia** clavate, 4-sterigmate, 25-33 x 6-9 μm, with a basal clamp.

**Basidiospores** cylindric, hyaline, smooth, IKI- , 10-12 x 2.5-4 μm.

**Type of rot.** – White rot of dead hardwoods; positive in gum guaiac solution.

**Cultural characteristics.** – See Nobles 1958; David 1967; Stalpers 1978.

**Sexuality.** – Heterothallic and tetrapolar (Stalpers 1978).

**Substrata.** – Dead hardwoods, most common on *Populus* and *Salix* (3, 20, 69, 145, 165).

**Distribution.** Northeastern U.S. and eastern Canada, also in the Southwestern U.S.

**Remarks.** Basidiocarps of *T. trogii* are similar to those of *Coriolopsis gallica*, but are generally paler in color.

17. Trametes versicolor (L.:Fr.) Pilat. Fig. 393

**Basidiocarps** annual, sessile or effused-reflexed, dimidiate, often in large imbricate clusters; upper surface hirsute to tomentose, highly variable in color, with sharply contrasted concentric zones of various shades of brown, buff, reddish-brown or bluish colors; pore surface cream-colored to cinereous, the pores angular to circular, 4-5 per mm, dissepiments thick; context cream-colored, tough-fibrous, with a thin black layer below the surface tomentum, up to 5 mm thick; tube layer concolorous and continuous with the context, up to 3 mm thick.

**Hyphal system** trimitic; contextual generative hyphae thin-walled, with clamps, 2.5-3 μm in diam; contextual skeletal hyphae thick-walled, nonseptate, 4-6 μm in diam; contextual binding hyphae thick-walled, nonseptate, much branched, 2-4 μm in diam; tramal hyphae similar.

**Cystidia** or other sterile hymenial elements lacking.

**Basidia** clavate, 4-sterigmate, 15-20 x 4-5 μm, with a basal clamp.

**Basidiospores** cylindric, slightly curved, hyaline, smooth, IKI-, 5-6 x
Trametes

Fig. 393. Trametes versicolor (RLG 9344). a, tramal generative hyphae; b, contextual skeletal hyphae; c, contextual binding hyphae; d, basidia; e, basidiospores.

1.5–2 μm.

**Type of rot.** – White rot of dead hardwoods. Positive in gum guaiac solution.

**Cultural characteristics.** – See Davidson et al. 1942; Nobles 1948, 1958, 1965; Bakshi et al. 1969; Stalpers 1978.

**Sexuality.** – Heterothallic and tetrapolar (Vandendries 1933).


**Distribution.** Throughout forest regions of North America. Circumglobal species.

**Remarks.** This is probably the most common wood rotting fungus on dead hardwoods throughout North America. Its basidiocarps are extremely variable in the color and other characters of the upper surface. *T. pubescens* basidiocarps are usually lighter in color, are thicker, and lack the blackish layer separating the upper tomentum.

**Fig. 394.** Trametes villosa (DES 14081). a, contextual generative hyphae; b, slender contextual binding hyphae; c, broad tramal binding hyphae; d, contextual skeletal hyphae; e, basidia; f, basidiospores.

18. **Trametes villosa** (Fr.) Kreisel


**Basidiocarps** annual, pileate, dimidiate to flabelliform, more rarely effused-reflexed, often fused laterally to form compound basidiocarps, flexible, up to 7 cm wide and long, up to 2 mm thick at the base; upper
Treuhspora

surface strigose to hirsute, white to unevenly pale to dirty brown, distinctly zonate with persistent tomentum, margin thin, undulated to lobed, often curled in dry specimens; pore surface white to cream, with age becoming more brownish, pores angular, thin-walled, 1–3 per mm, often slightly elongated radially in a characteristic way, dissepiments usually dentate to lacerate, tubes up to 1 mm deep, context white and thin.

Hyphal system trimitic; generative hyphae with clamps, hyaline, thin-walled, 1–2.5 μm wide; skeletal hyphae hyaline, thick-walled to solid, 2–5 μm wide; binding hyphae tortuous, solid, hyaline, common, 1–2.5 μm wide.

Cystidia or other sterile hymenial elements lacking, but hyphal pegs occurring.

Basidia clavate, 4-sterigmate, 10–15 × 4–6 μm, with a basal clamp.

Basidiospores cylindric to allantoid, hyaline, IKI-, 5.5–8.5 × 2.5–3.5 μm.

Type of rot. – White rot in conifers and hardwoods.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Common on dead conifers as well as hardwoods.

Distribution. – Southeastern United States, southwards in America to northern Argentina. In the paleotropical areas replaced by a similar species (T. pocas (Berk.) Ryv.) with shorter spores.

Remarks. Usually easy to recognize because of the thin pliable basidiocarp with a hirsute pileus and the large pores with dentate dissepiments. T. pavonia has much smaller pores, while T. hirsuta has thicker and larger basidiocarps with smaller pores.

Treuhspora Karst. emend Liberta.


Basidiocarps annual, resupinate, mostly soft and fragile, loosely attached; hymenial surface smooth to hydnaceous or poroid; hyphal system monomitc in most species; generative hyphae with clamps, commonly ampullate at some septa; cystidia present or absent; basidia clavate, 4-sterigmate; basidiospores globose to short-cylindric, smooth or ornamented with spines or warts, negative in Melzer’s reagent. Associated with white rots.

Type species: Treuhspora onusta Karst.

Treuhspora is a large genus in the family Corticiaceae and most species have a smooth to hydnaceous hymenial surface. Two North American species are distinctly poroid and are included here.


Fig. 395. Treuhspora mollusca (RLG 7477). a, subicular hyphae; b, basidia; c, basidiospores.

Key to poroid species of Treuhspora

1. Incrusted cystidia present in hymenium .......... 2. T. regularis
1. Cystidia absent from hymenium .......... 1. T. mollusca

1. Treuhspora mollusca (Pers.:Fr.) Liberta


Basidiocarps annual, resupinate, effused up to 6 cm, very soft and fragile, readily separable; margin white, often very thin, arachnoid, rhizomorphic; pore surface white to cream colored, the pores angular, 2–4 per mm, with thin, pubescent dissepiments that become lacerate with age; context white, azonate, soft, less than 0.5 mm thick; tube layer continuous and concolorous with the context, soft and fragile, up to 2 mm thick; taste mild.

Hyphal system monomitc; subicular hyphae thin-walled, hyaline, often ampullate and incrusted, frequently branched, with clamp connections, 2.5–5 μm in diam; tramal hyphae similar.

Cystidia and other sterile hymenial elements lacking.

Basidia short-cylindric, 4-sterigmate, 4.5–5.5 μm in diam, up to 14 μm long, with a basal clamp.

Basidiospores ovoid to subglobose, hyaline, IKI-, echinulate, 3.5–4.5 × 2.5–3.5 μm.

Type of rot – White rot of conifer and hardwood logs and slash; negative in gum guaiac solution.

Cultural characteristics. – See Nobles, 1958.

Sexuality – Unknown.
Trechispora

Substrata – Dead wood of hardwoods and conifers in numerous genera. (1, 3, 8, 97, 136, 138, 145, 153, 171, 190, 194, 196).
Distribution – Throughout the forest regions of North America. Circumglobal in forest regions.
Remarks – Trechispora mollusca occurs over a wide latitudinal range in North America. It is sympatric with T. regularis in the Southeast and can be differentiated by its lack of cystidia.

2. Trechispora regularis (Murr.) Liberta, Fig. 396
Basidiocarps annual, resupinate, effused up to several cm, soft and fragile, easily separated from substratum; pore surface white to cream colored, the pores angular, irregular, mostly 5-7 per mm but larger in some areas, with thin, floccose dissepiments; margin white, loosely floccose to arachnoid, with white mycelial strands or slender rhizomorphs; subiculum thin, soft, arachnoid, very thin; tube layer white to cream colored, soft and fragile, up to 2 mm thick.
Hyphal system monomitic; subicular hyphae thin-walled, hyaline, with frequent branching, with abundant clamps and some simple septa, often ampullate at the septa, 2–6 μm in diam.; tramal hyphae similar.
Cystidia abundant, cylindric, thin-walled, heavily incrusted with elongated crystals, 40–60 × 4–6 μm, with a basal clamp.

Basidia broadly clavate, 4-sterigate, 12–14 × 5–6 μm, with a basal clamp.
Basidiospores subglobose to ovoid, echinulate, hyaline, negative in Melzer’s reagent, 4–4.5 × 3–3.5 μm.
Type of rot – White rot of dead hardwoods.
Cultural characteristics – Unknown.
Sexuality – Unknown.
Substrata – Dead wood of several genera of hardwoods including Quercus.
Distribution – Mainly in the Gulf Coast Region up into the Central Hardwoods. Also in Central and South America.
Remarks – Trechispora regularis is quite similar to T. mollusca but is readily recognized by the conspicuous incrusted cystidia.

Trichaptum Murr.
Basidiocarps annual, resupinate, effused-reflexed or pileate; upper surface hispid to appressed tomentose, blackish, gray or dirty white; hymenophore iripoid, lamellate or poroid, mostly pale brownish to purplish when actively growing, tubes brownish, context distinctly duplex, lower part dense and dark, upper part white and loose; hyphal system dit- to trimitic; generative hyphae with clamps; skeletal hyphae dominant in the basidiocarps; binding hyphae rarely present, apparently absent or at least very difficult to demonstrate; cystidia present in the hymenium, thin- to thick-walled, subulate to clavate, smooth or apically incrusted; spores cylindrical, often slightly bent, smooth, hyaline, IKI-, thin-walled. On both conifers and hardwoods, causing a white rot. Cosmopolitan genus.
Type species: Polyporus trichomallus Berk. & Mont. (a synonym of Trichaptum perrottetii (Lév.) Ryv. – based on the same type specimen).
Remarks. The genus is characterized by the purplish to violet pore surface in actively growing specimens, paling to buff or pale brown in age and on drying. Microscopically the dimitic hyphal system, the cylindrical spores and the cystidia are diagnostic. The genus is unique in the Polyporaceae as the parenthosome in the dolipore apparatus is reported to be imperforate (Traquair & McKeen 1978, Moore 1984). So far, this feature has only been demonstrated in polyporoid fungi in the Hymenochaetaceae. Its phylogenetic significance is unclear.
Trichaptum

**Key to species**

1. Hymenophore lamellate to distinctly hydnoid ........................................ 2
2. Hymenophore poroid, sometimes with lacerate dissepiments .......................... 4
3. Hymenophore lamellate ................................................................................. 5
4. Basidiocarps petaloid, fanshaped to dimidiate; on hardwoods ......................... 2. **T. biforme**
5. Basidiocarps resupinate, effused-reflexed or sessile; on coniferous wood ........ 4. **T. fusco-violaceum**
6. Pores angular, 1–3 per mm; pileus, if present, hispse to coarsely strigose .......... 5
7. Pores angular to round, 3–6 per mm; pileus, if present, hispse to adpressed tomentose 6
8. Pileus strigose to hispse with dark brown to black hairs; basidiocarps sessile, up to 10 cm wide ....................................................... 6. **T. perrottetii**
9. Pileus hispse with gray to pale brown hairs; basidiocarps resupinate, effused-reflexed or sessile, up to 3 cm wide 3. **T. byssogenum**
10. Pore surface gray to black; southern-tropical species ................................. 7. **T. sectore**
11. Basidiocarps dimidiate to fanshaped, up to 6 cm wide, on hardwoods .......... 2. **T. biforme**
12. Basidiocarps resupinate, effused-reflexed to broadly sessile, rarely more than 1 cm wide, on coniferous wood, very rarely on hardwoods ........................ 1. **T. abietinum**


**Basidiocarps** annual, usually effused-reflexed, sometimes sessile or resupinate, pilei solitary or imbricate, often laterally fused, up to 1.5 × 8 × 0.2 cm; upper surface gray, hispse, azonate, smooth; margin concolorous; pore surface bright purplish, fading to ochraceous, rough, the pores angular, 4–6 per mm, with, thick, entire dissepiments that become thin and deeply lacerate with age, context usually less than

1 cm thick, duplex, the upper layer whitish, floccose, soft, the lower layer white, firm, tough-fibrous; tube layer concolorous and continuous with the lower layer of the context, up to 1.5 mm thick.

**Hyphal system** dimitic; contextual skeletal hyphae thick-walled, hyaline, with rare branching, nonseptate, 2.5–5 μm in diam; contextual generative hyphae thin-walled, hyaline, rarely branched, with clamps; 2–4 μm in diam; trama hyphae similar.

**Cystidia** abundant, usually capitately incrusted, imbedded or projecting to 15 μm, 4–7 μm in diam, arising from imbedded trama skeletal hyphae that curve out into the hymenium; hyphal pegs also present.

**Basidia** clavate, 4-sterigmate, 12.5–14 × 5–6 μm, with a basal clamp.

**Basidiospores** cylindric, slightly curved, hyaline, smooth, IKI–, 6–7.5 × 2.5–3 μm.

**Type of rot.** – White pocket rot of dead sapwood of conifers. The
Trichaptum

pockets are hollow and the wood becomes fragile and lacy in the late stages of decay.

Cultural characteristics. – See Raestad 1940; Robak 1942; Nobles 1948, 1958, 1965; Baxter 1948; Stalpers 1978.

Sexuality. – Heterothallic and tetrapolar (Robak 1942, Fries and Jonasson 1941; Macrae 1967, Magasi 1976).

Substrate. – Dead sapwood of conifers (1, 38, 54, 93, 97, 102, 136, 148, 171, 190, 194). Overholts (1953) reports occasional occurrence on hardwoods.

Distribution. Throughout coniferous forest regions of North America and circumglobal in the North Temperate Zone.

Remarks. Overholts' concept of *T. abietinum* included the taxon included here as *T. fusco-violaceum* and, as *P. abietinus* var. *abietis*, the taxon included here as *T. laricinum*. We accept the opinion of Macrae (1967), who carried out infertility tests and other comparative studies and concluded they are best considered as three distinct species. Magasi (1976) also reported the poroid, irpiciform, and lamellate forms were intersterile populations. *T. abietinum* is very similar to the common *T. biforme* found on hardwood slash. Basidiocarps of the latter species tend to be much wider than those of *T. abietinum*, are usually attenuated to a narrow base, and have a tomentose or glabrous upper surface. *T. subchartaceum* differs in having much thicker basidiocarps with a persistently poroid lower surface and is restricted to *Populus*. The restriction to sapwood is remarkably consistent, and *T. abietinum* basidiocarps often form a complete ring over the entire sapwood surface on the ends of large logs.

2. *Trichaptum biforme* (Fr. in Kl.) Ryv.


Basidiocarps annual, sessile; pilei solitary or imbricate, dimidiate to flabelliform or petaloid, up to 6 cm wide and 3 mm thick; pileus surface gray to buff, hirsute to glabrous with age, zonate; margin acute; pore surface purple to violaceous or fading to pale buff, often becoming irpiciform, the pores angular, 3-5 per mm; dissepiments becoming thin and lacerate or splitting to form spines; context pale buff, azonate, tough-fibrous, up to 1.5 mm thick; tube layer violaceous or concolorous with context, up to 2 mm thick.

Hyphal system dimitic; contextual generative hyphae thin-walled, with clamps, occasionally branched, 2.5-6 µm in diam; contextual skeletal hyphae thick-walled, nonseptate, rarely branched, 3-6 µm in diam;

Cystidia abundant, slightly thick-walled, fusoid, apically incrusted, 20-35 × 3-5 µm and projecting to 20 µm, with a basal clamp; thick-walled, clavate, sterile elements infrequent in hymenial layer.

Basidia clavate, 4-sterigmate, 12-22 × 4-5.5 µm, with a basal clamp.

Basidiospores cylindrical, slightly curved, hyaline, smooth, IKI-6-8 × 2-2.5 µm.

Type of rot. – White pocket rot of sapwood of dead hardwoods. The wood becomes lacy and fragile with small empty pockets.

Cultural characteristics. – See Davidson et al. 1942; Nobles 1948, 1958, and 1965; Macrae 1967; Bakshi et al. 1969; Stalpers 1978.

Sexuality. – Heterothallic and tetrapolar (Nobles et al. 1957).

Substrata. – Dead hardwoods in many genera, rarely on conifers (3, 8, 9, 10, 20, 25, 26, 27, 36, 47, 58, 69, 75, 78, 79, 89, 92, 93, 97, 104, 

Fig. 398. *Trichaptum biforme* (RLG 15711). a, contextual generative hyphae; b, contextual skeletal hyphae; c, thick-walled elements from subhymenium; d, schematic drawing of hymenium; e, cystidia; f, basidia; g, basidiospores.
Trichaptum


Distribution. Apparently in all states of the U.S. and all provinces of Canada. Circumglobal species.

Remarks. This is one of the most common polypores in North America, especially in the eastern hardwood forests. Basidiocarps of *T. biforme* are similar to those of *T. abietinum*, the common *Trichaptum* species on conifers. However, *T. abietinum* basidiocarps have a gray, hirsute upper surface and retain the purplish color of the hymenophore longer. They also tend to be thicker and dimidiate rather than petaloid.

*Trichaptum subchartaceum* basidiocarps are larger with a thick context and persistently poreid hymenophore, and found only on *Populus*.

3. **Trichaptum byssogenum** (Jungh.) Ryv.  

Fig. 399  

**Basidiocarps** annual, resupinate to effused-reflexed or sessile; upper surface matted-tomentose to hispid or strigose, tomentum chestnut brown, wearing away, surface finally grayish tan, coarsely strigose; pore surface purplish when fresh, dull purplish brown on age and drying, the pores circular to angular, 1–2 per mm, with thick entire dissepiments that become thin and lacerate, context pale woodbrown, soft, spongy and fibrous, up to 3 mm thick; tube layer sharply distinct from context, pale wood brown, rarely two-layered, up to 1 cm thick.

**Hyphal system** dimitic; contextual generative hyphae thin-walled, with inconspicuous clamps, 2–3.5 μm in diam; contextual skeletal hyphae hyaline, thick-walled, aseptate or with rare clamps, with rare branching, 2–4 μm in diam; tramal hypha similar.

**Cystidia** abundant, fusoid, thin- to moderately thick-walled, capitately incrusted, 15–35 × 3–6 μm.

**Basidia** clavate, 4-sterigmate, 14–17 × 5–6 μm, with a basal clamp.

**Basidiospores** cylindric, slightly curved, hyaline, smooth, IKI–, 5.5–8 × 2.5 μm.

**Type of rot.** – White pocket rot of dead conifers and hardwoods. The advanced stage of decay is characterized by empty pockets separated by very thin, fragile wood.

**Cultural characteristics.** – See Bakshi et al. 1969; Stalpers 1978.

**Sexuality.** – Unknown.

**Substrata.** – Evidently more common on juniper and bald cypress than on other substrata, but also known on a few other genera of conifers and hardwoods. Bakshi (1957) reports *T. byssogenum* (as *Polyporus versatilis*) to cause a severe decay of pine shingles on the roof of the Forest Research Institute in Dehra Dun. (93, 138, 146, 153, 187).

**Distribution.** Southern U.S. from Arizona to Florida and in the tropics.

**Remarks.** The large pores, loosely fibrous context, and the abundant encrusted cystidia characterize *T. byssogenum*. Apparently all of the *Trichaptum* species cause a similar fragile, lacy white pocket rot with empty pockets.

4. **Trichaptum fusco-violaceum** (Fr.) Ryv.  

Fig. 400  

**Basidiocarps** annual, usually effused-reflexed, rarely sessile or resupinate; pilei single or imbricate, often laterally fused, up to 1.5 × 8
Trichaptum fuscoviolaceum (RLG 13983). a, contextual generative hyphae; b, contextual skeletal hyphae; c, schematic drawing of hymenium; d, cystidia; e, basidia; f, basidiospores.

x 0.3 cm, upper surface white to gray, tomentose to slightly hirsute, azonate, margin white to pale brown; hymenophore with radially elongated and lacerate, short lamellae, along the margin irregular before a splitting occurs as the walls develop into teeth, bright purplish when fresh, fading to ochraceous or pale brown by age or drying, core of teeth pale brown and dense; context less than 1 mm, usually duplex with a lower layer with color and consistency as tubes, and an upper white, dense, cottony layer integrading with the tomentum on top.

Hyphal system dimitic; contextual skeletal hyphae thick-walled, nonseptate, with rare branching, 2.5–5 μm in diam; contextual generative hyphae thin- to thick-walled, with clamps, rather inconspicuous in mature specimens, 2–4 μm in diam; tramal hyphae similar.

Cystidia abundant, thick-walled, capitately incrusted, broadly fusoid, 4–6 μm in diam and imbedded or projecting to 10 μm; tramal skeletal hyphae that curve out into the hymenium; hyphal pegs also present.

Basidia clavate, 4-sterigmate, 12.5–14 x 5–6 μm, with a basal clamp.

Basidiospores cylindrical, slightly curved, hyaline, smooth, IKI-, 6–7.5 x 2.5–3 μm.

Type of rot. — White pocket rot of sapwood of dead conifers.

Cultural characteristics. — See Raestad 1940, Robak 1948, Macrae 1967.

Sexuality. — Heterothallic and tetrapolar (Raestad 1940, Robak 1942, Macrae 1967).

Substrata. — Dead sapwood of conifers. *Pinus* seems to be a preferred host, also on *Abies* and *Tsuga*.

Distribution. Throughout the coniferous forest regions of North America and circumglobal in the Northern Temperate zone.

Remarks. — Morphologically this species is separated from *T. abietinum* only by the hydnoid hymenophore. See remarks under the latter species.

5. *Trichaptum laricinum* (Karst.) Ryv. Fig. 401


Basidiocarps annual, sessile, effused-reflexed or resupinate, thin but rigid; upper surface tan to gray, hirsute, faintly zonate; lower surface purplish, brown in dried specimens, with distinct radial lamellae, sometimes poroid near the margin; context pale purplish-brown, coriaceous, less than 1 mm thick, continuous with the lamellar trama; lamellae up to 3 mm deep in vertical sections.

Hyphal system dimitic; contextual skeletal hyphae thick-walled, nonseptate, with rare branching, 3–5 μm in diam; contextual generative hyphae thin- to thick-walled, with clamps, rather inconspicuous in mature specimens, 2–4 μm in diam; tramal hyphae similar.

Cystidia abundant, thick-walled, capitately incrusted, broadly fusoid, 4–6 μm in diam and imbedded or projecting to 10 μm; tramal skeletal hyphae that curve out into the hymenium; hyphal pegs also present.

Basidia clavate, 4-sterigmate, 18–20 x 4–5 μm, with a basal clamp.

Basidiospores allantoid, hyaline, smooth, IKI-, 6–7 x 2–2.5 μm.

Type of rot. — White pocket rot of sapwood of dead conifers.


Sexuality. — Heterothallic and tetrapolar (Macrae 1967).

Substrata. — Sapwood of dead conifers (1, 97, 136, 138, 148).

Distribution. — Widely distributed in North American boreal conifer forests from Newfoundland to British Columbia. Also in North Europe.
Trichaptum

Fig. 401. Trichaptum laricinum (RLG 4665). a,) contextual generative hyphae; b, contextual skeletal hyphae; c, schematic drawing of hymenium; d, cystidia; e, basidia; f, basidiospores.

and Asia.

Remarks. Macrae and Aoshima (1966) give a complete listing of synonyms of *T. laricinum*. Macrae (1967) carried out infertility tests with homokaryons from poroid, irpiciform, and lamellate specimens of the *T. abietinum* complex and concluded they are best considered as three distinct species. These are represented by *T. abietinum* (poroid), *T. fusco-violaceum* (irpiciform), and *T. laricinum* (lamellate) in this flora. Overholts (1953) included this taxon as *Polyporus abietinus* var. *abietis*.

6. Trichaptum perrottetii (Lév.) Ryv.


Basidiocarps applanate, sessile, semicircular to elongated, shelf-like, mostly broadly-attached, usually not decurrent on the substratum, 5-15 cm long, 3-7 cm wide and up to 8 mm thick (tomentum not measured), tough and flexible; upper surface with a dense, strigose or hirsute layer of forked hairs, dark brown, becoming darker towards the base and more grayish towards the margin, azonate or weakly-zonate, up to 10 mm thick at the base; margin entire and sharp; pore surface at first violet, on drying becoming snuff brown, pores angular to round, first entire and thin-walled, 2-3 per mm, in older specimens with incised dissepiments, coalescing and in parts sinuous to daedaleoid, in the latter case up to 2 mm wide and several mm long; tubes deep brown, 2-5 mm deep; context very thin, 0.1-0.4 mm, brown to dark ochraceous.

**Hyphal system** dimitic; generative hyphae thin-walled, hyaline and with clamps, 2-4 μm wide; skeletal hyphae abundant, thick-walled to...
solid, nonseptate, mostly yellowish to light brown, 3–5 μm wide.

Cystidia abundant in the hymenium, clavate to ventricose with a tapering apex, smooth or with an apical crown of crystals, 10–18 μm long, slightly projecting.

Basidia clavate, 12–15 × 4–6 μm, 4 sterigmate, with a basal clamp.

Basidiospores cylindrical to oblong ellipsoid, hyaline, smooth, thin-walled, IKI-, 5–7 × 2–3(3.5) μm.

Type of rot. – White rot in dead hardwoods.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Hardwoods of many genera in the tropics.

Distribution. In United States known only from Florida, widespread in tropical America south to Argentina.

Remarks. This species is easy to recognize in the field due to the dense dark mat of stiff hairs on the pileus and the violet to brown pore surface. T. byssogenus has a much grayer pileus and less thinner tomentum on the pileus and is normally effused-reflexed. Microscopically the two species are similar.

7. Trichaptum sector (Ehrenb.:Fr.) Kreisel

Fig. 403


Basidiocarps annual, pileate, broadly attached or dimidiate to flabelliform, single or imbricate, coriaceous when fresh, flexible when dry, up to 5 cm wide and long, 1–4 mm thick, several basidiocarps often fused laterally; upper surface white to ochreous buff, zonate, adpressed velutinate to tomentose, often slightly shiny and radially fibrilate (lens); margin wavy when fresh, curled in when dry, pore surface gray, dark purplish brown to almost black, pores angular 3–6 per mm, often slightly dentate to lacerate in mature specimens; tubes concolorous, up to 1 mm deep; context duplex, lower part denser and almost as dark as the tube layer, upper layer white to gray and cottony, 1–2 mm thick.

Hyphal system trimitic; generative hyphae with clamps, 2–6 μm wide, dominating in the tomentum of the pileus; skeletal hyphae thick-walled, pale brown, nonseptate, mostly parallel, 2–4 μm wide; binding hyphae solid, tortuous, much branched, 1–2 μm wide.

Cystidia present in the hymenium, clavate to fusiform, thick-walled, capitately encrusted, embedded to slightly projecting, 15–20 × 4–7 μm.

Basidia clavate, 4-sterigmate, 8–12 × 4–6 μm, with a basal clamp.

Basidiospores cylindric-oblong to ellipsoid, hyaline, IKI-, 6–7 × 2–3 μm.

Type of rot. – White rot dead in hardwoods.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Dead hardwoods of many different genera, rarely on conifers (38, 104, 120, 124, 153).

Distribution. In United States known in the southeastern States to east Texas, widespread in tropical America south to northern Argentina. A very common species.

Remarks. The species is usually easy to recognize because of the dark pore surface and the small subshiny white to pale buff basidiospores.

2.5 μm.

8. Trichaptum subchartaceum (Murr.) Ryv.

Fig. 404

Trichaptum

Fig. 404. Trichaptum subchartaceum (PDK 536). a, contextual generative hyphae; b, contextual skeletal hyphae; c, cystidia; d, basidia; e, basidiospores.

Basidiocarps annual, effused-reflexed or sessile, dimidiate to elongate, often laterally fused, up to 6 cm wide and 1 cm thick; pileus surface gray to pale buff, hirsute to adpressed-strigose, azonate; margin rounded; pore surface purple to violaceous or fading to pale buff, the pores circular to angular, 3-4 per mm; dissepiments at first thick and entire, becoming thin and lacerate with age; context pale buff, duplex, upper layer soft, fibrous, azonate; up to 2 mm thick; lower layer firm, corky, faintly zonate, up to 5 mm thick; tube layer violaceous or fading to buff, up to 3 mm thick.

Hyphal system dimitic; contextual generative hyphae thin-walled, with clamps, 2.5-3.5 μm in diam; contextual skeletal hyphae thick-walled, hyaline, nonseptate, 2.5-6 μm in diam; trama hyphalae similar.

Cystidia abundant, thin- to slightly thick-walled, cylindric, apically incrusted, 5-7 μm in diam and projecting to 20 μm, with a basal clamp.

Basidia clavate, 4-sterigmate, 18-25 × 5.5-7 μm, with a basal clamp.

Basidiospores cylindric, slightly curved, hyaline, smooth, IKI-, 7.5-11 × 2-3 μm.

Type of rot. - White pocket rot of aspen and cottonwood logs and slash.

Cultural characteristics. - Unknown.

Sexuality. - Unknown.

Substrata. - Restricted to dead Populus and common on aspen and cottonwood.

Distribution. - A boreal fungus, in northern parts of eastern North America, and throughout the range of aspen in Western mountains from Arizona to Alaska.

Remarks. - This species is readily identified in the field by its violaceous pore surface, thick basidiocarps, and restriction to Populus. Trichaptum biforme may be sympatric but has thin, often petaloid and flabelliform basidiocarps that occur on many hardwoods and develop a hydnaceous hymenophore at maturity.

Tyromyces Karst.

Rev. Mycol. 3, no. 9:17, 1881.

Basidiocarps annual, pileate to resupinate, shortlived and sappy when fresh, usually rigid and fragile when dry, often with shrinking, taste mild to bitter; upper surface mostly white, drying darker; pore surface white to cream, drying darker; hyphal system mono- or dimitic; generative hyphae with clamps; gloeoplerous hyphae present in some species; cystidia absent, but cystidioles sometimes present, spores hyaline, thin-walled, allantoid to ovoid, IKI-, on hardwoods or conifers, causing a white rot. Cosmopolitan genus.

Type species: Tyromyces chioneus (Fr.) Karst.

Remarks. - The genus is restricted to species with generally white, pileate, and shortlived basidiocarps with clamped generative hyphae and a white rot. Some species have a restricted number of skeletal hyphae in the trama. Future research may show a closer relationship to species in Ceriporiopsis which includes resupinate species with more or less the same characteristics. In both genera, no true cystidia are known, no structures react to Melzer's reagent, and all spores are hyaline and thin-walled. Thus, there are rather few characteristics left for a further splitting of the genera. From numerous other genera we know that macromorphological characters such as pore shape and size, type of basidiocarp, type of tomentum etc. are easily adaptable characters of little value on a generic level.
Key to species
(If in doubt as to type of rot, see also Oligoporus)

1. Basidiocarp pendent
   1. T. cerifluus
2. Basidiocarp sessile-dimidiate
   2
3. Spores cylindrical
   3
4. Spores ovoid-ellipsoid
   4
5. Spores 1.5–2 μm wide; pores 3–5 per mm
   5
6. Spores 1–1.5 μm wide; pores 6–9 per mm
   6
7. Basidiocarp orange to apricot-red
   7. T. kmetii
8. Basidiocarp white, cream to sordid pale brown
   8. T. leucomallus
9. Basidiocarp range to apricot-red
   9. T. chioneus
10. Basidiocarp up to 5 mm thick; chlamydospores absent from context
    10. T. subgiganteus

7. Basidiocarp with odor of anise when fresh; pores 2–4 per mm, pore surface brown when bruised
   6. T. humeana
8. Spores 4–5 × 2.5–3.5 μm
   9. T. pseudolacteus
9. Spores 2.5–4 × 2–3 μm
   9
10. Spores 2.5–3 × 2–2.5 μm, pore surface white to pale ochraceous when dry; hyphae of context without short side-branches
    5. T. galactinus
11. Spores 3–4 × 2–3 μm; pore surface often greenish to pale ochraceous when dry, hyphae of context with short blunted sidebranches
    4. T. fumidiceps

Symbols for species of Tyromyces in synoptic key

1, T. cerifluus 5, T. galactinus 9, T. pseudolacteus
2, T. chioneus 6, T. humeana 10, T. subgiganteus
3, T. fissilis 7, T. kmetii 11, T. subpendulus
4, T. fumidiceps 8, T. leucomallus

Synoptic key to species of Tyromyces

Habit of basidiocarps
a. sessile 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
b. effused-reflexed 4, 9
c. pendent 1

Pileus characters
a. dimidiate 2, 3, 4, 5, 6, 7, 8, 9
b. elongated 4, 7
c. imbricate 1, 3, 5, 10
d. solitary 1, 2, 4, 5, 7, 9, 10
e. applanate 2, 3, 6
f. ungulate 2

Pileus surface
a. glabrous 1, 2, 6
b. pelliculose 1, 2
c. tomentose to pubescent 3, 4, 6, 7, 8, 9
d. fibrillose to strigose 5, 8
e. hirsute to hispid 10
f. scupose to rough 3, 4, 5, 7, 8, 9, 10
g. white to cream colored 1, 2, 3, 5, 6, 8, 9, 10
h. yellowish to buff or orange 1, 4, 5, 6, 7, 10
i. radially striate 4

Pore surface
a. white to cream colored 1, 2, 3, 4, 5, 6, 8, 9, 10
b. yellowish to buff or orange 4, 7, 9
c. discoloring on bruising or drying 2, 3, 5, 6, 7
d. pores 1–5 per mm 1, 2, 3, 6, 7, 10
e. pores 5–10 per mm 4, 5, 8, 9

Context
a. white to cream colored or pinkish 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
b. yellowish to buff or pale brown 5, 6
c. fibrous or fissile 2, 3, 5, 6, 9, 10
d. cheesy or friable 4, 7, 8
e. zonate 1, 3, 5, 9
f. less than 1 cm thick 1, 7, 8, 10
g. more than 1 cm thick 2, 3, 4, 5, 6, 8, 9
h. duplex 2, 4, 5, 7, 8

Hyphal characters
a. thin-walled 5, 6, 7
b. thin- to thick-walled 1, 2, 3, 4, 5, 6, 8, 9, 10
c. gloeoplerous hyphae present 8, 11
d. monomitic 1, 3, 4, 5, 6, 7, 8, 9, 10
e. dimitic 2

Basidiospores
a. cylindric to allantoid 2, 8
b. oblong to ellipsoid 1, 4, 5, 6, 7, 9
c. subglobose 3, 10
Tyromyces

1. Tyromyces cerifluus (Berk. & Curt.) Murr.


Basidiocarp annual, pendent to sessile, single or imbricate, attached by a dorsal contraction of the pileus, soft when fresh, fragile when dry, taste bitter, up to 4 cm wide and long, 5 mm thick at the central point of attachment or base; upper surface white, drying sordid cream to pale brown, often with some scattered darker spots, sometimes with a thin pellicle of agglutinated hyphae, first velvety, soon glabrous or finely radially fibrous; pore surface white, drying sordid pale brown or pale straw-colored, margin often distinct and curved when dry, pores angular to irregular, 2–4 per mm, with age split and lacerate; tubes fragile, darker than the context as if soaked with a resinous substance; context white to cream, soft when fresh, drying denser and sometimes with a resinous layer or cartilaginous thin zones, up to 3 mm thick.

Hyphal system monomitic; generative hyphae with clamps, in the context 3–6 μm wide and sparingly branched, in the trama rarely above 4 μm wide.

Cystidia and other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, with a basal clamp, 15–22 × 5–6 μm.

Basidiospores cylindric to oblong ellipsoid, hyaline, IKI–, 3–5 × 1.5–2.3 μm.

Type of rot. – Unknown.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Dead hardwood logs.

Distribution. Known only from the type collection from hardwood logs in South Carolina.

Remarks. In macromorphology this species is similar to O. subpendulus which, however, has much smaller pores, slightly wider spores and gloeoplerous hyphae in the trama. Fresh collections of T. cerifluus are desirable as the type of rot is unknown and the species comes rather close to some species placed in Oligoporus in this flora.

2. Tyromyces chioneus (Fr.) Karst. Fig. 406


Basidiocarp annual, pileate, applanate to slightly convex, tubes usually not decurrent, broadly attached to semicircular and dimidiate, more rarely spathulate, single or a few specimens together, up to 8 cm broad and 10 cm wide, 0.5–2 cm thick, soft and fleshy when fresh, drying rather hard and brittle, taste mild and with a slight aromatic scent when fresh; upper surface azonate, first whitish and finely tomentose, soon becoming glabrous as the hyphae agglutinate, then finely scurpice and warded, cream, light yellowish, or pale grayish to straw-colored as the agglutination proceeds there develops a smooth pellicle which on drying becomes radially to irregularly wrinkled, in old specimens rather distinct in section, in age somewhat discolored and then dirty
Tyromyces

Fig. 406. Tyromyces chioneus (RLG 9750). a, trama generative hyphae; b, trama skeletal hyphae; c, contextual generative hyphae; d, cystidiolae; e, basidia; f, basidiospores.

yellowish to pale sordid gray; pore surface white to pale cream, slightly shiny, drying somewhat darker, pores angular to round and mostly thin-walled, 3–4(–5) per mm; tubes concolorous with pore surface, up to 8 mm deep; context white and dense in dry condition, usually distinctly thicker than the tubes, up to 1.5–2 cm thick at the base.

*Hyphal system* dimitic; generative hyphae with clamps, in the context intricately branched and twisted and difficult to separate in long sections, sidebranches partly as tube-like hyphae, often separated by a septum, but also with repeated branchings, these hyphae are very characteristic and diagnostic for the species, they are randomly oriented, occasionally mixed with more unbranched, long hyphae, both types with rather numerous clamps, thin- to thick-walled, 3–8 μm wide, in parts collapsed, in the trama more or less parallel and more straight, mostly 2–4 μm wide; skeletal hyphae straight, thick-walled, 2–4.5 μm, present only in the trama.

*Cystidia* absent, fusoid cystidiolae presen, 9–13 × 4–5 μm.

*Basidia* clavate, 4-sterigmate, with a basal clamp, 10–15 × 4–5 μm.

*Basidiospores* cylindrical to slightly bent, hyaline, smooth, thin-walled and IKI–, mostly 4–5 × 1.5–2 μm.

*Type of rot.* White rot in dead hardwoods.

*Cultural characteristics.* See Nobles (1948); Stalpers (1978); David (1980).

3. Tyromyces fissilis (Berk. & Curt.) Donk

Fig. 407. Tyromyces fissilis (RLG15000). a, thin-walled contextual generative hyphae; b, thick-walled contextual generative hyphae; c, chlamydospores; d, basidia; e, basidiospores.

Sexuality. – Tetrapolar (David 1980).


Remarks. The slightly applanate, short-lived basidiocarp, frequently with a thin yellowish pellicle, provides the basis for a field determination. Microscopically the branched generative hyphae of the context and the slightly wider spores will separate it from the often confusingly similar *O. tephroleucus.*

Polyergus fissilis (Berk. & Curt.), Hooker's J. Bot. 1:234, 1849.

*Basidiocarp* annual, pileate, broadly attached, single, imbricate or more compound with several pilei along a common base, applanate to semi-hoofshaped and triquetrous in section, up to 10 cm wide and 20 cm long (in compound fruitbodies even larger), 4–12 cm thick at the base, sappy to waxy and tough when fresh, dries slowly with considerable shrinking and becoming dense and hard, then with a pleasant
Tyromyces

and sweet smell; upper surface tomentose to pubescent, often scrobiculate, to tufted, uneven and undulating, first white, then cream to ochraceous, sometimes with a pinkish tint, margin thick to thin, rounded or sharp; pore surface white, often with pinkish tints, drying creamish, pores round to angular, 2-3 per mm; tubes up to 25 mm deep, brown, dense, color much darker than the context, greasy and shiny when dry, stains paper in contact with sectioned tubes; context whitish, pinkish, or cream, drying slightly darker to pale amber or pallid straw-colored, often with fine radial zones, up to 5 cm thick.

**Hyphal system** monomitic; generative hyphae with clamps, thick to thin-walled, 3.5-6 μm wide, often with many small hyaline to pale yellowish crystals, hyphae of the context agglutinated in cordons or strings connected with looser or randomly arranged hyphae.

**Basidia** clavate, 4-sterigmate, 15-20 × 4-6 μm.

**Basidiospores** ellipsoid to subglobose, smooth, thin-walled, hyaline, IKI-, 4-6 × 3-4 μm.

**Chlamydospores** present in the context, globose, slightly thick-walled and non-amyloid, 4-10 μm in diameter.

**Type of rot.** - White rot of living hardwoods.

**Cultural characteristics.** - See Davidson et al. 1942; Stalpers 1978; Siepmann 1971.

**Sexuality.** - Heterothallic and bipolar (Stalpers 1978).

**Substrata.** - Living hardwoods or rarely on dead trees, particularly common on *Quercus* in the Southeastern U.S. (3, 26, 75, 104, 124, 143, 152, 153).

**Distribution.** Eastern Canada and United States. Known also from Europe.

**Remarks.** The large sappy and partly waxy basidiocarps that dry with considerable shrinking, staining the paper in which they are wrapped, makes this rather easy to recognize.

4. **Tyromyces fumidiceps** Atk.


**Basidiocarps** annual, sessile or effused-reflexed, semicircular to fan-shaped, single or imbricate, separable, 1-4 cm wide, 2-6 cm long and up to 1 cm thick at the base, soft and watery when fresh, fragile, more rigid when dry, with a fragrant scent when fresh; upper surface convex, azonate, gray, buff to pale brown, first hispid to tomentose, with age becoming scrobiculate to tufted, especially towards the base, often radially striate or undulated when dry; pore surface white to wood-colored, often with an olive to greenish tint, pores angular, thin-walled, in old specimens often slightly lacerated, 4-6 per mm; tubes up to 10 mm deep, concolorous with pore surface when fresh, cream to ochraceous when dry, inside of tubes often covered with numerous crystals (strong lens); context white, slightly colored towards the upper surface, 4-20 mm thick, friable.

**Hyphal system** monomitic; generative hyphae with clamps, often with irregular lumen, hyphae of context with numerous short sidebranches, the upper ones randomly oriented, the central ones more or less parallel to the pileus surface, 2.5-6 μm wide, those of the trama also with short sidebranches, 1.5-3.5 μm.

**Cystidia** absent; pointed cystidioles present among the basidia.

**Basidia** clavate, 4-sterigmate, with a basal clamp, 10-18 × 4.5-6 μm.

**Basidiospores** ellipsoid to ovoid with attenuated base, smooth, with an oil-drop, IKI-, 3-4 × 2-3 μm.

**Type of rot.** - Reported positive for laccase by Nobles (1958), Stalpers (1978) and David and Duhem (1986). Some of our collections are associated with a brown rot.

**Cultural characteristics.** - See Nobles 1958; Stalpers 1978; David and Duhem 1986.

**Sexuality.** - Tetrapolar (David and Duhem 1986).

**Substrata.** - Dead hardwoods, seemingly restricted to annually flooded areas along lakes and streams (3, 20, 69, 75, 165, 190, 195).

**Distribution.** Eastern United States and Canada. Rare in Europe.

**Remarks.** The small ellipsoid spores, the short sidebranches of the hyphae in the context, the often greenish pore surface, and the habitat should aid the identification.
Tyromyces

5. Tyromyces galactinus (Berk.) Lowe


Basidiocarp annual, sessile, single or imbricate, semicircular, broadly attached or dimidiate, up to 8 cm wide, 12 cm long and 1–3 cm thick at the base, soft, watery and sappy when fresh, rigid when dry, taste mild, with a slight fragrant odor when fresh; upper surface white to pale gray when fresh, becoming more yellow to pale ochraceous when dry, first strigose to tomentose, by age and drying more tufted to scupose, especially towards the base, more consistently tomentose towards the margin, normally azonate; pore surface white to cream, more yellowish to pale ochraceous when dry, pores thin-walled, angular, entire to lac-terate or denticulate with age, 4–6 per mm; tubes up to 10 mm deep, concolorous with pore surface; context slightly duplex, lower part dense and zonate, often with a few resinous bands and drying cartilaginous, upper part looser and more fibrous.

Hyphal system monomitic; generative hyphae with clamps, in the context thin-walled, 2–5 μm wide.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigate, 12–16 × 4–6 μm, with a basal clamp.

Basidiospores thin-walled, hyaline, ellipsoid to oval, IKI-, 2.5–3 × 2–2.5 μm.

Type of rot. – White rot in dead hardwoods.


Sexuality. – Heterothallic and bipolar (Nobles et al. 1957).

Substrata. – Dead deciduous wood (8, 20, 69, 75, 104, 143, 145, 147, 148, 153, 165).


Remarks. In the field the species may be recognized by the white sappy basidiocarp with a fragrant odor and a strigose to hispid pileus. The context is zonate or dries very dense. T. fumidiceps has similar small spores, but has different branched generative hyphae in the context and often the pore surface has a greenish to pale olivaceous color in dry condition. Also, its context is homogeneous and not duplex as in T. galactinus.

6. Tyromyces humeanus (Murr.) Lowe


Basidiocarp annual, pileate, sessile, applanate to convex, dimidiate to slightly spathulate, up to 7 cm wide, 10 cm long and 3 cm thick at the base, soft and sappy with strong odor of anise when fresh, rigid and brittle with less distinct odor when dry, taste “nutty” (acc. to Murrill) when fresh, more disagreeable when dry; upper surface white to gray; becoming ochraceous to pale yellowish brown, first velvety and dull, later glabrous, azonate; pore surface white, becoming discolored beige to pale brown when bruised or dried, pores angular to slightly irregular, 2–4 per mm; tubes up to 10 mm deep, drying fragile; context soft and fibrous, white to pale gray or brown, especially towards the pileus, homogeneous, up to 2 cm thick.

Hyphal system monomitic; generative hyphae with clamps, thin- to slightly thick-walled, 3–7 μm wide.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigate, 17–20 × 5–7 μm.

Basidiospores ellipsoid to oval, hyaline, IKI-, 3.5–5 × 2.5–3.5 μm.

Type of rot. – White rot in hardwoods.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Dead hardwoods.
Tyromyces

Fig. 410. Tyromyces humeanus (FL 7978, type). a, thin-walled contextual generative hyphae; b, thick-walled tramal generative hyphae; c, basidia; d, basidiospores.

Distribution. Known only from Florida.
Remarks. The species is recognized by the fairly large pores, the odor of anise and the change of color when bruised in fresh condition. More collections are needed to verify its morphological variation.

Basidiocarp pileate, broadly attached, appланate, semicircular to elongated, 0.5-2 cm wide, 0.5-5 cm long, 0.1-0.4 cm thick at the base, margin very thin and sharp, slightly wavy, fleshy and sappy when fresh, shrinks with drying, becoming light and brittle, mild in taste; upper surface bright orange when fresh, fading on drying to yellowish orange along the margin, straw-colored to pale ochraceous or cream in the more basal parts, when fresh finely velutinate to slightly warted or scuprose, on drying and age becoming more glabrous or with tufted agglutinated hairs or radial striae making the surface rough end uneven; pore surface light orange when fresh, cream to light straw-colored on drying, pores angular, thin-walled, when fresh more or less isodiametric and 3-4 per mm, when dry the tubes partly shrink and the pores become widened in parts, some up to 0.5 mm wide even if most pores still will be within the range of 3-4 per mm; tubes concolorous with pore surface, up to 3 mm deep; context white, soft and watery when fresh, slightly duplex and denser towards the tubes, fragile and with cavities when dry, up to 2 mm thick.

Hyphal system monomitic; generative hyphae with clamps, hyaline and thin-walled, on the pileus pinkish in KOH and in parts with an oily refractive content, 2-4 \( \mu m \) wide, in the context up to 8 \( \mu m \) wide, randomly oriented and with short, stout side-branches without septa often branching off in right angles; tramal hyphae parallel, 2-4 \( \mu m \) wide.

Cystidioles present in the hymenium, fusiform, thin-walled and tapering, 10-15 \( \times \) 4-6 \( \mu m \), often difficult to observe.

Basidia clavate, 4-sterigmate, with basal clamp, 14-20 \( \times \) 4-6 \( \mu m \).

Basidiospores broadly ellipsoid, smooth, thin-walled, hyaline, IKI-, 4-4.5 \( \times \) 2.5-3 \( \mu m \).

Type of rot. - White rot in hardwoods.

Cultural characteristics. - See David 1980.

Sexuality. - Tetrapolar (David 1980).

Substrata. - In North America known from Betula and an unknown
Tyromyces

**Fig. 412.** Tyromyces leucomallus (KD 999). a, contextual generative hyphae; b, basidia; c, basidiospores.

host. In Europe known from other deciduous hosts.

**Distribution.** Known from Louisiana and Ontario. Also known from Europe.

**Remarks.** The small apricot-orange colored basidiocarps are diagnostic in the field. The ellipsoid spores and the contextual generative hyphae with short sidebranches, make the species rather distinctive microscopically.

8. Tyromyces leucomallus (Berk. & Curt.) Murr.

**Fig. 412**


**Basidiocarp** sessile, annual, dimidiate or semicircular, convex, up to 5 cm wide, 8 cm long and 1-2 cm thick at the base, watery when fresh, soft and fragile when dry, taste mild, odor when fresh unknown; upper surface white to cream, often slightly darker when dry, azonate, velvety to tomentose, drying more scupose to slightly tufted, often radially fibrillos, margin thin and sharp; pore surface white to cream, pores thin-walled, angular, 6-9 μm wide; tubes up to 5 mm deep, brittle when dry; context white, soft and brittle, slightly duplex and looser towards the upper surface, up to 15 mm thick at the base.

**Hyphal system** monomitic; generative hyphae with clamps, with walls that swell and gelatinize in KOH, in the context slightly branched, 3-8 μm wide, in the trama more narrow and mixed with gloeoplerous hyphae, yellow and with an oily to grainy content, up to 9 μm wide. **Cystidia** or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, 10-14 × 4-6 μm.

**Basidiospores** allantoid, hyaline, IKI-, 3.5-4.5 × 1 μm.

**Type of rot.** – White rot in deciduous wood.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Dead deciduous trees.

**Distribution.** – Rare in the Gulf Coast Region, also in tropical America.

**Remarks.** The species is similar to *Oligoporus tephroleucus* which however has a brown rot, a smooth pileus and slightly larger spores. The spores in the type material are shorter than those cited by Lowe (1975:36) and only very rarely above 4.5 μm long. The gloeoplerous hyphae are a good diagnostic character together with the allantoid short spores.


**Fig. 413**


**Basidiocarp** annual, effused, reflexed to pileate, semicircular, convex, 3 cm wide, 5 cm long and 2.5 cm thick at the base, sappy when fresh, rigid when dry; upper surface white to cream, tomentose to finely scupose, in parts with a thin agglutinated pellicle; pore surface white to very pale ochraceous, pores round to angular, 4-6 per mm; tubes soft and fragile, up to 20 mm deep, context cream, soft and slightly fibrous, up to 8 mm thick, no distinct odor, taste disagreeable.

**Hyphal system** monomitic; generative hyphae with clamps, thin- to thick-walled, 3-6 μm wide in the context, narrower in the trama.

**Cystidia** or other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, 12-14 × 5-6 μm.

**Basidiospores** ellipsoid, hyaline, IKI-, 4-5 × 2.5-3.5 μm.

**Type of rot.** – Unknown, presumably a white rot.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Dead hardwoods.

**Distribution.** Known only from Florida.

**Remarks.** The white basidiocarps without odor and unchanged when bruised and rather small pores distinguish *T. pseudolacteus* from *T. humeana* which microscopically is very similar. More collections are
Tyromyces

Fig. 419. Tyromyces pseudolacteus (FL 17298). a, contextual generative hyphae; b, cystidioles; c, basidia; d, basidiospores.

needed to verify its morphological variation.

10. Tyromyces subgiganteus (Berk. & Curt.) Ryv. Fig. 414

Basidiocarp annual, pileate, sessile, single or imbricate, sappy when fresh, contracting and becoming rigid when dry, up to 4 cm wide, 6 cm long and 5 mm thick; upper surface white to cream, drying ochraceous to gray, first hirsute to velvety, in age becoming more adpressed velvety to finely scurfuse, azonate; pore surface white to pale straw-colored, pores round and entire, 3–5 per mm; tubes up to 5 mm deep, concolorous with pore surface, but darker than the context; context white and thin, up to 3 mm deep, often with dark resinous bands close to the tube-layer.

Hyphal system monomitic (?); generative hyphae with clamps, in the context the hyphae are wide with thickened walls, parallel, sparingly branched and with large conspicuous clamps, 3–6 μm wide, in the trama partly narrower, 2–4 μm wide, with small clamps, strongly agglutinated, in KOH also with swollen and gelatinized wider hyphae with very few clamps, 3–9 μm wide, like broken fragments of skeletal hyphae, their true nature is difficult to ascertain as the trama tissue remains hard and cartilaginous in Melzer’s reagent and the wider hyphae swell strongly in KOH.

Cystidia and other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate, 12–15 × 5–6 μm, with a basal clamp.

Basidiospores subglobose, thin-walled, often partly collapsed, with an oildrop, IKI-, 4–4.5 × 5–5.5 μm.

Type of rot. – White rot in hardwoods.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Dead and living deciduous trees, often noted on living Malus (3, 26, 75, 113, 145).


Remarks. The basidiocarps of T. subgiganteus contract and are often bent when dry and the pores become irregular in shape and size. The subglobose to ovoid spores are smaller than those of T. fissilis which also contracts on drying, but the basidics are considerably thicker and the tubes become partly greasy and stain paper. Spongipellis spumeus has much larger basidiocarps with thick-walled and considerably larger spores and a distinct duplex context while that of T.
Wolfiporia

_subgiganteus_ is dense and with scattered resinuous zones, and only the upper tomentum has a looser consistency.

**Wolfiporia** Ryv. & Gilbn.


_Basidiocarps_ annual, resupinate; pore surface white to ochraceous, the pores circular to angular, 1–5 per mm; subiculum white to pale buff, firm-fibrous; tube layer concolorous, up to 2 mm thick; hyphal system dimitic; generative hyphae thin- to thick-walled, simple septate, some inflated up to 20 µm; skeletal hyphae thick-walled, nonseptate; fusoid cystidioles present or absent; basidia clavate, 4-sterigate, simple-septate at the base; basidiospores ellipsoid to cylindrical, hyaline, negative in Melzer's reagent. Causes a brown cubical rot of hardwoods and conifers. North American genus with two species.

_Wolfiporia_ is a distinctive genus characterized by the lack of clamps, dimitic hyphal system, the greatly inflated hyphae, and a brown cubical rot.

**Key to species**

1. Pores angular, 1–3 per mm; basidiospores cylindrical, 8–11 µm long ........................................... 1. _W. cocos_

1. Pores regular, 3–5 per mm; basidiospores ellipsoid, 4–5 µm long ........................................... 2. _W. dilatohypha_

1. _Wolfiporia cocos_ (Schw.) Ryv. & Gilbn., _Fig. 415_


_Basidiocarps_ annual, originally in rounded patches, these becoming confluent and widely effused; pore surface light ochraceous buff to pinkish buff, with 1–2 pores per mm; the pores angular, variable; margin abrupt, fertile or sterile, often wide, tomentose, cartridge buff; subiculum cream to pale pinkish buff, fibrous to corky, 1–2 mm thick; tube layer pale buff, continuous with subiculum, up to 2 mm thick.

_Hyphal system_ dimitic; generative hyphae thin to thick-walled, simple-septate, occasionally branched, 3–14 µm in diam, some in lower subiculum greatly inflated, thick-walled, up to 20 µm in diam; skeletal hyphae thick-walled to almost solid, aseptate, rarely branched, 3–8 µm in diam. _Cystidia_ lacking, but scarcely projecting, fusoid, thin-walled cystidioles are present, 22–38 × 5–7 µm.

_Basidia_ clavate, 4-sterigate, 17–45 × 8–10 µm, simple-septate at the base.

_Fig. 415. Wolfiporia cocos_ (FL 1483). a, subicular hyphae; b, thin-walled trama hyphae; c, thick-walled trama hyphae; d, cystidioles; e, basidia; f, basidiospores.
Wolfiporia

**Basidiospores** cylindric, hyaline, smooth, IKI-, 8-11 × 3-4 µm.

**Type of rot**. Brown cubical root and butt rot of conifers and hardwoods; also decays dead standing and fallen trees.

**Cultural characteristics**. See Davidson et al. 1942; Nobles 1958; Stalpers 1978.

**Sexuality**. Unknown.

**Substrata**. Living and dead conifers and hardwoods, especially oaks. In the Lake States and Northeast most common on *Populus*. In western North America mainly on conifers (1, 3, 20, 41, 57, 69, 97, 112, 124, 138, 145, 148, 13, 157, 190, 194, 195, also *Zea*).

**Distribution**. Throughout the eastern U.S. and into southeastern Canada; also in the Pacific Northwest, California, and the Northern Rocky Mountain region.

**Remarks**. *Wolfiporia cocos* forms large hypogeous sclerotia known as tuckahoes, apparently from mycelium in roots. For an account of the tuckahoe stage see Weber (1929). Basidiocarps develop on the tuckahoes when they are incubated in a moist chamber. In nature *W. cocos* also fruits commonly on dead standing and fallen trees, not in association with the tuckahoe stage. It is an important cause of volume losses in stored *Populus* pulpwood (Fritz, 1954). Davidson and Campbell (1954) provide additional information on distribution and host relationships. Ginns & Lowe (1983) placed *Poria cocos* in synonymy with *Daedalea extensa* Pk. and proposed the new combination *Macrohyporia extensa*. However, the type specimen of *D. extensa* is a deteriorated specimen with no basidia, basidiospores, or other hymenial characters and cannot be assumed to have the same hymenial characters of *Poria cocos* simply because it has a similar hyphal system. Our interpretation is that this sterile specimen cannot be accepted as a teleomorph and therefore *Poria cocos* is the valid basionym of this fungus.


**Basidiocarps** annual, resupinate, becoming widely effused; margin fertile or sterile up to 3 mm, then pale cream colored, abrupt or minutely fimbriate; pore surface white to dingy cream colored, the pores angular, 4–6 per mm, with thin, entire dissepiments; subiculum white to cream colored, azonate, tough-fibrous, up to 2 mm thick; tube layer, yellowish ivory to pale buff, sharply distinct from subiculum, up to 2 mm thick.

**Hyphal system** dimitic; subicular generative hyphae thin to thick-walled, simple-septate, with occasional branching, some inflated up to

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*Fig. 416. Wolfiporia dilatohypha (MB 769). a, subicular hyphae; b, thin-walled tramaal hyphae; c, thick-walled tramaal hyphae; d, basidia; e, basidiospores.*
Wrightoporia

17 μm in diam; skeletal hyphae thick-walled, nonseptate or with thin secondary septa, with frequent branching, the walls typically uneven in thickness resulting in conspicuous variation in the diameter of the lumen, 4–8 μm in diam; tramal generative hyphae thin-walled, simple-septate, 2.5–4 μm in diam; tramal skeletal hyphae similar to those in subiculum.

Cystidia or other sterile hymenial elements absent.

Basidia clavate, 4-sterigmate; 12–19 × 5.5–6.5 μm, simple-septate at the base.

Basidiospores oblong ellipsoid to ovoid, hyaline, smooth, IKI-, 4–5 × 2.5–3 μm.

Type of rot. – Brown cubical heartrot of living oaks, also decays dead fallen hardwoods.

Cultural characteristics. – See Davidson et al., 1942.

Sexuality. – Unknown.

Substrata. – Reported as a heartrot fungus on living oaks and also on dead oaks and other hardwoods.

Distribution. From the Gulf Coast region north through the midwest and up to New York.

Remarks. The hyphal structure of W. dilatohypha is very similar to that of W. cocos which differs in having larger pores, basidia and basidiospores.

Wrightoporia Pouz.

Basidiocarps resupinate to pileate, annual to perennial; pores small to medium, white to cream or gray; hyphal system dimitic; generative hyphae with clamps, skeletal hyphae thick-walled to solid, dextrinoid to non-dextrinoid; spores less than 6 μm in largest dimension, globose to cylindrical, smooth to ornamented, weakly to strongly amyloid.

On dead wood, both of gymnosperms and angiosperms. Tropical to south temperate distribution.

Type species: Poria lenta Overh. & Lowe.

Key to species

1. Spores cylindrical ........................................ 2. W. cylindrospora
2. Spores globose to ellipsoid ................................ 2
4. Spores less than 5 μm in diameter ..................... 3
5. Pores mostly 2–3 per mm; spores mostly 3.5–4.5 μm in longest dimension ........................... 1. W. avellanea
6. Pores 4–6 per mm; spores mostly 2.5–3.5 μm in longest dimension ................................ 4. W. subrutilans
Wrightoporia

**Fig. 418.** Wrightoporia cylindrospora (Oslo 17336). a, subicular generative hyphae; b, subicular skeletal hyphae; c, basidia; d, basidiospores.

**Basidiospores** subglobose to broadly elliptical, hyaline, slightly asperulate, thin- to slightly thick-walled, 3.5-4.5 × 2.5-3.5(4) μm, distinctly amyloid.

**Type of rot.** – Reported to be associated with a brown rot, but not known with certainty.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Most common on hardwoods, rarely on conifers.

**Distribution.** Colorado and Florida. Widespread in the tropics, but rare.

**Remarks.** The species is recognized by the fairly large pores and the amyloid, finely ornamented spores.

2. Wrightoporia cylindrospora Ryv.


**Basidiocarps** resupinate, adnate and hard when dry, with a sweet odour when fresh, bitter when dry; pore surface cream, pale brown in other parts, pores round and entire, 5–7 per mm; tubes up to 5 mm deep measured vertically along the tubes, parts of the fruitbody having three distinct zones, cream to pale brown and somewhat resinous in older parts; context cream, less than 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline and 1–2 μm wide; skeletal hyphae dominating in the basidiocarp, straight to flexuous, thick-walled and hyaline, dextrinoid, 3–5.5 μm wide, in parts widened to 10 μm and some with a swollen apex.

**Cystidia** and other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, 6–10 × 3–4 μm.

**Basidiospores** cylindrical, smooth, thin-walled and amyloid, 3–4(5) × 1.5–2 μm.

**Type of rot.** – White rot of dead oaks.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Known only from *Quercus*.

**Distribution.** Known only from Maryland.

**Remarks.** The cylindrical, amyloid spores are characteristic.


**Basidiocarps** resupinate, effused, up to 3 mm thick, separable to slightly adnate, tough when dry; pore surface white to cream, margin white, pores round to angular, often slightly sinuous on oblique substrates, on average 2–3 per mm, thinned; tubes concolorous with pore surface, up to 2 mm deep; context thin and white.

**Hyphal system** dimitic; generative hyphae with clamps, 1–3 μm wide; skeletal hyphae thick-walled to solid, 1.5–3 μm wide, strongly dextrinoid; gloeoplerous hyphae rare and scattered, irregular and often with blunt side-branches, slightly yellowish when mounted in KOH, but negative in Melzer’s reagent, diameter variable, mostly 3–6 μm, but parts up to 15 μm wide.

**Cystidia** and other sterile hymenial elements absent.

**Basidia** clavate, 4-sterigmate, 15–20 × 4–8 μm.

**Basidiospores** globose, finely asperulate, hyaline, amyloid, 5–6 × 4.5–5.5 μm.

**Type of rot.** – Associated with a brown rot.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – On conifers in United States, on hardwoods and palms in subtropical and tropical areas.

**Distribution.** Widespread in United States, but rare. Also known from Central and South America and Africa.

**Remarks.** The species is recognized by its spores being larger than those of other species in the genus.
Wrightoporia lenta (JLL 1767, type). a, subicular generative hyphae; b, gloeopleurous hyphae; c, subicular skeletal hyphae; d, basidia; e, basidiospores.


Basidiocarps annual, resupinate to effused-reflexed, pileus elongated, usually triangular in section, often convex, up to 1.5 cm wide, 1–5 cm long, 2–10 mm thick, coriaceous when dry; upper surface dull, adpressed tomentose to glabrous, azonate, cream to pale brown, margin acute; pore surface cream to ochraceous, pores round to angular, often slightly sinuous on oblique substrates, (3–)4–5 per mm; tubes concolorous, up to 8 mm deep; context pale cream, fibrous to coriaceous, 3–10 mm thick.

Hyphal system dimitic; generative hyphae with clamps, hyaline and thin-walled, 2–4 μm wide; skeletal hyphae 2–5 μm wide, thick-walled and dextrinoid.

Gloeocystidia hyaline, scattered and rare, often difficult to observe in dry specimens, 3–8 μm wide, slightly swollen in the apex, embedded or bent into the hymenium and in some cases projecting slightly above the basidia, up to 60 μm long.

Basidia clavate, 4-sterigmate with a basal clamp, 12–15 × 5–6 μm.

Basidiospores ellipsoid, hyaline, finely asperulate and amyloid, 2.5–3.5 × 2–2.5 μm.

Type of rot. – Associated with a white rot.

Cultural characteristics. – Unknown.

Sexuality. – Unknown.

Substrata. – Dead conifers (Abies and Tsuga), also known from Magnolia.

Distribution. Known only from northeastern United States and Quebec.

Remarks. The species is recognized by being pileate and having gloeocystidia.
Additions

Fig. 421. Antrodiella fissiliformis. (LOO 19780). a, subicular generative hyphae; b, subicular skeletal hyphae; c, cystidia; d, cystidioles; e, basidia; f, basidiospores.

5. Antrodiella fissiliformis (Phil.) Gilbn. & Ryv., comb. nov. Fig. 421 Basionym — Poria fissiliformis Phil., Stud. Bot. Chech. 3:1, 1940.

Basidiocarps resupinate, annual, effused, separable, up to 6 mm thick, soft and tough when fresh, hard and partly shrinking when dry, margin narrow and white; pore surface cream to pale yellowish brown when dry, pores round 5–7 per mm; tubes brittle and semicartilaginous, pale brown; context white and fibrous, up to 1 mm thick.

Hyphal systems dimitic; generative hyphae dominating, thick-walled, nonseptate, hyaline, 2–5 μm wide, unbranched, dextrinoid. Cystidia clavate, not incrusted, 18–28 × 4.5–7 μm, projecting to 10 μm; fusoid cystidioles also present, 12–15 × 4–5 μm, not projecting, with a basal clamp; hyphal pegs rare.

Basidia clavate, 4-sterigmate, 10–15 × 4–6 μm, with a basal clamp. Basidiospores oblong ellipsoid, thick-walled, hyaline, IKI-, 2.5–4 × 1.5–2.5 μm.

Type of rot. Causes a white rot in dead hardwoods.

Cultural characteristics. Unknown.

Sexuality. Unknown.


Fig. 422. Inonotus jamaicensis (RLG 15819). a, contextual hyphae; b, basidia; c, basidiospores.

Distribution. Rare in eastern United States; also in Europe.

Remarks. The distinguishing characters of A. fissiliformis are the small spores, occasional cystidia, and the dimitic hyphal system. It is apparently widely distributed in eastern North America but not often collected.

Inonotus jamaicensis Murr.


Basidiocarps annual, pileate, pilei in imbricate clusters up to 25 cm wide, individual pilei dimidiate, often confluent, up to 1 × 4 × 7 cm; upper surface Cinnamon Brown to Auburn or Russet, tomentose to matted and fibrillose or scurfy, shallowly concentrically sulcate, faintly zonate, when covered by basidiospores Sanford's Brown; margin at first densely tomentose, Ochreous Buff to Cinnamon, up to 1 cm wide, eventually becoming concolorous with older portion, acute to rounded, narrowly sterile below; pore surface Chestnut Brown to Bis-
ter, glancing and lustrous when viewed obliquely, the pores angular, 2-4 per mm, with thin, entire dissepiments; context duplex, the lower part firm-fibrous, azonate, lustrous on cut surfaces, Buckthorn Brown to Antique Brown, separated from the upper part by a thin, black layer, upper part soft-spongy, Cinnamon Brown, made up of the deep surface tomentum; tube layer distinct, concolorous with the lower context or slightly darker, up to 8 mm thick; spore deposit Mars Yellow.

Contextual hyphae thin- to thick-walled, hyaline to dark reddish brown in KOH, simple-septate, with rare branching, 3-9 μm in diam, some very thick-walled, hyphae apparently nonseptate, of the skeletal hyphae type; trama hyphae similar, also some hyaline, thin-walled, simple-septate, 2-3 μm in diam; setal hyphae absent.

Setae or other sterile hymenial elements absent.

Basidia clavate, 2-4 sterigmate, 12-15 × 5.5-6.5 μm, simple-septate at the base.

Basidiospores ellipsoid, thick-walled, dark reddish brown in KOH when mature, weakly cyanophilous in cotton blue, negative in Melzer's reagent, 5.5-7 × 4-5 μm.

Type of rot. - Uniform white rot that becomes laminated with the wood separating along the annual rings. Dark zone lines and patches of yellowish brown mycelium are present in the advanced stages of decay.

Cultural characteristics. - Unknown.

Sexuality. - Unknown.

Substrata. - In Arizona known only on dead, fallen Arizona white oak (*Quercus arizonica*).

Distribution. Originally described from Jamaica. Otherwise known only from this report from southeastern Arizona.

Remarks. *Inonotus jamaicensis* differs distinctly from other North American species of *Inonotus* included in Vol. I of this flora. It is distinguished by its sessile, imbricate pilei, the duplex context with a distinct black layer between the upper and lower parts, the lack of setae or setal hyphae, and the pigmented basidiospores. The Arizona specimens have more thick-walled hyphae in the context but otherwise agree well with the holotype of *I. jamaicensis* (NYBG).

**Lindtneria thujatsugina** M.J. Larsen

*Fig. 423*


Basidiocarps developing in loose layer of partially decomposed needles and other organic matter, soft, cottony, pale purplish red when dried, the pores irregular, up to 1 μm in diam, the tubes poorly developed and shallow, with thick, entire, soft dissepiments; subiculum pale purplish red, arachnoid to floccose, soft and easily torn apart, less than 1 mm

**Fig. 423.** Lindtneria thujatsugina (FP 134615). a, hyaline, thin-walled subicular hyphae; b, pigmented, thick-walled subicular hyphae; c, basidia; d, basidiospores.
thick; tube layer thin, soft, concolorous with the subiculum.

**Hyphal system** monomitic; subicular generative hyphae thin-walled, hyaline in KOH with frequent branching, often cruciately branched at right angles, mostly simple-septate but with occasional clamps, 3–7.5 μm in diam with occasional inflations up to 12 μm in diam, sometimes organized into cordons; also some dark, thick-walled hyphae present, these with rare branching, simple-septate or with clamps, dark brown in KOH, smooth or roughened with fine tuberculate incrustation; trama hyphae thin-walled, with frequent branching, simple-septate and with clamps more abundant than in subiculum.

**Cystidia** or other sterile hymenial structures lacking.

**Basidia** irregular in shape, broadly clavate or with a swollen base and narrower at the apex, 4-sterigmate, 30–42 × 10–14 μm, with a basal clamp.

**Basidiospores** globose, coarsely spiny and often with a distinct flange that runs completely around the spore in the center or off to one side, hyaline in KOH, negative in Melzer’s reagent, 8–11 μm in diam including some coarse spines.

**Type of rot.** – Unknown.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Growing in litter under *Thuja plicata* and *Tsuga heterophylla*.

**Distribution.** Known only from the type locality in cedar-hemlock habitat at Benton-Creek near Priest River, Idaho.

**Remarks.** The purplish red color of the basidiocarps and the strikingly ornamented spores with the encircling flange makes this a highly distinctive species of *Lindtneria*.

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**Panellus pusillus (Lév.) Burds. & O.K. Miller**


**Basidiocarps** annual, laterally to centrally stipitate; pilei solitary, circular to reniform or dimidiate, curling up with inrolled margin on drying; upper surface whitish to cream colored when fresh, drying palebuff to tan or reddish brown after several years, farinaceous to finely tomentose or nearly glabrous, azonate, drying rugose to finely pubescent; pore surface whitish to cream colored, drying tan to reddish tan, the pores angular, radially aligned, 4–5 per mm tangentially, 2–3 per mm radially, with thick, entire dissepiments that appear finely farinaceous or sugary under a 30× lens; context cream colored, with a paler, more dense upper layer, drying firm, up to 2 mm thick; tube layer drying hard and rigid, slightly darker than context, up to 1 mm thick, not decurrent on stipe; stipe cylindrical to flattened, concolorous with pileus, up to 2 mm thick and 4 mm long.

**Hyphal system** monomitic; contextual generative hyphae with clamps, thin- to thick-walled, hyaline, with occasional branching, IKI –, mostly 3–6 μm in diam but some with inflated portions up to 12 μm in diam; trama hyphae similar but more thin-walled.

**Cystidia** present on or near dissepiment edges, cylindric to fusiform, thin-walled, not incrusted, 28–40 × 3–5 μm, obscured by abundant
acanthophysoid elements, these much branched and lobed, 30–50 \( \mu m \) long and with a main axis 2–8 \( \mu m \) i diam, acanthophysoid elements also present on surface of pileus and stipe; fusoid cystidioles also present in hymenium, imbedded or barely projecting, 20–50 \( \times \) 3.5–5 \( \mu m \).

**Basidia** narrowly clavate, 4-sterigmate, 15–20 \( \times \) 4–5 \( \mu m \), with a basal clamp.

**Basidiospores** oblong to elipsoid, thin-walled, hyaline, smooth, and amyloid, 4.5–5.5 \( \times \) 2.5–3 \( \mu m \).

**Type of rot** – White rot of dead hardwoods.

**Cultural characteristics** – See Burdsall and Miller, 1975.

**Sexuality** – Unknown.

**Substrata** – On dead wood of numerous hardwood genera (3, 25, 89, 104, 112, 153).

**Distribution.** Eastern United States from New York and Wisconsin to the Gulf Coast region.

**Remarks.** The genus *Panellus* of the Tricholomataceae contains a number of polyporoid species, most of which are strictly tropical (Corner, 1986). *Panellus pusillus* basidiocarps are morphologically similar to those of the common lamellate species *P. stipticus* (Bull.: Fr.) Karst., and are also bioluminescent (Burdsall and Miller, 1975).

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**Stigmatolemma poriaeforme** (Pers.:Fr.) W.B. Cke.  

**Basidiocarps** annual, resupinate, consisting of a gray subiculum with scattered to crowded gray cupules 200–300 \( \mu m \) in diam, apical pore conspicuous, outer surface of cupules appearing granular under a 30x lens; subiculum tomentose to cottony or very thin and arachnoid, sometimes white at the margin.

**Hyphal system** monomitic; subicular hyphae thin-walled, hyaline, nodose-septate, 2–3 \( \mu m \) in diam, with occasional branching; profusely branched and contorted dendrohyphidia at the apex of the cupules, these from hyphae 2–2.5 \( \mu m \) in diam, branches 1 \( \mu m \) in diam or less.

**Cystidia** or other sterile hymenial elements absent.

**Basidia** broadly clavate to clavate, 4-sterigmate, 20–30 \( \times \) 5.5–6.5 \( \mu m \), with a basal clamp.

**Basidiospores** globose, hyaline, smooth, thin-walled, negative in Melzer's reagent, 4.5–6 \( \mu m \) in diam.

**Type of rot.** – White rot of dead hardwoods.

**Cultural characteristics.** – Unknown.

**Sexuality.** – Unknown.

**Substrata.** – Dead hardwoods in numerous genera (9, 145, 153).

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**Stromatoscypha fimbriata** (Pers.:Fr.) Donk  

**Basidiocarps** annual, resupinate, becoming widely effused, soft, readily separable; margin conspicuously rhizomorphic, often up to 2 or 3 cm wide, white to cream-colored; pore surface ivory or cinereous, the pores developing by the development of an apical pore in isolated papillae which later become crowded or confluent to form a typical tube layer, circular to angular, 3–5 per mm in mature specimens, with thick dissepiments; context white to cream-colored, soft-fibrous, azonate, up to 1 mm thick, tube layer ivory to pale tan, distinct from the context, up to 0.5 mm thick; taste mild.

**Hyphal system** dimitic; subicular generative hyphae hyaline in KOH, thin-walled, rarely branched, with clamps, 2.5–3.5 \( \mu m \) in diam; subicular skeletal hyphae thick-walled, nonseptate, rarely branched, 1.5–2.5 \( \mu m \) in diam; trabal hyphae similar.

**Cystidia** or other hymenial structures absent.

**Basidia** cylindric to narrowly clavate, 4-sterigmate, 20–30 \( \times \) 5.6 \( \mu m \) with a basal clamp.
Fig. 426. Stromatocypha fimbriata (RLG 8359). a, subicular generative hyphae; b, subicular skeletal hyphae; c, basidia; d, basidiospores.

Basidiospores short-cylindric to ellipsoid, hyaline, smooth, IKI-, 4.5–5 x 2–3 μm.

Type of rot. – Spongy white rot of dead conifers and hardwoods.

Cultural characteristics. – See Stalpers 1978.

Sexuality. – Unknown.

Substrata. – Dead conifers and hardwoods in numerous genera (1, 3, 8, 20, 93, 145, 153).


Remarks. The development of the tubes from papillae which rupture at the apex is a unique feature of this species and readily separates it from other resupinate polyporoid fungi. The conspicuous rhizomorphs are also very characteristic.

Thelephora ajovalliensis Gilbn. & M. Blackwell


Basidiocarps annual, resupinate, originating as a loose, floccose, white mycelial primordium in which isolated circular cupules develop, these becoming deeper, more numerous and crowded; basidiocarps eventually assuming a polyporoid aspect, mostly in small scattered patches but some effused up to 3 cm in diam; pore surface white; pores in mature specimens circular to angular, highly variable in size, mostly 2–3 per mm, but some up to 1 mm in diam; dissepiments loosely plush-like

Fig. 427. Thelephorus ajovalliensis (RLG 12914, type). a, subicular generative hyphae; b, subicular skeletal hyphae; c, dendrohyphidia; d, thick-walled hymenial elements; e, basidia; f, basidiospores.
under a 30× lens, with a short nap of erect hyphae that give a fuzzy appearance; margin white, loosely floccose, like tissue of basidiocarp primordium; subiculum and tubes soft, easily sectioned, white.

**Hyphal system** dimitic; hyphae of trama between tubes generative, thin-walled to moderately thick-walled, narrow, uniform in diameter, with rare branches, with occasional clamps, 2–2.5 μm in diam; hyphae at dissepiment edges dendritically branched, thin- to moderately thick-walled, with simple septa and occasional clamps, 2.5–5 μm in diam; basidiocarp primordia, lower subiculum, and marginal tissue with abundant skeletal hyphae, these thick-walled, hyaline, aseptate, with rare branching, 2–5 μm in diam.

Cystidia absent; thick-walled or lobed and contorted cells, some of which may be sterile elements, present in hymenium.

**Basidia** broadly clavate, abruptly narrowed at the base, 4-sterigmate, 28–40 × 8–10 μm, with a basal clamp; some distorted basidia present, these lobed or contorted, or thick-walled as described above.

**Basidiospores** ellipsoid, hyaline, smooth, with a prominent apiculus, negative in Melzer’s reagent, 9–11.5 × 5–7 μm, sometimes adhering in groups of 2–4.

**Type of rot.** - Uniform white rot of dead ocotillo.

**Cultural characteristics.** - See Gilbertson and Blackwell 1982.

**Sexuality.** - Homothallic (Gilbertson and Blackwell 1982).

**Substrata.** - Known only on dead ocotillo (*Fouquieria splendens*).

**Distribution.** Known from the Ajo Valley, Organ Pipe Cactus National Monument, in the Sonoran Desert of southern Arizona.

**Remarks.** Although mature specimens of *T. ajovaliensis* have the macroscopic aspect of a resupinate polypore, development of the tubes and the microscopic structure are typical of species of the genus *Thelephorus* Fr. According to Ryvarden (1979) *Thelephorus* is placed in the Corticiaceae because the hymenium is restricted to the basal portion of the tubes or cupules. In *T. ajovaliensis* the hymenium does extend up the vertical sides of the tube or cupule to some extent.

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### Acknowledgments

This book represents an accumulation of knowledge from research on polypores over the past 38 years by both authors. For the past 20 years, research by RLG has been largely supported by the University of Arizona Agricultural Experiment Station. Research by RLG on wood-rotting fungi was also supported by grants from the National Science Foundation. Field work has been done in virtually every state in the U.S.A. and all provinces and territories of Canada with cooperation of many colleagues.

Also, many people have sent polypores for identification over the years and many of these collections have provided invaluable morphological and distributional data. Josiah L. Lowe has provided help on many occasions and graciously shared his incomparable knowledge of the polypores. Particular thanks are due Meredith Blackwell who has sent hundreds of collections from Louisiana and the Gulf Coast Region, provided working facilities at Louisiana State University, and collaborated in research on Gulf Coast fungi. J. Page Lindsey has contributed many important collections from Arizona, Colorado and Florida. She also made a number of the original camera lucida tracings used in preparation of the figures in this flora. The center for Forest Mycology Research, U.S. Forest Service, Madison has furnished support for RLG over the past 30 years. Joint research on wood-rotting fungi with Ross W. Davidson, Frances F. Lombard, John G. Palmer, Harold H. Burd- sell, Jr., Michael J. Larsen, Karen K. Nakasone and Orson K. Miller, Jr. of that Laboratory has been a major part of the total research program. Research with James E. Adaskaveg has been a critical factor in elucidating species of *Ganoderma*.

Research at the University of Arizona was greatly expedited by Angie Blewett who skillfully and cheerfully typed hundreds of pages of barely legible handwritten text material. She also compiled distribution data, information on host and substrata, and lists of authors and references as well as providing expert help with many editorial and other activities. RLG would also like to thank George B. Cummins for his advice and encouragement in all aspects of this enterprise and for the pleasure of his company. Lastly, RLG would like to thank his wife Pat, his son Park and his daughter Joan for sharing his life through the years when this work was done.

Financial support has been received by LR over the last 15 years from the Norwegian Research Council and the Norwegian Agency for International Development for which he is very grateful. The herbarium of the Royal Botanic Garden, Kew, England has generously offered
help and assistance for LR during his many visits to the Institution, especially during his year-long stay that initiated his interest in the polypores. LR also deeply acknowledges the long friendship with John Eriksson at the University of Göteborg who always has offered his time and his house whenever he was asked. Kurt Hjortstam and Karl-Henrik Larsson have been perfect companions on numerous fieldtrips both in Scandinavia and abroad and have been a major factor in keeping the mycological enthusiasm on a high level.

Ann-Christin Haave has patiently and skillfully typed large parts of the manuscript into the PC also providing help with the editorial work. Lastly LR wants to express his thanks to his wife Ingrid for her patience during long hours of work and many fieldtrips.

The loan of types and other specimens and use of the herbarium facilities by curators of mycological herbaria at the following institutions is gratefully acknowledged: The New York State Museum, Albany NY; The University of Michigan, Ann Arbor MI; Louisiana State University, Baton Rouge LA; The National Fungus Collections, USDA, Beltsville MD; University of California, Berkeley CA; The Farlow Reference Library and Herbarium of Cryptogamic Botany, Harvard University, Cambridge MA; The Rocky Mountain Forest and Range Exp. Sta., USFS, Fort Collins CO; The University of Florida, Gainesville FL; The University of Helsinki, Helsinki, Finland; Cornell University, Ithaca NY; The Royal Botanic Gardens, Kew, Richmond, Surrey, England; The Wilhelm G. Solheim Mycological Herbarium, University of Wyoming, Laramie WY; The Center for Forest Mycology Research, USFS, Forest Products Laboratory, Madison WI; The New York Botanical Garden, Bronx NY; The University of Oslo, Oslo, Norway; Biosystematics Research Institute, Agriculture Canada, Ottawa, Ontario, Canada; Museum National d'Histoire Naturelle, Paris, France; Washington State University, Pullman WA; The University of Washington, Seattle WA; Swedish Museum of Natural History, Stockholm, Sweden; The N.Y. State Univ. Coll. of Environmental Science and Forestry, Syracuse NY; University of Toronto, Toronto, Ontario, Canada; The University of Arizona, Tucson AZ; The L.O. Overholtz Herbarium, Pennsylvania State University, State College PA; The University of Illinois, Champaign-Urbana; and the Naturhistorisches Museum, Vienna, Austria.

Glossary

abrupt. (of the margin of resupinate basidiocarps) Without a thin, sterile margin.
acute. (of pileus margins) Tapering to a thin edge.
adnate. (of basidiocarps) Firmly attached to the substratum.
agglutinated. (of hyphae) Appearing gelatinized and glued together.
allantoid. (of spores) Sausage shaped; cylindric, uniform in diameter and distinctly curved.
amorphous. Having no definite shape or form; usually in reference to incrusting materials.
ampullate. (of hyphae) Swollen at the septa.
amyloid. (of spores, hyphae, cystidia) With a distinct color change to grayish or blackish blue in Melzer's reagent.
anamorph. The asexual reproductive stage of a fungus.
apiculate. (of spores). With a distinct apiculus or hilar appendix.
apiculus. Projection at the basal end of a basidiospore by which it is attached to the sterigma; also referred to as the hilar appendix.
appplanate. (of sessile basidiocarps or the pileate portion of effused reflexed basidiocarps) Thin, flattened horizontally.
appressed. (of groups or strands of hyphae) Closely flattened to the pilear surface.
appressed-strigose. (of pilear surfaces). With coarse, parallel hyphal strands closely flattened on the surface.
arachnoid. (of subiculum of margin of resupinate basidiocarps) Like a cobweb, with very loosely interwoven hyphae.
arculate. (of sterigmata) curved or arc-like.
arid. (of basidiocarp surfaces) Dry.
avellaneus. a pale brown color.
azonate. (of context or pileus surfaces) Uniform in color, without distinct zones.
basidiocarp. Fruiting body on which or in which basidia and basidiospores develop.
basidiospore. Sexual spore of the basidiomycetes; develops on a basidium following karyogamy and meiosis.
basidium. (pl. basidia) Specialized cell in which karyogamy and meiosis occur; gives rise to basidiospores.
binding hyphae. Much-branched, thick-walled, nonseptate hyphae in basidiocarps of species with a trimitical hyphal system.
bipolar. (of heterothallic basidiomycetes) With incompatibility controlled by one pair of alleles; a single dikaryon gives rise to two mating
Glossary

Types; also referred to as unifactorial.

Brown Rot. A decay of wood resulting from selective removal of cellulose and hemicellulose, leaving a brown, amorphous residue that usually cracks into cubical blocks and consists largely of slightly modified lignin.

Buff. A pale tan color.

Butt Rot. Decay in the heartwood of the basal part of a living tree.

byssoid. (of subiculum, context, or marginal tissue of basidiocarps) Soft, cottony.

Caespitose. (of stipitate basidiocarps) Developing in clusters.

candelabrum. (pl. candelabrum) Clustered groups of basidia formed by repeated branching of a single subhymenial generative hyphae.

capitate. (of cystidia) Swollen at the apex.

cartilaginous. (of basidiocarp tissue) Tough, like cartilage, not fibrous.

celullose. A long chain polymer of glucose anhydride units joined by β 1-4 linkages.

Chalky. (of basidiocarp tissue) Crumbly and brittle in consistency.

Cheesy. (of basidiocarp tissue) Soft and easily cut, uniform in texture.

Cheesnut Brown. A reddish orange color.

davate. (of basidia, cystidia) Club-shaped, widening toward the apex.

Compatible. (of homokaryotic mating types) Having the ability or the potential to undergo plasmogamy and establish a heterokaryon.

Concolorous. (of basidiocarp surfaces) Of the same color as a previously described structure.

Confluent. (of basidiocarps) Beginning development as separate structures, but fusing with growth.

Congeneric. Pertaining to species that belong to the same genus.

Conidiophore. (pl. conidiophores) The specialized cell or group of cells that gives rise to conidia.

Conidium. (pl. conidia) An asexual spore that develops externally or is extruded from a conidigenous cell.

cork. Basidiocarp of a wood-rotting fungus, particularly those that are perennial and become large.

Conspecific. Pertaining to individuals that belong to the same species.

Context. The inner tissue that supports the hymenophore of pileate basidiocarps.

cordon. A microscopic rope-like strand of intertwined hyphae found in the subiculum or marginal tissue of resupinate basidiocarps.

coriceous. (of thin, pileate basidiocarps) With a tough, leathery texture.

crucially septate. (of basidia) With vertical septa that divide the basidium into four cells, characteristic of the Tremellaceae.

Crumbly. Breaking up readily into small pieces.

Cystidiole. Inconspicuous sterile hymenial element that is equal in length to the basidia or projects only slightly.

Cystidium. (pl. cystidia) A conspicuous sterile hymenial element, projecting well beyond the basidia if in the hymenium, having walls that are hyaline or pale colored, and lacking conspicuously refractive contents.

daeidaleoid. (of pores) Irregularly lobed and sinuous in outline, labyrinthiform.

Decurrent. (of tubes in stipitate basidiocarps) Extending down on the stipe.

dendritic. (of hyphal ends) With repeated branching into hyphal ends with tapered apices.

dendrohyphidium. (pl. dendrohyphidia) Branched, slender, sterile element in the hymenium or subhymenium.
dentate. (of the hymenophore) With tooth-like projections.
dextrinoid. (of spores, hyphae etc.) Showing a distinct color change to bright reddish brown in Melzer's reagent.
dichotomous. (of branching hyphae) Branching by repeated equal forking.
dikaryon. A cell or mycelium with two nuclei per cell.
dimidiate. (of pileate basidiocarps) Semi-circular in outline as viewed from above.
dimitic. (of hyphael structure) With two different types of hyphae, generative and skeletal.
discoid. (of basidiocarps) Like a small plate or disk, usually with a central attachment.
dissepiment. End wall of one of the united tubes that compose the hymenophore of polypores.
double clamp connection. A septum with two clamp connections.
duplex. (of the context in pileate basidiocarps) Consisting of two distinct zones of different textures.
excentrically stipitate. (of basidiocarps) With a stipe not attached in the center of the pileus.
echinulate. (of spores) With slender, sharp spines.
effused. (of basidiocarps) Resupinate and adhering to the substratum.
effused-reflexed. (of basidiocarps) With part of the basidiocarp resupinate and part shelving into the pileus.
elipsoid. (of basidiospore shape) Having the form of a solid whose plane sections are all ellipses or circles.
endosporium. The inner wall of a double walled spore.
exosporium. The outer wall of a double walled spore.
expansa. expanded.
farinaceous. (of texture) mealy, with a loose, powdery appearance.
fascicles. A group or bundle of hyphae.
feltty. (of context tissue) With a compact but soft, interwoven tecture like felt.
fergussii named for C.L. Fergus.
ferruginous. Rusty reddish-brown in color.
filibrlose. (of basidiocarp surfaces) Having macroscopic, adpressed and radiating hyphal strands.
filiform. (of cystidia) slender and hair-like.
fimbriate. (of margin of resupinate basidiocarps or dissepiment edges) With radiating hyphae that give a minutely fringed appearance.

Glossary

flissile. (of context tissue) splitting readily due to parallel arrangement of hyphae.
flabelliform. (of pileate basidiocarps) Fan-shaped, tapering to a narrowed, lateral base.
flexuous. (of hyphae) Wavy or sinuous in outline.
floccose. (of basidiocarp surfaces) With a soft, cottony texture.
friable. (of context tissue) crumbling readily into small chunks.
fuliginous. A dark or dusky brown color; sooty.
fulvous. A dull yellowish brown color.
fusieous. A grayish brown, dusky or somber color.
fusiform. (of spores, cystidia etc.) Slender and tapering to one end or both ends.
fusoid. (of cystidioles) Almost fusiform.
gallic acid agar. Malt extract agar medium with 5 gm gallic acid per liter; darkens in the presence of polyphenol oxidases.
generative hyphae. The hyphal type present in all basidiocarps, typically thin-walled, with clamps or simple-Septate; from them develop the hymenial elements, and in some species, the skeletal and binding hyphae.
germ pore. A thin, circular area in the spore wall through which a germ tube develops.
glabrous. (of basidiocarp surfaces) Without hair, smooth.
glaning. (of pore surfaces) Showing a change in appearance from dull to lustrous when the orientation of the pore surface in regard to incident light is changed.
glaucous. (of basidiocarp surfaces) With a powdery coating that gives a frosty appearance.
globose. (of spores) Spherical.
gloeocystidium. (pl. gloeocystidia) Sterile hymenial or imbedded element with distinctly oily or refractive contents; in some species, becoming blackish in sulfuric benzaldehyde.
gloeopleurous hyphae. Hyphae with strongly refractive contents, usually staining brightly with phloxine or Melzer's reagent.
granulose. (of basidiocarp surfaces) With a grainy or granular outer layer.
gregarious. (of basidiocarps) Developing in quantity in a restricted area.
gum guaiac solution. A 5 per cent solution of gum guaiac in 95 per cent ethyl alcohol; used to test for polyphenol oxidases in cultures, rot, or basidiocarps; a blue color indicates a positive reaction.
guttule. A droplet of refractive material, commonly seen in spores
and other structures.

heartrot. Decay of the non-living heartwood of the living tree by fungi.

heterogenic incompatibility. The limiting of interfertility to pairings that bring together like factors.

heterokaryon. A cell or mycelium with 2 or more genetically different types of nuclei.

heterothallic. Self-sterile; a dikaryon results from fusion of compatible mating types.

hirsute. (of basidiocarp surfaces) With an outer covering of coarse, elongated hairs.

hispid. (of basidiocarp surfaces) With stiff, erect hairs.

homogeneous. (of context tissue) Uniform in consistency and color.

homogenic incompatibility. The limiting of interfertility to pairings that bring together different factors.

homokaryon. A cell or mycelium with nuclei of one genotype.

homothallic. Self fertile; a dikaryon develops from single basidiospores.

horny. (of textures) Hard and brittle, homogeneous in texture and difficult to section.

hyaline. (of color) Colorless, transparent.

hydnaceous. (of the hymenophore) Bearing the hymenium on spine-like protuberances.

hymenium. The layer of basidia and sterile elements lining the outer surface of the hymenophore.

hymenophore. The portion of the basidiocarp on which the hymenium develops.

hypha. (pl. hyphae) One of the individual filaments that make up the vegetative or reproductive mycelium of a fungus.

hyphal peg. Pidges or fascicles of sterile hyphae that appear as peg-like projections in cross-sections of tubes of polypores.

hyphidium. (pl. hyphidia) A slender, sterile hymenial or imbedded element characterized by distinctive branching.

hyphoid. (of cystidia) Not clearly differentiated from vegetative hyphae.

hyphochnoid. (of texture) With the hyphae loosely compacted into a soft, cottony to felt-like mat.

imbricate. (of basidiocarps) Developing in overlapping groups of pilei.

inbreeding. The formation of heterokaryons from plasmogamy between compatible homokaryons from the same paternal source.

incised. (of dissepiment edges) Deeply and sharply notched.

incompatible. (of homokaryons) Lacking the ability or potential to undergo plasmogamy and establish a heterokaryon.

incrusted. Lightly to densely covered with crystalline material.

Indian paint fungus. Echinodontium tinctorium

indurate. (of context tissue) Hardened.

influndibuliform. (of basidiocarps) Funnel-shaped.

involute. (of pilear margins) Curled inward.

irpiceiform. (of the hymenophore) Poroid in the early stages of development, with the dissepiments soon splitting to form an hydnaceous hymenophore.

isabelline. A dingy, pale yellowish brown color.

karyogamy. Fusion of nuclei.

KOH. Potassium hydroxide, here used as a 4 percent aqueous solution to rehydrate sections of dried specimens.

labyrinthiform. (of pores) Like a labyrinth or maze.

lac:cate. (of pilear surfaces) Appearing varnished or shellacked.

lacerate. (of dissepiments) Deeply split or torn.

lactiferous hypha. An hyphal element containing a white to colored liquid that exudes from cut or broken surfaces.

lamella. (pl. lamellae) A plate-like or gill-like element of the hymenophore; vertically oriented and radially aligned.

laminated rot. A rot in which the wood separates along the annual rings because of more rapid decay of springwood; sometimes called ringshake.

lamprocystidium. Sterile hymenial element with uniformly to partially thickened wall, often incrusted with crystalline or amorphous material.

laterally stipitate. (of basidiocarps) With a stipe attached at the margin of the pileus.

latericeous. A bright red color.

leptocystidium. Sterile hymenial element with a thin wall and lacking incrustation or refractive contents.

ligneous. (of context tissue) Woody.

lignicolous. Wood inhabiting.

lumen. (pl. lumina) The cavity within the wall of an hypha.

lunate. (of spores) New moon or crescent shaped.

mammillate. (of cystidia) With a nipple-like projection at the apex.
**Glossary**

**Melzer's reaction.** A solution consisting of 2.5 gms iodine, 7.5 gms potassium iodide, and 100 gms chloral hydrate per 100 ccs of water; used to detect amylloid or dextrinoid reactions.

**membranous.** (of resupinate basidiocarps) Thin, compact, but pliant like a membrane.

**meruloid.** (of the hymenophore) Thrown into anastomosing folds and ridges with the hymenium extending over the edges.

**moniliform.** (of cystidia) With regularly spread constrictions.

**monokaryon.** A cell or mycelium with one nuclear per cell.

**monomitic.** (of hyphal structure in basidiocarps) With only generative hyphae.

**mottled rot.** A type of white pocket rot in which the pockets are very indistinct, giving a splotched or spotty appearance to the decayed wood.

**mucronate.** (of cystidia) With a small pointed projection at the apex.

**multiallelic.** Having a series of alleles at the locus or loci for incompatibility in a population of heterothallic species.

**multiple clamp connections.** Several (usually 3-6) clamp connections at the same septum.

**mycelial fan.** A mass of mycelium, usually between bark and wood, with feathery branching strands.

**mycelial felt.** A mass of mycelium that fill shrinkage cracks in decayed wood, usually becoming compactly interwoven to form tough, leathery felt-like sheets.

**mycelium.** A mass of hyphae.

**Nigrofomes.** gender, m. Fomes with black coloration.

**nodulose.** (of basidiocarps or pilear surfaces) In the form of rounded knobs or nodules.

**obconic.** (of basidia, spores) Like an inverted cone, having a very narrow base and a broad apex.

**oblong.** (of spores) Short, cylindric, and less than twice as long as broad.

**obovate.** (of spores) Egg shaped, with the narrow end at the base.

**ochraceous.** A yellowish buff color.

**ochrotalba.** A combination of ocher color and white.

**odium.** (pl. odia) An asexual spore formed by the fragmentation of vegetative hyphae into short, cylindric segments.

**ollaceous.** A yellowish green color like that of a green olive.

**outbreeding.** The formation of heterokaryons from plasmogamy between compatible homokaryons from genetically different parental sources.

**ovoid.** (of spores) Egg shaped.

**pallid.** Pale in color; nearly white.

**papillate.** (of basidiocarp surfaces) With small, rounded or hemispherical projections.

**papyracea.** Pertaining to papyrus, papery.

**pathogenic.** Capable of causing disease.

**pellicle.** A thin, compact layer that is easily peeled off or flaked away.

**pendent.** (of basidiocarps) Hanging or suspended by a slender dorsal attachment.

**petaloid.** (of basidiocarps or pilei) Laterally attached, thin, and elongated like a flower petal.

**phylogenetic.** Indicating natural evolutionary relationships.

**pileate (of basidiocarps)** With a reflexed, shelf-like portion having a sterile upper surface.

**pileus.** (pl. pilei) In stipitatae, sessile, or effused-reflexed basidiocarps, the portion with a sterile upper surface and hymenophore on the lower surface.

**pilose.** (of basidiocarp surfaces) With long, soft, densely crowded filaments giving a plush-like texture.

**pin rot.** A white rot with small, empty pockets, giving it a lacy appearance.

**polypore.** A fungus with a basidiocarps bearing an hymenophore consisting of united tubes opening by pores.

**polyporoid.** (of the hymenophore) In the form of united tubes opening by pores.

**poroid.** (of the hymenophoral surface of polypores) With pores which are the aperatures of united tubes.

**pruinose.** (of basidiocarp surfaces) With a finely powdered or frosty appearance.

**pubescent.** (of basidiocarps surfaces) With fine, silky hairs.

**pulvinate.** (of basidiocarps) Shaped like a small circular cushion and usually distinctly convex.

**punctate.** (of spores) With minute spots or depressions.
Glossary

pyriform. (of spores) Pear shaped.

quercina. inhabiting oaks.

quinine fungus. *Fomitopsis officinalis*.

radicating. (of stipes) With an elongated and root-like underground portion.

raduloid. (of the hymenophore) With broad, flattened, tooth-like projections.

reflexed. (of basidiocarps) Having a pileate portion with a sterile upper surface.

refractive. (of hyphal or cystidial contents) Light deflecting.

reniform. (of spores) Kidney shaped.

resinous. (of consistency or taste) Like resin, as if impregnated with resin, or tasting like resin.

resupinate. (of basidiocarps) Completely effused with no pileate portions.

reticulate. (of hymenophoral or spore surfaces) With a net-like, anastomosing system of folds or ridges.

rhizomorph. A macroscopic strand composed of few to many intertwined hyphae, particularly at the margin of resupinate basidiocarps or in the substratum associated with basidiocarps.

rhizomorphic. (of basidiocarps) With rhizomorphs.

rimose. (of basidiocarp surfaces) Rimsily cracked.

root rot. Decay in the roots of a living tree; sometimes by pathogenic fungi.

rufescent. (of basidiocarps) Reddish, particularly becoming reddish on bruising or drying.

rugose. (of basidiocarp surfaces) Wrinkled.

salmon. A pinkish orange color.

saprot. A decay of the dead sapwood of dead standing or fallen trees, stumps and slash by fungi.

sclerotium. (pl. sclerotia) A hard vegetative resting structure consisting of compactly arranged an usually thick-walled hyphae.

scabrous. (of basidiocarp surfaces) Rough to touch.

scrupose. (of basidiocarp surfaces) Rough with small projecting, pointed fascicles of hyphae.

scurfy. (of basidiocarp surfaces) Covered with thin, dry scales or flakes.

secondary septum. A cross wall that develops in a mature cell, not associated with nuclear division.

sepiment. (pl. septa) A transverse wall delimiting a single cell of hyphae.

serrate. (of dissepiment edges) With sharp teeth like a saw.

sessile. (of pileate basidiocarps) Without a stipe.

seta. (pl. setae) A sterile hymenial element with brown, thickened walls, a pointed apex, and which darkens in KOH solution.

setal hyphae. A thick-walled, pointed, brown hypha, found in subicular and marginal tissue of basidiocarps, mycelium in rotted wood, or cultures.

setulose. (of hymenial surfaces) With setae, especially when discernable with a 10x hand lens.

simple-septate. (of hyphae) With septa but lacking clamp connections.

sinuous. (of hyphae) Wavy or flexuous.

skeletal hyphae. Thick-walled, nonseptate hyphae that develop from generative hyphae.

skeletalystidium. (pl. skeletocystidia) A thick-walled, sterile hymenial or imbedded element that represents the end of a trama skeletal hypha.

slash. The residue of nonmerchantable cull logs, tops, branches, and other material left after timber harvesting, thinning, pruning, or natural phenomena such as severe windstorms or snow and ice damage.

spathulate. (of basidiocarps or pilei) Spathula shaped or spoon-like.

spherical. (of spores) Shaped like a ball; all sections through the center are circles.

squamous. (of basidiocarps surfaces) With scales.

squamule. A small, scale-like structure.

stellate. (of crystals) Arranged in radiating or star shaped patterns.

sterigma. (pl. sterigmata) An arcuate, tapering projection on which a basidiospore develops.

stipe. A stalk-like or stem-like structure that supports the pileus.

stipitate. (of basidiocarps) With a stipe.

striate. (of spores or pilear surfaces) Ornamented with parallel lines, grooves, or projections.

strigose. (of basidiocarp surfaces) With coarse, stiff adpressed hyphae or hyphal strands.

stringy rot. A type of white rot in which the decayed wood has a fibrous appearance in the advanced stages.

subglobose. (of spores) Almost spherical but slightly elongated.

subhymenium. The tissue immediately below the hymenium.

subiculum. The sterile tissue between the tubes and the substratum in resupinate basidiocarps.
Glossary

subquamosa. somewhat scaly.
substratum. (pl. substrata) The material, such as wood, on which a fungus grows and from which it derives food.
substipitate. (of basidiocarps) With a narrowed base but not a clearly differentiated stipe.
subulate. (of setae) Narrow at the base and tapering uniformly to a point; awl shaped.
sulcate. (of basidiocarp surfaces) With concentric grooves and ridges.
sulphur fungus. Laetiporus sulphureus.
sympatric. Referring to two or more different taxa that occur in close spatial proximity.
tannic acid agar. Malt agar extract medium with 5 gm tannic acid per liter; used to detect polyphenoloxidases.
terrestrial. (of basidiocarps) Developing on the ground.
tetrapolar. With incompatibility controlled by two pairs of non-linked alleles that segregate independently; a single dikaryon gives rise to four mating types; also referred to as bifactorial.
tomentose. (of basidiocarp surfaces) With densely matted hyphae that give a wooly texture.
top rot. Decay in the upper trunk of a living tree.
trama. The sterile tissue between the tube walls of polypores.
trinitic. (of hyphal structure in basidiocarps) With generative, skeletal, and binding hyphae.
truncate. (of spores) With the apical end appearing as if cut off squarely.
trunk rot. Decay in the main trunk of a living tree above the stump level.
tuberculate. (of spores) With rounded or wart-like projections.
tuckahoe. The sclerotium of Wolfiporia cocos or Polyporus tuberaster.

umber. A dark, dull brown color.
umbilicate. (of pilei) With a deep central depression.
umbo. A central protuberance on the upper surface of the pileus.
undulate. (of the margin of pileate basidiocarps) Wavy, not flat or uniformly curved.
ungulate. (of pileate, sessile basidiocarps) Hoof shaped.
urniform. (of basidia) Urn shaped, with a swollen base and narrow median portion expanded at the apex.

vascular hypha. An hypha with dark or refractive contents.
velvety. (of basidiocarp surfaces) With a short, dense surface layer of erect hyphae.

ventricose. (of setae, cystidia) With a distinctly swollen base and abruptly narrowing apical portion.
verrucose. (of spores) With small, rounded warts.
vessicile. An inflated or swollen hyphal cell.
villose. (of basidiocarp surfaces) With long, silky hairs.
vinaceous. With pale lavender or purplish tints.
viscid. (of basidiocarp surfaces) Covered with a slimy material when fresh.
volva. A sac-like structure that encloses the hymenial surface of Cryptoporus volvatus at maturity.

whiterot. Type of decay resulting from enzymatic action of fungi that degrade all components of wood and also bleach the decayed wood in the later stages.

zonate. (of pilear surfaces or margins) marked with bands of different colors or textures.
### Authors of Names of North American Polypores

A question mark (?) indicates that dates of birth or death were not available.

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<td>Sowerby</td>
</tr>
</tbody>
</table>
List of authors

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Derivation of the accepted generic and specific names for North American polypores

abietinum. inhabiting the fir tree (Abies).
Abortiporus. gender, m. with prematurely formed pores.
aculeifera. bearing needles or points.
admirabilis. becoming wonderful or strange.
adustus. scorched or appearing burned.
alabamae. of Alabama.
alachuanae. of Alachua County, Florida.
Albatrellus. gender, m. from an Italian fungus name.
albidae. white.
albomaquinea. a combination of white and dark brown.
albocitrinus. a combination of white and lemon yellow.
alboluteus. a combination of white and yellow.
aminus. bitter in taste.
americanae. of America.
amorpha. without definite form.
Amylocystis. gender, f. with amyloid cystidia.
amylodextrиноidea. with amyloid and dextrinoid reactions.
Amylosporus. gender, m. with amyloid spores.
andersonii. named for F.W. Anderson.
anexina. dry or without fluid.
anguloporus. having angular pores.
anosum. aged or full of years, perennial.
anularis. relating to a ring.
Anomoporia. gender, f. having irregular pores.
Antrodia. gender, f. full of caves.
Antrodiella. gender, f. diminutive of Antrodia.
apacheriensis. of Apacheria, a region in the southwestern U.S.
and northern Mexico inhabited by Apache Indian tribes.
applanatum. flattened.
Aporpium. gender, n. without buckles.
arctostaphyli. on Actostaphylius.
arcurarius. with small boxes, referring to pores.
arizonicus. of Arizona.
aurea. golden yellow, splendid.
Aurificaria. gender, f. with golden yellow tissue.
Derivation of scientific names

Auriporia. gender, f. with golden yellow pore surface.
avellaneus. drab, the color of a fresh hazel nut.

baboquivariensis. of the Baboquivari Mountains of Arizona.
badius. chestnut colored, brown.
ballouii. named for W.H. Ballou.
balsameus. inhabiting the balsam fir (Abies balsamea).
berkeleyi. named for M.J. Berkeley.
betulinus. inhabiting birch trees (Betula).
biennis. lasting for two years.
biiforme. with two forms or stages.
Bjerkandera. gender, f. named for C. Bjerkander.
Boletopsis. gender, f. having the appearance of a Bolete.
bombycina. silky.
Bondarzewia. gender, f. named for A.S. Bondarzew.
borealis. northern.
brownii. named for V.S. Brown.
brunalis. referring to winter.
byrsina. pertaining to a skin or hide.
byssogenum. bearing a fine thread, soft and cottony.
Byssoporia. gender, f. polypore with fine threads, soft, cottony.
caeruleoporus. with a dark blue pore surface.
caesius. bluish gray.
cajanderi. named for A.K. Cajander.
campbellii. named for J.D. Campbell.
campestris. growing in a field.
carbonarium. growing on charred wood.
carbonica. causing a brown carbonizing rot.
carnegiea. growing on saguaro (Carnegiea).
carneogrisea. a combination of flesh colored and gray.
carya. growing on hickory (Carya).
cavernulosa. full of caverns.
cerifluus. like flowing wax.
Ceriporia. gender, f. poroid and waxy.
Ceriporiopsis. gender, f. with the appearance of Ceriporia.
Cerrera. gender, f. from an Italian fungus name.
cervina. tawny, like a deer.
Chaetoporellus. gender, m. diminutive of Chaetoporus; poroid and with cystidia.
chioneus. snow white.
Derivation of scientific names

Daedaleopsis. gender, f. having the appearance of Daedalea.
Daedalea. gender, f. off-white.
Daedalanthes. alluring, delicate.
Dedaloi. named for Dedaloff.
Dedalus. hanging down.
Diacanthodes. gender, f. like a double thorn.
Dichiturn. gender, m. with hyphae that branch dichotomously.
Dichrous. of two colors.
Dilatohypha. with swollen or dilated hyphae.
Diplomitoporus. gender, m. polypore with a dimitic hyphal system.
Discal. expanded or spread out.
Donkioporia. gender, f. polypore named for M.A. Donk.
Drummondii. named for J.R. Drummond.
Dryadeus. similar to a dryad or wood nymph.
Dryophilus. oak loving.
Dulcis. sweet.
Dulcispora. sweet spore.
Earliella. gender, f. named for F.S. Earle.
Echinodontium. gender, n. from a combination of Greek words meaning hedgehog and tooth; literally spiny teeth.
Echinoporia. gender, f. a spiny polypore.
Ectypus. carved, worked in relief.
Elegans. neat, elegant.
Elliopsopora. with elliptical spores.
Ellissianus. named for J.B. Ellis.
Ellisii. named for J.B. Ellis.
Epimilitinus. on a red substrate.
Everhartii. named for B.M. Everhart.
Eucelsa. tall, elevated.
Extensus. stretched out, extended.

Farlowii. named for W.G. Farlow.
Fasciatatus. bundled or fascicled.
Fastuosus. haughty, full of pride.
Feyi. named for A.L.A. Fee.
Ferox. fierce, bold. in reference to the rot.
Ferrus. of a rusty iron color.
Ferrugineofuscus. a combination of rust color and dark brown.
Ferruginicincta. of a rust color and banded.

Ferruginosus. of a rusty iron color.
Fimbriatella. diminutive of fimbriatus; fringed or with a border of hairs.
Fimbriatus. fringed, with a border of hairs.
Fissiliformis. with the appearance of being easily split.
Fissilis. tending to split.
Fistulina. gender, f. with small, hollow tubes.
Flava. yellow.
Flavipora. with a yellow pore surface.
Flettii. named for J.B. Flett.
Floriformis. with the appearance of a flower.
Folcula. inhabiting burned over places.
Fomentarius. used for tinder.
Fomes. gender, m. tinder.
Fomitella. gender, f. diminutive of Fomes.
Fomitopsis. gender, f. having the appearance of Fomes.
Fractipes. with broken feet.
Fragilis. brittle, fragile, easily broken.
Fragrans. fragrant, pleasant smelling.
Fraxinea. of the ash tree (Fraxinus).
Fraxinophila. ash loving.
Frondosa. full of leaves (with many pilei).
Fruticosa. of bushes or shrubs.
Fulgens. shining, glowing.
Fumidiceps. with smoky heads or caps.
Fumosa. smoky.
Fusccocerrena. gender, f. like Cerrena but dark brown.
Fuscoviolaceus. a combination of dark brown and violet.
Galactinus. milky white.
Gallica. of France.
Ganoderma. gender, n. with a shiny or lustrous skin.
Giganteus. large, gigantic.
Gilvescens. pale yellow.
Gilvus. pale yellow.
Globiformes. gender, m. Fomes with globular or spherical fruiting bodies.
Gloeophyllum. gender, n. with glutinous or sticky leaves.
Gloeoporus. gender, m. a glutinous or sticky polypore.
Glomeratus. wound or closely gathered together.
Gossypina. cottony.
Graveolens. strong-smelling.
Derivation of scientific names

grenadensis. of the island of Grenada.
Grifola. gender, f. from an Italian fungus name.
guttulatus. sprinkled with dots of resin or oil.

Hapalopilus. gender, m. with a soft, tender pileus or cap.
Haploporus. gender, m. with simple pores.
hartigii. named for R. Hartig.
hepatica. liver colored, dark reddish brown.
Heterobasidion. gender, m. with different or variable basidia.
heteromorpha. with differing or variable form.
Hexagonia. gender, f. with hexagonal or six-sided pores.
hibernicus. of Ireland.
hirsuta. hairy, with rather coarse, erect or ascending hairs.
hirtus. rough, with stiff hairs.
hispidus. shaggy, rough, with coarse, rigid, erect hairs.
humeana. named for H.H. Hume.
humilis. on the ground.
Hydnochaete. gender, f. having teeth with bristles.
hydnoides. resembling a Hydnum.
Hydnopolyporus. gender, m. with tubes that split and become hydnaceus.

igniarius. pertaining to fire.
increasata. thickened, made stout.
incrusted. incrusted, with a coating.
inermis. unarmed, without setae.
Inonotus. gender, m. fibrous and ear-like.
iodinus. the color of iodine.
Irpea. gender, m. a large rake with iron teeth.
Ischnoderma. gender, n. with withered or wrinkled skin.

Jahnoporus. gender, m. named for H. Jahn.
jamaicensis. of the island of Jamaica.
johnsonianus. named for L.N. Johnson.
Junguhinia. gender, f. named for F.W. Junguhhn.
juniperina. inhabiting junipers.
kmetii. named for Kmet.

lacetus. milky.
Lactiporus. gender, m. a gay, pleasing polypore.
laevigatus. smooth.

lapponicus. of Lappland.
laricinus. inhabiting larches (Larix).
latemarginatus. with a broad margin.
laticrens. concealed, hidden.
lenis. soft, mild.
lena. pliant, tough.
Lensites. gender, f. named for F.A. Lenz.
Leptoporus. gender, m. with slender or small pores.
leucomallellus. like a small, white lock of matted wool.
leucomallus. like a white, matted lock of wool.
leucospongia. white and spongy.
ilacina. pale dull violet.
linbladii. named for M.A. Lindblad.
Lindtneria. gender, f. named for Lindtner.
lineatus. marked by fine, parallel lines.
linteus. like linen or canvas.
lobufatum. lobed.
loweii. named for J.L. Lowe.
lucidum. clear, shining.
ludovicianus. of Louisiana.
lundellii. named for S. Lundell.
luteoalba. a combination of golden yellow and white.
luteoumbrina. a combination of golden yellow and umber brown.

malicola. inhabiting apple trees (Malus).
mappus. like a napkin.
maxima. large.
medulla-panis. narrow-like, pithy bread.
Megasporoporia. gender, f. polypore with large spores.
Melanoporia. gender, f. polypore with dark or black fruiting bodies.
melanoporum. with a black pore surface.
melanopus. with dark or black feet.
meliaceae. of the chinaberry tree (Melia).
melleoporus. with honey colored pore surface.
membranaceus. like skin or parchment.
merrillii. named for E.D. Merrill.
Meripilus. gender, m. part of a pileus.
Meruliporia. gender, f. combination of Merulius and Polia.
mexicanum. of Mexico.
Microsporellus. gender, m. diminutive of Microsporus; with small pores.
Derivation of scientific names

microporus. with small pores.
minusculoides. very small, trifling.
modesta. unassuming, modest.
mollis. soft.
mollusca. soft.
montagnae. named for J.P.F. C. Montagne.
montana. of mountains.
mucida. musty or moldy.
munzii. named for P.A. Munz.
musculicola. inhabiting moss.
mutabilis. changeable.
mutans. changeable or variable.
myceliosa. with abundant mycelium.

narymica. of Narym in Siberia.
Navisporus. gender, m. with navicular or boat-shaped spores.
nidulans. nesting or lying in a cavity.
nigra. black.
nigrolimitatus. bounded or limited by a black line or layer.
Nigroporus. gender, m. with a black pore surface.
nitida. shining or polished, bright.
nivea. snowy or snow white.
nivosus. full of snow or snowy.
nobilissimus. very well known or famous.
novo-guineensis. of New Guinea.

obductus. covered over, overspread.
oblectabilis. worthy of delight or amusement.
obliquus. slanting sidewise.
obovatus. egg-shaped with the broad end up.
occentralis. western.
ochracea. ocher color, yellowish buff.
odoratum. sweet-smelling.
odorus. fragrant.
officinalis. used in medicine.
ohiensis. of Ohio.
oleracea. pertaining to the odor of rotten cabbage of cultures.
Oligoporus. gender, m. with few or small pores.
olivacea. with the color of a green olive.
oregonense. of Oregon.
overholtsii. named for L.O. Overholts.

Oxyporus. gender, m. polypore with a sharp, acid taste.

Pachykytospora. gender, f. pertaining to the large, ornamented spores.
pachyodon. with thick teeth.
palmicola. inhabiting palms.
palustris. in marshy places.
pannocincta. with the texture of felt and banded.
aparadoxa. strange, contrary to expectation.
Parmastomyces. gender, m. named for E. Parmasto.
patouillardii. named for N. Patouillard.
pavonia. pertaining to peacocks.
peckianus. named for C.H. Peck.
pellicula. a little skin or hide.
pendulus. hanging down.
Perenniporia. gender, f. polypore with perennial fruiting bodies.
perennis. perennial.
perdelicatus. completely dainty, fastidious.
perrottetii. named for Perrottet.
persicinus. peach colored.
pes-caprae. foot of a goat.
Phaeolus. gender, m. dark, obscure.
Phellinus. gender, m. made of cork, corky.
philophila. bark loving.
Phylloporia. gender, f. a leaf-like polypore.
Physisporinus. gender, m. diminutive of Physisporus.
pini. on pines (Pinus).
pinicola. inhabiting pines.
Piptoporus. gender, m. polypore that falls off.
placentus. a small, round, flat cake.
planellus. diminutive of planus, flat, level, even.
pocula. cup, bowl.
Polyporoletus. gender, m. combination of Polyporus and Boletus.
Polyergus. gender, m. many pores.
pomaceus. of fruit trees.
populinus. inhabiting poplar trees (Populus).
Porodisculus. gender, m. diminutive of Porodiscus, a little poroid disk.
porrectus. projected, extended forward horizontally.
portoricensis. of Puerto Rico.
protractum. drawn out, lengthened.
Derivation of scientific names

prunica. inhabiting plum trees (Prunus).
Pseudofavolus. gender, m. false Favolus.
pseudolacteus. not truly milky.
pubescens. with hairs of puberty, downy.
pulchellus. beautiful.
punctatus. spotted as if by punctures.
punctatiformis. like punctatus.
purpurea. purplish.
Pycnoporellus. gender, m. diminutive of Pycnoporus.
Pycnoporus. gender, m. with compact, dense pores.
Pyroclastes. gender, m. fire Fomes.
quercustris. dwelling in oaks (Quercus).
radiatus. with rays or radiating markings.
radicata. rooted.
radiculosa. with many roots.
rancidus. disgusting, offensive.
regularis. regular, uniform.
repandus. bent backward, turned up.
resinosum. resin-like, resinous, or tasting like resin.
reticulata. netted, marked with a network.
rheades. of Rhea, daughter of Uranus and Gaea, mother of Zeus.
rhodella. rosy red.
rizob. on Ribes.
rickii. named for J. Rick.
rigida. rigid, stiff.
Rigidiporus. gender, m. polypore with rigid hymenophore.
rivosus. cracked.
rivulosa. with fine, wavy channels or grooves.
robiniae. growing on black locust (Robinia).
robiniophila. Robinia loving.
robustus. oaken, strong, robust.
romellii. named for L. Romell.
rosea. red like a rose, ruddy.
rufitinctus. dyed or colored with red.
salmonicolor. the color of a salmon or salmon flesh, pink.
sanguineus. blood red.
sanquinolentus. bloody, full of blood.
scabrosus. rough or gritty to the touch.
Schizopora. gender, f. with split pores.

schweinitzii. named for L.D. von Schweinitz.
scutellata. covered with small scales or plates.
sector. one who cuts off.
semistipitatus. almost or partly stipitate.
semisupinus. almost or partly supine.
separilibia. separable.
sepium. growing in hedges.
sequoiae. growing on redwood (Sequoia).
serialis. arranged in rows.
sericeomollis. silky, soft.
setulosa. with abundant hairs.
similis. like another taxon.
sinuosa. bent, curved.
Sistotrema. gender, n. literally, a shaking hole.
sitkensis. of the island of Sitka, Alaska.
skamaniae. of Skamania County, Washington.
Skeletocutis. gender, f. a dried up skin.
smithii. named for A.H. Smith.
soloniensis. of Solon.
sonora. of the Sonoran Desert.
sordida. dirty, foul.
spiculosus. having points or spikes.
spissa. compact, crowded.
Spongipellis. gender, f. spongy skin.
spraguei. named for C.J. Sprague.
spumeus. foaming, frothing.
squalens. dirty or filthy.
squamosus. scaly.
stellae. star-like, in reference to crystals.
stereoides. like Stereum.
stipticus. bitter in taste.
striatum. striped.
suaveolens. sweet-smelling.
subacida. somewhat sour or acid.
subchartaceum. somewhat papery or chartaceous.
subectypus. somewhat carved, worked in relief.
subgiganteus. somewhat gigantic.
subiculosus. with a profuse production of mycelium below the fruiting body.
subincarnata. somewhat fleshy.
sublividus. somewhat bluish.
**Derivation of scientific names**

subpendulus. somewhat hanging or pendent.
subrubescens. somewhat reddish.
subrufa. somewhat red.
subrutilans. somewhat red.
subvermispora. with somewhat worm-like spores.
sulcatus. furrowed.
sulphureus. sulphur yellow.
supina. lying on the back.

tabacina. tobacco colored, pale brown.
tarda. slow, sluggish.
taxicola. inhabiting the yew (Taxus).
tenuiculus. very thin.
tenuis. thin.
tepetensis. of the Tepeita Valley, near Cuernavaca, Mexico.
tephroleucus. a combination of ash colored and white.
tephropora. with ash colored or gray pore surface.
terrestre. of the earth.
texanus. of Texas.
thelphoroides. like Thelephora.
Tinctoporellus. gender, m. with colored or tinted pore surface.
tinctorium. dyed or tinted.
tomentosus. densely covered with matted short hairs, woolly.
torulosus. cylindrical with bulges and constrictions.
trabeum. wearing a ceremonial robe with purple stripes.
trachyspora. with rough spores.
Trametes. gender, f. the woof.
transmutans. completely changeable or variable.
Trechispora. gender, f. with rough spores.
tremulae. growing on quaking aspen (Populus tremula).
Trichaptum. gender, n. with clinging hairs.
tricholoma. with a hairy border or margin.
trichomallus. like a densely hairy lock of wool.
trogii. named for J.G. Trog.
tsugae. growing on hemlock (Tsuga).
tuberaster. like a little potato (referring to a sclerotium).
tuberculosa. bearing knobs or bumps.
Tyromyces. gender, m. with a cheesy consistency.

ulmarius. growing on elm (Ulmus).
umbellatus. umbellate.
umbrinellus. with the color of umber, dark.
undosus. full of waves, billowy.
unicolor. of one color.
vaillanti. named for S. Vaillant.
vaninii. named for S.I. Vanin.
variegata. variegated.
variiformis. with variable or different forms.
varius. different, changing.
versatilis. capable of changing or turning, versatile.
versicolor. of various colors.
versiculites. of various skins.
villosa. hairy, shaggy.
vinctus. bound, banded.
vinosus. wine-colored, purplish red.
virgatus. twiggy, made of twigs, also striped.
viridans. growing green.
Viticola. inhabiting grape vines (Vitis).
vitreus. like glass, glassy.
volvatus. provided with a volva.

wahlbergii. named for Wahlberg.
weirianus. named for J.R. Weir.
weirii. named for J.R. Weir.
Wolfiporia. gender, f. named for F.W. Wolf.
Wrightiporia. gender, f. named for G. Wright.

xantha. yellow.
xylostromatoides. like a wooden bed or mattress.

zealandicus. of New Zealand or the Netherlands.
zonata. banded, zonate.
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References
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References


References


References


castelotonensis, Fuscoporella

cavernola, Megassporoporia

cavernula, Pol. 437

cavernulosa, Pol. 437
cerifera, Pol. 784
cerifluus, Tyromyces 784, 785

ceriporopa, Pol. 34, 80, 187, 781
cerrena, Pol. 197, 224, 747
cerrena, Pol. 349
cervina, Tram. 52, 784, 735, 786, 787
cerasin, Boletus 785

Chaetoporella 34, 79, 198

chionea, Pol. 785

chionea, Tyr. 46, 47, 489, 781, 785

cromatic, Poria 241

crypsis, Phylloporum 624

chrysitis, Pol. 324

chrysosoma, Phell. 46, 47, 553, 554, 599

chrysosoma, Pol. 553, 690

cinerascens, Pol. 248

cinnabarinus, Pol. 687

cinnabarinus, Pyc. 7, 53, 53, 687, 689

cinnamomea, Colt. 202, 203, 207, 209, 213

cinnamomea, Irpeps 351

cinnamomea, Pol. 803

cinclus, Ino. 53, 356, 364, 365, 408

cinclus, Tram. 365

Climacocystis 34, 79, 201
cocos, Poria 798, 800
cocos, Sclerotium 798

cocos, Wolfspora 48, 798, 800, 802

coffea, Pol. 353

coffeatorpora, Phell. 588
cognata, Poria 482

collabens, Jung. 53, 410, 411, 414

collabens, Pol. 411

colliculosus, Pol. 504

colossus, Gano. 289, 294, 295

colossutus, Pol. 295
colossutus, Tomophaga 295

Coltricia 34, 38, 70, 202, 289

Coltriciella 34, 70, 210

commune, Schizoph. 48

compacta, Pareripora 513

compactus, Pol. 513

conchatus, Fomes 554

conchatus, Phell. 48

conchatus, Phell. 554

conchifer, Boletus 787

conchifer, Pol. 787

conchifer, Tram. 48, 787

conchifer, Gleeop. 350

concolor, Poria 514

confluens, Alba. 87, 91, 100, 103

confluens, Boletus 91

confluens, Pol. 91

confluens, Sistotrema 708, 709

confragosa, Daed. 286

confragosa, Daedalea 46, 47, 49, 50, 226

Coniaflora 444

contiguus, Phell. 556, 558, 591

contiguus Pol. 556

conwyana, Poria 241

corineus, Irpeps 285

Coriolopsis 34, 78, 214, 245, 781

Coriolus 781, 785

corum, Borrentina 289

coronadensis, Pol. 659, 645, 653

corrosus, Inonotus 654

corruatus, Pol. 249

corticale, Oxy. 187, 189, 492, 498, 495, 501

corticale, Pol. 498

corticale, Poria 492

crasa, Ant. 121, 129, 146

crasa, Phys. 129

craterellus, Pol. 655

crataegata, Hez. 345

cristatus, Alba. 87, 94

cristatus, Boletus 54

cristatus, Pyc. 94

crustacea, Poria 594

crustacea, Rigist. 694

crustulina, Poria 241

crustulina, Diplo. 46, 55, 129, 240, 241

Cryptopus 34, 80, 220

cryptopus, Pol. 659, 657

culina, Earli. 249

culina, Fomitipora 556

culina, Pol. 788

culina, Plyco. 297

culina, Tram. 781, 738

cuculatus, Fanolus 681

cuculatus, Pseudofanolus 681

cuneatus, Oxyporus 493, 494, 501

cuneatus, Coriolellus 492

cupuliformis, Pol. 679

curtipes, Favolus 681

cuticularis, Ino. 48, 49, 51, 557, 566, 569, 583

cuticularis, Pol. 569

cutisfractus, Tyromyces 484

Cyclomyces 34, 70, 222, 683

cylindrospora, Wrightiopora 804

Dacryobolus 49

Daedalea 34, 73, 224

Daedaleopsis 34, 73, 226

Diatrona 34, 78, 228, 285

dealbatus, Microsporellus 446,

dealbatus, Pol. 51, 447

deceptivus, Pol. 210

decurrent, Pol. 809, 671

decipiens, Pol. 785

delectans, Spongipellis 733, 734,

demidoffii, Pol. 691

demidoffii, Pyro. 55, 691, 693

Dendroporoporus 839
denmus, Fomes 579
dependens, Coltri. 210
dependens, Phell. 558, 559
dependens, Pol. 520
dependens, Pyropolyporus 558
delplaneta, Daedalea 745
discanthodes 34, 71, 233
dichomitus 34, 81, 237
dichrous, Gloeop. 47, 48, 49,
51, 58, 59, 227, 328, 390, 531
dichrous, Pol. 588
dilatohypha, Wolfiporia 800, 802
Diplomitoporus 34, 82, 119, 240
discolor, Poria 527
dispausus, Alba. 87, 96
dispanus, Pol. 96
distorta, Poria 153
distorta, Abt. 88
distorta, Pol. 85
Donkporia 34, 77, 247
drummondii, Pol. 740
drummondii, Tram. 740, 750
dryadeus, Ino. 51, 52, 356, 970,
371
dryadeus, Pol. 371
dryophilus, Ino. 48, 51, 357, 372,
373, 395, 401
dryophilus, Pol. 373
dryophilus var. vulpinus, Pol. 395
duratitus, Lept. 158
duratius, Pol. 158
durescens, Fomit. 269, 271, 281
durescens, Pol. 271
earlii, Pol. 169
earlii, Poria 424
Earliellae 34, 73, 80, 249
Echinodontium 34, 73, 77, 251
Echinoporia 34, 81, 265
ectypus, Pol. 740
ectypus, Tram. 740, 745, 759
ectypus, Daedalea 745
elegans, P. 689, 649, 659, 661, 674
elegans, Pol. 659
elegans, Tram. 10, 74, 740, 745
ellipsoidpera, Perenniporia 514,
515
eillusana, Perenniporia 49, 515,
517, 522
eillusius, Fomes 515
eillusius, Tyr. 298
eillusius, Alba. 87, 96, 98
eillusius, Pol. 98
eii, Poria 524
eimplinitus, Pol. 729
epilimitus, Tinctoporellus 51,
729
eupora, Poria 418
everharti, Fomes 559
everharti, Munconioporus 559
everhartii, Phell. 48, 559, 561,
621
excelsa, Ceriporia 15, 177, 179
excelsa, Pol. 186
excelsa, Poria 179
expansa, Donk. 247
expansa, Boletus 247
extensa, Daedalea 800
extensa, Macrolepiota 300
extensus, Phell. 561, 562
extensus Pol. 561
fagicola, Pol. 655
farinaceus, Hipez 885
farinaceus, Olig. 456
farlowi, Ino. 357, 369, 374, 375,
383
farlowii, Pol. 375
fasciatus, Fomes 49, 50, 268, 263,
266, 269
fasciatus, Pol. 269
fastuosus, Phell. 563
fastuosus, Pol. 563
fauclus, Pol. 645
fei, Fomes 278
fei, Fomit. 269, 272, 273
fei, Pol. 273
ferglusii, Perenniporia 517, 519
ferox, Ant. 121, 130, 142
ferox, Poria 150
ferrea Poria 564
ferreus, Phell. 58, 564, 565, 570,
597
ferrugineofusca Poria 585
ferrugineofuscus Phell. 52, 565,
566, 567, 570, 571, 589,
ferrugineo-velutinus, Phell. 567
ferrugineo-velutina Poria 587
ferruginicincta, Ceriporia 177,
180
ferruginicinta, Poria 180
ferruginosa Poria 588
ferruginosus, Phell. 47, 52, 565,
568
ferruginosus Pol. 568
fibrillosus Pol. 685
fibrillosus Pycnoporiella 688
fibrobolus, Boletus 246
fimbriata, Stromatocyphus 815
fimbriata, Jung. 410, 412
fimbriata, Poria 412
fimbriatus, Pol. 412
fimbriatus, Hydnop. 534
fimbriatus, Pol. 534
fissiliformis, Antrodiaella 808
fissilis, Pol. 787
fissilla, Tyr. 48, 50, 51, 356, 787,
797
Fistulinia 54, 70, 268
flava, Lind. 428, 430
flavescens, Tram. 240
flava, Poria 140
flavipora Poria 705
flavipora, Schizopora 705, 706
flavumarginata Fomitoporia 567
fletii, Alba. 87, 100
fletii, Pol. 100
flocosus Nanioporus 450
floridana Hex. 667
floriformis, Olig. 466
floriformis Pol. 466
floriformis Tyromyces 466
foculca, Coll. 208, 204, 210
foccula, Pol. 204
fomentarius, Fomes 14, 46, 57,
48, 80, 224, 265, 309
fomentarius, Pol. 265
Fomes 54, 77, 153, 263
Fomitella 34, 266
Fomitoporia 49, 82, 158, 268
fractipes, Abt. 46, 52, 83, 85
fraxinella, Ceriporia 177, 180
fraxinea, Perenn. 48, 51, 519
fraxinea, Boletus 519
fraxinea, Pol. 519
fraxinophila P. 48, 55, 251, 522,
528
fraxinophilus Pol. 521
frondosa, Grif. 7, 48, 51, 332, 444
frondosa, Boletus 332
frondosa, Pol. 332
fruticuta, Phyllopora 625
fruticum Pol. 685
fulgens Hydnum 685
fulgens, Pycnoporiella 58, 685,
686, 687
fulgisis, Pol. 406
fulves Fomes 595
fumidiceps, Tyromyces 788, 791
fumosa, Rjerk. 165, 166
fumosa, Boletus 166
fungsus, Pol. 166
Fuscoferreut 74, 75, 285
fuscus-violaceum, Trichaptum
770, 773, 776
fuscus, Cyclom. 222, 223
galactinus, Pol. 790
galactinus, Tyromyces 790, 791
gallica, Corio. 46, 47, 48, 52, 214,
216, 219, 761
gallicus, Pol. 816
Ganoderma 34, 63, 70, 287,458
geotropus Fomes 495, 699, 700
giganteus, Merl. 7, 50, 353, 442,
444
gilvescens, Cerip. 187, 188, 191
gilvescens, Poria 191
gilveus, Boletus 571
gilvus, Phell. 50, 51, 59, 571, 578,
612
gilvus Pol. 571
Globifomes 34, 71, 307
Phaeolus, Alba.
philippinensis, Daed.
perrottetii, Trichaptum
peregrinus, Pol.
peregrinus, Boletus, 503
paradoxa, Schiz.
parkei, Porodiscus
Farnstromyces
parvulus, Porodiscus
pecilanus, Alba.
peckianus, Boletus
pellicula, Oxyporus
pendula, Fomes
pendulatus, Olig.
perdelicatus, Olig.
peckianus, Alba.
pecilia, Oxyporus
pendula, Fomes
pendulatus, Porodiscus
perdelicatus, Olig.
perdelicatus, Polyst.
pavonia, Tram.
pavonica, Boletus
pavonia, Polyst.
peckianus, Alba.
pecilia, Oxyporus
pendula, Fomes
pendulatus, Porodiscus
perdelicatus, Olig.
perdelicatus, Polyst.
pavonia, Tram.
pavonica, Boletus
pavonia, Polyst.
peckianus, Alba.
pecilia, Oxyporus
pendula, Fomes
pendulatus, Porodiscus
perdelicatus, Olig.
perdelicatus, Polyst.
pavonia, Tram.
pavonica, Boletus
pavonia, Polyst.
peckianus, Alba.
pecilia, Oxyporus
pendula, Fomes
pendulatus, Porodiscus
perdelicatus, Olig.
perdelicatus, Polyst.
pavonia, Tram.
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perdelicatus, Olig.