

# **East Asian Polypores**

**M. Núñez & L. Ryvarden**

**with drawings by L. Ryvarden**

**Volume 2**

**Polyporaceae s. lato**

**Synopsis Fungorum 14**

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New combinations proposed in this book:

*Flabellophora obovata* (Jungh.) Nunez & Ryvarden p.

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**CONDENSED KEY TO POLYPORACEAE S.L.**

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1. Basidiocarps stipitate (all species with numerous pilei from a common base belong here)..... **Key A**
  1. Basidiocarps resupinate to pileate, sometimes with a tapering lateral base or stipe..... 2
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  8. Hyphal system di- or trimitic..... **Key I**
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Basidiocarps stipitate
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  1. Basidiocarps larger..... 3
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 3. Context light to dark brown ..... 10
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### Key B

Basidiocarps sessile to resupinate, hymenophore hydroid,  
 lamellate to daedaloid

1. Basidiospores echinulate, strongly amyloid..... **Echinodontium**  
 1. Basidiospores smooth, negative in Melzer's reagent..... 2
2. Mature basidia with septate epibasidium ..... **Elmerina holophaea**  
 2. Mature basidia non-septate..... 3

- 5. Hyphal system monomitic..... 6
- 5. Hyphal system di-to trimitic..... 7
  
- 6. Without cystidia, basidiospores dextrinoid..... **Parmastomyces**
- 6. With amyloid cystidia, basidiospores negative  
in Melzer's reagent ..... **Amylocystis**
  
- 7. Basidiospores smooth, truncate to ellipsoid, usually distinctly  
thick-walled and with a variable dextrinoid reaction .. **Perenniporia.**
- 7. Basidiospores smooth or finely asperulate, thin-walled, non-dextrinoid,  
vegetative hyphae more or less dextrinoid or amyloid ..... 8
  
- 8. Basidiospores globose, finely asperulate (difficult to observe),  
generative hyphae simple-septate..... **Heterobasidion**
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- 11. Pore surface white to tan, brown rot species..... **Antrodia**

**Key E**

Basidiocarps sessile to resupinate, hymenophore poroid, basidiospores smooth, basidiospores, cystidia and hyphae negative in Melzer's reagent, generative hyphae simple-septate

- 1. Basidiocarps purplish black..... **Nigrofomes**
- 1. Basidiocarps differently coloured..... 2
  
- 2. Cystidia present, either in hymenium and/or trama..... 3
- 2. Cystidia absen..... 9
  
- 3. Cystidia smooth and thin-walled..... 4

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### Key C

Basidiocarps sessile to resupinate, hymenophore poroid,  
basidiospores ornamented

1. Basidiospores amyloid or dextrinoid ..... 2
1. Basidiospores negative in Melzer's reagent ..... 3
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strong scent of anise..... **Haploporus odorus**
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longer than 8 Fm ..... **Pachykytospora**
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4. Hyphal system monomitic..... **Trechispora**

### Key D

Basidiocarps sessile to resupinate, hymenophore poroid,  
basidiospores smooth, cystidia or hyphae amyloid or dextrinoid

1. Basidiospores amyloid..... 2
1. Basidiospores dextrinoid or negative in Melzer's reagent..... 3
2. Hyphal system monomitic ..... **Anomoporia**
2. Hyphal system di-trimitic..... **Wrightoporia**
3. Basidiospores pale yellow to yellowish brown  
when mature..... **Abundisporus**
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4. Basidiocarps pileate, hyphae amyloid, trama monomitic,  
context dimitic, basidiospores ovoid, dextrinoid .. **Pseudopiptoporus**
4. Without the combination of these characters..... 5

14. Basidiocarps pileate to resupinate, basal hyphae thick-walled,  
resembling skeletal hyphae ..... **Rigidoporus**
14. Basidiocarps resupinate, basal hyphae thin-walled ..... 15
15. With rhizomorphs, growing on organic debris on the ground,  
basidiospores thick-walled and cyanophilous .... **Byssoporia terrestre**
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and non-cyanophilous ..... **Physisporinus**

**KEY F**

Basidiocarps sessile to resupinate, hymenophore poroid, basidiospores smooth and negative in Melzer's reagent, generative hyphae with clamps, tubes and context black, dark brown, orange to cinnabar red

1. Tubes and context orange to cinnabar red ..... 2
1. Tubes and context brown to purplish black..... 4
2. Hyphal system monomitic ..... **Hapalopilus**
2. Hyphal system di-trimitic..... 3
3. Basidiospores allantoid, narrower than 1 Fm, hyphae encrusted in the  
dissepiments..... **Piloporia albomarginata**
3. Basidiospores ellipsoid, up to 3 Fm wide, hyphae not encrusted in the  
dissepiments ..... **Pycnoporus**
4. Basidiocarps small, rarely above 5 mm wide and hanging **Porodisculus**
4. Basidiocarps larger, sessile to resupinate ..... 5
5. Basidiospores thick-walled, yellowish brown..... 6
5. Basidiospores thin-walled to slightly thick-walled, hyaline..... 7
6. Basidiocarps soft and spongy, hyphal system monomitic,  
cystidia present in fascicles..... **Paratrichaptum**
6. Basidiocarps tough and dense, hyphal system trimitic,  
cystidia absent ..... **Abundisporus**
7. Basidiocarps perennial, very hard, pileus with a crust ..... 8
7. Basidiocarps annual to biennial, soft to tough ..... 9
8. White-rot species, pilear crust light grey, smooth and sulcate,

3. Cystidia metuloid and encrusted..... 7
4. Basidiocarps orange to reddish or dark brown..... 5
4. Basidiocarps white to cream-coloured ..... 6
5. Basidiocarps reddish to orange, basidiospores cylindrical to oblong  
ellipsoid, cystidia hyaline ..... **Pycnoporellus**
5. Basidiocarps dark brown, basidiospores subglobose, cystidia with  
yellowish to dark contents ..... **Phaeolus**
6. Cystidia up to 110 Fm long, projecting, basidiospores thick-walled,  
8-10 Fm long ..... **Leucophellinus**
6. Cystidia up to 50 Fm, embedded, basidiospores thin-walled,  
shorter than 8 Fm ..... **Oxyporus**
7. Basidiospores allantoid ..... **Castanoporus castaneus**
7. Basidiospores globose to subglobose ..... 8
8. Pore surface vivid orange, pinkish or dark grey,  
mucronate cystidiols present ..... **Rigidoporus**
8. Pore surface white to pale ochraceous,  
mucronate cystidiols absent ..... **Oxyporus**
9. Hyphal system dimitic..... 10
9. Hyphal system monomitic ..... 11
10. Basidiocarps resupinate, white to ochraceous, hyphae  
often inflated to 20 Fm ..... **Wolfiporia**
10. Basidiocarps pileate, yellow, orange or light brown, hyphae  
up to 8 Fm wide..... **Laetiporus**
11. Basidiospores allantoid, cylindrical to oblong ellipsoid..... 12
11. Basidiospores globose to subglobose ..... 14
12. Basidiocarps white, cream, beige or pink ..... **Ceriporia**
12. Basidiocarps green, reddish or purplish at least when dry ..... 13
13. Basidiocarps with the hymenium continuous over the dissepiments,  
context white and strikingly different from the tubes,  
white rot species ..... **Gloeoporus**
13. Basidiocarps with sterile dissepiments, context and tubes of  
equal colour, brown rot species ..... **Leptoporus mollis**

tubes and context light-coloured, cystidia present in hymenium or trama

1. Branched brown cystidia present in the hymenium and/or pilear surface..... **Echinochaete**
1. Cystidia hyaline and unbranched .....2
2. Hyphal system dimitic with skeletal hyphae, pore surface pinkish, yellow to pale brown or violet ..... 3
2. Hyphal system monomitic, pore surface white to sordid ochraceous when dry ..... 5
3. Basidiocarps pileate, pore surface often with violet shades when fresh ..... **Trichaptum**
3. Basidiocarps resupinate, pore surface cocoa-brown, pink to yellow . 4
4. Cystidia ventricose, skeletal hyphae few, restricted to the context, causes a brown rot ..... **Auriporia**
4. Cystidia clavate, arising from skeletal hyphae, skeletal hyphae dominating, causes a white rot..... **Junghuhnia**
5. Basidiocarps pileate, up to 4 cm thick, pilear surface hirsute, cystidia ventricose, up to 50 Fm long ..... **Climacocystis**
5. Basidiocarps resupinate to pileate, up to 2 cm thick, pileus, if present, smooth or finely velutinous, cystidia ventricose to tubular, up to 26 Fm long .....6
6. Cystidia tubular, thin-walled and smooth, basidiospores allantoid, 3-4 Fm long ..... **Chaetoporellus**
6. Cystidia different, basidiospores globose to allantoid, longer than 4 Fm ..... 7
7. Pore surface pale lilac ..... **Porodontia**
7. Pore surface white to beige ..... 8
8. Basidiospores globose, cystidia fusoid to mucronate ..... **Physisporinus rivulosus**
8. Basidiospores cylindrical to allantoid, cystidia different ..... 9
9. Capitulate hyphal ends present, dissepiments encrusted, white rot species ..... 9
9. Capitulate hyphal ends absent, dissepiments not encrusted, brown rot species ..... **Oligoporus**

- pore surface brown ..... **Fomes**
8. Brown-rot species, pilear crust black and scrupose,  
mostly azonate, pore surface purplish black ..... **Melanoporia**
9. Pore surface and context grey to vinous..... **Nigroporus**
9. Pore surface and context brown ..... 10
10. Basidiocarps fleshy and sappy when fresh, hyphal system monomitic  
although some sclerified hyphae may occur ..... 11
10. Basidiocarps tough to hard when fresh, hyphal system di-trimitic ... 12
11. Pileus cinnamon, cherry red to violet with KOH ..... **Hapalopilus**
11. Pileus dark brown to black, no reaction with KOH ..... **Ischnoderma**
12. Basidiocarps resupinate ..... 13
12. Basidiocarps pileate ..... 14
13. Basidiospores ellipsoid, causes a white rot ..... **Donkioporia expansa**
13. Basidiospores cylindrical to allantoid,  
causes a brown rot ..... **Gloeophyllum**
14. Context with a black line, binding hyphae absent,  
basidiospores usually shorter than 12 Fm ..... 15
14. Context homogeneous, binding hyphae present,  
basidiospores longer than 12 Fm ..... 16
15. Basidiospores 8-12 Fm long, skeletal hyphae smooth,  
on hardwoods ..... **Datronia**
15. Basidiospores 4-5 Fm long, skeletal hyphae finely encrusted,  
on gymnosperms ..... **Piloporia sajanensis**
16. On gymnosperms, causing a brown rot ..... **Gloeophyllum**
16. On angiosperms, causing a white rot..... 17
17. Pores 2-5 mm wide, if smaller, pileus hirsute with black,  
often forked hairs, basidiospores longer than 12 Fm .... **Hexagonia**
17. Pores smaller, pileus velutinous to hispid,  
basidiospores up to 12 Fm ..... **Corioloipsis**

### KEY G

Basidiocarps sessile to resupinate, hymenophore poroid, basidiospores smooth and negative in Melzer's reagent, generative hyphae with clamps,

not grey to almost black, no distinct dense zone between  
context and tubes..... 8

- 8. Basidiocarps effused-reflexed, distinctly monomitic without thickened hyphae, causing a brown rot ..... **Oligoporus**
- 8. Basidiocarps distinctly pileate, normally with no effused part, with thickened hyphae which may be interpreted as skeletal, causing a white rot ..... **Tyromyces**

**KEY I**

Basidiocarps sessile to resupinate, hymenophore poroid, basidiospores smooth and negative in Melzer's reagent, hyphal system di-trimitic, generative hyphae with clamps, tubes and context light-coloured, cystidia absent.

- 1. Hymenium inside isolated papillae which open up to pores ..... **Stromatoscypha**
- 1. Hymenium with tubes sharing lateral walls..... 2
- 2. Basidiocarps resupinate, tubes shallow with hymenium only at the tube bottom, dendrohyphidia present in the dissepiments..... **Theleporus**
- 2. Basidiocarps resupinate to pileate, tubes at least 1 mm deep with hymenium on the tube walls, dendrohyphidia absent .....3
- 3. Mature basidia septate..... 4
- 3. Mature basidia aseptate..... 5
- 4. Probasidia clavate, aseptate, pores wider than 1 mm ..... **Elmerina**
- 4. Probasidia globose, septate, pores 3-5 per mm..... **Protomerulius**
- 5. Basidiocarps with a tapering lateral base..... 6
- 5. Basidiocarps resupinate to broadly attached .....10
- 6. Basidiocarps light brown with a dark cuticle extending to 1 cm from the pilear base..... **Whitfordia**
- 6. Basidiocarps without a dark cuticle ..... 7
- 7. Skeletal hyphae present, brown-rot species ..... 8
- 7. Skeletal hyphae absent, skeleto-binding hyphae present, white-rot species..... 9
- 8. Basidiocarps orange, developing an sclerotium

10. Arthroconidia arising from hyphae on pileus ..... **Echinoporia**  
 10. Arthroconidia absent ..... **Schizopora**

### KEY H

Basidiocarps sessile to resupinate, hymenophore poroid,  
 basidiospores smooth and without reaction in Melzer's reagent,  
 hyphal system monomitic, generative hyphae with clamps,  
 tubes and context light-coloured, cystidia absent

1. Basidiocarps resupinate..... 2  
 1. Basidiocarps pileate..... 5
2. Basidia urniform with 4 to 8 sterigmata, hyphae with numerous  
 oildrops and with scattered ampullaceous swellings  
 at the septa..... **Sistotrema**
2. Basidia clavate with 4 sterigmata, hyphae without oildrops  
 and without ampullaceous swellings ..... 3
3. Pore surface pale pink to deep reddish, dense and gelatinous,  
 hymenium continuous over the dissepiments,  
 context white and cottony ..... **Gloeoporus**
3. Pores differently coloured, hymenophore not gelatinous,  
 dissepiments normally sterile, context more or less  
 of same colour as tubes ..... 4
4. Basidiocarps resupinate, causing a white rot ..... **Ceriporiopsis**
4. Basidiocarps resupinate to pileate, causing a brown rot ..... **Oligoporus**
5. Basidiospores amygdaliform to globose,  
 thick-walled and cyanophilous ..... **Spongipellis**
5. Basidiospores differently shaped, thin-walled and non-cyanophilous. 6
6. Pileus adpressed velutinous and dark brown or glabrous  
 with a black wrinkled surface, pores and tubes  
 whitish to pale brown when fresh. .... **Ischnoderma**
6. Pileus white, greyish to discoloured, but never with a black  
 wrinkled surface ..... 7
7. Tube layer buff, grey to blackish, context white, in one species  
 separated from the tubes by a thin dark zone ..... **Bjerkandera**
7. Tubes and context more or less of same colour, or tubes at least

**ABORTIPORUS** Murrill

Bull. Torrey Bot. Club 31:421, 1904.

Basidiocarps annual, substipitate, dimidiate to infundibuliform; pores angular to daedaloid; context white to pale buff, duplex, upper layer soft, spongy, lower layer firm, fibrous; hyphal system mono-dimitic; generative hyphae with clamps; chlamydospores present or absent in the upper context; cystidia present or absent; basidiospores hyaline, smooth, subglobose to ellipsoid, slightly thick-walled, negative in Melzer's reagent. Causing a white rot.

**Type species:** *Boletus distortus* Schwein. = *Daedalea biennis* Bull.:Fr.

**Remarks.** The genus seems to be related to *Spongipellis*, sharing with it the duplex context, monomitic hyphal system and slightly thick-walled basidiospores. Basidiocarps of the type species are highly variable in shape and size and it has repeatedly been described as new. A survey of the genus and the many synonyms and forms of the type species are provided by Fidalgo (1969).

**Abortiporus biennis** (Bull.:Fr.) Singer

Fig. 77

Mycologia 36:68, 1944. - *Daedalea biennis* Bull.:Fr., Syst. Mycol. 1:332, 1821. - *Boletus biennis* Bull., Hist. Champ. France p.449, 1789. - *Polyporus yuananensis* Zhang & Zhao, Acta Mycol. Sin. Suppl. 1:275, 1986.

**Basidiocarps** annual, laterally or centrally stipitate to sessile, usually solitary, sometimes imbricate, almost circular to dimidiate, up to 15 cm in diameter when circular; pilear surface whitish to pale brown, azonate or faintly zonate, tomentose, shallowly sulcate or appressed-fibrillose around the margin, margin concolorous; stipe buff, tomentose, up to 5 cm long and 1.5 cm thick; pore surface light buff, when fresh with a reddish tint, darkening when touched, pores angular or daedaloid, 1-3 per mm, with thick, entire dissepiments that become thin and lacerate, tubes concolorous and continuous with the lower context, up to 6 mm long; context tan, upper portion spongy, light buff, the lower part firm-corky, cream-coloured, the whole up to 8 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, in the upper context hyaline, thin-walled, rarely branched, 3-5.5 Fm wide, some with very few clamps and difficult to separate from skeletal hyphae; hyphae of lower context more variable, with frequent clamps, 2-3 Fm wide, some thick-walled, with rare clamps, rarely branched, 2.5-4 Fm wide; tramal hyphae similar to those of the lower context.

**Gloeocystidia** infrequent to abundant, highly refractive in Melzer's reagent, negative in sulfobenzaldehyde, irregular in shape, broadly clavate to cylindrical with swellings and constrictions, 60-75 x 7.5-8.5 Fm.

**Basidia** clavate, 23-35 x 5-6.5 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to ovoid, 4-6.5 x 3.5-5 Fm.

**Chlamydospores** present in the context, hyaline, smooth, subglobose, 7-10 Fm in diameter.

**Substrata.** Numerous hardwood genera, rarely on conifers, often on the ground

- within the substrate ..... **Laccocephalum hartmanni**
8. Basidiocarps whitish, not developing an sclerotium  
 within the substrate ..... **Piptoporus**
9. Dendrohyphidia present..... **Pseudofavolus**
9. Dendrohyphidia absent ..... **Polyporus**
10. Pore surface covered with a volva-like structure, except  
 for a small hole close to the base..... **Cryptoporus**
10. Pore surface exposed ..... 11
11. Hyphal system dimitic, all species with effused-reflexed  
 basidiocarps belong here ..... 12
11. Hyphal system trimitic..... 16
12. Arboriform hyphae present, on conifers..... **Dichomitus squalens**
12. Arboriform hyphae absent, unbranched skeletal hyphae present ..... 13
13. Skeletal hyphae in the dissepiments finely encrusted..... **Skeletocutis**
13. Skeletal hyphae mostly smooth, occasionally with  
 scattered large crystals..... 14
14. Causing a brown rot, all species with basidiospores  
 longer than 7 Fm belong here..... **Antrodia**
14. Causing a white rot ..... 15
15. Basidiocarps pileate to resupinate, often dense when dry,  
 basidiospores ellipsoid to cylindrical, up to 5 Fm long,  
 on dead wood or on other polypores..... **Antrodiella**
15. Basidiocarps always resupinate, leathery, basidiospores allantoid to  
 cylindrical, 5-7 Fm long, always on dead wood..... **Diplomitoporus**
16. Basidiocarps resupinate, colouring the wood in orange . **Tinctoporellus**
16. Basidiocarps pileate, not colouring the wood in orange ..... 17
17. Causing white rot..... **Trametes**
17. Causing brown rot ..... **Fomitopsis**

**Hyphal system** dimitic; generative hyphae with clamps, 2-4 mm wide; skeletal hyphae thick-walled, mostly 3-6 mm wide, but in the context some hyphae up to 1 mm wide, pale yellow to fuscous brown, unbranched, but also some hyphae with moderate branching.

**Basidia** subclavate, 10-12 x 3-4.5 mm, 4-sterigmate.

**Basidiospores** ellipsoid, 2-3 x 1-1.5 mm, pale yellowish, dextrinoid with age.

**Substrata.** On dead hardwoods.

**Distribution.** Paleotropical species, but not common. In East Asia known from subtropical China and Japan.

**Remarks.** The species is macroscopically almost identical with *A. roseo-albus* which may be separated by the larger basidiospores. In the end it may be that the two species are proved to be different forms of the same species. *A. pubertatis* is a temperate species without any crust, and with the largest basidiospores in the genus (see below).

**Abundisporus pubertatis** (Lloyd) Nunez & Ryvar den comb. nov.

Basionym: *Polyporus pubertatis* Lloyd, Mycol. Writ. 4:358, 1915 (BPI!).

**Basidiocarps** annual to perennial, sessile to effused-reflexed, broadly attached, light in weight, triquetrous, convex to unguulate, up to 10 cm long, 7 cm thick at the base; pilear surface first velutinate and lilac grey to reddish grey, then glabrous and vinaceous brown, dark brown and broadly concentrically sulcate in old specimens, with a wide pinkish margin up to 1 cm; pore surface pinkish to lilac grey, then vinaceous brown, pores angular to round, 6-7 per mm, tubes up to 5 cm long, pinkish buff to vinaceous brown; context fibrous-corky, yellowish brown to vinaceous brown, a thin crust might be present in old specimens.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, 2-2.5 Fm wide; skeletal hyphae thick-walled, hyaline to pale olivaceous brown, 2-5 Fm wide, mostly unbranched.

**Basidia** clavate, 25-30 x 8-10 Fm, 4-sterigmate.

**Basidiospores** ellipsoid, slightly thick-walled, pale brown, 3.5-5 x 2.5-3.5 Fm.

**Cultural characteristics.** Unknown.

**Substrata.** On *Quercus* spp.

**Distribution.** Temperate Asian species known from Far East Russia, Northern China (Changbai), and Japan (Kyushu and Honshu).

**Remarks.** This is the only known temperate species in *Abundisporus*, and it differs from the tropical ones by its larger basidiospores. Besides, it is restricted to deciduous *Quercus* spp.

**ALBATRELLUS** Gray

Nat. Arr. Brit. Plants 1:645, 1821.

Basidiocarps annual, stipitate, terrestrial or on buried wood, fleshy; pilear surface smooth to rimose or scaly, tubes not readily separated; stipe central to lateral; hyphal

from buried roots.

**Distribution.** Cosmopolitan species, in East Asia known from China, Japan, and Taiwan.

**Remarks.** *Abortiporus biennis* differs from similar stipitate polypores in its abundant gloecystidia and chlamydospores. Typically, the pore surface darkens to reddish when touched in fresh.

### **ABUNDISPORUS Ryvarden**

Belg. J. Bot. 131:154, 1998.

Basidiocarps pileate to effused-reflexed, annual to perennial; pilear surface glabrous, mostly sulcate, grey, brown to fuscous; pores small to medium, entire, round to angular, tubes concolorous with the pore surface; context homogeneous and brown; hyphal system di-trimitic; generative hyphae with clamps; skeletal hyphae brown; binding hyphae present or absent; cystidia absent; basidiospores slightly thick-walled, yellowish to pale brown, ellipsoid to truncate, variably dextrinoid. On dead hardwoods. Mostly tropical genus, with one temperate species.

**Type species:** *Polyporus fuscopurpureus* Pers.

**Remarks.** The small coloured basidiospores and the coloured skeletal hyphae make this a distinct genus. In the field its species may easily be mistaken for an *Inonotus* species because of the dark brown basidiocarps.

#### Key to species

1. Basidiospores 2-3 x 1-1.5 mm, tropical to subtropical species ..... **A. fuscopurpureus**
1. Basidiospores 3.5-5 x 2.5-3.5 mm, temperate Asian species..... **A. pubertatis**

### **Abundisporus fuscopurpureus** (Pers.) Ryvarden

Belg. J. Bot. 131:154, 1998.. - *Polyporus fuscopurpureus* Pers., Voy. aut. Monde, Bot. p. 172, 1827.

**Basidiocarps** perennial, solitary, broadly attached or dimidiate with a contracted base, applanate to slightly conchate or unguulate, woody hard, up to 12 cm long, 8 cm wide and 3 cm thick at the base; pilear surface first finely tomentose and umber brown, then glabrous, dark umber, fuscous to vinaceous brown, often ochraceous to pale brown along the margin, sulcate in concentric zones and frequently radially striate or rugulose, some warts may occur, cuticle present, up to 150 mm thick, black in section, margin acute to rounded, often deflexed in dry specimens; pore surface first cream, pinkish to buff, with age chocolate or vinaceous brown, pores very small, 7-9 per mm, tubes concolorous with the pore surface or darker, often stratified, 1-3 mm in each stratum, totally up to 2 cm long at the base; context up to 3 mm thick, chocolate to deep vinaceous brown.

8. Tissue becoming red after drying..... 9  
 8. Tissue not becoming red after drying..... 10
9. Pilei greyish blue when fresh..... **A. caeruleoporus**  
 9. Pilei yellowish green or olivaceous..... **A. cristatus**
10. Pilear surface tan with dark squamules, basidiospores 5-6 x 3.5-4.5 Fm. **A. avellaneus**
10. Pilear surface white to buff, becoming areolated with yellowish cracks, basidiospores 3.5-4 x 2.5-3.5 Fm..... **A. ovinus**

**Albatrellus avellaneus** Pouzar

Ceska Mykol. 26:16, 1972.

**Basidiocarps** annual, single, centrally stipitate, pileus circular to flabelliform, 4-10 cm wide; pilear surface rough to squamulose, azonate, avellaneus with a whitish margin at first, becoming yellow to orange-buff with yellowish margin, drying orange tan with blackish-brown squamules; stipe 6-8 cm long, 1-1.5 cm thick, glabrous, white, staining ochraceous, drying blackish brown; pore surface white at first, staining yellow and drying dull brown, pores angular, 2-3 per mm, with dissepiments that become thin and lacerate, tubes decurrent, white, staining yellow, drying brown and brittle, 3-4 mm long; context white, staining yellow when cut, 2-4 mm thick, when dry less than 1 mm thick, dark brown and brittle.

**Hyphal system** monomitic; generative hyphae simple-septate, in the trama thin-walled, with occasional branching, parallel, 3-4.5 Fm wide, in the context thin- to thick-walled, hyaline, with rare branching, mostly 3-7 Fm wide but some inflated up to 13 Fm wide, moderately amyloid, large golden globules full of many small droplets present in Melzer's reagent mounts of contextual and tramal hyphae; gloeopleurous hyphae also present, highly refractive in Melzer's reagent and staining brightly in phloxine, 4-6 Fm wide; hyphae from lower stipe thin- to thick-walled, hyaline, with occasional branching, 4-13 Fm wide, amyloid in scattered areas of sections.

**Basidia** clavate to pedunculate, 21-37 x 5.5-8 Fm, with four sterigmata.

**Basidiospores** ovoid to broadly ellipsoid, slightly thick-walled, negative in Melzer's reagent, 5-6 x 3.5-4.5 Fm.

**Substrata.** On the ground under conifers.

**Distribution.** Known from subtropical Eastern North America and cited for subtropical China (Guadong) by Zhao & Zhang (1992).

system monomitic; generative hyphae with clamps or simple septa, often inflated; cystidia absent; basidiospores ellipsoid to subglobose, smooth, negative or amyloid in Melzer's reagent.

**Type species:** *Boletus albidus* Pers. = *Polyporus ovinus* Schaeff.:Fr.

**Remarks.** The taxonomic position of the genus is uncertain. All species have mycorrhizal connections with trees and this and the generally large fleshy basidiocarps with inflated hyphae point to a relationship with Agaricales.

### Key to species

1. Clamp connections numerous on the contextual hyphae..... 2
1. Clamp connections absent or extremely rare on the contextual hyphae..... 4
2. Basidiospores 8-11 Fm long..... **A. pes-caprae**
2. Basidiospores up to 5 Fm long..... 3
3. Pore surface yellow, tissue not turning red after drying..... **A. peckianus**
3. Pore surface cream to salmon pink, tissue becoming red after drying... **A. confluens**
4. Basidiocarp caespitose with numerous pilei, golden yellow when fresh **A. dispan-sus**
4. Basidiocarp with single or a few confluent pilei..... 5
5. Pilear surface viscid, bluish green when fresh, drying orange brown and with a resinous cuticle..... **A. yasudai**
5. Pilear surface without a viscid cuticle..... 6
6. Basidiocarps slender, infundibuliform, pilei up to 4 cm wide..... 7
6. Basidiocarps larger, usually flat, pilei up to 15 cm wide..... 8
7. Stipe and context white, tubes continuous with the context..... **A. cantharel-lus**
7. Stipe apricot, black towards the base, context buff, separated from the tubes by a dark, resinous layer..... **A. tianschani-cus**

**Hyphal system** monomitic; generative hyphae simple-septate, in the trama up to 3.5 Fm wide, in the context and stipe usually up to 5 Fm wide, some inflated to 10 Fm wide; stipe hairs up to 5.5 Fm wide, slightly thick-walled and distinctly amyloid.

**Basidia** clavate, 22-29 x 7-9 Fm, with four sterigmata. up to 3 Fm wide.

**Basidiospores** shortly ovoid to ovoid-ellipsoid, thin-walled, amyloid, with a lateral apiculus, 5-7 x 4.5-5.5 Fm.

**Substrata.** On the ground.

**Distribution.** Only known from temperate Japan (Sendai, Honshu).

**Remarks.** The species is close to *A. tianschanicus* because of the lack of clamps and its amyloid basidiospores. It differs in its slender basidiocarps with a white stipe, which is peach-coloured with a black base in *A. tianschanicus*.

**Albatrellus confluens** (Fr.) Kotl. & Pouzar

Ceska Mykol. 11:154, 1957. - *Polyporus confluens* Fr., Syst. Mycol. 1:355, 1821.

**Basidiocarps** annual, centrally to laterally stipitate, usually confluent, pileus convex, circular to flabelliform or lobed and contorted, up to 15 cm wide and 3 cm thick, margin deflexed; pilear surface pinkish buff, sometimes with yellow or grey tints when fresh, becoming salmon pink on drying, pitted, finely tomentose, azonate, later glabrous and becoming areolate, drying rugose; stipe short and thick, branched, irregular, cream-coloured to pinkish buff when fresh, glabrous, becoming salmon pink and rugose on drying, up to 6 cm long and 2 cm thick; pore surface cream-coloured when fresh, slowly becoming salmon pink after drying, pores circular to angular, 3-5 per mm, with thick, fimbriate dissepiments that become thin and lacerate, tubes concolorous with the pore surface, up to 3 mm long, decurrent on the stipe; context cream-coloured, drying pale pinkish tan with a darker reddish zone above the tubes, soft and fleshy when fresh, drying hard and resinous, up to 2 cm thick near the stipe; odour pleasant, taste somewhat bitter.

**Hyphal system** monomitic; generative hyphae with simple septa and numerous conspicuous clamps, hyaline, thin-walled in the trama and up to 3-5 Fm wide, with frequent branching, staining brightly in phloxine, in the context highly irregular and with variable width, 4-50 Fm wide, fragmenting and collapsing in sections from dried specimens and not readily separable; gloeopleurous hyphae also present, appearing refractive in Melzer's reagent and staining in phloxine, contorted with bulbous swellings, 4-18 Fm wide.

**Basidia** clavate, often bent sharply at the base, 20-25 x 6-7.5 Fm, with four sterigmata.

**Basidiospores** ovoid to ellipsoid, weakly amyloid, slightly thick-walled, 4-5 x 2.5-3.5 Fm.

**Substrata.** On the ground in coniferous forests, usually close to *Pinus* spp.

**Distribution.** Cosmopolitan in coniferous forest ecosystems. In East Asia known from China and Japan.

**Remarks.** *Albatrellus confluens* is recognized by its large, pinkish buff basidiocarps.

**Remarks.** This taxon is morphologically similar to *A. ovinus*. It differs in the presence of squamules and the orange-buff colour of mature pilei and in having slightly larger basidiospores.

***Albatrellus caeruleoporus* (Peck) Pouzar**

Folia Geobot. Phytotaxon. 1:358, 1966. - *Polyporus caeruleoporus* Peck, N.Y. State Mus. Ann. Rept. 26:68, 1874.

**Basidiocarps** annual, centrally stipitate, single to confluent, circular, up to 6 cm wide; pilear surface varying from grey to vivid blue when fresh, becoming pale greyish brown to reddish orange when dry, glabrous to slightly scurfy or squamulose, azonate, margin concolorous, acute to rounded, usually fertile below; stipe cream-coloured to pinkish buff when fresh, becoming salmon pink and rugose on drying, up to 8.5 cm long and 2 cm thick; pore surface grey to blue, becoming greyish brown to bright orange when dry, pores angular, 2-3 per mm, dissepiments becoming thin and lacerate, tubes becoming reddish orange in the herbarium, up to 3 mm long; context cream-coloured to pale buff, azonate, firm when dry, up to 1 cm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, thin-walled, with frequent branching, in the trama 2.5-7 Fm wide, in the context up to 15 Fm wide, subhymenium composed of inflated, interlocked hyphae that are almost pseudoparenchymatous and up to 15 Fm wide.

**Basidia** clavate, 20-38 x 6.5-8 Fm, with four sterigmata.

**Basidiospores** ovoid to subglobose, thick-walled, negative in Melzer's reagent, 4-6 x 3-5 Fm.

**Substrata.** On the ground, commonly under conifers.

**Distribution.** Temperate species known from in Eastern North America and Japan.

**Remarks.** The blue colour typical of fresh basidiocarps fades on drying. *Albatrellus yasudai* has also blue basidiocarps, but is a more slender species with a viscid pileus and smaller pores.

***Albatrellus cantharellus* (Lloyd) Pouzar**

Ceska Mykol. 26:196, 1972. - *Polyporus cantharellus* Lloyd, Mycol. Writ. 4:54, 1915.

**Basidiocarps** stipitate, slender, solitary to gregarious; pilei 1.5-4 cm wide, infundibuliform to applanate, thin and fragile; pilear surface first pale brown, mouse grey when dry, finely felted; stipe white, up to 4 cm long and 1 cm wide, cylindrical, slightly broadened at the base, velutinous, covered by decurrent pores sometimes down to the base; pore surface white when fresh, pale yellowish brown with a slight orange tint in some specimens, pores 2-4 per mm, round to radially elongated on the stem, leaving a margin of about 1.5 mm wide, dissepiments fimbriate, tubes up to 0.4 mm long; context white to yellowish, up to 1 mm thick when dry, separated from the pileus by a thin, dark brown cuticle which is missing in some parts.

**Basidiospores** ovoid to oblong, negative in Melzer's reagent, 4-5 x 3-4 Fm.

**Substrata.** Associated with conifers and producing a brown rot.

**Distribution.** Temperate species originally described from Japan (Honshu), it has also been found in China (Xizang) and in Western North America.

**Remarks.** This is a very distinctive species of *Albatrellus* being the only one which produces large numbers of small spatulate pilei forming a caespitose basidiocarp.

**Albatrellus ovinus** (Schaeff.:Fr.) Murrill

J. Mykol. 9: 1903. - *Polyporus ovinus* Schaeff.:Fr., Syst. Mycol. 1:346, 1821. - *Boletus ovinus* Schaeff., Fung. Bavar. 4:83, 1774.

**Basidiocarps** annual, centrally to laterally stipitate, usually single, occasionally caespitose; pilei circular to reniform, up to 15 cm wide and 2.5 cm thick, pilear surface cream-coloured to buff, glabrous, usually becoming areolate with pale yellow colouration in the cracks, drying rugose, sometimes with a faint pinkish tint, margin concolorous; stipe cream-coloured to brownish, very finely tomentose, drying rugose, up to 7 cm long and 3 cm thick; pore surface cream to pale yellow when fresh, drying olivaceous to pinkish olivaceous, pores circular near the margin, angular near the stipe, 3-5 per mm, with thick, entire dissepiments that become thin and lace-rate, tubes decurrent, yellowish when fresh, drying pinkish buff or olivaceous buff, brittle, up to 4 mm long; context cream to pinkish brown, with a dark layer next to the tubes, fleshy when fresh, drying firm, up to 2 cm thick near the stipe; aromatic with a pleasant odour.

**Hyphal system** monomitic; generative hyphae simple-septate, thin-walled, amyloid in scattered areas, in the trama with occasional branching, 2.5-4 Fm wide, in the context with frequent branching, with irregular swellings and constrictions, ranging from 4-30 Fm wide, in dried specimens collapsed and fragmenting readily, difficult to separate; gloeopleurous hyphae also present, refractive in Melzer's reagent and staining in phloxine, often sinuous and with bulbous swellings, up to 13 Fm wide; large, irregular golden brown globules exuded in Melzer's reagent.

**Basidia** clavate, 20-26 x 5-7 Fm, with four sterigmata.

**Basidiospores** ovoid to subglobose, negative in Melzer's reagent, slightly thick-walled, 4-5 x 3-3.5 Fm.

**Substrata.** On soil in coniferous forests, almost exclusively connected to *Picea* spp..

**Distribution.** Circumboreal in coniferous forest ecosystems. In East Asia known from China and Japan.

**Remarks.** *Albatrellus ovinus* is commonly sympatric with *A. confluens* and their basidiocarps often develop together in large numbers. Basidiocarps of *A. confluens* of have pinkish-buff tones, and its pores do not become yellow when touched. *A. ovinus* is a popular edible fungus, often collected in large quantities.

**Albatrellus peckianus** (Cooke) Niemelä

**Albatrellus cristatus** (Fr.) Kotl. & Pouzar

Ceska Mykol. 11:154, 1957. - *Polyporus cristatus* Fr., Syst. Mycol. 1:356, 1821.

**Basidiocarps** annual, stipitate, solitary to confluent, pileus circular or lobed, up to 13 cm wide and 1.5 cm thick; pilear surface brownish to yellowish-green or olivaceous, azonate, finely tomentose or with appressed tufts of hyphae, usually areolate to squamulose, margin concolorous, undulate; stipe central or eccentric, greenish to buff, up to 4 cm long and 1.5 cm thick; pore surface white to yellowish or greenish yellow when fresh, becoming pinkish and eventually distinctly reddish when dried, pores circular to angular, 2-4 per mm, with thick dissepiments that become thin and lacerate with age, tubes becoming pale reddish in dried specimens, distinct from context, up to 6 mm long, sometimes separated by a thin, darker layer; context cream-coloured to pinkish buff, fleshy when fresh, drying firm and friable, up to 1 cm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, turning pale red in KOH, in the trama 2.5-4.5 Fm wide, with occasional branching, thin- to moderately thick-walled, contextual hyphae thin- to thick-walled, with frequent branching, mostly 5-12 Fm wide but some inflated up to 20 Fm, fragmenting into short segments in sections from dried specimens, weakly to strongly amyloid.

**Basidia** clavate, 25-35 x 7-10 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid, weakly amyloid, 5-7 x 4-5 Fm.

**Substrata.** On soil in coniferous and hardwood forests.

**Distribution.** Temperate areas in eastern North America, Europe, and Asia. In East Asia known from China, Japan, and Vietnam.

**Remarks.** The yellowish-green pileus and reddish pore surface and tubes on dried specimens are diagnostic characters for *A. cristatus*.

**Albatrellus dispansus** (Lloyd) Canf. & Gilb.

Mycologia 63:965, 1971. - *Polyporus dispansus* Lloyd, Mycol. Writ. 3:192, 1912.

**Basidiocarps** annual, substipitate, up to 20 cm wide from a shallowly rooted base up to 7 cm broad, branching into large numbers of spatulate pilei, these densely imbricate and confluent, 1-4 cm broad; pilear surface yellow to yellowish buff when fresh, vivid orange when dry, finely tomentose or scurfy, becoming rugose with age and drying, azonate; pore surface white when fresh, drying orange to faintly vinous, pores angular, 2-3 per mm with thin, entire dissepiments; context white when fresh becoming

orange when dry, firm, brittle, very hard and difficult to section after drying, from less than 1 mm thick at the margin to 1 cm thick near the base of branches.

**Hyphal system** monomitic; generative hyphae simple-septate, red in KOH, thin-walled, in the trama 3-6 Fm wide, in the context 5-30 Fm wide, very contorted and lobed.

**Basidia** clavate, 17-20 x 5-6 Fm, mostly with two straight, 8 Fm-long sterigmata.

coloured, firm-fibrous when dry, azonate, up to 2 cm thick.

**Hyphal system** monomitic; generative hyphae with clamps and simple septa, hyaline, thin-walled and usually much collapsed, often branched, 4-14 Fm wide; hyphae of pilear surface scales often thick-walled, with cylindrical to clavate apices, 5-16 Fm wide, with conspicuous clamps; gloeopleurous hyphae present.

**Basidia** clavate, 30-55 x 8-12 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to amygdaliform, conspicuously apiculate, negative in Melzer's reagent, 8-11 x 6-8 Fm.

**Substrata.** Terrestrial, associated with conifers.

**Distribution.** Distributed in North America, Europe, and Asia, but not common. In East Asia known from Japan and Vietnam.

**Remarks.** *Albatrellus pes-caprae* is recognized by the brown basidiocarps with a scaly pilear surface, large pores, and microscopically by the large, amygdaliform basidiospores.

**Albatrellus tianschanicus** (Bondartsev) Pouzar

Folia Geobot. Phytotax. Bohem. 1:358, 1966. - *Scutigera tianschanicus* Bondartsev, Bot. Mater. Otdel. Spor. Rastenij. 13:220, 1960. - *Albatrellus henanensis* Zhao & Zhang, Acta Mycol. Sin. 10:226, 1991.

**Basidiocarps** annual, centrally stipitate, solitary to gregarious; pileus circular with a central depression, up to 4 cm wide; pilear surface light brown to tan, appearing squamulose due to irregular patches of dark tissue; stipe cylindrical, apricot to buff near the decurrent tubes, darker and black near the base, up to 2.5 cm long and about 5 mm thick; pore surface ochraceous to pale brown, pores angular, 2-3 per mm with dissepiments that become lacerate, tubes up to 2 mm long, concolorous with the context but dark and resinous at the base of the tubes and clearly differentiated from the context by a thin, dark resinous layer, tubes decurrent on the stipe to about 1 cm; context buff to pale apricot in dried specimens, soft and easily sectioned, up to 2 mm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, thin-walled, scarcely branched, up to 15 Fm wide, in the context some inflated portions up to 25 Fm wide, amyloid in sections near the pilear surface; gloeopleurous hyphae present, highly refractive in Melzer's reagent; some tufts of hyphae on the pilear surface with strongly amyloid granules scattered on the surface.

**Basidia** clavate, 22-28 x 6-10 Fm, with four sterigmata.

**Basidiospores** subglobose to ovoid or broadly ellipsoid, slightly thick-walled, weakly amyloid in masses, 4.5-5.5 x 3-4 Fm.

**Substrata.** On the ground under *Picea*, probably mycorrhizal.

**Distribution.** Described from Central Russia, also present in China (Henan).

**Remarks.** The apricot colouration and squamulose pilei are distinct.

**Albatrellus yasudai** (Lloyd) Pouzar

Ann. Bot. Fenn. 7:54, 1970. - *Polyporus peckianus* Cooke, Trans. Proc. Bot. Soc. Edinburg 13:148, 1879. - *Scutigera syringae* Parmasto, Bot. Mat. Otdela Spor. Rast. Bot. Inst. Akad. Nauk SSSR 15:132, 1962.

**Basidiocarps** annual, centrally to laterally stipitate, solitary to gregarious, single to caespitose; pilei circular to reniform, up to 7 cm wide and 1 cm thick, concave to infundibuliform at maturity; pilear surface yellow when fresh, drying yellowish tan to pale buff, glabrous to minutely scurfy or fibrillose, azonate to faintly zonate, smooth, margin concolorous, acute, often deflexed, narrowly sterile to fertile below; stipe cylindrical, yellow to light buff, darker brown at the base, minutely tomentose, up to 4 cm long and 1.5 cm thick; pore surface bright yellow when fresh, drying yellow to light buff, pores circular to angular, 4-5 per mm, enlarging when dry, dissepiments becoming thin and lacerate with age, tubes yellow to light buff, decurrent on the stipe, up to 2 mm long; context pale yellow to light buff, azonate, up to 3 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps and simple septa, thin-walled, in the trama up to 4 Fm wide, in the context occasionally branched, mostly 3-8 Fm wide, some contorted and swollen up to 15 Fm wide; gloeopleurous hyphae abundant and conspicuous, often sinuous and contorted with irregular swellings, with occasional branching, 4-12 Fm wide, with occasional clamps.

**Basidia** clavate, 22-28 x 5-6 Fm, with four sterigmata.

**Basidiospores** ovoid to ellipsoid, negative in Melzer's reagent, 3.5-4.5 x 2.5-3 Fm.

**Substrata.** Terrestrial or on buried wood, recorded on *Fagus* and *Tilia*, in Japan recorded on coniferous forest soil.

**Distribution.** Temperate Eastern North America, Europe, China (Qinghai), and Japan (Hokkaido).

**Remarks.** The yellowish basidiocarps with small basidiospores characterize this species. *Albatrellus syringae* (Parm.) Pouzar, described from Estonia and distributed in Eurasia, has almost the same macroscopic characteristics, but its basidiospores are slightly larger (4-5 x 3-4 Fm). This taxon has recently been found in western North America (Ginns 1997a), and may be a form of *A. peckianus*.

**Albatrellus pes-caprae** (Pers.:Fr.) Pouzar

Folia Geobot. Phytotaxon. 1:357, 1966. - *Polyporus pes-caprae* Pers.: Fr., Syst. Mycol. 1:354, 1821 - *Polyporus pes-caprae* Pers., Traite Champ. Comest. p.241, 1819.

**Basidiocarps** annual, laterally stipitate, solitary to caespitose; pilei circular to reniform or irregular in shape, up to 12 cm wide; pilear surface reddish brown, with scales 1-2 mm wide composed of erect hyphae; stipe eccentric to lateral, cylindrical or bulbous at the base, pale buff or with spots staining darker brown to reddish brown, glabrous to faintly squamulose, appearing reticulate on the underside from poorly developed decurrent tubes, up to 6 cm long and 3 cm wide; pore surface yellowish-cream to pinkish when fresh, yellowish when touched and pale brownish when dry, pores angular to hexagonal, mostly 1-2 per mm but some up to 2 mm wide, with thin, lacerate dissepiments, tubes pale brownish, up to 3 mm long; context cream-

bitter.

**Hyphal system** monomitic; generative hyphae with clamps, mostly thick-walled with a narrow and sinuous lumen, hyaline, weakly to strongly amyloid, in the trama 3-4.5 Fm wide, in the context 4-10 Fm wide.

**Cystidia** abundant, mostly thick-walled, fusiform, moderately to strongly amyloid, some encrusted at the apex, 30-45 x 5-9 Fm, projecting to 15 Fm.

**Basidia** clavate, 20-25 x 7-8 Fm, with four sterigmata.

**Basidiospores** cylindrical, 8-11 x 2.5-3.5 Fm.

**Substrata.** Restricted to dead conifers like *Abies* and *Pinus*.

**Distribution.** Circumboreal in coniferous forest ecosystems. In East Asia only known from northern China (Changbai).

**Remarks.** *Amylocystis lapponica* is a rare species found only in pristine and old coniferous forests. In Asia its basidiocarps develop near melting snow in the spring, rotting towards the autumn. This is not the case in Europe where they appear in the autumn. Young basidiocarps of *Ischnoderma resinosum* may resemble *A. lapponica*, but a microscopic study will reveal the differences.

**ANOMOPORIA** Pouzar

Ceska Mykol. 20:172, 1966.

Basidiocarps annual, resupinate, loosely attached, soft to brittle, margin with or without rhizomorphs; pore surface white, yellow or pinkish; hyphal system monomitic; generative hyphae with clamps; basidiospores ellipsoid, smooth, thin-walled and amyloid. On dead conifers and hardwoods, causing a brown rot.

**Type species:** *Polyporus bombycinus* Fr.

**Remarks.** The characters of *Anomoporia* are similar to those of *Amylocorticium* in the Corticiaceae, with the exception of the poroid hymenophore. Both genera have soft, pigmented tissue with a monomitic hyphal system and clamps. Both genera are brown rot fungi. Species of *Wrightoporia* also have amyloid basidiospores, but these are mostly finely asperulate, and all species have a dimitic hyphal system with dextrinoid hyphae.

**Key to species**

- 1. Basidiospores 5-7 Fm long..... 2
- 1. Basidiospores up to 5 Fm long..... 3
- 2. Basidiocarps salmon pink, vesiculi present in the context..... **A. vesiculososa**
- 2. Basidiocarps violet-brown or lavender, vesiculi absent..... **A. bombycina**

Ceska Mykol. 26:199, 1972. - *Polyporus yasudai* Lloyd, Mycol. Writ. 4:44, 1913.

**Basidiocarps** annual, solitary to caespitose with 2-3 basidiocarps; individual pilei 3-7 cm broad, thin, orbicular, rather regular, applanate to infundibuliform; pilear surface smooth, viscid when fresh, bluish green drying orange brown; stipe central, cylindrical, up to 3 cm long and 4.5 mm thick, smooth or slightly porulose because of the decurrent pores in the upper half, white when fresh, yellowish to brownish when dry; pore surface white when fresh, drying yellowish brown, sometimes with a slight orange tint, pores small, 4-5 per mm, regular, with thin dissepiments, tubes up to 0.4 mm long; context white when fresh, drying cinnamon, up to 2 mm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, in the trama up to 4.5 Fm wide, in the context inflated up to 12 Fm wide, the pilear surface consist of a palisade of clavate generative hyphae; stipe hairs sparse, thick-walled, amyloid, up to 6.5 Fm wide.

**Basidia** clavate, 17-20 x 6-7 Fm, with four arcuate sterigmata 3.5-5 x 0.8 Fm.

**Basidiospores** shortly ovoid, slightly thick-walled, negative in Melzer's reagent, 4.5-5.2 x 3.5-4.5 Fm.

**Substrata.** On the ground in coniferous and hardwood forests.

**Distribution.** Known only from temperate Japan (Honshu).

**Remarks.** The bright greenish-blue colours of the pileus disappear when dry, but the resinous cuticle over the pilear surface, quite unique in *Albatrellus*, is visible with the microscope.

### AMYLOCYSTIS Singer

Mycologia 36:66, 1944.

Basidiocarps annual, pileate to effused-reflexed; pilear surface tomentose to hispid; pore surface and context white, bruising reddish brown; hyphal system monomitic; generative hyphae with clamps, mostly thick-walled, amyloid; cystidia thick-walled, often encrusted at the apex, amyloid; basidiospores cylindrical, hyaline, smooth, negative in Melzer's reagent. Boreal, monotypic genus causing a brown rot in coniferous trees.

**Type species:** *Polyporus lapponicus* Romell

**Remarks.** The genus is similar to *Oligoporus* with the exception of the amyloid hyphae and cystidia.

### *Amylocystis lapponica* (Romell) Singer

Fig. 78

Mycologia 36:66, 1944. - *Polyporus lapponicus* Romell, Ark. Bot. 11, 3:17, 1911.

**Basidiocarps** annual, effused-reflexed to pileate, dimidiate, up to 15 cm wide; pilear surface light buff, becoming dark reddish brown on bruising or drying, tomentose to hispid, azonate, margin concolorous, rounded to acute; pore surface white when fresh, becoming dark reddish brown with age, bruising, or drying, pores 3-4 per mm, angular, dissepiments thin, becoming lacerate, tubes slightly darker than the context, up to 4 mm long; context pale buff, corky, azonate, up to 2 cm thick; taste slightly

more irregular, 2-4 per mm, with thin dissepiments, tubes concolorous, up to 2 mm long; context cream buff to pale brown, soft, up to 1 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, richly branched, hyaline, but with a few scattered yellowish crystals, 2-6 Fm wide, in the context mostly 4-6 Fm wide.

**Basidia** broadly clavate, 25-40 x 5-8 Fm, with four long sterigmata.

**Basidiospores** broadly ellipsoid, 5-7 x 3-5 Fm.

**Substrata.** On conifers.

**Distribution.** Circumboreal in the coniferous forest zone. In East Asia known from Northern China (Changbai) and Japan.

**Remarks.** *Anomoporia bombycina* is often recognized in the field because of its pale lavender to violet-brown colour.

### **Anomoporia flavissima** Niemelä

Ann. Bot. Fennici 31:102, 1994.

**Basidiocarps** annual, resupinate, soft and fragile, 5-15 x 2-5 cm wide, margin thin, lemon yellow from the beginning, radially fibrous or soft cottony; rhizomorphs very thin, yellow, abhymenial surface yellowish; pore surface at first bright chrome or sulphur yellow, finally vitelline, pores round to angular, (3)4-5(6) per mm, dissepiments entire, tubes concolorous and soft, up to 1 mm long; context up to 0.5 mm thick, cottony soft, yellow.

**Hyphal system** monomitic; generative hyphae with clamps, in the trama thin-walled and up to 4 Fm wide, sparsely branched, hyaline, in the context thick-walled and solid and up to 9.5 Fm wide, often covered with coarse crystals, the preparation usually exuding oily droplets; hyphae in the rhizomorphs encrusted, up to 5.5 Fm wide.

**Cystidia** thin-walled, vesicular, submerged in the hymenium, up to 17 Fm in diameter, mostly collapsing.

**Basidia** cylindrical, 11-15 x 3-5 Fm, with two to four sterigmata.

**Basidiospores** ellipsoid to subglobose, usually uniguttulate, 3-4(4.4) x 2-3 Fm.

**Substrata.** On very rotten wood of hardwoods and conifers.

**Distribution.** Circumpolar in the boreal coniferous forest, but very rare, in East Asia known from Far East Russia and Northern China (Changbai).

**Remarks.** This species is very similar to *A. albolutescens* except for smaller pores and presence of vesicular cystidia. For further differences, see Niemelä (1994).

### **Anomoporia kamtschatica** (Parmasto) M. Bondartseva

Novosti Sist. Nizshih Rasteniy 9:135, 1972. - *Fibuloporia kamtschatica* Parmasto, Issledovanie Prirod. Daln. Vostoka 1:257, 1963.

**Basidiocarps** annual, resupinate, soft and friable, orbicular, 1-3 cm in diameter, sometimes more effused, margin thin, white when fresh, cream-coloured when dry, cottony or arachnoid, thinning out, never rhizomorphic; pore surface at first white, then cream, pores round or fused together and then sinuous to irregular, 1-3 per mm,

3. Pore surface and rhizomorphs yellow..... 4
3. Pore surface and rhizomorphs cream to white..... 5
4. Basidiocarps soft-corky, pores bright yellow from the beginning, vesicular cystidia present..... **A. flavissima**
4. Basidiocarps friable, cottony, pores cream when young, vesicular cystidia absent..... **A. albolutescens**
5. Basidiospores thick-walled, rhizomorphs absent..... **A. kamtschatica**
5. Basidiospores thin-walled, rhizomorphs conspicuous..... **A. myceliosa**

**Anomoporia albolutescens** (Romell) Pouzar

Ceska Mykol. 20:172, 1966. - *Polyporus albolutescens* Romell, Arkiv f. Bot. 11, 3:11, 1911. - *Poria kazakstanea* Pilát, Bull. Soc. Mycol. Fr. 52:318, 1936.

**Basidiocarps** annual, resupinate, small to widely effused, up to 3 mm thick, easily separable, soft and brittle, margin usually wide, fimbriate and with yellow rhizomorphs; pore surface cream to pale chrome yellow, often with an orange brown tint when dry, pores angular, thin-walled and 2-4 per mm, tubes concolorous, up to 2 mm long; context white, up to 1 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, in the trama thin-walled, smooth and 2-4 Fm wide, in the context and rhizomorphs smooth to finely encrusted, thin- to slightly thick-walled, 2.5-5 Fm wide, sparingly branched.

**Basidia** clavate, 17-22 x 5.5-7 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subglobose, 3-5 x 2.5-3.5 Fm.

**Substrata.** On coniferous wood, mostly on *Larix*, more rarely on hardwoods such as *Acer* and *Betula*.

**Distribution.** Circumboreal in the coniferous forests, but rare. In East Asia known from Northern China (Changbai), Japan (Hokkaido), and Far East Russia.

**Remarks.** Separated from *A. myceliosa* mainly by the yellow rhizomorphs and pore surface.

**Anomoporia bombycina** (Fr.) Pouzar

Ceska Mykol. 20:172, 1966. - *Polyporus bombycinus* Fr., Elench. Fung. 1:117, 1828.

**Basidiocarps** annual, resupinate, orbicular to widely effused with age, up to 3 mm thick, soft when fresh, fragile when dry, easily separable, margin white to pale violet-brown or lavender, fimbriate to cottony, rarely with some scattered rhizomorphs; pore surface cream to pale lavender, pores at first circular, soon angular and

context 0.3-0.4 mm thick, cottony, pale greyish.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, in the context up to 5 Fm wide, some of them covered with crystals, others with capitate hyphal ends or vesiculi with oily content.

**Basidia** clavate, 15-25 x 4.5-7 Fm, with four sterigmata.

**Basidiospores** subellipsoid, mono- to biguttulate, 4.5-7.5 x 2.5-3.5 Fm.

**Substrata.** On *Abies nephrolepis*.

**Distribution.** Known from temperate China (Changbai) and Japan (Hokkaido).

**Remarks.** The species is recognized macroscopically by its resupinate basidiocarps with salmon tints, and microscopically by the vesiculi in the context. *A. vesiculosa* may be mistaken for *A. bombycina* when dry, which however has wider basidiospores.

**ANTRODIA** P. Karst.

Medd. Soc. Fauna Fl. Fenn. 5:40, 1880.

Basidiocarps annual, more rarely perennial, resupinate to pileate, white, cream to tan-coloured; hyphal system dimitic; generative hyphae with clamps, thin walled, hyaline; skeletal hyphae thick-walled to solid, hyaline to rarely pale brown, mostly negative in Melzer's reagent, rarely amyloid; basidiospores cylindrical, allantoid to oblong-ellipsoid, hyaline, thin-walled, smooth and negative in Melzer's reagent. Cosmopolitan genus, mainly temperate or boreal, causing a brown rot.

**Type species:** *Daedalea serpens* Fr. = *Daedalea albida* Fr.

**Remarks.** The genus concept follows Gilbertson & Ryvarden (1986) to include mostly resupinate, dimitic species with clamped generative hyphae, hyaline skeletal hyphae and causing a brown rot.

**Key to species**

- 1. Basidiospores generally longer than 7 Fm, all species with pores wider than 1 mm key out here..... 2
- 1. Basidiospores generally shorter than 7 Fm..... 10
- 2. Basidiospores slightly fusiform with a tapering apex, on conifers..... 3
- 2. Basidiospores cylindrical, on conifers or hardwoods..... 4
- 3. Basidiocarps leathery; skeletal hyphae dominant, common species..... **A. serialis**
- 3. Basidiocarps fragile, generative hyphae dominant, skeletal hyphae few, rare boreal species..... **A. infirma**

dissepiments lacerate, tubes cream, up to 3 mm long; context up to 0.2 mm, white, cottony and soft.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, in the trama thin-walled, up to 4 Fm wide, in the context sparsely branched, thin-walled, often with collapsed sections.

**Basidia** subclavate, 11-20 x 4-7 Fm, with four sterigmata.

**Basidiospores** ellipsoid to oblong, with a flattened ventral side and often slightly truncate, usually uniguttulate, thick-walled, amyloid, 4-5.5 x 3-4 Fm.

**Substrata.** On very rotten conifers, usually in cavities.

**Distribution.** Circumpolar in coniferous forests, but rare. In East Asia known from Far East Russia.

**Remarks.** The species differs from the rest of the species in *Anomoporia* by its thick-walled basidiospores.

### **Anomoporia myceliosa** (Peck) Pouzar

Ceska Mykol. 20:172, 1966. - *Poria myceliosa* Peck, N.Y. State Mus. Bull. 54:952, 1902.

**Basidiocarps** annual, resupinate, becoming widely effused, up to 2 mm thick, soft to brittle, easily separable, margin wide, white, fimbriate, usually with conspicuous white rhizomorphs; pore surface white to pale cream-coloured, pores circular when young, becoming irregular with age, 2-4 per mm, usually with thin dissepiments, tubes concolorous with the context, up to 2 mm long; context white, soft-fibrous, up to 1 mm thick, sometimes with a more yellowish zone next to the substrate.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, hyaline, with frequent branching, 2.5-4 Fm wide.

**Basidia** clavate, 12-20 x 4-5 Fm, with four sterigmata.

**Basidiospores** narrowly ellipsoid, 3.5-4.5 x 2.5-3 Fm.

**Substrata.** On rather rotten wood of conifers like *Abies*, *Larix*, *Picea*, and *Pinus*, rarely on hardwoods such as *Betula*.

**Distribution.** Circumboreal in the coniferous forest regions from Europe through the Himalayas, China, Far East Russia, Japan (Hokkaido), and North America.

**Remarks.** The species is recognized by its white basidiocarps. Ryvarden & Gilbertson combined the species in *Ceriporiopsis*, but we keep the species in *Anomoporia* because of its amyloid basidiospores, since the type of rot for this species is still unknown.

### **Anomoporia vesiculosa** Dai & Niemelä

Ann. Bot. Fenn. 31:66, 1994.

**Basidiocarps** annual, resupinate, 7 cm long and 3-4 cm wide, cottony, easily separable from the substrate, margin thin and narrow, pale greyish-white, with a faint tint of lavender; pore surface pale ochraceous with salmon tints, pores angular, 1-3 per mm, some elongated, tubes concolorous with the pore surface, up to 4 mm long;

- 12. Basidiocarp brittle when dry, pore surface cream when dry,  
basidiospores 4.5-6 x 2.5 Fm..... **A. gossy-**  
**pina**
- 12. Basidiocarps soft and cottony when dry, pore surface pale  
sordid brown when dry, basidiospores 5-7 x 3-4 Fm ..... **A. vaillan-**  
**tii**
- 13. Skeletal hyphae strongly to slightly amy-  
loid..... 14
- 13. Skeletal hyphae negative in Melzer's reagent.....  
17
- 14. Basidiospores allantoid, 1-1.5 Fm wide, pore surface white to citric yellow,  
often cracked in polygons..... **A.**  
**xantha**
- 14. Basidiospores allantoid to cylindrical, pore surface grey, cream to pale sordid  
brown,  
not cracked .....  
15
- 15. Skeletal hyphae strongly amyloid, basidiospores 2-3 Fm wide ..... **A.**  
**carbonica**
- 15. Skeletal hyphae weakly amyloid, basidiospores 1.5-2 Fm wide .....  
16
- 16. Basidiocarps annual, pore surface greyish, skeletal hyphae dissolving in KOH,  
pores 3-5 per mm ..... **Diplomitoporus lind-**  
**bladii**
- 16. Basidiocarps perennial, pore surface pale orange to pale sordid brown,  
skeletal hyphae unchanged in KOH, pores 5-7 per mm ..... **A.**  
**sitchensis**
- 17. Basidiospores 2-3 Fm wide **see Diplomitoporus**
- 17. Basidiospores 1-2 Fm wide .....  
... 18
- 18. Pores 1-3 per mm, irregular, sinuous, dissepiments lacerate..... **A.**  
**sinuosa**
- 18. Pores 3-6 per mm, angular to round, dissepiments entire .....  
.. 19
- 19. Basidiospores allantoid, 5-7 Fm long, context cottony,

4. Pore surface pale brown..... 5  
 4. Pore surface white to cream..... 6
5. On hardwoods, basidiospores 7-10 Fm long ..... **A. malicola**  
 5. On conifers, basidiospores 10-12 Fm long ..... **A. variiformis**
6. Basidiospores in average longer than 10 Fm ..... 7  
 6. Basidiospores in average shorter than 10 Fm.....  
 ... 9
7. Basidiospores 10-18 Fm long, pores angular, 0.5 to 1 mm wide, or sinuous  
 to lamellate and larger, on all types of hardwoods or *Picea*..... 8  
 7. Basidiospores 9-12 Fm long, pores angular 2-3 per mm,  
 usually on *Salix* or *Populus*..... **A. macra**
8. Basidiocarps light brown when dry, basidia 30-40 Fm long,  
 basidiospores 5-7 Fm wide, usually on *Picea*..... **A. heteromorpha**  
 8. Basidiocarps white to cream, basidia 15-25 Fm long,  
 basidiospores 3.5-5 Fm wide, usually on hardwoods ..... **A. albida**
9. Pores 2-4 per mm, rare boreal species..... **A. primaeva**  
 9. Pores 0.5-1 per mm, widespread temperate species..... **A. ramentacea**
10. Basidiospores ellipsoid to subellipsoid.....  
 11  
 10. Basidiospores cylindrical to allantoid.....  
 13
11. Context and older tubes disintegrated to a white amorphous  
 and crumbly mass..... **A. crassa**  
 11. Context and tubes distinct, easily distinguished.....  
 12

**Hyphal system** dimitic; generative hyphae with clamps, in the white context and in the trama hyaline and thin-walled, 2-4 Fm wide, in the brown layer next to the substrate pale brown and with scattered clamps, 3-5 Fm wide and mixed with skeletal hyphae which are thick-walled to almost solid, hyaline to pale brown, rarely dichotomously branched, 2-5 Fm wide.

**Cystidia** absent, but sometimes hyphal ends penetrate the hymenium.

**Basidia** clavate 15-20 x 4-6 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 5-7 x 1.5-2 Fm.

**Substrata.** On conifers, usually on much decayed *Pinus* logs, basidiocarps develop from wood scars. White mycelial felts develop in the decayed wood.

**Distribution.** Circumpolar in the coniferous zone, but restricted to high altitudes or areas with continental climate. In East Asia known from Northern China (Changbai).

**Remarks.** In the field recognized by the often uneven brown pore surface and cottony, soft basidiocarps with a distinct brown zone in the context next to the substrate.

***Antrodia carbonica*** (Overh.) Ryvarden & Gilb.

Mycotaxon 19:139, 1984. - *Poria carbonica* Overh., Can. J. Res. 21(C):232, 1943.

**Basidiocarps** annual to occasionally perennial, resupinate, widely effused, tough and corky, adnate, up to 1 cm thick, margin well delimited, white, weathering pale brown; pore surface white to cream, pores circular to angular 3-5 per mm, tubes white, up to 1 cm long; context cottony to fibrous, white and thin, tissue instantly blue-black where touched with Melzer's reagent; taste bitter.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 3-4 Fm wide, straight to sinuous; skeletal hyphae thick-walled, hyaline, unbranched, 5-8 Fm wide; binding hyphae thick-walled, hyaline, much branched, 2-4 Fm wide, transitional to skeletal hyphae; all hyphae strongly amyloid.

**Basidia** clavate, 20-25 x 5-7 Fm, with four sterigmata.

**Basidiospores** cylindrical to oblong, 5-6.5 x 2-3 Fm.

**Substrata.** On conifers.

**Distribution.** Western North America and high elevations in Guatemala and Mexico, North Africa, and the Himalayas, in East Asia known from cold temperate China (Changbai) and Japan (West Honshu).

**Remarks.** The strong amyloid reaction of the skeletal hyphae is normally sufficient for identification of this species.

***Antrodia crassa*** (P. Karst.) Ryvarden

Norw. J. Bot. 20:8, 1973. - *Physisporus crassus* P. Karst., Krit. Øfvers. Finl. Basidsv. p.319, 1889.

**Basidiocarps** perennial, resupinate, soft when fresh, hard and brittle when dry, separable, margin white, smooth and narrow; pore surface white to cream, pores 3-6 per mm, tubes white to slightly yellowish as if partly soaked with a resinous substance especially in old specimens, young parts of tubes distinct, lower parts disintegrated

ochraceous to cinnamon brown ..... **A. albo-**

**brunnea**

19. Basidiospores cylindrical, 4-5 Fm long, context white and crumbly ..... **A.**

**sordida**

**Antrodia albida** (Fr.) Donk

Persoonia 4:339, 1966. - *Daedalea albida* Fr., Syst. Mycol. 1:338, 1821.

**Basidiocarps** annual, resupinate to effused-reflexed, usually extended along the wood, often imbricate, separable when dry, tough and corky, margin in resupinate specimens wide to narrow, white to cream; pilei (when present) up to 2 cm wide, often elongated, white to cream, first finely tomentose, later the hyphae agglutinate making the pileus partly smooth, partly with small irregular tufts of hyphae especially along the margin, azonate or with narrow, slightly sulcate zones; pore surface white to cream or yellowish in old specimens, pores round to angular, in pileate specimens often split at the margin or almost purely lamellate to semidaedaloid, 1-3 per mm, in resupinate specimens mostly 2-3(4) per mm, tubes up to 1.5 cm long; context up to 3 mm thick, white and corky.

**Hyphal system** dimittic; generative hyphae with clamps, richly to moderately branched, 2.5-5 Fm; skeletal hyphae dominating in the context and pilear surface, hyaline, thick-walled to solid, 3-6.5 Fm wide.

**Cystidia** absent; hyphoid hyphae and cystidiols sometimes present among the basidia, their occurrence is, however, variable.

**Basidia** clavate, 30-40 x 6-9 Fm, with two to four sterigmata.

**Basidiospores** cylindrical to oblong ellipsoid, 10-14 x 3.5-5 Fm.

**Substrata.** On hardwoods of many genera.

**Distribution.** Temperate species, widely distributed. In East Asia known from China, Japan (Honshu, Hokkaido), Far East Russia, and Taiwan.

**Remarks.** The large basidiospores are quite distinct among other species growing on hardwoods. The pores are often slightly irregular and sinuous. Asian specimens are commonly pileate and have a lamellate hymenophore.

**Antrodia albobrunnea** (Romell) Ryvar den

Norw. J. Bot. 20:8, 1973. - *Polyporus albobrunneus* Romell, Ark. Bot. 11, 3:10, 1911.

**Basidiocarps** annual to biannual, resupinate extending to 40 cm, up to 4 mm thick, soft when fresh, more tough when dry, separable, margin often wide and cottony, determinate or with radiating strands in actively growing specimens, white, becoming pale brown with age; pore surface first white but soon pale or ferruginous brown, often discoloured in patches, more evenly brown when dry, pores circular to angular, usually thin-walled, 3-5 per mm, tubes white to pale brown, up to 3 mm long; context cottony, white to ochraceous and with a distinct cinnamon brown zone next to the substrate, up to 1 mm thick.

**Antrodia heteromorpha** (Fr.) Donk

Personia 4:339, 1961. - *Daedalea heteromorpha* Fr., Syst. Mycol. 1:340, 1821.

**Basidiocarps** annual, pileate, effused-reflexed or resupinate, often of large dimensions when growing on the underside of logs, more commonly imbricate to nodulose when growing on stumps and standing trunks, margin white and distinct, often narrow; individual pilei up to 3 cm wide and 10 cm long, corky and tough; pilear surface first white to cream, weathering to pale sordid brown, first finely tomentose, glabrous with age, or with tufts of agglutinated hyphae, zonate, either smooth or sulcate; pore surface white to cream or buff, pores angular to sinuous or daedaloid, 1-2 per mm, on sloping substrates sometimes larger, dissepiments thick, becoming fimbriate, tubes concolorous, up to 3 cm long; context thin and white.

**Hyphal system** dimitic; generative hyphae with clamps, thin- to thick-walled, 2-4 Fm wide; skeletal hyphae hyaline, thick-walled to semisolid, straight to sinuous and with occasional dichotomous branching, 3-7 Fm wide.

**Cystidia** absent; occasional pointed cystidiols may occur between the basidia, although their presence is variable.

**Basidia** clavate, 30-40 x 9-11 Fm, with four sterigmata.

**Basidiospores** cylindrical to oblong ellipsoid, 10-13 x 5-7 Fm, often slightly curved near the apiculus.

**Substrata.** On conifers, occasionally on hardwoods.

**Distribution.** Widely distributed in the boreal coniferous forests, in East Asia known from Northern China and Japan.

**Remarks.** *Antrodia heteromorpha* may be confused with *A. albida* which however usually grows on hardwoods and has narrower basidiospores.

**Antrodia infirma** Renvall & Niemelä

Karstenia 32:35, 1992.

**Basidiocarps** annual, resupinate, up to 10 cm in the longest dimension, soft when fresh, brittle when dry, margin white to cream, somewhat paler than the pore surface which is white when fresh, becoming cream to ochraceous when dry, pores angular, 3-4 per mm, intermixed with some larger ones, dissepiments thin and papery when dry, tubes up to 3 mm long; context thin and white, up to 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, dominant throughout the basidiocarp, thin-walled, 2-5 Fm wide, often with an oily content, some hyphae becoming gloeopleurous with age, some sclerified generative hyphae may occur in the context; skeletal hyphae rare, mostly present in the trama, slightly flexuous, thick-walled with a distinct lumen, 2.5-5 Fm wide.

**Cystidia** absent; pointed, smooth, thin-walled cystidiols usually present, 19-29 x 3-5 Fm.

**Basidia** clavate, 16-22 x 4-8 Fm, with four sterigmata.

**Basidiospores** narrowly ellipsoid to slightly fusiform, 7-9 (9.5) x 2-3 Fm.

and crumbly as the context, which is impossible to distinguish, up to 1 cm thick and faintly zonate in section; taste bitter.

**Hyphal system** dimittic; generative hyphae with clamps, thin-walled and 2-5 Fm wide; skeletal hyphae hyaline, thick-walled to solid, sinuous, unbranched to occasionally dichotomously branched, 3-5 Fm wide, microscopical preparations often filled with oily drops.

**Cystidia** absent; fusoid, non-projecting cystidiols usually abundant among the basidia, up to 18 Fm long, hyaline to weakly yellowish.

**Basidia** clavate, 15-10 x 5-7 Fm, with four sterigmata.

**Basidiospores** broadly cylindrical to oblong ellipsoid, 4.5-7 x 2.5-3.5 Fm.

**Substrata.** On conifers.

**Distribution.** Circumpolar in the coniferous zone, in East Asia known from Korea and Northern China (Changbai).

**Remarks.** The perennial basidiocarps with a white, crumbly context, and the broad basidiospores are diagnostic characters. Both *A. sitchensis* and *A. sordida*, which may have resinous irregular bodies in microscopical preparations, have more narrow basidiospores, and both have skeletal hyphae with a positive reaction in Melzer's reagent.

### ***Antrodia gossypina* (Speg.) Ryvarden**

Norw. J. Bot. 20:8, 1973. - *Poria gossypina* Speg., Buenos Aires Mus. Arg. Cien. Nat. Anal. 6: 169, 1899.

**Basidiocarps** annual, resupinate, often widely effused, up to 5 mm thick, separable, soft to cottony, margin white and wide, rhizomorphs white to yellow, absent or present; pore surface at first white to cream, in age and drying becoming straw to cream-coloured, pores angular, 3-6 per mm, tubes concolorous, rather waxy and brittle when dry, in part soaked by some resinous substance in old basidiocarps, up to 3 mm long; context white and cottony, up to 2 mm thick, in old specimens contrasting with the darker tubes.

**Hyphal system** dimittic; generative hyphae with clamps, thin-walled, 3-6 Fm wide, dominant in the trama; skeletal hyphae scattered in the trama, more common in the context, unbranched, hyaline, negative in Melzer's reagent, thick-walled to solid, 3-5 Fm wide.

**Basidia** clavate, 15-20 x 4-5 Fm, with four sterigmata.

**Basidiospores** ellipsoid, often guttulate, 4.5-6 x 2.5 Fm.

**Substrata.** On dead conifers, very rarely on hardwoods.

**Distribution.** Circumpolar in the coniferous forest ecosystems. In East Asia known from Japan (Hokkaido).

**Remarks.** Macroscopically this species resembles *A. vaillantii* when rhizomorphs are present, but basidiocarps of the latter are much softer, not waxy-resinous and brittle like those of *A. gossypina*. Further, *A. vaillantii* has larger and wider basidiospores.

unbranched, 2-5 Fm wide, in the context with short branches 2-3 Fm wide.

**Basidia** clavate, 25-40 x 7-10 Fm, with four sterigmata.

**Basidiospores** cylindrical to navicular, 7-10 x 2.5-4 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Temperate species, in East Asia known from Northern China (Chang-bai), Japan (Kyushu), Korea, and Far East Russia up to Sakhalin.

**Remarks.** The even pale brown colour will separate this species from other *Antrodia* species on hardwoods. Typically there will be a brown, narrow, elongated pileus along the upper part of the basidiocarp. *Antrodia albida* is also common on hardwoods but differs macroscopically in its paler, cream-coloured to buff basidiocarps.

***Antrodia primaeva*** Renvall & Niemelä

Karstenia 32:30, 1992.

**Basidiocarps** annual, resupinate to effused-reflexed, soft to crumbly when fresh, shrinking under drying and brittle to fairly hard when dry, up to 20 cm in longest dimension, 1.5 cm thick, margin distinct in resupinate specimens; pilei if present, triquetrous, up to 7 x 1.5 cm long, 1-2 cm thick at the base; pilear surface cream to unevenly pale brown with some darker spots, first matted to finely tomentose, later glabrous, azonate, in mature specimens radially scurpouse, usually paler than the pores; pore surface white to cream, drying yellowish or discoloured pale brown, pores angular, 2-4 per mm, dissepiments papery, tubes concolorous or slightly paler; context white to cream, up to 1.5 cm at the base of the pileus, in old specimens with a thin agglutinated cuticle.

**Hyphal system** trimitic; generative hyphae with clamps, dominant in the basidiocarp, thin-walled, 2-6 Fm wide in the context, up to 4 Fm in the trama, gloeopleurous hyphae present; skeletal hyphae few in the context, most abundant in the trama, unbranched, thick-walled to semisolid, 3-5 Fm wide; binding hyphae only present in the lower context, thick-walled and with frequent short branches, 1.5-4 Fm wide.

**Cystidia** absent; pointed cystidiols rarely present.

**Basidia** clavate, 15-26 x 4.5-8 Fm, with four sterigmata.

**Basidiospores** narrowly ellipsoid to subfusiform, 6.5-9(11) x 2.2-3.5 (3.8) Fm.

**Substrata.** Known only from dead trunks or stumps of *Pinus* and *Abies*, often on charred wood.

**Distribution.** Boreal species known from Scandinavia and Northern China (Chang-bai).

**Remarks.** The species is microscopically very similar to *A. infirma*, which has thinner, resupinate basidiocarps. *Dichomitus squalens*, growing in the same area and often on the same substrate has a white rot and distinctly arboriform hyphae.

***Antrodia ramentacea*** (Berk. & Broome) Donk

Persoonia 4:339, 1966. - *Polyporus ramentaceus* Berk. & Broome, Ann. Mag. Nat. Hist. 5:210, 1879.

**Substrata.** Dead trunks of *Pinus sylvestris* and rarely *Picea abies*.

**Distribution.** Known from Finland and Northern China (Changbai).

**Remarks.** From similar *Oligoporus* species, *A. infirma* is separated by the skeletal hyphae and larger basidiospores.

***Antrodia macra*** (Sommerf.) Niemelä

Karstenia 25:38, 1985. - *Polyporus macer* Sommerf., Suppl. Flora Lapp. p. 279, 1826.

**Basidiocarps** annual, resupinate, more rarely nodulose, and then with scattered sloping pilei over an effused pore surface, up to 1 cm thick; pilear surface, if present, glabrous to finely scrupose or radially striate, white when fresh, cream to wood-coloured when dry, rarely more than 1 cm wide; pore surface white to ochraceous, pores (1)2-3 per mm, a few occasionally larger, especially on sloping substrates, tubes elongated, up to 1 cm long, concolorous with the pore surface; context crumbly and indistinct, white, 1-3 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 Fm wide; skeletal hyphae hyaline, thick-walled to solid, 2-4 Fm wide.

**Cystidia** absent; pointed cystidiols scattered in the hymenium, 18-25 x 4-6 Fm.

**Basidia** clavate, 22-27 x 6-8 Fm, with four sterigmata.

**Basidiospores** cylindrical to oblong-ellipsoid, 9-12 x 3.5-4.5 Fm.

**Substrata.** On hardwoods, mainly on trees of Salicaceae.

**Distribution.** Temperate species in Europe and Asia. In East Asia known from Far East Russia and Northern China (Changbai).

**Remarks.** The species is related to *Antrodia albida*, but separated by its crumbly context, shorter basidiospores, and its preference for Salicaceae.

***Antrodia malicola*** (Berk. & M.A. Curtis) Donk

Persoonia 4:340, 1966. - *Trametes malicola* Berk. & M.A.Curtis, Acad. Nat. Sci. Phila. J. II, 3:209, 1856.

**Basidiocarps** annual to biennial, resupinate to effused-reflexed, more rarely sessile, individual pilei projecting up to 1.5 cm from the substrate, tough to corky, hard when dry, separable; pilear surface pale wood brown, becoming greyish to blackish with age, at first finely tomentose, soon agglutinated and glabrous, sometimes more scrupose, margin acute to rounded; pore surface uniformly pale cinnamon to wood brown, pores circular and regular, 3-4 per mm on horizontal parts of the pilei, commonly more irregular, angular to sinuous, 2-3 per mm, in resupinate parts also larger and daedaloid, up to 3-4 mm long and about 1 mm wide, often with sinuous dissepiments, tubes concolorous or paler, up to 5 mm long; context pale brown, tough-fibrous, 1-2 mm thick; taste mild.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled to slightly thick-walled in the context, difficult to observe in the latter, 2-4 Fm wide; skeletal hyphae dominant, semisolid to thick-walled, straight to sinuous, usually

tal hyphae dominant, hyaline to very light brownish, thick-walled to solid, 3-6 Fm wide.

**Cystidia** absent; fusoid cystidiols often present, 12-24 x 6-8 Fm.

**Basidia** clavate, 20-25 x 5-7 Fm, with four sterigmata.

**Basidiospores** cylindrical to fusoid, often almost navicular, 7-8.5(10) x 2.5-4 Fm.

**Substrata.** On conifers.

**Distribution.** Cosmopolitan in coniferous forests. In East Asia known from China, Japan, Far East Russia, and Korea.

**Remarks.** When pileate, the pale brownish pileus and the conifers hosts are good field characteristics. Microscopically the navicular basidiospores are diagnostic. Old basidiocarps are often attacked by an reddish imperfect species miscolouring the pore surface. Insects are particularly fond of the species, and their excrements are commonly found clinging to the pore surface.

***Antrodia sinuosa*** (Fr.) P. Karst.

Medd. Soc. F. Flora Fenn. 6:10, 1881. - *Polyporus sinuosus* Fr., Syst. Mycol. 1:382, 1821.

**Basidiocarps** annual, resupinate and often widely effused, tough and hard when dry, up to 3 mm thick, separable, margin white, narrow to almost lacking; pore surface white to wood-coloured or pale sordid brown on drying, pores angular to sinuous, on drying often cracking and split, 1-3(4) per mm, tubes concolorous, up to 5 mm long, dissepiments entire to fimbriate; context white, cottony to tough, about 1 mm thick; taste bitter.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 Fm wide; skeletal hyphae hyaline, thick-walled to semisolid, straight to sinuous, occasionally branched, 2-5 Fm wide, negative in Melzer's reagent, more common in the context than in the trama.

**Cystidia** absent; fusoid, non-projecting cystidiols often present among the basidia, 12-20 x 3-4 Fm.

**Basidia** clavate, 20-22 x 4-5 Fm, with four sterigmata.

**Basidiospores** cylindrical to subballantoid, 5-6 x 1.5-2 Fm.

**Substrata.** On conifers, rarely on hardwoods, also in humid cellars.

**Distribution.** Circumpolar in the boreal coniferous zone, in East Asia known from China, Korea, Japan, Far East Russia, and Northern Thailand.

**Remarks.** The species is usually easy to recognize in the field because of the sinuous pores and the pale sordid brown colour when dry. Old basidiocarps of *A. xantha* can resemble those of *A. sinuosa*, but the pores are smaller, with a yellowish tint, and the skeletal hyphae are amyloid.

***Antrodia sitchensis*** (Baxter) Gilb. & Ryvarden

Mycotaxon 22:364, 1985. - *Poria sitchensis* Baxter, Papers Mich. Acad. Sci., 23:293, 1938.

**Basidiocarps** annual, resupinate, up to 4 mm thick, normally small and orbicular, adnate, tough and cartilaginous when fresh, hard when dry, margin narrow, white and floccose, in old and dry specimens frequently curled up; pore surface white, becoming buff to straw-coloured or unevenly resinous brown, pores angular, in small specimens 1-2 per mm, up to 1-2 mm wide in older specimens, tubes up to 4 mm long, concolorous with the context, resinous and brittle in old specimens; context white and tough, 1 mm thick; taste bitter.

**Hyphal system** dimittic; generative hyphae with clamps, abundant, hyaline, thin- to thick-walled, in parts slightly gelatinized in KOH, moderately to frequently branched, 2.5-5 Fm wide; skeletal hyphae hyaline, solid to thick-walled, unbranched, dominant in the context, up to 6 Fm wide.

**Cystidia** absent; fusoid, thin-walled cystidiols common, especially in immature hymenia, 15-25 x 4-5 Fm.

**Basidia** clavate, 30-40 x 8-10 Fm, with four sterigmata.

**Basidiospores** cylindrical to narrowly ellipsoid, 9-11 x 4.5-5 Fm.

**Substrata.** In Europe almost exclusively on *Pinus*, rarely on other conifers. In East Asia on *Abies firma* and *Pinus densiflora*.

**Distribution.** Boreal Eurasian species, in East Asia known from Japan (Kyushu).

**Remarks.** Small resupinate specimens of *A. heteromorpha* may be confusingly similar, but this species is seemingly restricted first of all to *Picea*. Its basidiospores are also larger, and normally its basidiocarps remain tough and white to cream, not becoming resinous as in *A. ramentacea*.

### **Antrodia serialis** (Fr.) Donk

Persoonia 4:340, 1966. - *Polyporus serialis* Fr., Syst. Mycol. 1:370, 1821.

**Basidiocarps** annual or perennial, resupinate to effused-reflexed, often elongated along the wood grain, in some cases with imbricate pilei on vertical surfaces, or several fused longitudinally, easily separable from the substrate, corky and tough, margin white, undulating, narrow and sharply delimited towards the substrate, taste absent or slightly bitter; pilei narrow, rarely above 2 cm wide; pilear surface first white, then yellowish brown to dirty greyish brown, azonate, slightly striate, finely tomentose to slightly tufted or fibrillose, darkens permanently in KOH; pore surface first white, later cork-coloured and when dry or late in the season light brownish-ochraceous, very often attacked by hyphomycetes which discolour the hymenium leaving reddish areas, old specimens, especially from previous seasons, very often badly eaten by insects which leave the pore surface partly covered by granulated excrements clinging to the surface, pores round to angular, on vertical surfaces often elongated and split, somewhat variable with age and exposition, 2-4 per mm, tubes white, up to 8 mm long on vertical substrates; context up to 4 mm thick, white, corky to coriaceous.

**Hyphal system** dimittic; generative hyphae with clamps, hyaline, thin- to distinctly thick-walled, moderately branched, 2-5 Fm wide, more scarce in the context; skele-

Norw. J. Bot. 20:8, 1973. - *Polyporus vaillantii* DC.:Fr., Syst. Mycol. 1:383, 1821. - *Boletus vaillantii* DC., Fl. France 6:38, 1815.

**Basidiocarps** annual, resupinate, often widely effused, up to 4 mm thick, separable, soft-fibrous, margin often wide with rhizomorphs, white to cream; pore surface white to cream, becoming pale sordid brown in parts when dry, pores circular to angular, 2-4 per mm, in old basidiocarps also larger, tubes concolorous with the context, soft and cottony, drying somewhat brittle in old specimens, up to 4 mm long; context soft and cottony, white, 1-2 mm thick; taste mild.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-6 Fm wide; skeletal hyphae dominant in the context and rhizomorphs, solid to thick-walled, hyaline, unbranched to rarely dichotomously branched, 2-5 Fm wide.

**Cystidia** absent; fusoid cystidiols present, 20-25 x 4-6 Fm.

**Basidia** clavate, 20-28 x 6-8 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid, 5-7 x 3-4 Fm.

**Substrata.** Known primarily on conifers and mostly found on structural timbers in mines, basements, etc. in humid locations, very rare on hardwoods.

**Distribution.** Cosmopolitan in the coniferous forest zone and an important cause of decay in structural timbers. In East Asia known from Northern China (Changbai), Japan (Honshu and Hokkaido) and Northern Vietnam.

**Remarks.** The species is normally recognized by its relatively soft basidiocarps with a rhizomorphic margin.

#### ***Antrodia variiformis* (Peck) Donk**

Persoonia 4:340, 1966. - *Polyporus variiformis* Peck, N.Y. St. Mus. Ann. report. 42:122, 1889.

**Basidiocarps** annual to perennial, pileate to resupinate, often widely effused, tough and coriaceous when dry, when pileate with a narrow sloping pileus often elongated along the decurrent pore surface, up to 1 cm wide, light brown and finely pubescent, more glabrous with age and then with some weak concentric zones; pore surface light brown, pores angular, 1-2 per mm, on sloping substrates often split and sinuous, up to 3-4 mm long, dissepiments often fimbriate, tubes whitish to pale brown, up to 6 mm long; context white to pale brownish, very thin, rarely over 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin- to slightly thick-walled, 2-4 Fm wide; skeletal hyphae dominant, thick-walled, slightly yellow, often almost solid, up to 6 Fm wide, mostly straight, less frequently somewhat flexuous and dichotomously branched or with short lateral branches.

**Basidia** clavate, 25-35 x 6-8 Fm, with four sterigmata.

**Basidiospores** cylindrical, 8-10(11) x 3-4.5 Fm.

**Substrata.** On conifers, rarely on hardwoods.

**Distribution.** Widespread in America. In East Asia known from China (Sichuan, Changbai).

**Remarks.** The species is easy to recognize by the light brown basidiocarps with

**Basidiocarps** perennial, resupinate, effused about 70 x 10 cm, up to 2 cm thick, hard when fresh, more brittle when dry, separable, margin narrow, white to rusty brown; pore surface cream to buff, drying pale orange brown, pores round, 5-7 per mm, tubes concolorous, stratified, in old specimens as if soaked with some resinous substance, up to 1 cm long, dissepiments thick; context cream and dense, distinctly paler than the tubes, up to 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, difficult to observe, thin-walled and 2-4 Fm wide; skeletal hyphae dominant, thick-walled, straight, unbranched to rarely dichotomously branched, amyloid 2-5 Fm wide, drops and irregular bodies of resinous substances commonly present in microscopic preparations.

**Cystidia** absent; fusoid cystidiols scattered among the basidia.

**Basidia** clavate, 18-24 x 5-7 Fm, with two to four sterigmata.

**Basidiospores** cylindrical to allantoid, 5-5.5 x (1.5)2-2.5 Fm.

**Substrata.** On conifers.

**Distribution.** Circumpolar in the boreal coniferous forests. In East Asia known from Japan (Hokkaido) and Far East Russia (Primorsk).

**Remarks.** *Antrodia sitchensis* can usually be recognized in the field by the perennial basidiocarps with a resinous, rusty brown margin and the orange brown pore surface with small and regular pores.

***Antrodia sordida*** Ryvarden & Gilb.

Mycotaxon 19:143, 1984.

**Basidiocarps** perennial, resupinate, effused, soft when fresh, hard and brittle when dry, adnate, margin narrow and white; pore surface white to cream, drying pale straw-coloured to sordid brown, pores small and round, 4-6 per mm, tubes stratified, pale tan with a dark, very thin zone between each layer, totally up to 8 mm long; context white and crumbly, 1-2 mm thick; taste bitter.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled and 2-4 Fm wide in the trama, some hyphae thick-walled and with scattered clamps in the context; skeletal hyphae thick-walled to semisolid, unbranched and sinuous, weakly dextrinoid (observe in mass), 2-5 Fm wide; microscopical preparations often filled with oily drops.

**Basidia** clavate, 12-15 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, 4-5 x 1.5-1.8 Fm.

**Substrata.** On conifers.

**Distribution.** North America, Europe, Northern China (Changbai), and Japan (Hokkaido), but not common.

**Remarks.** The stratified basidiocarps with a white, crumbly, disintegrated context resemble those of *A. crassa*, but the basidiospores of *A. sordida* are much narrower, and cystidiols, so common in *A. crassa*, have not been seen in *A. sordida*.

***Antrodia vaillantii*** (DC.:Fr.) Ryvarden

ospores, hyphal system, and the same cartilaginous to slightly resinous and dense consistency when dry. The main character separating the two genera is the presence of encrusted skeletocystidia in *Junghuhnia*.

Many species of *Antrodiella* have a conspicuous connection with dead basidiocarps of other polypores and corticoid species, growing on or near them. The reason for this connection is not known, but see Niemelä et al (1995) and Holmer et al (1997) for details and discussions.

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- 5. Pilear surface dark brown to bay when dry, tropical to subtropical species .....**A. liebmannii**
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- 6. Basidiocarps pileate, yellowish brown, context with dark lines,

large, angular pores and large, cylindrical basidiospores. *Antrodia serialis* is separated by its smaller pores and fusiform basidiospores.

**Antrodia xantha** (Fr.) Ryvarden

Norw. J. Bot. 20:8, 1973. - *Polyporus xanthus* Fr., Syst. Mycol. 1:379, 1821.

**Basidiocarps** annual, resupinate, often widely effused and up to 5 mm thick, or as numerous nodulose pilei on a more or less vertical surface, adnate, soft when fresh, crumbly and chalky when dry, margin narrow and white; pore surface citric to sulphurous yellow to cream when fresh, fading by drying to almost pure white or pale sordid brown, when old characteristically cracking into square pieces, pores round, 5-7 per mm, sinuous in old basidiocarps and then 2-3 pores per mm, tubes cream to white; context white, chalky, up to 1.5 mm thick; taste bitter.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, 2-4 Fm wide; skeletal hyphae hyaline, dominant, semisolid, straight to slightly sinuous, unbranched to occasionally dichotomously branched, 3-6 Fm wide, amyloid, often swelling in KOH.

**Cystidia** absent; pointed, non-projecting cystidiols occur scattered among the basidia, 10-14 x 3-4 Fm.

**Basidia** clavate, 10-15 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid, 4-4.5 x 1-1.5 Fm.

**Substrata.** Usually on conifers in open and dry localities and commonly on decorticated or burned wood, more rarely on hardwoods, especially on *Salix* spp. in boreal and continental areas.

**Distribution.** Holarctic. In East Asia known from China, Japan, Far East Russia, and Northern Thailand.

**Remarks.** The characteristic cracking and the yellowish colour separates this species from the white-rot fungus *Diplomitoporus lindbladii*, which also has amyloid skeletal hyphae, allantoid basidiospores, and is white when young.

**ANTRODIELLA** Ryvarden & I. Johans.

Prelim. Polyp. Fl. East Africa:256, 1980.

Basidiocarps annual to perennial, pileate to resupinate, soft to coriaceous with a semitransparent appearance when fresh, often dense and hard when dry; pore surface pale ochraceous to straw-coloured in most species, tubes in many species as if soaked with some resinous substance; hyphal system di-trimitic; generative hyphae with clamps; skeletal hyphae hyaline and thick-walled; binding hyphae present or absent; cystidia absent or present in the hymenium or as apical parts of the skeletal hyphae which may bend into the hymenium; basidiospores hyaline, smooth, thin-walled, negative in Melzer's reagent and generally less than 5 Fm in longest dimension. On dead wood causing a white rot. Cosmopolitan genus.

**Type species:** *Polyporus semisupinus* Berk. & M.A. Curtis

**Remarks.** The genus is related to *Junghuhnia*, sharing the same type of rot, basidi-

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**Antrodiella albocinnamomea** Dai & Niemelä

Mycotaxon 64:70, 1997.

**Basidiocarps** annual, mostly resupinate, very rarely effused-reflexed, easily separable, leathery, margin thinning out, cottony to fimbriate; pore surface cream becoming orange when mature, pores angular, 3-5(6) per mm, dissepiments even or lacerate, tubes cream to pale cinnamon, corky to cartilaginous, up to 3 mm long; context cream, up to 0.5 mm thick, with a very thin crust next to the substratum, abhymenial surface orange.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, frequently branched, up to 3 Fm wide in the trama and 5 Fm wide in the context; skeletal hyphae hyaline, thick-walled to subsolid, sinuous, rarely branched, up to 3 Fm wide in the trama and 6 Fm wide in the context, where they can be encrusted.

**Cystidia** hymenial, clavate to pyriform, thin-walled, up to 20 x 8 Fm.

**Basidia** clavate, 8-11 x 3.5-4.5 Fm, with four sterigmata.

**Basidiospores** oblong to subcylindrical, 4-5.5 x 2-3 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Temperate East Asian species known from China (Changbai), Japan (Hokkaido, Honshu), and Far East Russia (Sakhalin).

**Remarks.** The species is recognized by its resupinate, leathery basidiocarps with

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9. Pileus velutinous, cinnamon brown, basidiospores 2.5-3.5 x 1.5-2 Fm....**A. minu-**  
**tispora**
10. Pores elongate, 1-3 per mm, basidiocarps orange..... **A. au-**  
**rantilaeta**
10. Pores angular, 5-7 per mm .....  
... 11
11. Pileus white to cream, azonate..... **A. semi-**  
**supina**
11. Pileus cinnamon to pale brown, zonate, with a strong scent of anise..... **A.**  
**fragans**
12. Pores 1-2 per mm.....  
... 13
12. Pores 3 or more per mm.....  
... 14
13. Basidiocarps vivid orange..... **A. au-**  
**rantilaeta**
13. Basidiocarps cream to straw-coloured..... **A.**  
**americana**
14. Basidiospores cylindrical to allantoid, up to 1.5 Fm wide..... **A.**  
**gypsea**
14. Basidiospores ellipsoid to subglobose, wider than 1.5 Fm .....

hyaline, 3-6 Fm wide, unbranched, mostly solid; tomentum mainly composed of thick-walled to solid generative and skeletal hyphae.

**Cystidia** absent; thin-walled cystidiols scattered in the hymenium, 18-22 x 4-6 Fm.

**Basidia** subclavate, 16-20 x 3.5-4 Fm, with four sterigmata.

**Basidiospores** oblong-ellipsoid, 3-4 x 1.5-2 Fm.

**Substrata.** On dead hardwood. Some collections were made on wood also colonized by *Schizopora* sp.

**Distribution.** Asian species known from temperate areas in Malaysia (Mt. Kinabalu), Japan (Honshu), and Taiwan (Taichung).

**Remarks.** The species is recognized by its vivid orange basidiocarps with large pores.

**Antrodiella citrinella** Niemelä & Ryvarden

Karstenia 23:26, 1983.

**Basidiocarps** annual, resupinate to very narrowly effused-reflexed, adnate, 2-7 cm long x 1-2 cm wide, tough when fresh, hard and corky when dry, margin sharply delimited, often expanding locally in a semicircular fashion, matted, white to very pale citric yellow, 1-2 mm wide, slightly deflexed when dry; pilear surface straw-coloured, matted, appressed-velutinous; pore surface pale to bright citric yellow, fading somewhat when dry, pores circular, a few slightly elongated, 3-4 (5) per mm, dissepiments finely fimbriate, tubes white when fresh, drying straw-colour, 1 mm long; context white to straw-coloured, tough-fibrous, 0.5 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, 2-4 Fm wide; skeletal hyphae dominant, hyaline, thick-walled to solid, 2-5 Fm wide, with a distinct lumen.

**Cystidia** absent.

**Basidia** clavate, 10-12 x 4-5 Fm, with four sterigmata.

**Basidiospores** subglobose, uniguttulate, 3-3.5 x 2-2.5 Fm.

**Substrata.** On conifers, usually on or near basidiocarps of *Fomitopsis pinicola* and *F. rosea*. It seems to prefer wet swampy localities in shady spruce forests.

**Distribution.** Apparently restricted to well preserved Eurasian boreal forests. In East Asia known from Northern China (Changbai).

**Remarks.** The bright citric yellow pore surface, the small basidiospores and the association with *Fomitopsis* spp. are diagnostic characters. Basidiocarps of *A. xantha* have a similar colour in fresh condition, but have allantoid basidiospores, amyloid skeletal hyphae and are associated with a brown rot.

**Antrodiella fragrans** (A. David & Tortic) A. David & Tortic

Cryptog. Mycol. 7:4, 1986. - *Trametes fragrans* A. David & Tortic, Acta Bot. Croat. 38:133, 1979.

**Basidiocarps** annual, pileate, sessile, more rarely effused-reflexed, usually imbricate, up to 4 cm long, 2 cm wide and 0.5-1 cm thick, flexible and tough when fresh, hard and fragile when dry, with a strong scent of anise that persists in the herbarium;

orange colours both on the pore and abhymenial surfaces, contrasting with the cream context and margin.

**Antrodiella americana** Ryvarden & Gilb.

Mycotaxon 18: 138, 1984.

**Basidiocarps** annual, resupinate, orbicular to widely effused, growing as pulvinate patches up to 5 mm thick, tough to coriaceous, drying dense, margin byssoid, white, wide to absent; pore surface cream to straw-coloured, pores angular, 1-2 per mm, more regular near the margin, in old specimens often slightly split and fimbriate, tubes concolorous, up to 3 mm long; context white to cream, rather dense with age, up to 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin- to slightly thick-walled, 2-4 Fm wide; skeletal hyphae hyaline, sinuous, scarcely branched, thick-walled, 2.5-5 Fm wide.

**Cystidia** clavate, thin-walled, 40-50 x 8-10 Fm, present at the bottom of the tubes, but difficult to find.

**Basidia** clavate, 10-12 x 3.5-4.5 Fm, with four sterigmata.

**Basidiospores** cylindrical to subellipsoid, 2.5-3.5 x 1-1.8 Fm.

**Substrata.** Usually on or near dead basidiocarps of *Hymenochaete* spp. In East Asia collected mainly on *Quercus serrata* and *Prunus* spp.

**Distribution.** Temperate species in North America, Europe, and East Asia (Honshu in Japan and Chabarovsk in Far East Russia), but not common. There is an unconfirmed record from China (Dai 1996a).

**Remarks.** On sight the basidiocarps may remind of *Ceriporiopsis aneirina*, *Schizopora paradoxa* or even *Irpex lacteus* but are easily separated from all these species by its tiny basidiospores and dimitic hyphal system. The association with *Hymenochaete* spp. especially *H. tabacina*, is in many cases a good field character.

**Antrodiella aurantilaeta** (Corner) Hattori & Ryvarden

Trans. Mycol. Soc. Japan 34:364, 1993. - *Tyromyces aurantilaetus* Corner, Beih. Nova Hedw. 96:161, 1989.

**Basidiocarps** annual, effused-reflexed to more rarely resupinate, occasionally pileate, dimidiate or laterally fused, up to 1.5 cm wide and 7 cm long, fleshy-tough in fresh condition, corky when dried; pilear surface orange, more vivid towards the margin, drying sordid white, sulcate, tomentose with hairs up to 1 mm thick at the base of the pileus; pore surface orange, concolorous with the pileus, pores angular to irregular, partly irpicoid, 1-3 per mm, occasionally over 1 mm wide, dissepiments thin to thick, entire to fimbriate, tubes pale orange, up to 5 mm long; context concolorous with the tubes, very thin, usually less than 1 mm thick, with a thin, darker line below the tomentum.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, 1.5-4 Fm wide, thin- to slightly thick-walled, in the context solid, up to 6 Fm wide; skeletal hyphae

Mycotaxon 50:35, 1994. - *Polystictus gypseus* Yasuda, Bot. Mag. Tokyo 32:249, 1918. - *Junghuhnia conchiformis* Zeng & Ryvarden, Mycotaxon 44:55, 1992.

**Basidiocarps** annual, sessile, effused-reflexed to occasionally resupinate, single to imbricate, soft, cottony, very light in weight; pilei dimidiate to elongated, up to 2 cm long and 1 cm wide in single pilei, up to 3 mm thick, margin usually sharp; pilear surface white, pubescent, usually sulcate; pore surface white, pores angular, 5-6 per mm, tubes white, up to 3 mm long; context white, soft-fibrous, up to 2 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, 1.5-2 Fm wide, in the context slightly thick-walled, 2-3 Fm wide; skeletal hyphae hyaline, thick-walled to almost solid, 2-3 Fm wide, unbranched, almost straight.

**Cystidia** scattered in the hymenium, acute, thin- to slightly thick-walled and usually with an amorphous matter at the apex.

**Basidia** clavate, 6-9 x 3-4.2 Fm, with four sterigmata.

**Basidiospores** subellipsoid, 2.2-3 x 1-1.5 Fm.

**Substrata.** On conifers, usually on *Abies*, *Chamaecyparis*, and *Cryptomeria*.

**Distribution.** Temperate Asian species known from Japan (Hokkaido and Honshu), Northern China (Changbai) and Far East Russia.

**Remarks.** The species resembles *Oxyporus cuneatus* at first sight because of its white and effused-reflexed basidiocarps and the host trees, but the latter species has larger pores and lacks clamps.

***Antrodiella hoehnelii* (Bres.) Niemelä**

Karstenia 22:11, 1982. - *Polyporus hoehnelii* Bres. in v. Höhnel, Sitzungber. Kaiserl. Akad. Wiss. Wien, Math. Naturwi. Kl. 121:344, 1912.

**Basidiocarps** annual, pileate, broadly attached, often imbricate, rarely projecting more than 3 cm, up to 5 cm long and 1.5 cm thick in individual pilei, tough when fresh, dense and hard when dry, margin almost glabrous; pilear surface cream to peach-coloured, azonate or weakly concentrically zonate, scrupose with conical protuberances which are somewhat radially oriented; pore surface concolorous or darker than the pilear surface, pores angular, 4-6 per mm when young and fresh, shrinking with drying and age and becoming more angular and irregular up to 1 mm wide, especially towards the base and the margin, dissepiments lacerate, tubes up to 8 mm long; context cream, up to 3 mm thick, dense, lighter than the pilear surface and often with darker resinous lines or streaks; no scent or taste.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, 1.5-3 Fm wide; skeletal hyphae dominant in the trama and context, hyaline, thick-walled to solid, in the trama usually 3-6 Fm wide and often covered with small tetrahedral crystals, in the context up to 7 Fm wide; binding hyphae mainly present in the context, sparingly branched, 2-3 Fm wide.

**Cystidia** absent.

**Basidia** clavate, 12-15 x 3.5-4.5 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 3.5-4.5 x 1.5-2 Fm.

pilear surface cinnamon to pale brown with orange tints, paler when fresh and then often slightly greyish, velutinous, zonate; pore surface pale orange to brown, glancing when fresh, margin white to pale yellow, pores circular, 6-7 per mm, dissepiments entire, tubes pale orange brown, up to 5 mm long; context concolorous and up to 5 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 2-4 Fm wide; skeletal hyphae pale brown, thick-walled, with a distinct lumen, straight to slightly sinuous, unbranched, 3-5 Fm wide, in the dissepiments a few skeletal hyphae are covered with crystals; binding hyphae richly branched, thick-walled, 3 Fm wide, difficult to find in the context.

**Cystidia** absent.

**Basidia** clavate, 8-12 x 4-5 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid, 3-4 x 2-3 Fm.

**Substrata.** On hardwoods.

**Distribution.** Known from cold-temperate Central Europe and East Asia (Japan and Far East Russia).

**Remarks.** The pileate, imbricate basidiocarps with pale brown to orange pilei and the strong scent of anise should be sufficient for a field determination.

***Antrodiella globospora*** Núñez & Ryvarden

Fungal Div. 3:109, 1999.

**Basidiocarps** pileate, annual, sessile, tough when fresh, hard when dry, up to 2.5 cm wide and long, 3-6 mm thick, pilear surface glabrous, smooth when fresh, slightly wrinkled when dry, azonate, white, margin sharp, pore surface cream to ochraceous, pores tiny, invisible to the naked eye, 7-8 per mm, 1-3 mm deep, context dense and white, 1-3 mm thick, contrasting with the tubes.

**Hyphal system** dimitic, generative hyphae with clamps, hyaline, thin- to distinctly thick-walled, in the subiculum up to 7 mm wide, skeletal hyphae thick-walled to solid, hyaline, 3-7 mm wide.

**Cystidia** smooth, hyaline, ventricose and pointed, 12-15 x 5-8 mm, scattered in the hymenium.

**Basidia** clavate, 4-sterigmate, 10-14 x 6-8 mm, with a basal clamp.

**Basidiospores** globose, 3- 3.5 mm diam. and with a fairly large oil drop.

**Substrata.** Known from *Castanopsis* sp. and *Quercus* sp. in warm-temperate forests.

**Distribution.** Known only from the type locality at Kyushu, Kagoshima Prefecture, Okuchi, Yama-no-kami, Japan.

**Remarks.** This species is characterized by the white dull pileus, the globose spores and the smooth ventricose cystidia. It may remind one of *A. semisupina* (Berk. & M. A. Curtis) Ryvarden which however has ellipsoid basidiospores and no ventricose cystidia.

***Antrodiella gypsea*** (Yasuda) Hattori & Ryvarden

cm thick; pilear surface yellowish brown, darkening when dry and old, finely pubescent, concentrically zonate, margin acute; pore surface cream, becoming ochraceous, tan when dry, pores round, 5-7 per mm, tubes non-stratified, concolorous with the pore surface and denser than the context; context cream, 1-5 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin- to thick-walled, 2-5 Fm wide; skeletal hyphae hyaline, thick-walled to almost solid, strongly agglutinated in the context and difficult to tease apart.

**Cystidia** absent.

**Basidia** clavate, 7-11 x 4-5.5 Fm, 4-sterigmata.

**Basidiospores** minute, oblong-subellipsoid, 2.5-3.5 x 1.5-2 Fm.

**Substrata.** On conifers and hardwoods.

**Distribution.** Described from India, it has recently been found in warm-temperate Japan (Kyushu).

**Remarks.** The species is recognized by its yellowish brown pileus, yellow-tan pore surface and small, subellipsoid basidiospores.

**Antrodiella romellii** (Donk) Niemelä

Karstenia 22:11, 1982. - *Poria romellii* Donk, Persoonia 5:84, 1967.

**Basidiocarps** annual, resupinate, coriaceous, orbicular to confluent, up to 4 mm thick, dense and hard when dry and semitranslucent in section as if partly soaked with a resinous substance; pore surface cream to light buff when dry, pores angular, usually 6-8 per mm, but some larger may occur during drying, tubes concolorous, up to 2 mm long; context white, up to 1 mm thick.

**Hyphal system** di-trimitic; generative hyphae with clamps, thin-walled, 2-3 Fm wide; skeletal hyphae hyaline, thick-walled, 2-4 Fm wide, some slightly more branched hyphae of even thickness are also present, 1.5-3 Fm wide, they may be interpreted as binding hyphae.

**Cystidia** absent; hyphal pegs may occur.

**Basidia** clavate, 9-15 x 3-5 Fm, with four sterigmata.

**Basidiospores** oblong ellipsoid to short cylindrical, 3.5-4 x 2-2.5 Fm.

**Substrata.** On dead hardwoods, occasionally on conifers.

**Distribution.** Temperate species, in East Asia known from Northern China (Changbai), Japan, and Far East Russia up to Sakhalin.

**Remarks.** The species is undoubtedly related to *A. semisupina*, but is separated by a consistently resupinate basidiocarp with a buff pore surface and larger basidiospores.

**Antrodiella semisupina** (Berk. & M.A. Curtis) Ryvardeen

Prelim. Polyp. Fl. East Africa p. 261, 1980. - *Polyporus semisupinus* Berk. & M.A. Curtis, Grevillea 1:50, 1872.

**Basidiocarps** annual, usually pileate to effused-reflexed, rarely resupinate, when pileate often imbricate with many narrow pilei fused laterally, individual pilei rarely above 2 cm wide, up to 4 mm thick at the base, resupinate specimens up to 5 mm

**Substrata.** On dead hardwoods, especially *Fagus*, but often as a saprophyte on dead basidiocarps of *Inonotus* species.

**Distribution.** Temperate Eurasian species, in East Asia known from Japan (Hokkaido) and Far East Russia.

**Remarks.** The peach-coloured basidiocarps with a scrupose pilear surface are distinctive field characters.

***Antrodiella liebmannii*** (Fr.) Ryvardeen

Prelim. Polyp. Fl. East Afr. p. 258, 1980. - *Polyporus liebmannii* Fr., Nova Acta Reg. Soc. Sci. Upsal. III, 1:59, 1851.

**Basidiocarps** annual, solitary to imbricate, pileate, mostly flabelliform to dimidiate, sometimes with a short distinct stipe-like base arising from a mycelial disk on the substrate, up to 3 cm wide and long, 1-2 mm thick, watery and brittle when fresh, resinous to woody hard when dry and then the whole basidiocarp often curled; pilear surface cream to pink when fresh, brown to deep bay when dry and then somewhat radially striate, first finely tomentose, soon glabrous in concentric zones, margin sharp; stipe or attenuated base if present, flattened to circular, brownish and glabrous with age, up to 1 cm long, 2-4 mm thick; pore surface cream when fresh, pale tan and sometimes rimose when dry, pores very small, 8-10 per mm, tubes concolorous with the pore surface, up to 1 mm long, paler than the context which is translucent when fresh, pale brown to almost umber and resinous when dry, sometimes with narrow bands reflecting stages of growth.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 1.5-3.5 Fm wide, rather difficult to observe in dried specimens; skeletal hyphae dominant, densely agglutinated and difficult to tease apart, moderately to very thick-walled, 3-8 Fm wide, unbranched or rarely dichotomously branched.

**Cystidia** difficult to see, fusoid, thick-walled, originating in the trama and bending into the hymenium, ventricose with an umbonate apex, thick-walled, 10-15 x 4-6 Fm.

**Basidia** subglobose to subclavate, 6-12 x 4.5-5 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to subglobose, 2-3 x 2-2.5 Fm.

**Substrata.** On hardwoods of all kinds.

**Distribution.** Pantropical, in East Asia known from subtropical China, Japan, Northern Thailand, and Vietnam.

**Remarks.** The watery basidiocarps with very tiny pores that dry bay and resinous are good field characteristics.

***Antrodiella minutispora*** (D.A. Reid, Thind & Chatr.) Ryvardeen

Prelim. Polyp. Fl. East Africa p. 259, 1980. - *Polyporus minutisporus* D.A. Reid, Thind & Chatr., Trans. Br. mycol. Soc. 42:42, 1959.

**Basidiocarps** annual, pileate, solitary or imbricate, fleshy when fresh, woody hard when dry, dimidiate to sessile, applanate, up to 6 cm long, 2-6 cm wide and up to 1.5

**Basidiospores** cylindrical to oblong-ellipsoid, (3)4-4.5 x 1-2 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Temperate East Asian species known from Northern China (Chang-bai), Japan (Hokkaido, Honshu), and Far East Russia (Primorsk).

**Remarks.** The species reminds of *A. minutispora* and *A. fragans* by being pileate with brown colours. The first species differs in being tropical to subtropical and having smaller basidiospores. The latter smells strongly of anise even when dry, has encrusted hyphae in the dissepiments, and broadly ellipsoid basidiospores.

**Antrodiella versicutis** (Berk. & M.A. Curtis) Gilb. & Ryvardeen

North Am. Polyp. p.158, 1986. - *Polyporus versicutis* Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10:308, 1868.

**Basidiocarps** annual, pileate, sessile to dimidiate and flabelliform, up to 8 cm long, 6 cm wide and 5 mm thick, tough when fresh, hard and brittle when dry; pilear surface ochraceous or very pale yellowish brown, with age the upper hyphae become agglutinated to a reddish brown, thin cuticle spreading from the base, glabrous, smooth or with narrow sulcate zones, in dry condition matted, but papery pelliculose on the surface, margin sharp and usually curved in dried specimens; pore surface ochraceous to straw-coloured, pores 6-8(9) per mm, tubes dense and concolorous with the pore surface, up to 2 mm long, in old specimens as if soaked with a resinous substance; context white to pale cream, distinctly paler than tubes, up to 2 mm thick at the base, dense and with a very thin cuticle towards the pilear surface.

**Hyphal system** dimitic; generative hyphae with clamps, in the context thin- to slightly thick-walled, sparingly branched, 3-5 Fm wide, in the trama narrower, thin-walled and more intricately branched, 2-4 Fm wide; skeletal hyphae present only in the trama, straight to sinuous, unbranched, thick-walled to almost solid 3-5 Fm wide.

**Cystidia** absent.

**Basidia** clavate, 8-12 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 4-4.5(5) x 1-1.5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Temperate to subtropical species, known from East America and East Asia (Zhejiang and Sichuan in China, and Japan).

**Remarks.** The red cuticle when developed is a good field character. Otherwise, the allantoid-cylindrical basidiospores separate this species from the similar, also pileate *A. minutispora*.

**Antrodiella zonata** (Berk.) Ryvardeen

Bol. Soc. Argent. Bot. 28:228, 1992. - *Irpex zonatus* Berk., Hooker's J. Bot. 6:168, 1854 - *I. brevis* Berk., Flora Nov. Zeal. 2:181, 1855. - *I. consors* Berk., J. Linn. Soc. 16:51, 1877. - *I. decurrens* Berk., Grevillea 19:109, 1891. - *I. kusanoi* Henn. & Shirai, Bot. Jahrb. 28:267, 1900 (teste Ito 1955). - *Irpiciporus japonicus* Murrill,

thick, soft and waxy when fresh, dense and cartilaginous or resinous when dry and often semitranslucent, partly loosening along the margin when dry; pilear surface first white, azonate and appressed velutinous, with age becoming glabrous, slightly zonate and pale straw-coloured, sometimes with some radial lines, margin sharp and bent down when dry, in resupinate parts white to cream, often slightly fimbriate; pore surface cream to pale straw-coloured, becoming deeper in colour, glancing when turned in incident light, pores round to angular and thin-walled, in resupinate and horizontal parts 5-7 per mm, almost invisible to the naked eye, on sloping substrata irregular and up to 3 per mm, tubes concolorous, semitranslucent and dense, up to 3 mm long; context white and dense, 1-2 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, 2-4 Fm wide, often difficult to observe properly in dried specimens; skeletal hyphae dominant, agglutinated, unbranched to occasionally branched, hyaline, thick-walled, 2-5 Fm wide; binding hyphae rare, much branched, thick-walled, hyaline, 2-3 Fm wide.

**Cystidia** absent; fusoid cystidiols present, 10-14 x 3-4 Fm.

**Basidia** clavate, 11-14 x 4-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 2.5-3.5 x 2-3 Fm.

**Substrata.** Usually on hardwoods, rarely on conifers and on or near basidiocarps of other polypores like *Fomes*, *Fomitopsis*, and *Trichaptum* species.

**Distribution.** Temperate species, in East Asia fairly rare compared to Europe, known from China, Japan, Far East Russia, and Northern Thailand.

**Remarks.** Most authors agree that this taxon represents a complex of several similar species (Dai & Niemelä 1997). Mating tests have not been performed between the different morphotypes. For a narrower concept of the species, see Niemelä et al. (1992) and Vampola & Pouzar (1996).

***Antrodiella ussuri*** Dai & Niemelä

Mycotaxon 64:74, 1997.

**Basidiocarps** annual, pileate to effused-reflexed, often imbricate, readily separable from the substrate, tough, becoming hard and cartilaginous when dry, up to 7 cm long, 3 cm wide, and 6 mm thick; pilear surface pale tan to brownish, glabrous, widely concentrically sulcate, margin sharp; pore surface cream becoming pale buff to pale brown with age, glancing, pores round to angular, up to 9 per mm, dissepiments mostly entire, tubes concolorous with the pore surface, slightly darker than the context, brittle, up to 4 mm long; context tan, dense and hard, up to 3 mm thick, usually concentrically zonate.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, up to 4 Fm wide; skeletal hyphae hyaline, dominant, thick-walled but with a lumen, occasionally branched, strongly interwoven, up to 5 Fm wide; binding hyphae tortuous, thick-walled, with a lumen, up to 3.5 Fm wide.

**Cystidia** hymenial, thin-walled, clavate to fusiform, 15-17 x 4-5 Fm.

**Basidia** clavate, 9-11 x 4-5 Fm, with four sterigmata.

1. Basidiocarps resupinate, basidiospores ellipsoid .....  
 .... 2
1. Basidiocarps pileate to effused-reflexed, basidiospores allantoid..... **A.**  
**pileata**
2. Basidiocarps soft and easily sectioned, pore surface yellow,  
 basidiospores 5-8.5 x 3-4 Fm ..... **A.**  
**aurea**
2. Basidiocarps shrinking and resinous when dry, pore surface orange,  
 basidiospores 4.5-6 x 2-3 Fm..... **A.**  
**aurulenta**

**Auriporia aurea** (Peck) Ryvardeen

Norw. J. Bot. 20:3, 1973. - *Poria aurea* Peck, N.Y. State Mus. Ann. Rep. 43:21, 1890.

**Basidiocarps** annual, resupinate, margin yellow, radially fimbriate; pore surface yellow when fresh, drying yellowish-buff to pale brownish, pores circular to angular, 2-4 per mm, tubes up to 3 mm long, hymenium and subhymenium drying darker and forming a distinct layer visible under a 30 x lens, soft and easily sectioned; context cream drying pale buff with darker resinous zones, soft, up to 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, with occasional branching, 2-4 Fm wide; skeletal hyphae hyaline, thick-walled, with occasional simple septa, 2-3.5 Fm wide, faint amyloid reaction visible in the tramal tissue.

**Cystidia** frequent in the hymenium, projecting, ventricose, thick-walled, usually apically encrusted, hyaline, 20-55 x 12-25 Fm, some branched at the base and appearing rooted.

**Basidia** clavate, 25-30 x 6-8 Fm, with four sterigmata.

**Basidiospores** subellipsoid, 5-8.5 x 3-4 Fm.

**Substrata.** Dead conifers and hardwoods.

**Distribution.** Known from North America, recently cited for Northern China (Dai 1996).

**Remarks.** The conspicuous, thick-walled, encrusted cystidia and the yellow colour of the basidiocarps are diagnostic characters for *A. aurea*. *A. aurulenta* is also resupinate, but has orange basidiocarps and smaller basidiospores (see below).

**Auriporia aurulenta** A. David, Tortic & Jelic  
 Bull. Soc. Mycol. Fr. 90:364, 1974.

**Basidiocarps** annual, resupinate, up to 16 cm long and 5 mm thick, separable, with a distinct scent of almonds when fresh persisting for some months in the herbaria, margin concolorous, sterile, radially fimbriate; pore surface orange when fresh, dry-

Mycologia 1:166, 1909.

**Basidiocarps** annual, usually effused-reflexed and imbricate with several individual pilei arising from the same context, coriaceous when fresh, dense and cartilaginous when dry, pileus up to 1.5 cm wide or rarely wider, 1-2 cm long, but sometimes fused with adjacent pilei, margin sharp when fresh, usually strongly curved when drying; pilear surface first white to pale ochraceous, later pale buff, in old and hibernating specimens often darker from the base with dingy spots, glabrous, usually with radial lines or narrow folds or furrows; hymenophore first poroid, but soon irpicoid as the pores split, teeth flattened to round and pointed, 1-2 per mm, when young pruinose, later smooth, concolorous with the pilear surface; context dense, tough, whitish to pale ochraceous, up to 2 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 2.5-4 Fm wide; skeletal hyphae abundant, hyaline, unbranched, smooth, thick-walled, 3-7 Fm wide, protruding in the dissepiments parallel to the tube walls, not projecting obliquely through the hymenium.

**Cystidia** present, but often difficult to find, smooth, thin-walled, tubular to bladder-like or ventricose with a swollen base and elongated neck, hyaline and negative with sulfobenzaldehyde, embedded in the hymenium or in the dissepiments, with a root up to 60 Fm long, up to 18 Fm wide.

**Basidia** clavate, 12-18 x 4-8 Fm, with four sterigmata.

**Basidiospores** oblong-ellipsoid, (4.5)5-6 x (2.5)3-3.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Known from New Zealand, Australia, South Argentina, in Asia known from India to Thailand, Vietnam, China (Jiangxi and Zhejiang), Far East Russia, and Japan (Kyushu and Honshu).

**Remarks.** The imbricate, ochraceous basidiocarps with irpicoid pores, and the bladder-like cystidia make the species easy to identify. For a discussion about the taxonomic position of the species, see Ryvarden (1992).

### **AURIPORIA** Ryvarden

Norw. J. Bot. 20:3, 1973.

Basidiocarps annual, resupinate to pileate; pore surface orange to yellowish; hyphal system mono-dimitic; generative hyphae with scattered clamps; skeletal hyphae, when present, few, mostly confined to the context; cystidia ventricose, thick-walled and apically encrusted; basidiospores cylindrical to ellipsoid, smooth, thin-walled and negative in Melzer's reagent. On both hardwoods and conifers, causing a brown rot. Temperate genus.

**Type species:** *Poria aurea* Peck.

**Remarks.** The genus is similar to *Oligoporus* being mono-dimitic and causing a brown rot. However, the thick-walled, heavily encrusted cystidia are characteristic.

### **Key to species**

Medd. Soc. Fauna Fl. Fenn. 5:38, 1879.

Basidiocarps annual, resupinate to pileate; pilear surface light coloured, azonate, finely pubescent; pore surface blackish to brown, distinctly delimited towards a white to pale cream context; hyphal system monomitic; hyphae thin-walled in the hymenium, more thick-walled to almost solid in the context and pileus, clamps usually large and conspicuous; cystidia absent; basidiospores oblong-ellipsoid, hyaline, smooth, thin-walled, negative in Melzer's reagent. Cosmopolitan genus with two species, causing a white rot.

**Type species:** *Polyporus adustus* Wild.:Fr.

**Remarks.** *Bjerkandera* is a satellite genus to *Tyromyces* by its monomitic hyphal system with clamped, hyaline generative hyphae. The coloured tubes, distinctly separated from the context, make the two species characteristic and justifies the genus, although Pouzar (1966) has proposed to include the genus as a section under *Tyromyces*.

#### Key to species

1. Basidiocarps mainly effused-reflexed to resupinate, pore surface and tubes smoky gray to blackish, context up to 6 mm thick.....

#### **B. adusta**

1. Basidiocarps pileate, pore surface and tubes buff to ochre, context up to 1.5 cm thick.....

#### **B. fumosa**

***Bjerkandera adusta*** (Wild.:Fr.) P. Karst.

Medd. Soc. Fauna Fl. Fenn. 5:38, 1879. - *Boletus adustus* Wild., Fl. Berl Prodr. p. 392, 1787. - *Polyporus adustus* Wild.:Fr., Syst. Mycol. 1:363, 1821.

**Basidiocarps** annual, resupinate, effused-reflexed to pileate, often with imbricate, narrowly elongated pilei; pilei up to 4 cm wide, usually thin and deflexed when dry, up to 8 mm thick at the base, soft and pliable when fresh, hard and brittle when dry, taste slightly bitter; pilear surface white to cream, becoming greyish to blackish along the margin (as if burned), azonate to weakly concentrically zonate, first finely velutinous, later the hyphae agglutinate and the surface becomes smooth to finely scurpouse; pore surface grey to black, pores round to angular, 4-6 per mm, more rarely irregular and larger, tubes grey to black, up to 2 mm long, separated towards the light context by a very thin black zone; context white and fibrous, distinctly thicker than the tubes, up to 6 mm thick at the base, often with thin, black lines reflecting different periods of active growth.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, on the surface of the pileus and in the context thick-walled to almost solid with small to large conspicuous clamps, moderately branched, 3-8 Fm wide, in the trama delicately thin-walled and frequently branched, 2-4 Fm wide.

ing yellowish-buff, in dry specimens becoming red to violet with KOH, pores circular to angular, 2-3 per mm, shrinking when dry, tubes concolorous with the context, up to 1 cm long; context yellowish-orange, drying pale buff with darker resinous streaks, soft, up to 1 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, occasionally with double clamps, hyaline, thin-walled, with occasional branching, 2-4 Fm wide; gloeoplerous hyphae present, staining brightly in phloxine.

**Cystidia** frequent in the hymenium, of two types p. 1) ventricose, thick-walled, fusoid, hyaline, 20-35 x 8-12 (15) Fm, encrusted at the apex; 2) thin-walled leptocystidia, 35-70 x 4-6 Fm wide in the narrow neck, 8-10 Fm wide in the basal part, single or in groups of 2-4.

**Basidia** clavate, 20-26 x 7-8 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 4.5-6 x 2-3 Fm.

**Substrata.** Dead conifers, also on *Populus*.

**Distribution.** Eurasian species, in East Asia known from Japan (Honshu) and Korea.

**Remarks.** The orange basidiocarps and the conspicuous, thick-walled cystidia are diagnostic characters for *A. aurulenta*.

### ***Auriporia pileata*** Parmasto

Mycotaxon 11:173, 1980. - *Postia amylocystis* Dai & Renvall, Ann. Bot. Fennici 31:72, 1994.

**Basidiocarps** annual, pileate to effused-reflexed, sometimes substipitate, solitary or imbricate to conrescent, soft, light in weight, 0.5-2 x 2-3 cm, 1.5-2.5 mm thick; pilear surface whitish cream or cream at the base, later yellow-orange, glabrous, smooth to slightly radially rugose, indistinctly zonate, becoming vinous in KOH; pore surface cream with a yellowish tint, pores subangular, 3.5-4 per mm, with entire or slightly fimbriate dissepiments; context white, slightly fibrous, 0.5-1 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, thin- to thick-walled and up to 3.5 Fm wide, in the context solid and up to 4.5 Fm wide, frequently with medallion clamps.

**Cystidia** numerous, ventricose, thick-walled, apically encrusted, 25-40 x 7-14 Fm.

**Basidia** clavate, some slightly utriform, 15-20 x 4-5.5 Fm, with two to four sterigmata.

**Basidiospores** allantoid, 4.5-5.5 x 0.8-1.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Temperate Asian species, known from Northern China (Changbai), Japan (Kyushu, Honshu), and Far East Russia (Primorsk).

**Remarks.** This is the only pileate *Auriporia* species. Microscopically, the cystidia are characteristic.

### **BJERKANDERA** P. Karst.

**Type species:** *Boletus leucomelas* Pers.

**Remarks.** The systematic position of this genus has been much disputed. Today there is a general agreement that the genus belongs in the Thelephoraceae, mainly because of the angular and coloured basidiospores and the presence of thelephoric acid in the basidiocarps.

### Key to species

1. Basidiocarps brown to black, up to 5 cm wide, with a thick cuticle up to 1 mm both on the pileus and stipe, basidiospores verrucose..... **B. atrata**
1. Basidiocarps green to black, up to 10 cm wide, soft and brittle and without a thick cuticle, basidiospores with angular ornamentation..... **B. leucomelas**

### **Boletopsis atrata** Ryvardeen

Nord. J. Bot. 2:278, 1982.

**Basidiocarps** annual, laterally stipitate, soft and pliable when fresh, dense and brittle when dry, pileus 2-5 cm wide, spatulate to semicircular with rear lobes bent backwards making the basidiocarps look centrally stipitate with a centrally depressed and circular pileus; pilear surface black, glabrous, azonate and finely radially wrinkled when dry; stipe black, 2-3 cm long, 4-8 mm thick, glabrous and longitudinally wrinkled when dry, in one specimen branched in the upper part with fused pilei; pore surface pale brown when fresh, darker when touched, cinnamon to dark brown when dry, pores angular and thin-walled, 2-3 per mm, very shallow on the upper part of the stipe, up to 3 mm long in central parts of the basidiocarp; context ochraceous, very dense, about 1 mm thick in the pileus, with a very hard, black cuticle up to 1 mm thick both on the pileus and stipe.

**Hyphal system** monomitic; generative hyphae with clamps, 2-5 Fm wide, thin-walled in the trama, more thick-walled in the context.

**Basidia** both terminal and pleural, 12-25 x 6-10 Fm, with four sterigmata.

**Basidiospores** globose, thick-walled, verrucose, 4.5-6 Fm in diameter.

**Substrata.** On the ground.

**Distribution.** Only known from Thailand, initially described from the North (Chi-ang Mai), a second collection has been made in the tropical South East.

**Remarks.** The species is separated from *B. leucomelas* by a different ornamentation on the basidiospores atypical in Thelephoraceae, and a denser basidiocarp with a black, resinous cuticle. It may be that both species are not related phylogenetically. *Boletopsis atrata* is included in this flora because the species was described from subtropical Thailand, thus it may be found further north.

### **Boletopsis leucomelas** (Pers.) Fayod

**Basidia** clavate, 10-14 x 4-5 Fm, with four sterigmata.

**Basidiospores** oblong-ellipsoid, 4-5.5 x 2.5-3 Fm.

**Substrata.** On dead hardwoods, rarely on conifers.

**Distribution.** Cosmopolitan species, quite common, especially in temperate areas. In East Asia known from China, Japan, Taiwan, Far East Russia, Northern Thailand, and Vietnam.

**Remarks.** The white pilei with blackish pore surface are usually easy to recognize. However, frequently the species is resupinate or only with a weakly developed pileus, more or less dirty whitish. In such cases a section is necessary to reveal the darker coloured tubes. In doubtful cases the wide and thick-walled hyphae with large clamps in the context should be diagnostic.

**Bjerkandera fumosa** (Pers.:Fr.) P. Karst.

Medd. Soc. Fauna Fl. Fenn. 5:38, 1879. - *Polyporus fumosus* Pers.: Fr., Syst. Mycol. 1:367, 1821 - *Boletus fumosus* Pers., Synop. Meth. Fung. p.530, 1801.

**Basidiocarps** annual, effused-reflexed to pileate, pilei solitary or imbricate, dimidiate, often laterally fused, up to 5 x 10 x 2 cm; pilear surface buff, tomentose to glabrous, azonate, smooth, margin concolorous; pore surface buff to smoky grey, the pores cupulate near the margin, circular to angular, 2-5 per mm, with thick, entire dissepiments that become papery, tubes pale smoky grey, up to 4 mm long, separated from the context by a thin layer darker than the context; context buff, azonate, soft-fibrous, up to 1.5 cm thick.

**Hyphal system** monomitic; generative hyphae with abundant clamps, hyaline, in the trama thin-walled, often branched, up to 3.5 Fm wide; in the context thin- to moderately thick-walled, often branched, 3-7 Fm wide.

**Basidia** clavate, 12-14 x 4-5 Fm, with four sterigmata.

**Basidiospores** subellipsoid, hyaline, smooth, 5-5.5 x 2-3.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Temperate areas of North America, Europe, and Asia. In East Asia known from China, Japan (including subtropical Okinawa), Taiwan, Far East Russia, and Northern Thailand.

**Remarks.** The pore surface of *B. fumosa* is usually much paler than in *B. adusta*, and this makes that the dark line between the context and tubes is more distinct than in *B. adusta*. In addition, basidiocarps of the latter species are usually quite thin.

**BOLETOPSIS** Fayod

Malpighia 3:72, 1889.

Basidiocarps annual, stipitate, fleshy, grey to pale sordid brown, darker when touched; pileus smooth to finely scaly; stipe central to lateral; hyphal system monomitic; generative hyphae with clamps, hyaline, delicately thin-walled, of highly variable diameter; basidiospores ornamented, hyaline to very pale brownish, negative in Melzer's reagent. On the ground, probably mycorrhizal.

**Remarks.** The genus is highly characteristic because of the strongly amyloid and ornamented basidiospores. Due to these characteristics and the presence of lactiferous hyphae, it has been placed in Russulales (Redhead 1993).

Key to species

1. Pileus tan to ochraceous, usually imbricate at the base of hardwoods..... **B. berkeleyi**

1. Pileus purplish-brown, usually solitary or few pilei on a branched stipe at the base of conifers..... **B. mesenterica**

**Bondarzewia berkeleyi** (Fr.) Bondartsev & Singer

Ann. Mycol. 39: 47, 1941. - *Polyporus berkeleyi* Fr., Nov. Symb. Mycol. p. 56, 1851.

**Basidiocarps** annual, stipitate, developing from an underground sclerotium; pilei solitary to imbricate, usually flabelliform, up to 25 x 15 x 3 cm; pilear surface tan to yellowish, azonate, finely tomentose or appressed-strigose to glabrous, margin concolorous; pore surface tan, pores circular to angular, 1-2 per mm, with thick dissepiments that become thin and lacerate, tubes concolorous and continuous with the context, decurrent on the stipe, up to 2 cm long; stipe usually branched, lateral, up to 8 cm thick; context pale buff, azonate, corky, up to 3 cm thick.

**Hyphal system** dimitic; generative hyphae simple-septate, hyaline, thin-walled, with rare branching, in the trama up to 2 Fm wide, in the context up to 7 Fm wide; skeletal hyphae hyaline, thick-walled, with rare branching, 2-14 Fm wide.

**Basidia** clavate, 35-55 x 8.5-12 Fm wide, with four sterigmata.

**Basidiospores** globose to subglobose, ornamented with short, irregularly arranged, strongly amyloid ridges, 7-9 x 6-8 Fm, spore print ochraceous.

**Substrata.** Fruiting at the base of hardwood trees and stumps. Particularly common on *Quercus* and *Castanea*.

**Distribution.** Temperate species in hardwood forest regions of Eastern North America and East Asia (Hokkaido, Japan, and China).

**Remarks.** *Bondarzewia berkeleyi* and *B. mesenterica* have been confused in the past. The first species occurs on hardwoods and *B. mesenterica* on conifers. *Bondarzewia berkeleyi* forms imbricate basidiocarps with tan to ochraceous pilei. *Bondarzewia mesenterica* has a purplish-brown pileus surface and typically fruits solitary or with few pilei from one stipe. In culture, Stalpers (1978) reports that generative hyphae of *B. mesenterica* have occasional clamps in culture while those of *B. berkeleyi* do not.

**Bondarzewia mesenterica** (Schaeff.) Kreisel

Feddes Rep. 95:699, 1984. - *Boletus mesentericus* Schaeff., Fung. Bavar. 4:91, 1774.

Malphigia 3:72, 1889. - *Boletus leucomelas* Pers., Syn. Meth. Fung. 1:515, 1801.

**Basidiocarps** annual, stipitate, fleshy, up to 10 cm wide and 4 cm thick in center, about as tall as wide; pileus often irregular in outline with undulating margin, fleshy when fresh, soft to brittle when dry; pilear surface deep greyish to blackish, in young specimens paler along the margin, when old with fine scales or tufts, when dry dark brownish grey to greenish black and wrinkled, azonate, smooth, glabrous and matted, margin thin and wavy; stipe central to lateral, grey to pale sordid olivaceous brown, up to 7 cm long and 3 cm wide, smooth to finely squamose with darkened scales, fleshy when fresh, wrinkled when dry, solid; pore surface at first white, soon becoming pale lilac grey to olivaceous grey, drying grey to brown, pores thin-walled, angular, 1-3 per mm, tubes white to greenish white, usually distinctly paler than the context, up to 8 mm long; context white when fresh, darkening to lilac grey when broken in fresh condition, becoming greenish grey when dry, often somewhat darker just above the tubes and with a slight greenish tint close to the pilear surface, up to 3 cm thick, entire basidiocarp sepia black in contact with KOH; taste initially mild, but developing to a slight soapy and bitter after-taste, slightly bitter when dry.

**Hyphal system** monomitic; generative hyphae with clamps, delicately thin-walled or in the trama slightly thick-walled, hyaline and of variable diameter, 3-20 Fm, with irregular branching, clamps sometimes small and inconspicuous, in other cases large and prominent.

**Basidia** clavate, 20-35 x 5.5-8.5 Fm, with four sterigmata.

**Basidiospores** angular and irregularly tuberculate in outline, hyaline to pale brownish in mass, thin-walled, 5-6.5 x 4-5 Fm.

**Substrata.** Terrestrial, in grassy and rich coniferous forests, usually on calcareous soil, seemingly mycorrhizal.

**Distribution.** Circumboreal in the coniferous forest zone, but everywhere rare. In East Asia known from China (Fujian), and Japan (Honshu).

**Remarks.** The species can be recognized by its blackish pileus and white pore surface when fresh, and its occurrence in rich coniferous forests.

### **BONDARZEWIA** Singer

Rev. Mycol. 5:4, 1940.

Basidiocarps annual, centrally to laterally stipitate or sessile, pilei single or imbricate; pilear surface ochraceous to purplish-brown, finely tomentose or strigose to glabrous; pore surface white to cream-coloured, pores 1-2 per mm; context white to buff, fleshy-tough, drying hard; hyphal system dimitic; generative hyphae simple-septate; skeletal hyphae hyaline, with rare branching; lactiferous hyphae present in the trama; cystidia absent; basidia clavate, large, 40-55 x 8-12 Fm, with four sterigmata; basidiospores globose to subglobose, hyaline, ornamented with short, irregularly arranged, amyloid ridges. Causes a white stringy rot of heartwood in roots and butt of living conifers and hardwoods.

**Type species:** *Cerioporus montanus* Quél. = *Boletus mesentericus* Schaeff.

gin usually rhizomorphic to fimbriate, white to pale yellowish; pore surface variable in colour, mostly cream to yellowish or straw-coloured, but often orange to greenish or with purplish patches, when old more brownish, pores angular, sometimes irregular and semidaedloid, 2-3 per mm, tubes concolorous with the pore surface, up to 3 mm long; context thin and cottony, paler than the pore surface.

**Hyphal system** monomitic; generative hyphae with clamps and simple septa, hyaline, thick-walled with a linear lumen, 2-4.5 Fm wide, tramal hyphae without clamps, 2-4.5 Fm wide; hyphae of the rhizomorphs up to 11 Fm wide, often twisted, lobate and contorted with irregular wall thickening; both types of hyphae variably encrusted with round to angular granules.

**Basidia** clavate, 15-25 x 5-6 Fm, with four sterigmata, with a simple septum at the base.

**Basidiospores** ellipsoid to globose, 4.5-5.5 x 3-4 Fm.

**Substrata.** The basidiocarps develop on rotten debris on the ground or on dead wood of conifers such as *Abies*, *Juniperus*, *Picea* and *Pinus*, but also noted on hardwoods including *Castanea*, *Populus*, and *Quercus*.

**Distribution.** Rare species, circumpolar. In East Asia known from China (Hebei) and Japan (Honshu).

**Remarks.** The species is normally easy to recognize because of the soft and yellowish basidiocarps and the subglobose, slightly thick-walled basidiospores. Larsen & Zak (op. cit.) have split the species into five varieties based on the pore surface colour. *Sistotrema albolutea* has urniform basidia with a clamp at the base, and thin-walled basidiospores, although macroscopically it is very similar to *Byssoporia terrestris*.

### CASTANOPORUS Ryvarden

Synopsis Fung. 5:121, 1991.

Basidiocarps annual, resupinate, effused, margin wide, cinnamon; pores angular to irpicoid, cinnamon to purplish, 1-2 per mm; hyphal system monomitic; generative hyphae simple-septate; cystidia conical, thick-walled, mostly encrusted; basidiospores cylindrical, 6-7 x 2-3 Fm. Monotypic, temperate Asian genus, on conifers.

**Type species:** *Merulius castaneus* Lloyd

**Remarks.** The type species characteristically grows on conifers and has a resupinate, cinnamon basidiocarps with large, irpicoid pores.

### *Castanoporus castaneus* (Lloyd) Ryvarden

Synopsis Fung. 5:121, 1991. - *Merulius castaneus* Lloyd, Mycol. Writ.4, note 40:555, 1916. - *Cystidiophorus merulioides* Bondartsev & Ljub., Bot. Mater. Otd. Spor. Rast. 16:125, 1963.

**Basidiocarps** annual, resupinate, with a wide, cinnamon margin up to 3 mm broad; pore surface cinnamon to salmon pink, darkening to purple when dry, pores irregu-

**Basidiocarps** annual, centrally to laterally stipitate, with an underground sclerotium; pilei solitary or several on a branched stipe, flabelliform, up to 11 cm wide and 1 cm thick; pilear surface purplish brown, azonate, scurfy to finely tomentose, drying rugose, margin concolorous; pore surface cream-coloured, pores angular, 1-3 per mm, with thin dissepiments that become lacerate, tubes continuous and concolorous with the context, up to 2 mm long, often decurrent on the stipe almost to ground level; context cream-coloured, azonate, firm, fissile when dry, up to 1 cm thick; odour very pleasant, nut-like.

**Hyphal system** dimitic; generative hyphae simple-septate, thin-walled, with rare branching, in the trama 2.5-4 Fm wide, in the context 4-8 Fm wide; skeletal hyphae hyaline, thick-walled, with infrequent branching, 3-8 Fm wide.

**Basidia** broadly clavate, 30-55 x 10-12 Fm, with four sterigmata.

**Basidiospores** globose to subglobose, hyaline, ornamented with irregularly arranged, short, strongly amyloid ridges, 6-8 x 5-7 Fm.

**Substrata.** Fruiting on stumps or near the base of living conifers, producing stringy rot of the heartwood of roots and stumps.

**Distribution.** Widespread in Europe, North America, and temperate Asia (China, Japan, Far East Russia, and Taiwan), but not common.

**Remarks.** The fleshy basidiocarps growing on stumps or from roots of living or dead conifers is a good field character. Microscopically, the amyloid, crested basidiospores will immediately rule out any other polypore.

#### **BYSSOPORIA** Lars. & Zak

Can. J. Bot. 56:1123, 1978.

Basidiocarps resupinate, poroid, soft, with rhizomorphs, whitish to yellow, more rarely orange to bluish green; hyphal system monomitic, hyphae with clamps and simple septa; cystidia absent; basidiospores ellipsoid to subglobose with slightly thickened walls, acyanophilous and negative in Melzer's reagent. Mycorrhizal with conifers and growing on the ground, on organic debris, or on very rotten wood. Monotypic and cosmopolitan genus.

**Type species:** *Polyporus terrestris* DC.:Fr.

**Remarks.** Previously this species was often included in *Byssocorticium* with resupinate corticoid species. However, *B. terrestris* is separated from these species by several characters. Firstly, its basidiospores are acyanophilous while the other species have cyanophilous basidiospores. Furthermore, *B. terrestris* is mycorrhizal while the other species are wood-inhabiting. This species does not have basidial clamps as do the other species. For the time being we prefer to keep it separate in a genus of its own.

#### **Byssoporia terrestris** (DC.:Fr.) Lars. & Zak

Can. J. Bot. 56:1122, 1978. - *Polyporus terrestris* DC.:Fr., Syst. Mycol. 1:383, 1821.

**Basidiocarps** annual, resupinate, soft and separable, effused, up to 3 mm thick, mar-

3. Basidiocarps pinkish to reddish, basidiospores 5-7.5 Fm long ..... **C.**  
**purpurea**
3. Basidiocarps mostly white, cinnamon or greenish,  
 basidiospores 3.5-5 Fm long ..... **C.**  
**viridans**
4. Basidiospores longer than 6 Fm.....  
 .... 5
4. Basidiospores up to 5 Fm long.....  
 ... 6
5. Hymenophore as shallow, white tubes, pores 3-4 per mm..... **C.**  
**reticulata**
5. Hymenophore with longer tubes, pores ochraceous, 1-3 per mm..... **C.**  
**mellea**
6. Basidiocarps cream to tan..... **C.**  
**alachuana**
6. Basidiocarps pinkish..... 7
7. Pores 2-3 per mm, hyphae with whorled branching, sometimes with clamps  
 in the subiculum..... **C.**  
**excelsa**
7. Pores 3-5 per mm, hyphae branching at right angles, without clamps in the  
 subiculum..... **C. tarda**

**Ceriporia alachuana** (Murrill) Hallenb.

Iran. J. Pl. Path. 15:14, 1979. - *Poria alachuana* Murrill, Bull. Torrey Bot. Club 65:659, 1938.

**Basidiocarps** annual, resupinate, at first cupulate, sterile margin often conspicuous, soft-floccose, paler than the pore surface; pore surface cream-coloured to tan, pores angular, 3-5 per mm, with thin, minutely fimbriate dissepiments, tubes up to 2.5 mm long, concolorous and continuous with the context, drying brittle but easily sectioned; context thin, up to 400 Fm thick, soft, cream-coloured.

**Hyphal system** monomitic; generative hyphae simple-septate, thin- to thick-walled, with moderate branching, often at right angles, 2.5-6 (7) Fm wide.

**Basidia** clavate, 12-19 x 4.5-5.5 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly oblong-ellipsoid, 4-5 x 2-2.5 Fm.

**Substrata.** Known from several hardwoods.

**Distribution.** Widespread in Iran, Nepal, Japan, and Northern Thailand.

lar, irpicoid, often incomplete, 1-2 per mm or wider, tubes up to 2 mm long, dissepiments pruinose, cinnamon; context up to 1 mm thick, cinnamon.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, in the subhymenium thin-walled and up to 3 Fm wide, in the trama and context thick-walled, hyaline to yellowish, up to 5 Fm wide, often encrusted, scarcely branching, lumen with a yellowish content.

**Cystidia** conical, pedunculate, thick-walled, usually but not always encrusted at the apex, 50-55 x 14-16 Fm, arising in the trama and projecting into the hymenium more than 20 Fm.

**Basidia** clavate, 28-30 x 5-7 Fm, with four sterigmata.

**Basidiospores** broadly allantoid, slightly thick-walled, smooth, hyaline, 5-7 x 2-3 Fm.

**Substrata.** On conifers, almost exclusively on *Pinus*.

**Distribution.** Temperate Asian species, known from China, Japan, Far East Russia, and Northern Thailand.

**Remarks.** The species is easy to recognize by its host and its cinnamon, irpicoid, resupinate basidiocarps.

### CERIPORIA Donk

Med. Bot. Mus. Univ. Utrecht 9:170, 1933.

Basidiocarps annual, resupinate; pore surface white, tan or cinnamon, dirty greenish to purple, pores medium, 2-6 per mm; hyphal system monomitic; generative hyphae simple-septate; cystidia absent; basidiospores cylindrical to allantoid, oblong ellipsoid or subglobose, hyaline, thin-walled, smooth, negative in Melzer's reagent. Mostly on hardwoods, rarely on conifers, causing a white rot.

**Type species:** *Polyporus viridans* Berk. & Broome

**Remarks.** The genus is characterized by a monomitic hyphal system with simple-septate generative hyphae, hyaline basidiospores, lack of cystidia, and a white rot in the attacked wood. It may be looked upon as a counterpart to *Ceriporiopsis* which is separated in principle only by clamped generative hyphae.

### Key to species

1. Basidiospores 1-2 Fm wide..... 2
1. Basidiospores 2-3.5 Fm wide..... 4
2. Basidiocarps deep reddish-orange, pores 7-9 per mm..... **C. spissa**
2. Basidiocarps greenish white to pale cinnamon, pores usually 3-5 per mm..... 3

**Distribution.** Widespread in the paleotropics, also known from subtropical China (Guangdong) and Japan (Okinawa).

**Remarks.** The species is related to *C. reticulata*, but is more distinctly poroid, has larger pores, a more yellowish basidiocarp, and shorter basidiospores.

***Ceriporia purpurea* (Fr.) Donk**

Konn. Nederl. Akad. Wetensch. Amst. Proc. Ser. C. 74 no.1:28, 1971. - *Polyporus purpureus* Fr., Syst. Mycol. 1: 379, 1821.

**Basidiocarps** annual, usually of small dimension, up to 7 cm long, 5 cm wide and 2 mm thick, separable, soft when fresh, brittle when dry, margin thin, pink to purplish; pore surface pink to deep purple, pores angular to round, in old specimens partly fimbriate and lacerate, 3-5 per mm; context thin, pale purplish or concolorous with the pore surface.

**Hyphal system** monomitic; generative hyphae simple-septate, branched often at right angles, in the trama quite narrow, 2-4 Fm wide, in the context up to 6 Fm wide.

**Basidia** clavate, 14-20 x 4-6 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 5-7.5 x 1.5-2 Fm.

**Substrata.** On hardwoods.

**Distribution.** Widely distributed species and probably cosmopolitan, but apparently rare. In East Asia known from China, Japan, and Far East Russia (Primorsk).

**Remarks.** The species is easily recognized by its deep purplish colour, the simple-septate hyphae and the large, allantoid basidiospores. Species in *Gloeoporus* with purplish basidiocarps are separated by a continuous hymenium over the dissepiments.

***Ceriporia reticulata* (Hoffm.:Fr.) Domanski**

Acta. Soc. Bot. Pol. 32:732, 1963. - *Polyporus reticulatus* Hoffm.:Fr., Syst. Mycol. 1:385, 1821. - *Mucilago reticulatus* Hoffm., Deutschl. Fl. Bot. Taschenb. 2:, 1795.

**Basidiocarps** annual, resupinate, usually effused in small patches, fragile, separable, margin white, thin, arachnoid to cottony, fimbriate, with the tubes originating as isolated shallow depressions in the marginal tissue; pore surface greyish to white or grading from cream to pinkish or pale orange, pores 3-4 per mm, circular to irregular, tubes white, soft and fragile, up to 1 mm long; context thin, often merely a loose net of hyphae, byssoid, white to pinkish.

**Hyphal system** monomitic; generative hyphae simple-septate, thin-walled, often branched at right angles, loosely interwoven, 3-7 Fm wide.

**Basidia** clavate, 15-20 x 5-7 Fm, with four sterigmata.

**Basidiospores** allantoid, 7-9.5 x 2-3.5 Fm.

**Substrata.** On dead hardwoods, occasionally on dead polypores such as *Bjerkandera* and *Inonotus* species, rarely on conifers like *Picea*.

**Distribution.** Cosmopolitan species, in East Asia known from China, Taiwan, Japan, and Korea.

**Remarks.** Macroscopically *C. alachuana* looks like a small, tan specimen of *C. reticulata*, which however is white, and has much larger basidiospores. Tan to pale cinnamon specimens of *C. viridans* can be recognized by longer and more slender basidiospores (4-6 x 1.5-2 Fm).

**Ceriporia excelsa** (Lund.) Parmasto

Spor. Rast. 12:222, 1959. - *Poria excelsa* Lund., Fungi Exs. Suec. No. 1329, 1940.

**Basidiocarps** annual, resupinate, becoming widely effused, soft, separable, margin narrowly sterile, usually pale purplish, arachnoid or floccose; pore surface pink to reddish orange, tubes forming as isolated depressions, later fusing, pores circular to angular, 2-3 per mm, with thick dissepiments that become thin and lacerate with age, tubes concolorous with the context, up to 0.5 mm long; context white or pinkish to tan, soft, azonate, up to 1 mm thick.

**Hyphal system** monomitic; generative hyphae mostly simple-septate, hyaline, thin- to slightly thick-walled, slightly ampullate at the septa and frequently with whorled branching, in the trama 3-4.5 Fm wide, in the context 5-15 Fm wide, rarely with single, double, or multiple clamps.

**Basidia** clavate, 14-16 x 4-6 Fm, with four sterigmata.

**Basidiospores** oblong to short-cylindrical, hyaline, smooth, negative in Melzer's reagent, 3.5-5 x 2-2.5 Fm.

**Substrata.** On dead hardwoods, rarely on conifers.

**Distribution.** Temperate species in all continents, in East Asia known from Northern China (Changbai), Japan (Honshu) and Far East Russia (Primorsk, Chabarovsk).

**Remarks.** Basidiocarps of *C. excelsa* is usually pale pink to pale purplish. *Ceriporia alachuana* has smaller pores and a cream to tan pore surface.

**Ceriporia mellea** (Berk. & Broome) Ryvar den

Bull. Jard. Bot. Nat. Belg. 48:98, 1978. - *Polyporus melleus* Berk. & Broome, Trans. Linn. Soc. 14:53, 1875.

**Basidiocarps** annual, resupinate, usually orbicular to more effused, rarely above 10 cm long and wide and 1.5 mm thick, consistency soft when fresh, more coriaceous to brittle when dry, margin sterile, often somewhat byssoid; pore surface cream-yellow to ochraceous or even greenish, dull, pores irregular, round to angular, 1-3 per mm, dissepiments thin, tubes up to 1 mm long but usually shorter, concolorous with the pore surface; context concolorous with the pores or somewhat lighter, in effused specimens 0.5-1 mm thick, but usually thinner, continuing without change into the dissepiments.

**Hyphal system** monomitic; generative hyphae simple-septate, thin- to slightly thick-walled, hyaline to yellow, 3-7 Fm wide.

**Basidia** clavate, 19-23 x 4.5-5.5 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly allantoid, 6-8 x 3-3.7 Fm.

**Substrata.** On dead hardwoods.

bai) by Dai (1996a).

**Remarks.** *Ceriporia tarda* can usually be recognized in the field by the rose-pink colouration of the pore surface. *Ceriporia excelsa* can sometimes have a pinkish tint, but has larger pores (2-3 per mm).

**Ceriporia viridans** (Berk. & Broome) Donk

Med. Bot. Mus. Univ. Utrecht 9:171, 1933. - *Polyporus viridans* Berk. & Broome, Ann. Mag. Nat. Hist. Ser. 3, 7:379, 1861.

**Basidiocarps** annual, resupinate, effused to small, up to 20 cm long and 2 mm thick, soft when fresh, brittle when dry, margin thin and white; pore surface first whitish, then cream, drying cinnamon or sordid greenish brown, more rarely pinkish, pores round to angular, regular in size, 3-5 per mm; context white to tan, up to 0.5 mm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, thin-walled and freely branched mostly at right angles, in the trama 2.5-4 Fm wide, in the context up to 7 Fm wide and slightly thick-walled.

**Basidia** clavate, 12-15 x 4-6 Fm, with four sterigmata.

**Basidiospores** allantoid, cylindrical to oblong ellipsoid, 3-5 x 1.5-2 Fm.

**Substrata.** On hardwoods.

**Distribution.** Cosmopolitan species, in East Asia known from China, Japan, and Far East Russia.

**Remarks.** The species is recognized by the short cylindrical to allantoid basidiospores and the simple-septate hyphae. The colour of the pore surface is extremely variable and may be whitish, tan, cinnamon, orange and then pinkish to almost purplish. Lowe (1966) has a long list of synonyms and has also sorted them according to colour of the pore surface if this characteristic is accepted as specific.

**CERIPORIOPSIS** Domanski

Acta Soc. Bot. Pol. 32:731, 1963.

Basidiocarps annual, resupinate, mostly light-coloured; pores small to medium-sized; context white to light-coloured, thin; hyphal system monomitic; generative hyphae with clamps; cystidia absent; basidiospores smooth, thin-walled, hyaline, negative in Melzer's reagent. On dead wood, causing a white rot. Cosmopolitan genus.

**Type species:** *Poria gilvescens* Bres.

**Remarks.** The genus comes close to *Oligoporus*, sharing most of its characters with the important difference that *Oligoporus* species cause a brown rot. The genus as defined here may include elements of different phylogenetic origin, but as nothing is known about primitive and advanced characters in this group, we prefer to keep them together based on a common hyphal system and type of rot.

**Key to species**

**Remarks.** The pores of *C. reticulata* have a distinctive net-like or reticulate appearance in the field. The relatively large, allantoid basidiospores are also diagnostic for this species.

**Ceriporia spissa** (Schwein.:Fr.) Rajchenb.

Mycotaxon 17:276, 1983. - *Polyporus spissus* Schwein.:Fr., Elench. Fung. p.111, 1828.

**Basidiocarps** annual, becoming widely effused, margin usually sterile, pinkish buff, minutely tomentose, fertile areas often patchy over a large area of sterile mycelium; pore surface orange when fresh, darkening to reddish brown on drying, pores 7-9 per mm, on sloping substrates larger and splitting and then to 4-5 per mm, tubes cheesy in consistency, orange when fresh, dark reddish brown on drying, up to 1 mm long, sections giving off a white oily exudate in KOH; context pinkish buff, soft, less than 1 mm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, thin-walled, with frequent branching, 2-3.5 Fm wide, some partially encrusted with an amorphous, yellowish material, in the trama parallel, very compactly arranged and difficult to separate, moderately thick-walled.

**Basidia** clavate, 12-24 x 5-6 Fm, with four sterigmata.

**Basidiospores** allantoid, 4-6 x 1.5-2 Fm.

**Substrata.** Dead hardwoods in Europe, in North America and East Asia on many genera of hardwoods and conifers.

**Distribution.** Widely distributed in North America and recorded from Northern China (Changbai) and Japan (Honshu). In Europe known only from the Canary Islands (Spain).

**Remarks.** *Ceriporia spissa* is one of the most beautiful polypores and its bright orange basidiocarps are very distinctive in the field.

**Ceriporia tarda** (Berk.) Ginns

Mycotaxon 21:326, 1984. - *Polyporus tardus* Berk., Lond. Bot.4:56, 1845 - *Poria tarda* (Berk.) Cooke, Grevillea 1:109, 1886.

**Basidiocarps** annual, becoming widely effused, usually adnate, sterile margin usually rather wide, thinning out; pore surface pinkish to cream, usually drying cream to pinkish-buff, tubes originating as isolated cupolas and then uniting, the pores 3-5 per mm; context white to cream, soft, thin.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, thin-walled, occasionally ampullate at the septa, frequently branched at right angles, some with granular encrustation, 3-6 Fm wide.

**Basidia** clavate, 10-20 x 4-5 Fm, with four sterigmata.

**Basidiospores** oblong to subellipsoid, 4-5 x 2-2.5 Fm.

**Substrata.** Dead hardwoods, occasionally on conifers.

**Distribution.** Widely distributed in North America, recently cited for China (Chang-

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8. Basidiospores subcylindrical, 2-3  $\mu\text{m}$  wide, pore surface totally or partly resinous brown, pores 2-3 (4) per mm, microscopical preparations with numerous globules, basal hyphae thick-walled ..... **C. resinascens**

8. Basidiospores ellipsoid, 3.5-5  $\mu\text{m}$  wide, pore surface cream to straw-coloured, pores 1-3 per mm, no globules present in microscopical preparations, all hyphae equally thin-walled..... **C. aneirina**

**Ceriporiopsis albonigrescens** Nunez, Parmasto & Ryvardeen

Fungal Div. 5:108, 2001.

**Basidiocarps** resupinate, annual, soft and fragile when dry, up to 2.5 cm wide and 7 cm long, 2-3 mm thick, pore surface whitish, black where touched, pores angular to irregular, 1-4 mm, tubes whitish 1-2 mm deep, context concolorous, dense and thin, up to 500  $\mu\text{m}$  thick.

**Hyphal system** monomitic, generative hyphae with clamps, hyaline, thin-walled, 2-5  $\mu\text{m}$  wide.

**Basidia** clavate, 4-sterigmate, 12-15 x 4-5  $\mu\text{m}$ .

**Basidiospores** ellipsoid, 2.5-3 x 1.5-1.7  $\mu\text{m}$ .

**Substrata.** Known only from dead and rotten *Abies nephrolepis*.

**Distribution.** Known only from the type locality in Russia, Primorsk, District Ternei, Sichote-Alin Biosph. Reservatum, Maisa.

**Remarks.** The species is distinct with its black reaction when touched and the small basidiospores.

**Ceriporiopsis aneirina** (Sommerf.:Fr) Domanski

Acta Soc. Bot. Pol. 32:732, 1963. - *Polyporus aneirinus* Sommerf.:Fr., Elench.

Fung. 1:123, 1828. - *P. aneirinus* Sommerf., Suppl. Flora Lapp. p.27, 1826.

**Basidiocarps** annual, resupinate, becoming widely effused, tough, not easily separable, margin whitish to pale tan, sterile, entire to slightly fimbriate, up to 2 mm wide; pore surface cream-coloured to tan, pores angular, 1-3 per mm, with thin, entire dissepiments, tubes continuous and concolorous with the context, up to 1 mm long; context whitish, azonate, tough, up to 1 mm thick; taste mild.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline in KOH, thin-walled, often branched, 2-5.5  $\mu\text{m}$  wide, in the context often heavily encrusted.

**Basidia** clavate to globose-pedunculate 20-43 x 5-8  $\mu\text{m}$  (mostly 20-28  $\mu\text{m}$  long), with four sterigmata.

**Basidiospores** broadly ellipsoid, 5-8 x 3.5-5  $\mu\text{m}$ .

**Substrata.** Primarily on dead, fallen *Populus*, rarely on other hardwoods. The

1. Basidiospores cylindrical to allantoid, less than 1.5 mm wide..... **C. subvermispora**
1. Basidiospores subcylindrical to subglobose, wider than 1.5 mm.....  
... 2
2. Basidiospores shorter than 5 mm in longest dimension..... 3
2. Basidiospores longer than 5 mm in longest dimension..... 6
3. Pore surface becoming partly blackish when bruised or dried, basidiospores up to 3 mm long..... **C. albonigrescens**
3. Pore surface more or less unchanged when bruised or dry, basidiospores longer than 3 mm.....  
. 4
4. Basidiospores subcylindrical, 1.5-2 mm wide, basal hyphae and dissepiments with small rod like crystals, pore surface straw-coloured to pale orange brown when dry..... **C. gilvescens**
4. Basidiospores ellipsoid 2.5-3.5 mm wide, basal hyphae smooth, pore surface whitish to pale cream when dry.....  
5
5. Basidiospores 4-5 x 2.8-3.5 mm..... **C. balaenae**
5. Basidiospores 3-4 x 2.5-3 mm..... **C. consobrina**
6. Basidiocarps with cream rhizomorphs, pores angular 1-2 per mm..... **C. cremea**
6. Basidiocarps without cream rhizomorphs, spores round to angular, 1-4 per mm.....  
7
7. Pores 3-4 per mm, pore surface reddish when dry; scattered intercalary skeletal hyphae in the subiculum..... **C. subrufa**
7. Pores 1-3(4) per mm, pore surface straw-coloured or resinous brown when dry, no intercalary skeletal hyphae present .....

basidiospore size as 5-6 x 3-3.5 Fm.

**Substrata.** On dead wood of Salicaceae.

**Distribution.** Temperate Asian species described from Far East Russia, also known from Northern China (Changbai).

**Remarks.** The species is related to *C. aneirina*, but separated by its cream basidiocarps with rhizomorphs and its smaller basidiospores.

**Ceriporiopsis gilvescens** (Bres.) Domanski

Acta Soc. Bot. Pol. 32:731, 1963. - *Poria gilvescens* Bres., Ann. Mycol. 6:40, 1908.

**Basidiocarps** annual, resupinate, adnate, becoming widely effused, waxy and soft when fresh, hard and brittle when dry, up to 4 mm thick, margin white to pale pinkish yellow, fimbriate, contrasting with the pore surface; pore surface at first whitish with shades of pink, darker when bruised, straw-coloured to orange brown when dry, pores angular to circular, 4-5 per mm, tubes concolorous with the context, often dense and resinous in old specimens; context thin and dense, pale straw-coloured.

**Hyphal system** monomitic; generative hyphae with clamps, thin- to slightly thick-walled, 2-4 Fm wide, in the dissepiments often characteristically covered with small rod-like crystals.

**Basidia** clavate, 14-18 x 4-6 Fm, with four sterigmata.

**Basidiospores** subcylindrical, 3.5-4.5(5) x 1.5-2 Fm.

**Substrata.** On numerous hardwood genera.

**Distribution.** Cosmopolitan species, in East Asia known from Japan, China (Changbai), Korea, and Far East Russia.

**Remarks.** The pale orange-brown pore surface with a white margin is a good field characteristic. Microscopically the subcylindrical basidiospores and the encrusted dissepiments are typical.

**Ceriporiopsis mucida** (Pers.:Fr.) Gilb. & Ryvardeen

Mycotaxon 22:364, 1985. - *Polyporus mucidus* Pers.:Fr., Syst. Mycol. 1:382, 1821. - *Poria mucida* Pers., Obs. Mycol. 1:87, 1796.

**Basidiocarps** annual, resupinate, effused, separable, soft when fresh, friable when dry, up to 3 mm thick, margin wide to narrow, with or without rhizomorphs, white to pale cream; pore surface cream to pale chrome yellow or straw-coloured, pores angular, in parts slightly sinuous and irregular, 3-5 per mm when regular, dissepiments thin, tubes concolorous with the context, up to 1.5 mm long; context white and thin, about 1 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, smooth or with small crystals, especially in the margin and the context, 2.5-4 Fm wide.

**Basidia** clavate, 13-16 x 4-6 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to subglobose, 2.5-3.5(4) x 2-2.5 Fm.

**Substrata.** On dead hardwoods and conifers.

**Distribution.** Circumpolar in the Northern hemisphere, also known from tropical

decayed wood becomes quite soft, develops a laminated structure, and separates readily along the annual rings.

**Distribution.** Circumpolar, in East Asia known from Northern China (Changbai), Japan (Kyushu), and Far East Russia.

**Remarks.** Morphological features of diagnostic importance are the large angular pores and broad basidiospores. *Oxyporus corticola* is similar macroscopically, but differs microscopically in having cystidia and simple-septate hyphae.

**Ceriporiopsis balaenae** Niemelä

Nat. Can. 112:449, 1985.

**Basidiocarps** annual, resupinate, rarely more than 5 cm in longest dimension, 1-3 mm thick, soft when fresh, brittle and fragile when dry, margin narrow to lacking, white; pore surface cream-coloured, drying yellow to honey or pale straw-coloured, pores thin-walled, angular, 2-3 per mm, becoming split and irregular, up to 1 mm wide, on sloping substrates sinuous, tubes up to 3 mm long, concolorous with the pore surface; context white and very thin.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, smooth, 2-4 Fm wide, weakly amyloid (heating recommended).

**Basidia** clavate, 14-18 x 4-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 4-5 x 2.5-3.5 Fm.

**Substrata.** usually on *Salix* spp. and *Populus tremula*.

**Distribution.** Known from North America and Europe from very few collections. The only record for East Asia (Changbai) consists of a young specimen (Dai 1996).

**Remarks.** Macroscopically this species reminds of *C. aneirina* which however has larger basidiospores (5-8 x 3.5-5 Fm). The latter species also has encrusted basal hyphae, while they are smooth in *C. balaenae*. *Ceriporiopsis subrufa* has similar basidiospores, but smaller pores, besides its basidiocarps become reddish to pale brown when dry.

**Ceriporiopsis cremea** (Parmasto) Ryvarden

Acta Mycol. Sin. 5:227, 1986. - *Fibuloporia cremea* Parmasto, Nat. Stud. Far East (Issueld Prio. Dalnego Rostoka) p. 255, 1963.

**Basidiocarps** annual, resupinate, effused up to 8 cm, soft, fragile when dry, up to 3 mm thick, margin up to 3 mm wide, radiate-fibrillose, white, with cream rhizomorphs up to 1 mm thick; pore surface cream, drying yellowish, pores at the margin first cupulate, then angular, about 1-2 per mm, irregular, with lacerate dissepiments, tubes up to 3 mm long; context white, very thin, up to 0.2 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to slightly thick-walled, in the context up to 5 Fm wide, interwoven, in the trama parallel, intermingled with a yellow matter.

**Basidia** clavate, 12-17 x 5-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subcylindrical, 4.5-5.5 x 2.5-3.5 Fm. Dai (1996) gives

**Hyphal system** monomitic; generative hyphae with clamps, thin- to thick-walled, 3-6 Fm wide.

**Basidia** clavate, 12-20 x 5-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 5-7 x 3-4 Fm.

**Substrata.** On hardwoods, also reported on *Pinus*.

**Distribution.** Rare species in Eastern North America and Europe, recently found in Changbai, Northern China (Dai, 1996a) and Russia (Nunez, Parmasto & Ryvarden 2001).

**Remarks.** This species resembles *C. aneirina* both macro- and microscopically, but is separated by its reddish to pale brown colour when dry and by smaller pores.

**Ceriporiopsis subvermispora** (Pilát) Gilb. & Ryvarden

Mycotaxon 22:364, 1985. - *Poria subvermispora* Pilát, Stud. Bot. Cech. 3:2, 1940.

**Basidiocarps** annual, resupinate, separable, soft and fleshy when young, brittle when dry, up to 3 mm thick, margin narrow, white, finely fibrillose; pore surface white to pale cream, smoky brown when touched, drying ochre, pores angular, 2-4 per mm, with thin dissepiments, tubes white, fragile, up to 2 mm long, dissepiments farinose; context white, soft to tough in old specimens, often with dense cartilaginous or resinous zones.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled, 2.5-5 Fm; hyphae encrusted in the dissepiments, apical clusters of crystals may occur on other hyphae.

**Basidia** clavate, 12-18 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid, 4.5-5.5(6) x 1-1.5 Fm.

**Substrata.** In Europe most common on *Picea*, in North America and East Asia also reported on other conifers and on *Acer*, *Populus*, and *Quercus*.

**Distribution.** Temperate species in the North Hemisphere. In East Asia known from China, Korea, and Far East Russia.

**Remarks.** The species is similar to *Oligoporus hibernicus* and related species, sharing with them the same type of basidiospores but separated by the encrusted hyphae and the white rot. All *Oligoporus* species, however, cause a brown rot.

**CERRENA** S. F. Gray

Nat. Arr. Brit. Plants 1:649, 1821.

Basidiocarps annual, pileate, effused-reflexed or resupinate; pilear surface hispid to hirsute, zonate; pores large and daedaloid or becoming irpicoid; context duplex with a dark line; hyphal system trimitic; generative hyphae with clamps; skeletal and binding hyphae hyaline to yellowish; cystidia present in one species; basidia clavate, with four sterigmata; basidiospores subellipsoid, negative in Melzer's reagent. Causes a white rot on dead hardwoods. Cosmopolitan genus.

**Type species:** *Daedalea unicolor* Bull.:Fr.

**Remarks.** The genus is usually easy to recognize in the field because of the coarse

areas. In East Asia known from China, Japan, Northern Thailand, and Far East Russia.

**Remarks.** The soft, often rhizomorphic basidiocarp with a yellowish colour makes the species recognizable in the field. Microscopically, the small subglobose basidiospores and the monomitic hyphal system are diagnostic.

**Ceriporiopsis resinascens** (Romell) Domanski

Acta Soc. Bot. Pol. 32:732, 1963. - *Polyporus resinascens* Romell, Arch. Bot. 11:20, 1911.

**Basidiocarps** annual, resupinate to nodulose on sloping substrata, adnate, soft when fresh, resinous and brittle when dry, up to 8 cm wide and long in large specimens, usually smaller, up to 3 mm thick, margin white and floccose, usually contrasting with the pore surface; pore surface at first whitish, ochraceous to unevenly pale dirty brown, soon becoming evenly pale brown, pores angular, 3-4 per mm, larger and more irregular on nodulose specimens, tubes concolorous with the pore surface, resinous, brittle when dry, up to 6 mm long; context whitish and fibrous, up to 3 mm thick and contrasting strikingly with the tubes, sometimes with a dense dark zone next to the substratum.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, hyaline, 2-4 Fm wide, in the trama distinctly thick-walled and agglutinated with irregular resinous substances, these partly crystalline and partly as globules or drops, in the context thick-walled, distinct, moderately branched, with scattered clamps, fragmenting and in broken sections easily taken as skeletal hyphae, 2-6 Fm wide.

**Cystidia** absent; slightly swollen hyphal ends occur in the dissepiments.

**Basidia** clavate, 18-24 x 4-6 Fm, with four sterigmata.

**Basidiospores** cylindrical to oblong-ellipsoid, 4-6(-8) x 2-3 Fm.

**Substrata.** Dead hardwoods.

**Distribution.** Eurasian species, in East Asia known from Far East Russia (Primorsk) and Japan.

**Remarks.** The species is usually easy to recognize late in the season when the pale brown, brittle tubes contrast strongly with the white floccose margin. The pores are smaller and the basidiospores narrower than in *C. aneirina* which seems to be the closest relative.

**Ceriporiopsis subrufa** (Ellis & Dearn.) Ginns

Mycotaxon 21:326, 1984. - *Poria subrufa* Ellis & Dearn., Roy. Canad. Inst. Proc. N. Ser. 1:89, 1897.

**Basidiocarps** annual, resupinate, adnate, up to 1 cm thick, soft when fresh, fragile when dry, margin whitish to pink, finely floccose; pore surface white to pale cream when fresh, darkens to straw-coloured or reddish brown, pores angular, thin-walled, (2)3-4 per mm, tubes ochraceous to pinkish, dense, up to 9 mm long; context thin and fibrous contrasting with the denser tubes, tan to pale cream.

**Basidiocarps** annual, pileate, effused-reflexed or rarely resupinate, often imbricate, dimidiate, up to 10 cm wide and 6 mm thick; pilear surface pale brownish to grey, hirsute to almost glabrous, often green due to algae, sulcate; pore surface ivory to pale buff in young specimens, becoming greyish with age, the pores daedaloid, variable, 3-4 per mm, in parts larger, dissepiments at first thick and fimbriate, becoming thin and lacerate, tubes continuous and concolorous with the lower context, up to 1 cm long; context duplex, up to 3 mm thick, corky, lower layer cream-coloured, separated from the soft, spongy, darker upper layer by a thin dark zone.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline and thin-walled, 2-4 Fm wide; skeletal hyphae hyaline, thick-walled, 2.5-5 Fm wide; binding hyphae hyaline, thick-walled, multibranched, 2-4 Fm wide.

**Cystidia** absent; skeletal hyphal ends expanding to 4-6 Fm at the apices, thick-walled but walls thinning towards the apex; fusoid cystidiols present in the hymenium, thin-walled, 16-20 x 4-6 Fm.

**Basidia** clavate, 20-25 x 5-6 Fm, with four sterigmata.

**Basidiospores** subellipsoid, 5-7 x 2.5-4 Fm.

**Substrata.** Living and dead hardwoods, besides numerous exotic trees in park and gardens, causing stem canker (Blanchette 1982).

**Distribution.** Cosmopolitan in the Northern hemisphere. In East Asia known from China, Japan, and Far East Russia.

**Remarks.** Basidiocarps of *C. unicolor* are easy to recognize because of the hirsute pileus, the black line in the context and the labyrinthine hymenophore. *Cerrena unicolor* was identified as the fungal symbiont of the wood wasp *Tremex columba* on *Fagus grandifolia* in eastern Canada by Stillwell (1964). This is the only known polypore symbiont of a wood wasp.

### CHAETOPORELLUS Singer

Mycologia 36:67, 1944.

Basidiocarps annual, resupinate; pore surface white to tan; hyphal system monomitic; generative hyphae with clamps; cystidia cylindrical, thin- to thick-walled, encrusted or smooth; basidia clavate, with four sterigmata; basidiospores cylindrical, hyaline, negative in Melzer's reagent. Cosmopolitan, monotypic genus.

**Type species:** *Poria latitans* Bourdot & Galzin

**Remarks.** The genus is related to *Hyphodontia* in the Corticiaceae by its hyphal system and allantoid basidiospores. However, being poroid, it is included in this flora.

### *Chaetoporellus latitans* (Bourdot & Galzin) Singer

Mycologia 36:67, 1944. - *Poria latitans* Bourdot & Galzin, Bull. Soc. Mycol. France 41:226, 1925.

**Basidiocarps** annual, resupinate, usually fertile to the margin; pore surface tan, pores angular, 1-3 per mm, with thin, entire dissepiments that split deeply and become lacerate, tubes up to 2 mm long; context less than 1 mm thick, tan to pale buff.

tomentum, often greyish to pale green due to algae, the irregular hymenophore, and the distinct black line between the tomentum and context. The genus is undoubtedly closely related to *Trametes* where similar basidiocarps are found in species like *T. hirsuta* and *T. versicolor* which however have regular poroid hymenophores. We feel that as long as *Cerrena* species are so easy to recognize in the field, a genus of its own is justified.

### Key to species

1. Hymenophore poroid-irpicoid, cystidia clavate, protruding through the hymenium..... **C.**

#### **cystidiata**

1. Hymenophore poroid-daedaloid, cystidia absent, but some skeletal hyphal ends expanding at the apex..... **C. unicolor**

### **Cerrena cystidiata** Rajchenb. & de Meijer

Mycotaxon 38:176, 1990.

**Basidiocarps** annual, imbricate or laterally confluent, flabelliform to dimidiate, 2-6 x 2-9 cm wide, up to 4 mm thick, pilei appanate, thinning towards the margin; pilear surface dark brownish to dark beige, tomentose, zonate with or without glabrous zones; pore surface poroid-daedaloid at the margin, pores 2-3 per mm, soon becoming totally split and irpicoid, 3-3.5 per mm, with irregular dissepiments, spines brown to dark brown, up to 1.5 mm long; context cream, up to 1.5 mm thick, separated from the dark tomentum by a black line.

**Hyphal system** dimitic; generative hyphae with clamps, 3-4.5 Fm wide, thin-walled in the trama, thick-walled in the context and the tomentum; skeletal hyphae hyaline to yellowish, 2-4.5 Fm wide, unbranched to rarely branched, thick-walled.

**Cystidia** common to scattered, clavate, arising from skeletal hyphae, enclosed in the dissepiments, or protruding through the hymenium up to 10 Fm, clavate, 30-40 x 5-7 Fm, thin-walled, negative in sulphobenzaldehyde.

**Basidia** clavate, 18-20 x 5-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid to broadly ellipsoid, 5-6 x 3.2-4 Fm.

**Substrata.** On dead wood.

**Distribution.** Described from Brazil, also found in cold temperate Japan (Hokkaido).

**Remarks.** The species looks like *C. unicolor*, but its hymenophore is clearly more irpicoid than in the latter species. Besides, the clavate cystidia are very characteristic.

### **Cerrena unicolor** (Bull.:Fr.) Murrill

J. Mycol. 9:91, 1903. - *Daedalea unicolor* Bull.:Fr., Syst. Mycol. 1:336, 1821 - *Boletus unicolor* Bull., Herb. France:408, 1785.

moderately branched, in the trama up to 4 Fm, in the context up to 8 Fm wide; some long, thick-walled segments without clamps resemble skeletal hyphae.

**Cystidia** usually numerous, ventricose, tapering to the apex, either acute or slightly rounded, mostly smooth, but also some with a few apical crystals, thin-walled in the lower part, distinctly thickened towards the apex, up to 50 Fm long from the basal clamps from which they arise, 5-12 Fm wide, embedded in the hymenium or slightly projecting.

**Basidia** clavate, 20-30 x 6-8 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid, 4.5-6.5 x 3-4.5 Fm.

**Substrata.** In Europe known almost exclusively from conifers, very rarely on hardwoods. In North America and East Asia it occurs on many hardwoods. This species causes a white mottled rot in the butt and roots of living conifers and continues decay in dead trees and stumps.

**Distribution.** Circumboreal, in East Asia known from China (Sichuan, Xizang) and Japan.

**Remarks.** *Climacocystis borealis* is recognized readily in the field because of the watery and sappy basidiocarps often occurring in abundance, the whitish to pale ochraceous colour, the coarsely hirsute pileus, and the slightly irregular pores. Microscopically, the ventricose cystidia are diagnostic.

## CORIOLOPSIS Murrill

Bull. Torrey Bot. Club 32:358, 1905.

Basidiocarps annual to biennial, pileate to effused-reflexed; pileus velutinous to hirsute, more rarely glabrous, zonate to azonate, yellowish to umber brown; pore surface concolorous, in some species with a greyish to blue tint, pores entire, round to angular, small to moderately large; context golden to umber brown; hyphal system trimitic; generative hyphae with clamps, hyaline, thin-walled; skeletal hyphae thick-walled to solid, ochraceous to deep golden brown; binding hyphae thick-walled and concolorous with the skeletal hyphae; cystidia absent; basidiospores hyaline, cylindrical to oblong-ellipsoid, smooth, thin-walled, negative in Melzer's reagent, mostly 6-12 Fm long. On hardwoods, causing a white rot. Cosmopolitan genus, most species are restricted to the tropical zone.

**Type species:** *Polyporus occidentalis* Klotzsch

**Remarks.** The borderline between the genera of the trimitic polypores is intricate as few characters are available for their delimitation. *Hexagonia* and *Coriolopsis* have been separated from the other genera by their brown colours. See Ryvarden (1991) and Niemelä et al. (1992) for further comments.

### Key to species

1. Pilear surface glabrous to scrupo-

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, with occasional branching, 2-4 Fm wide, in tropical specimens the generative hyphae are thick-walled.

**Cystidia** cylindrical, with refractive contents, thin-walled, smooth, projecting to 10 Fm, 25-35 x 3-4.5 Fm.

**Basidia** clavate, 10-12 x 3-3.5 Fm, with four sterigmata.

**Basidiospores** narrowly allantoid, 3.5-5 x 0.5-0.8 Fm.

**Substrata.** Dead wood of conifers, especially *Pinus*, in temperate areas, but also recorded on hardwoods like *Acer* and *Fagus*. In the tropics on numerous hardwoods.

**Distribution.** Cosmopolitan species, but not common. In East Asia known from China (Changbai), Japan, and Far East Russia.

**Remarks.** *Chaetoporellus latitans* may be mistaken as a *Ceriporiopsis* species, but they all lack cystidia and have much larger basidiospores.

### **CLIMACOCYSTIS** Kotl. & Pouzar

Ceska Mykol. 12:103, 1958.

Basidiocarps annual, pileate; pileus surface hirsute to scrupose, white to light cream; pore surface white, pores angular and moderately large; context white and duplex; hyphal system monomitic; generative hyphae with clamps; cystidia acute, slightly ventricose, thick-walled towards the apex, embedded or only slightly projecting; basidiospores broadly ellipsoid, hyaline, smooth, negative in Melzer's reagent. On living and dead conifers, causing a white rot. Monotypic genus.

**Type species:** *Polyporus borealis* Fr.

**Remarks.** *Climacocystis* has characteristics similar to those of some species of *Oligoporus*. The main characters separating the two genera are the ventricose, slightly thick-walled cystidia of *Climacocystis* and the type of rot. The duplex consistency of the context is not striking even if the context is considerably thicker than in most *Oligoporus* species.

### **Climacocystis borealis** (Fr.) Kotl. & Pouzar

Ceska Mykol. 12:103, 1958. - *Polyporus borealis* Fr., Syst. Mycol. 1:366, 1821.

**Basidiocarps** annual, often gregarious, pilei flabelliform to broadly sessile, flat to triquetrous, semicircular, up to 15 cm long, 8 cm wide and 4 cm thick towards the base, often imbricate, soft and watery when fresh, light and brittle when dry, taste mild; pilear surface flat to slightly convex, white to light cream or straw-coloured when fresh, tomentose to hirsute but the hairs agglutinate in drying and the surface then often partly glabrous, partly scrupose, often with radial striae, and deep straw-coloured; pore surface white to cream or light straw-coloured, usually oblique, pores thin-walled and angular, in parts more irregular and split, about 1-2 per mm, tubes concolorous with the pore surface, up to 5 mm long; context white to cream, duplex, fibrous, with a lower dense layer, up to 2 cm thick.

**Hyphal system** monomitic; generative hyphae with clamps, thin- to thick-walled,

True fungi of China p. 759, 1964. - *Polyporus asper* Jungh., Verh. Batavisch. Genootsch. 17:60, 1838.

**Basidiocarps** annual to biennial, hard, solitary or imbricate, often effused reflexed, up to 10 cm broad, 5 cm wide and 1.5 cm thick, dimidiate to flabelliform with a tapering base, flat to slightly convex; pilear surface dark fulvous to ferruginous in young specimens, more chestnut to reddish brown with darker patches when older, usually with a distinct reddish tint, concentrically sulcate and ridged, radially striate with warts and scrupose tufts of agglutinated hairs, most erect near the base, more flattened near the margin, the hairs disappear and then a very thin cuticle is present, margin acute, thin, often somewhat deflexed, sterile to 2 mm; pore surface fulvous to rusty brown often with an ashy tint, usually darker than the context, pores round, entire, relatively thick-walled, 3-4 per mm, tubes concolorous, up to 7 mm long; context fulvous, rusty brown to umber, turning black in KOH, usually zonate reflecting the growth zones, up to 1 cm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, often collapsed and difficult to find; skeletal hyphae yellowish to light brown, thick-walled but always with a distinct lumen, up to 8 Fm wide; binding hyphae irregular in outline, strongly branched or with a few long tapering branches, thick-walled, yellow to light brown, up to 6 Fm wide.

**Basidia** clavate, 25-35 x 6-8 Fm, with four sterigmata.

**Basidiospores** cylindrical, 9-12 x 3-4.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Throughout the paleotropics, but seemingly more common in Asia and Australia. In East Asia known from subtropical China (Sichuan), Japan (Okinawa), Taiwan, and Vietnam.

**Remarks.** The species may be recognized when it is typically developed by its forked hairs and erect processes on the pileus, usually in reddish brown colours and rather large pores. It may be confused with *C. retropicta* which, however, has smaller basidiospores.

**Corioloopsis gallica** (Fr.) Ryvarden

Norw. J. Bot. 19:230, 1973. - *Polyporus gallicus* Fr., Syst. Mycol. 1:345, 1821 - *Trametes hispida* Baglietto, Erbar. crittog. ital. II, 1872.

**Basidiocarps** annual to biennial, often imbricate from a common, effused resupinate part, individual pilei broadly sessile, up to 10 cm wide, 7 cm broad and 1 cm thick, semicircular or elongated, corky to tough; pilear surface densely hirsute to hispid, at first brownish, soon dirty grey, zonate or azonate, more hispid at the base than at the margin, the hirsute tomentum clearly distinct towards the brown context; pore surface brown to grey, pores angular, thin-walled, 1-3 mm wide, in larger and older specimens often radially elongated and deeply split, tubes up to 1.5 cm long, tubes whitish to grey on the inner walls, trama brown; context rusty to umber brown, mostly thin, more rarely up to 1 cm thick, at first black in KOH, then fading back to

- se..... 2
1. Pilear surface velutinous to tomentose..... 6
2. Basidiocarps olivaceous brown, pileus smooth or with basal outgrowths.... **C. strumosa**
2. Basidiocarps cinnamon to dark brown, pileus smooth or with some scrupose warts or striae..... 3
3. Basidiospores 5-8 Fm long..... 4
3. Basidiocarps 9-12 Fm long..... **C. aspera**
4. Pore surface fulvous to olivaceous..... 5
4. Pore surface pinkish..... **C. glabrorigens**
5. Context cinnamon..... **C. sanguinaria**
5. Context dark olivaceous brown..... **C. retropicta**
6. Pores 1-2 per mm..... 7
6. Pores 3-6 per mm..... **C. polyzona**
7. Tropical to subtropical species, pore surface with an ashy blue tint..... **C. telfarii**
7. Temperate to boreal species, pore surface cinnamon to light brown..... 8
8. Context rusty to umber brown; pores 1-3 mm wide; basidiospores 10-16 Fm long..... **C. gallica**
8. Context cream to isabelline, pores 1-2 per mm, basidiospores 8-12 Fm long .. **C. trogii**

**Corioloipsis aspera** (Jungh.) Teng

Norw. J. Bot. 19:230, 1972. - *Polyporus polyzonus* Pers., Gaudichaud Voy. aut.

Monde Bot. p.170, 1827. - *Polyporus occidentalis* Klotzsch, Linnaea 8:486, 1833.

**Basidiocarps** annual to biennial, sometimes reflexed, commonly broadly attached, less often dimidiate, solitary or imbricate, single pilei flabelliform to reniform, up to 10 cm wide and 15 cm long, 2-7 mm thick at the base, coriaceous and flexible to corky; pilear surface yellowish-ochraceous when fresh, soon darker, fulvous, ochraceous-brown or greyish-brown, in old specimens frequently with green tints due to algae, tomentose to slightly hispid in numerous sulcate to flat, concentric zones, tomentum 1-3 mm thick, margin thin, flat to undulating, often lobed and incised; pore surface cream to beige when fresh, darkens to golden-brown or fulvous, pores round to angular, on average 2-3 per mm, on oblique substrates somewhat elongated radially and up to 1 mm long, tubes concolorous with the pore surface, in section often lighter than the trama, up to 4 mm long, sometimes stratified; context ochraceous to golden-brown, darker towards the base, duplex, lower part fibrous and semi-glossy in section, upper part loose and more faded, in old specimens it may become greyish-brown to dark brown, the two parts usually easy to distinguish in sections and sometimes with a separating thin black line, lower part up to 3 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled and hyaline, 1.5- 2.5 Fm wide; skeletal hyphae hyaline to yellow, dominant, thick-walled but with a distinct lumen, 3-8 Fm wide, in the context up to 10 Fm wide, in the tomentum solid and agglutinated; binding hyphae more sparingly present, hyaline to slightly yellowish, with short branches, 3-6 Fm wide.

**Basidia** clavate, 25-35 x 7-10 Fm, with four sterigmata.

**Basidiospores** oblong to subellipsoid, (4.5)5-8.5 x (2)2.5-3.5 Fm.

**Substrata.** On dead hardwoods of all kinds, especially in areas with periodical dry seasons, where the basidiocarps may persist from one rainy season to the next one.

**Distribution.** Pantropical, in East Asia known from subtropical China, Japan, Taiwan, Northern Thailand and Vietnam.

**Remarks.** *Corioloopsis polyzona* may be confused with old specimens of *Trametes hirsuta* as this species becomes ochraceous to fulvous brown when it has been stored in the herbarium for a long time, but the last one is a temperate-boreal species.

### ***Corioloopsis retropicta* (Lloyd) Teng**

Chung-kuo Ti Chen-chun p.760, 1963 - *Trametes retropicta* Lloyd, Mycol. Writ. 7:1113, 1922.

**Basidiocarps** annual, pileate, applanate, sessile, solitary to gregarious, up to 6 cm long, 4 cm wide and 6 mm thick, hard; pilear surface buff to cinnamon, semiglossy, glabrous, roughened mainly at the base, which usually has outgrowths or stiff hairs and develops a dark brown cuticle, neatly concentrically zonate with brown lines especially towards the margin, slightly radially sulcate, margin sharp and entire, bent downwards; pore surface olivaceous to cocoa brown, pores 5-7 per mm, angular, with farinose dissepiments, tubes up to 3 mm long, whitish inside; context up to 3

almost the original colour.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, 2-4.5 Fm wide; skeletal hyphae thick-walled to solid, golden brown in the trama and context, hyaline in the tomentum, 2.5-6 Fm wide; binding hyphae tortuous, thick-walled to almost solid, light golden brown, 2.5-4.5 Fm wide.

**Basidia** clavate, 20-40 x 5.5-8 Fm, with four sterigmata.

**Basidiospores** cylindrical, 10-16 x 3-5 Fm, size varying considerably even within the same basidiocarp.

**Substrata.** On dead hardwoods, besides many exotic trees in gardens and parks.

**Distribution.** Known from North America, Europe, and North Africa, cited for temperate China by Zhao & Zhang (1992).

**Remarks.** When typically developed this is an easily recognizable species because of its quite thick basidiocarps with a hispid to villose, often greyish pileus, large pores, and a brown pore surface and context. *Coriolopsis trogii* may be somewhat similar macroscopically, but has a cream-buff context.

***Coriolopsis glabro-rigens*** (Lloyd) Nunez & Ryvarden comb. nov.

Basionym: *Polystictus glabro-rigens* Lloyd, Mycol. Writ. 7:1145, 1922.

**Basidiocarps** annual, effused-reflexed, with small, convex pilei up to 2 cm long, 1 cm wide, and 3 mm thick, growing from a common resupinate part 15 x 5 cm and up to 3 mm thick; pilear surface snuff brown, glabrous to radially appressed-strigose, semiglossy, margin deflexed; pore surface isabelline with a dark pinkish tint, slightly glancing, pores circular to angular, 6-7 per mm, tubes concolorous with the pore surface, up to 3 mm long; context soft fibrous, snuff brown to isabelline, up to 1 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, up to 2 Fm wide; skeletal hyphae light brown, thick-walled, with a wide lumen, straight, unbranched, up to 8 Fm wide, in the context with numerous secondary septa, in the dissepiments some hyphal ends with apical crystals (see in Melzer?s); binding hyphae tortuous, thick-walled, light brown to yellowish, with a wide lumen, up to 5 Fm wide.

**Basidia** not seen.

**Basidiospores** narrowly ellipsoid, 6.5-7 x 2.5-3 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Tropical to subtropical Asian species, in East Asia known from subtropical Japan (Okinawa).

**Remarks.** The species is easy to recognize by its effused-reflexed basidiocarps with a pinkish pore surface and snuff brown, glossy pilei. The encrusted dissepiments is a deviating character in the genus, but we do not know the taxonomic value of this character.

***Coriolopsis polyzona*** (Pers.) Ryvarden

(Yunnan, Guangxi), Japan (Okinawa), Taiwan, Northern Thailand, and Vietnam.

**Remarks.** The species is usually easy to recognize because of the very small pores and the narrow pilei, either imbricate or solitary. The pileus is finely roughened and dull when young. Specimens are frequently eaten by insects which leave a fine-grained powder clinging to the pileus and pore surface. *Corioloopsis asper* also develops a red cuticle on the pileus, but both the pores and basidiospores are larger than in *C. sanguinaria*.

**Corioloopsis strumosa** (Fr.) Ryvarden

Kew Bull 31:95, 1976. - *Polyporus strumosus* Fr., Epicr. p.462, 1838.

**Basidiocarps** annual, solitary to imbricate, usually dimidiate with a contracted base, applanate, flabelliform to reniform, up to 15 cm long and 12 cm wide, up to 5 mm thick at the base, coriaceous and flexible, margin thin and sharp, in some specimens with a short sterile stipe-like extension at the base, up to 2 cm long and about 1 cm thick; pilear surface olivaceous-brown, umber or hazel-brown, glabrous, first dull and velvety to touch, soon smoother and semiglossy with numerous concentric, slightly sulcate zones and some radial striae, with age the pileus becomes finely warted to scrupose starting from the base, often with a secondary azonate outgrowth, margin thin, undulating or lobed; pore surface in shades of brown, pruinose actively growing, then darkening when touched, later more dull sepia to olivaceous-brown, pores entire, round, 4-6 per mm, tubes more or less concolorous with the pore surface, 1-2 mm long; context dark olivaceous-brown, dense, homogenous, often with some weak concentric zones, up to 5 mm thick, black in KOH.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, often flattened and distorted, 1-3.5 Fm wide, moderately branched; skeletal hyphae thick-walled but always with a distinct lumen, hyaline to yellow, 3-8 Fm wide, walls usually 1-1.5 Fm thick, sinuous; binding hyphae often difficult to find, hyaline, moderately thick-walled and branched, about 2.5 Fm wide.

**Basidia** clavate, 14-17 x 6-8 Fm, with four sterigmata.

**Basidiospores** cylindrical, (8.5)9-12 x 3-3.7 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Widespread in the paleotropics from Western Africa to Australia, in East Asia known from warm-temperate Japan (Honshu), China (Yunnan, Guangxi), Northern Thailand, and Vietnam.

**Remarks.** The species may be recognized by the dimidiate, glabrous, mostly olivaceous pileus and the secondary warts from the base when they are developed. The pores are in some specimens almost invisible to the naked eye and darken when touched in fresh condition.

**Corioloopsis telfarii** (Klotzsch) Ryvarden

Norw. J. Bot. 19:230, 1972. - *Polyporus telfarii* Klotzsch, Linnaea 8:484, 1833.

**Basidiocarps** annual to biennial, solitary or imbricate, in some cases fused laterally

mm thick, fibrous, dark brown, darker than the pilear surface and tubes, continuous with the trama, homogeneous, sometimes with a darker line towards the pilear surface.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, 2-2.5 Fm wide; skeletal hyphae honey brown, thick-walled, straight, with a wide lumen, unbranched, up to 4 Fm wide; binding hyphae tortuous, thick-walled, with a lumen, honey brown, up to 4 Fm wide.

**Basidia** subclavate, 16-18 x 5-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 5.5-6.5 x 2.5-3 Fm.

**Distribution.** Tropical to subtropical Asian species, in East Asia known from subtropical China and Japan (Okinawa).

**Remarks.** This species has been confused with *C. sanguinaria*. The latter species has larger basidiospores and a cinnamon context, not brown as in *C. retropicta*. The pore surface of *C. retropicta* reminds strongly of that of *C. caperata* (Berk.) Murrill, but this species has longer basidiospores (Ryvarden 1992).

### **Corioloipsis sanguinaria** (Klotzsch) Teng

True fungi of China p. 760, 1964. - *Polyporus sanguinarius* Klotzsch, Linnaea 8:484, 1833.

**Basidiocarps** annual to biennial, pileate to effused-reflexed, solitary to densely imbricate, usually elongated, single pilei rarely above 6 cm wide and 10 cm long, 2-4 mm thick, but in fused specimens up to 1 cm at the base, sessile, dimidiate, conchate to flabelliform or reniform, margin undulating, frequently lobed or incised and sharp, coriaceous to flexible in thin specimens, harder in thicker ones; pilear surface first ochraceous, then evenly cinnamon to yellowish brown, with age a reddish cuticle may develop from the base as irregular patches or bands as the upper hyphae agglutinate, in old specimens this cuticle may attain a chestnut or bay colour, glabrous, finely scrupose, azonate or with some weak concentric zones; pore surface appanate or widely effused and decurrent on the substrate, ochraceous when young, cinnamon to deep fulvous in older specimens, frequently, but not always, with an ashy tint, pores entire, round to slightly angular, 5-8 per mm, in some specimens almost invisible to the naked eye, tubes up to 4 mm long, concolorous with the pore surface; context fibrous, golden brown to cinnamon, 2-8 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, 2-3 Fm wide; skeletal hyphae thick-walled but always with a distinct lumen, golden yellow to brown, 2-8 Fm wide; binding hyphae abundant in the context, thin- to slightly thick-walled, yellowish, mostly 2-4 Fm wide, often with many short branches tapering towards the ends.

**Basidia** clavate, 25-30 x 6-8 Fm, with four sterigmata.

**Basidiospores** oblong-ellipsoid to subellipsoid, 5-8 x 2-3.5 Fm.

**Substrata.** On dead hardwoods of all kinds.

**Distribution.** Paleotropical species, quite common, also present in subtropical China

**Basidia** clavate, 18-23 x 6-7.5 Fm, with four sterigmata.

**Basidiospores** cylindrical, (8)10-12 x 2.5-4 Fm.

**Substrata.** On dead hardwoods, most common on *Populus* and *Salix*. In Ukraine also reported on *Pinus*.

**Distribution.** Circumpolar in temperate forests, in East Asia known from China, Japan (Hokkaido), and Far East Russia.

**Remarks.** Basidiocarps of *C. trogii* are similar to those of *C. gallica*, but are generally paler in colour. The smaller basidia and basidiospores of *C. trogii* are an important microscopic difference between the two species treated here.

### **CRYPTOPORUS** (Peck) Shear

Bull. Torrey Bot. Club 29:450, 1902.

Basidiocarps annual, sessile, triquetrous, margin of the pileus extending over the pore surface as a volva with a small basal opening; pore surface pale to dark brown; context ivory white, fibrous, azonate; hyphal system trimitic; generative hyphae with clamps; cystidiols fusoid, embedded or barely projecting; basidiospores cylindrical, hyaline, negative in Melzer's reagent. Causes a white superficial saprot of conifers.

**Type species:** *Polyporus volvatus* Peck

**Remarks.** The volva enclosing the pore surface is the distinctive character on which the genus is based, and an adaptation to basidiospore spreading by insects.

### **Key to species**

1. Basidiospores 12-16.5 x 4.5 Fm..... **C. volvatus**  
 1. Basidiospores 7.5-10 x 4.5 Fm..... **C. sinensis**

### **Cryptoporus sinensis** Wu & Zang

Mycotaxon 74:416, 2000.

**Basidiocarps** annual, sessile, triquetrous, solitary, up to 3 cm wide and long, 2 cm thick; pilear surface cream-coloured to yellowish or tan, azonate, glabrous, often coated with a shiny, laccate layer, smooth or rugose, margin concolorous, continuous with a volva-like structure which completely encloses the pore surface except for a small hole at the base; pore surface pale to dark chocolate brown, pores circular, 4-5 per mm, with thick, entire dissepiments, tubes pinkish buff, up to 6 mm long; context ivory white, azonate, soft-corky, up to 6 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, with occasional branching, mostly 3-7 Fm wide but inflated portions at branches up to 15 Fm wide; skeletal hyphae thick-walled, hyaline, with occasional branching, 2.5-8 Fm wide.

**Cystidia** absent; cystidiols fusoid, not projecting, thin-walled, 15-25 x 6-11 Fm.

to elongated basidiocarps, broadly attached to dimidiate, flabelliform to reniform or semicircular, appanate to conchate with concave surface, up to 10 cm long, 7 cm wide, 2-5 mm thick, thin and flexible when dry; pilear surface ochraceous to fulvous in old specimens, variably covered with antler-like, forked hairs 1-5 mm long, in some specimens very dense, in others more scattered, slightly concentric zonate, mostly strongly radially striate, most easily seen in specimens with few hairs or when the hairs agglutinate or wear away with age, margin thin, sharp and deflexed; pore surface wood-coloured to ochraceous, pale fulvous in old specimens, pores angular, thin-walled, 1-2 per mm, in older specimens becoming lacerate to almost irpicoid in parts as some pores grow stronger than others, in such cases from 1-3 mm wide, in some specimens with a distinct pale whitish-blue tint, tubes up to 7 mm long, light-coloured in the tubes, ochraceous to pale fulvous in section, dissepiments fimbriate; context fibrous, ochraceous to fulvous.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline and thin-walled, 1.5-3.5 Fm wide; skeletal hyphae thick-walled, hyaline, yellow to almost golden, 3-7 Fm wide; binding hyphae irregular, hyaline to slightly yellowish, most easily seen in the context, 1.5-4 Fm wide, tapering towards the ends.

**Basidia** clavate, 18-22 x 6-7 Fm, with four sterigmata.

**Basidiospores** cylindrical, 8-11.5 x 3-4.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Paleotropical species, but rather rare. In East Asia also known from warm-temperate China (Guangxi, Jiangxi), Northern Thailand, Vietnam, Far East Russia, and Taiwan.

**Remarks.** When typically developed, *C. telfarii* is easily recognized by the antler-like and forked hairs on the pileus, and the large, almost irpicoid pores.

### **Coriolopsis trogii** (Berk.) Domanski

Mala Flora Gryzbow 1:230, 1974. - *Trametes trogii* Berk. in Trog, Verz. Schweiz. Schwein. Suppl. 2:52, 1850.

**Basidiocarps** annual, sessile, triquetrous, tough-corky, up to 12 cm long, 4 cm wide, and 4 cm thick; pilear surface cream-buff to ochraceous-buff, coarsely hispid, azonate or faintly zonate, margin sharp; pore surface ochraceous buff, pores angular to labyrinthiform, 1-2 per mm, dissepiments thin and lacerate, tubes concolorous and continuous with the lower context, up to 1 cm long; context buff to ochre, duplex, darkening slightly with KOH, reaction stronger in older basidiocarps, lower layer firm, up to 2 mm thick, and evenly integrated with the soft spongy and fibrous upper layer, which is up to 5 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, sparingly branched, 2-4 Fm wide; skeletal hyphae yellowish, thick-walled, with occasional branching, 4-6 Fm wide, cyanophilous, not common in the trama; binding hyphae hyaline to yellowish, thick-walled, partly arboriform, partly tortuous with short side branches, 2-3.5 Fm wide, dominant in the trama.

yellowish brown; basidiospores oblong-ellipsoid to cylindrical, thin-walled, hyaline, negative in Melzer's reagent; chlamydospores present in some tropical species. On hardwoods, causing a brown rot. Small cosmopolitan genus.

**Type species:** *Daedalea quercina* L.:Fr.

**Remarks.** Previously this was a collective genus for all species with daedaleoid to labyrinthine hymenophore. As more microscopical, chemical and other characters have become available, most species have been transferred to other genera. From other species with a daedaleoid hymenophore, *Daedalea* is separated by the cork-coloured basidiocarps with thick dissepiments, a distinct catahymenium formed by widened skeletal ends (Rajchenberg 1985), and a brown rot in the attacked wood.

#### Key to species

1. Hymenophore poroid..... 2
  1. Hymenophore labyrinthine, pores or lamellae 1-4 mm wide..... **D. quercina**
  2. Tropical to subtropical species, with a black cuticle when old..... **D. incana**
  2. Temperate species, without a black cuticle when old..... **D. dickinsii**

#### **Daedalea dickinsii** Yasuda

Bot. Mag. Tokyo 36:127, 1922.

**Basidiocarps** annual to perennial, sessile, dimidiate, applanate to triquetrous, up to 20 cm long, 10 cm wide, and 5 cm thick, margin usually dull; pilear surface pale ochraceous with a pinkish buff tint, glabrous, with lighter outgrowths from the base of the pileus, broadly concentrically sulcate; pore surface concolorous with the pileus, pores circular to angular, partly elongated, 1-2 per mm, dissepiments thick and entire, tubes up to 1.5 cm long; context tough corky, pinkish buff, up to 2 cm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, 1.5-3 Fm wide; skeletal hyphae hyaline to pale brown, thick-walled to almost solid, unbranched, 2.4-4.5 Fm wide; binding hyphae moderately branched, up to 2.5 Fm wide.

**Cystidia** absent; skeletal hyphae with widened apices protruding in the hymenium, 23-48 x 1.5-4 Fm.

**Basidia** subclavate, 18-25 x 4.5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, 4-5.5 x 1.8-2.5 Fm.

**Substrata.** On hardwoods, mostly on *Fagus* and *Quercus*.

**Distribution.** Temperate Asian species, from India to Japan, and at high elevations in Taiwan.

**Basidia** clavate, 15-25 x 7-9 Fm, with four sterigmata.

**Basidiospores** cylindrical, 7.5-10 x 4.5 Fm.

**Substrata.** On living or recently killed conifers, mainly on *Pinus*.

**Distribution.** Known only from Central and South China.

**Remarks.** The species is separated from *C. volvatus* by shorter basidiospores.

**Cryptoporus volvatus** (Peck) Shear

Bull. Torrey Bot. Club 29:98, 1877. - *Polyporus volvatus* Peck, N.Y. State Mus. Ann. Rep. 27:98, 1877.

**Basidiocarps** annual, sessile, triquetrous, solitary or gregarious, up to 5 cm wide and long, 4 cm thick; pilear surface cream-coloured to yellowish or tan, azonate, glabrous, often coated with a shiny, laccate layer, smooth or rugose, margin concolorous, continuous with a volva-like structure which completely encloses the pore surface except for a small hole at the base; pore surface pale to dark chocolate brown, pores circular, 4-5 per mm, with thick, entire dissepiments, tubes pinkish buff, up to 6 mm long; context ivory white, azonate, soft-corky, up to 2 cm thick; taste slightly bitter.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, with occasional branching, mostly 3-7 Fm wide but inflated portions at branches up to 15 Fm wide; skeletal hyphae thick-walled, hyaline, with occasional branching, 2.5-8 Fm wide; binding hyphae thick-walled, frequently branched, 1.5-2.5 Fm wide.

**Cystidia** absent; cystidiols fusoid, not projecting, thin-walled, 20-28 x 5-7 Fm.

**Basidia** clavate, 20-25 x 8-10 Fm, with four sterigmata.

**Basidiospores** cylindrical, 12-16.5 x 4.5 Fm.

**Substrata.** On living or recently killed conifers, mainly on *Pinus*, often fructifying from cavities made by adult beetles emerging from the wood.

**Distribution.** Widely distributed in coniferous forest regions of North America, also known from East Asia (China, Japan, Far East Russia, Northern Thailand, and Vietnam).

**Remarks.** Setsuda (1995) has demonstrated that the incursions of adult beetles into basidiocarps are synchronized with the sporulation of *C. volvatus*.

**DAEDALEA** Pers.: Fr.

Syst. Mycol. 1:331, 1821. - *Daedalea* Pers., San. Math. Fung. p.499, 1801.

Basidiocarps perennial, pileate, flat to triquetrous, broadly sessile; pileus surface smooth to velutinous, often concentrically sulcate; hymenophore irregular, partly poroid, partly split into sinuous pores, labyrinthine to daedaleoid, or strictly lamellate, ochraceous; context light to deep brown; hyphal system trimitic; generative hyphae with clamps, thin-walled, hyaline; skeletal hyphae thick-walled to solid, light ochraceous brown, with widened ends that bend from the trama to form part of a cataphyllum; binding hyphae tortuous, with short stout branches, hyaline to light

measured tangentially, walls 1-3 mm thick, tubes up to 4 cm long, light ochraceous on the inner tube walls while the trama is distinctly darker; context up to 1 cm thick, ochraceous to tobacco brown, with indistinct annual zones.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, 1.5-4 Fm wide; skeletal hyphae dominant, thick-walled to solid, light brown, 3-6 Fm wide, with straight walls and several single branches with parallel walls and not tapering from the main body.

**Cystidia** absent; skeletal hyphae bend into the hymenium as a dense catahymenium with cystidia-like, rounded and thick-walled apices, often with a fine granular exudate.

**Basidia** clavate, 20-27 x 6-7.5 Fm, with four sterigmata, immersed among the catahymenium, occurring singly between the projecting skeletal hyphae.

**Basidiospores** cylindrical, 5.5-6 x 2.5-3.5 Fm, difficult to find in most specimens as the periods of sporulation seem to be short and the basidia collapse rapidly on drying.

**Substrata.** Mainly on *Quercus*, but also noted on other hardwoods.

**Distribution.** Asia, North Africa and Europe in the range of oaks. In East Asia it is replaced by *Daedalea dickinsii*, which is reported to be a poroid form of *D. quercina* (Roy & Pal 1994).

**Remarks.** *Daedalea quercina* is usually easy to recognize because of the even, pale colour, the very hard basidiocarps, and the irregular daedaleoid hymenophore.

#### DAEDALEOPSIS Schroet.

Krypt. Fl. Schles. 3:492, 1888.

Basidiocarps annual, pileate to effused-reflexed; pilear surface pale brown to deep red, zonate, mostly glabrous; hymenophore lamellate to tubular; context pale brown, tough-fibrous; hyphal system trimitic; generative hyphae with clamps; skeletal and binding hyphae pale brown; dendrohyphidia present; basidiospores cylindrical, slightly curved, hyaline, smooth, negative in Melzer's reagent. Causes a white rot of dead hardwoods, rarely on conifers.

**Type species:** *Daedalea confragosa* Bolt.:Fr.

**Remarks.** The genus may be related to *Datronia* by its faintly tinted skeletal hyphae, the dendrohyphidia along the dissepiments, and the long, cylindrical basidiospores.

#### Key to species

1. Basidiocarps always triquetrous..... 2
1. Basidiocarps effused-reflexed to applanate..... 3

**Remarks.** According to Roy & Pal (1994), Indian specimens of *D. dickinsii* are compatible with *D. quercina*. In the Far East, the taxon with regular pores clearly dominates, therefore we keep them as separate species.

**Daedalea incana** (Lév.) Ryvar den

Mycotaxon 20:148, 1984. - *Trametes incana* Lév., Ann. Sci. Nat. Ser. 3:196, 1844.

**Basidiocarps** perennial, applanate, semicircular and dimidiate, up to 10 cm wide and long, up to 2 cm thick at the base, coriaceous to woody hard when dry; pilear surface dull, pale cinnamon to ochraceous, when young with a pinkish tint, becoming darker, glabrous, narrowly sulcate in concentric bands, often covered with lighter and velvety outgrowths that spread irregularly towards the margin, when old developing a black cuticle that becomes irregularly rimose; pore surface ochraceous to pale cinnamon, pores angular to elongate, 1-2(3) per mm, tubes concolorous with the pore surface except the inner parts that are stuffed with white mycelium, distinctly stratified, up to 1.5 cm long; context ochraceous in different shades, in some specimens with distinct thin black lines separating various layers of outgrowths on the pileus, the upper zones paler than the lower ones, total context up to 6 mm long.

**Hyphal system** trimitic; generative hyphae with clamps, 2-3.5 Fm wide; skeletal hyphae solid to thick-walled, golden brown, 2.5-6 Fm wide, tortuous, clavate hyphal ends protruding towards the tube lumen; binding hyphae solid and moderately branched, golden brown, often tortuous, 2-5 Fm wide, emerging in the hymenium (catahymenium) with apices up to 5 Fm wide.

**Basidia** not seen.

**Basidiospores** broadly ellipsoid, 5.5-6 x 3-3.5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Asian species, known from India, Nepal, Sri Lanka, China (Changbai, Jiangxi), Japan, and The Philippines.

**Remarks.** The large pores, and the rimose, black cuticle developed when old are distinct characteristics. The pore surface is reminiscent of *Daedalea dickinsii*, but this species never develops a black cuticle when old.

**Daedalea quercina** L.:Fr.

Syst. Mycol. 1:333, 1821. - *Agaricus quercinus* L., Spec. Plant. p.1176, 1753.

**Basidiocarps** perennial, single or with a few pilei fused laterally, applanate to triquetrous, broadly sessile to dimidiate, semicircular, up to 20 cm wide, 15 cm broad and 8 cm thick, corky to woody and hard, margin usually smooth, ochraceous; pilear surface buff to light brown, greyish in old specimens, flat to slightly convex, often with a slightly raised base, smooth to finely velutinous, in some specimens with light ochraceous outgrowths extending from the base; pore surface flat to oblique, especially close to the substrate, ochraceous, hymenophore irregular, along the margin elongated-poroid, in the inner parts with sinuous pores or daedaleoid to labyrinthine or almost lamellate, on oblique parts the pores are deeply split, mostly 1-4 mm wide

**Daedaleopsis confragosa** (Bolton:Fr) Schroet.

Krypt. Fl. Schles. 3:493, 1888. - *Daedalea confragosa* Bolton:Fr., Syst. Mycol. 1:336, 1821. - *Boletus confragosus* Bolton, Hist. Funguses 3:160, 1789.

**Basidiocarps** annual, pileate to effused-reflexed, dimidiate, tough-corky, up to 12 cm wide; pilear surface buff to light brown, matted, strigose to glabrous, usually zonate and shallowly sulcate; pore surface light buff to darker brown with age, the pores variable, circular or radially elongated and up to 1 mm wide, daedaleoid, or with dissepiments splitting to form a radially lamellate hymenophore, tubes pale buff to brown, continuous with the context, up to 1 cm long; context concolorous with the tubes, firm-corky, azonate, up to 2 cm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, with occasional branching, 2-6 Fm wide; skeletal hyphae light brown, thick-walled, with rare branching, 4-7 Fm wide; binding hyphae light brown, thick-walled, frequently branched, 2-4.5 Fm wide.

**Dendrohyphidia** present in the hymenium and dissepiments, thin-walled, not encrusted, 2-3 Fm wide.

**Basidia** narrowly clavate, 30-45 x 4-5 Fm, with four sterigmata.

**Basidiospores** cylindrical to allantoid, 9-11 x 2-2.5 Fm.

**Substrata.** Common on hardwoods, rarely reported on coniferous wood.

**Distribution.** Temperate circumpolar species. In East Asia known from China, Japan, Far East Russia, and Northern Thailand.

**Remarks.** *Daedaleopsis confragosa* is a rather variable species, especially the hymenophore. The closest species seems to be *D. conchiformis*, which is macroscopically similar except for its effused-reflexed, café-au-lait basidiocarps.

**Daedaleopsis purpurea** (Cooke) Imazeki & Aoshima

Flora of Eastern Himalaya p. 619, 1966. - *Trametes purpurea* Cooke, Grevillea 10:121, 1882. - *Daedaleopsis nipponica* Imazeki, Bull. Tokyo Sci. Mus. 6:78, 1943.

**Basidiocarps** annual, pileate, triquetrous, often solitary, semicircular, broadly attached, up to 8 cm long, 4 cm wide and 1.5 cm thick; pilear surface in brown and reddish tones, velutinous, rugose, concentrically sulcate, the brown tomentum wearing away concentrically and leaving glabrous, dark purplish zones, radially rugose, applanate to umbonate at the base, margin entire, undulate, usually lighter than the rest of the pileus; pore surface cream, with an ashy tint when fresh, reddening when touched, dark brown when old, pores irregular, entire to sinuous, 1 per mm or slightly wider, tubes light brown to olivaceous brown, concolorous with the context, up to 1.5 cm long; context café-au-lait, olivaceous towards the pilear surface, felty, with a thin black crust, up to 1.5 cm thick and zonate under the umbo, up to 5 mm thick towards the margin.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin- to slightly thick-walled, up to 2 Fm wide; skeletal hyphae thick-walled, light brown, unbran-

2. Basidiocarps cream to yellowish, azonate, velutinous to glabrous..... **D.**

**sinensis**

2. Basidiocarps dark brown, concentrically tomentose..... **D.**

**purpurea**

3. Basidiocarps effused-reflexed, often imbricate..... 4

3. Basidiocarps pileate, flat to broadly attached..... 5

4. Pore surface ivory to pale buff, on *Styrax* ..... **D.**

**styracina**

4. Pore surface greyish brown, on other hardwoods..... **D. conchiformis**

5. Hymenophore lamellate, pileus in shades of red..... **D.**

**tricolor**

5. Hymenophore poroid, daedaleoid to semilamellate, pileus brown..... **D. confragosa**

**Daedaleopsis conchiformis** Imazeki

Bull. Tokyo Sci. Mus. 6:77, 1943.

**Basidiocarps** annual, pileate to effused-reflexed; pileus dimidiate, applanate, imbricate, 2-6 cm long, 3-6 mm thick, margin thin and acute, deflexed; pilear surface café-au-lait to cinnamon, glabrous, smooth or with lighter outgrowths from the base, concentrically sulcate, radially ridged and partly rough; pore surface greyish brown, pores regular to angular, partly elongated, (1)2-3 per mm, dissepiments thin and becoming lacerate, tubes pale brown, 1-4 mm long; context corky, pale brown, 1-2 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, 2-3 Fm wide; skeletal hyphae thick-walled, hyaline to pale yellow, unbranched to occasionally branched, 2.5-5 Fm wide; binding hyphae thick-walled, hyaline to pale yellow, branched and contorted, up to 5 Fm wide.

**Dendrohyphidia** not seen.

**Basidia** and **basidiospores** not seen.

**Substrata.** On hardwoods.

**Distribution.** Temperate West-Pacific species known from China (Jiangxi), Far East Russia, and Japan. There is also one record from Iryan Jaya in Indonesia (Imazeki 1952), and Papua New Guinea (Quanten 1993).

**Remarks.** The species is very similar to *D. confragosa*, but it has smaller, effused-reflexed basidiocarps with a café-au-lait pilear surface. Compatibility tests between both species should be performed.

mm thick; pilear surface in dark brown to purple tones, glabrous, semiglossy, concentrically zonate, radially sulcate, margin ashy grey, cream or ivory, always lighter than the rest of the pileus; hymenophore mostly lamellate except for a few pores in the resupinate areas, ivory to pale buff, becoming ashy gray in old specimens, pores or lamellae 2-3 mm wide, radially arranged, several short lamellae are present among the entire ones, lamellae up to 6 mm long, pores shallow, tubes up to 2 mm long; context leathery, concolorous with the hymenophore, up to 2 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin- to thick-walled, up to 2 Fm wide; skeletal hyphae hyaline to brown, thick-walled, in the context with a lumen, up to 6 Fm wide, unbranched; binding hyphae tortuous, up to 3 Fm wide, hyaline.

**Dendrohyphidia** not seen.

**Basidia** clavate, 25-30 x 8-9 Fm, emerging from a catayahmenium.

**Basidiospores** cylindrical, 8-8.5 x 2-2.5 Fm.

**Substrata.** On dead, mostly standing hardwoods, especially on *Styrax japonica*.

**Distribution.** Cold-temperate Asian species only known from Japan (Honshu and Hokkaido).

**Remarks.** Easily recognized by the effused-reflexed, orbicular basidiocarps with ivory-buff, shallow pores and growing mainly on *Styrax*.

**Daedaleopsis tricolor** (Bull.:Fr.) Bondartsev & Singer

Ann. Mycol. 39:64, 1941. - *Agaricus tricolor* Bull., Hist. de Champ. 2:380, 1791.

**Basidiocarps** annual, pileate, sessile, often semicircular and imbricate, appanate, up to 14 cm wide and long, 1-3 cm thick at the base; pilear surface at first ashy grey to pale brown, later becoming red to deep bay in zones from the base or in distinct spots, glabrous, sulcate and concentrically zonate; pore surface brown, poroid to lamellate, but never entirely poroid, lamellae dichotomously branched, pores usually more prominent close to the base, lamellae more pronounced towards the margin, sometimes with concentric poroid zones, pores angular to sinuous, 1-2 per mm, 0.5 to 1 mm wide, up to 3 mm long, lamellae 10-17 per cm measured tangentially, tubes or lamellae up to 1.4 cm long; context pale brown, tough and homogeneous with a thin, dark cuticle from the base in deep bay specimens.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, with occasional branching, 2-6 Fm wide; skeletal hyphae light brown, thick-walled, with rare branching, 4-7 Fm wide; binding hyphae yellowish to brown, thick-walled, frequently branched, 2-4.5 Fm wide.

**Dendrohyphidia** present when basidia are absent, hyaline, thin-walled at the tip, brown and thick-walled at the base, up to 30 Fm long.

**Basidia** and **basidiospores** as in *D. confragosa*.

**Substrata.** Mainly on *Salix*, but also noted on other hardwoods. It is often seen along rivers and small streams.

**Distribution.** Temperate species in Europe and East Asia (China, Japan, and Far

ched, up to 7 Fm wide, loose in the context; binding hyphae tortuous, hyaline to pale yellowish, up to 3.5 Fm wide, mostly abundant in the trama.

**Dendrohyphidia** abundant in the hymenium, thin-walled, up to 2 Fm wide.

**Basidia** clavate, inconspicuous, 12-15 x 4-5 Fm, no sterigmata seen.

**Basidiospores** not seen.

**Substrata.** On dead, mainly standing hardwoods.

**Distribution.** Cold-temperate Asian species known from the Himalayas, China, and Japan.

**Remarks.** The triquetrous basidiocarps of *D. purpurea* are thicker than those in other *Daedaleopsis* species. The abundant dendrohyphidia help in the genus identification.

**Daedaleopsis sinensis** (Lloyd) Y.C. Dai

Fung. Sci. 11:90, 1996. - *Daedalea sinensis* Lloyd, Mycol. Writ. 7:1112, 1922 - *Trametes radiata* Burt, Ann. Miss. Bot. Gard. 18:475, 1931.

**Basidiocarps** annual to biennial, pileate, applanate to triquetrous, about double so thick at the base than near the margin, woody hard when dry, up to 8 x 4 x 3 cm; pilear surface pale ochraceous to isabelline, at first finely velutinous, soon glabrous and with age tuberculate to irregularly warted, azonate; pore surface pale cream darkening to light brown when dry, pores angular, sinuous to lamellate, thin-walled, 1-2 per mm, with fimbriate dissepiments, tubes up to 2.5 cm long, concolorous with the context and about twice its length; context dense, cream to isabelline or pale brown, usually concentrically zonate, up to 1 cm thick at the base.

**Hyphal system** trimitic; generative hyphae with clamps, 2-4 Fm wide; skeletal hyphae abundant, hyaline to pale brown, thick-walled to almost solid, 3-6 Fm wide; binding hyphae solid, hyaline to pale brown, tortuous, 3-4 cm wide.

**Dendrohyphidia** abundant, frequently branched, both in the hymenium and in the dissepiments, hyaline, up to 2 Fm wide.

**Basidia** clavate, 15-20 x 5-6 Fm, with four sterigmata.

**Basidiospores** allantoid, 7.5-9.5(11) x 2-2.5(3) Fm.

**Substrata.** On hardwoods, mainly *Betula* and *Alnus*.

**Distribution.** Temperate Asian species, known from Northern China (Changbai) and Far East Russia (Amur, Chabarovsk).

**Remarks.** The species is recognized by the triquetrous basidiocarps, sinuous pores, and the cream to pale ochraceous, glabrous pileus with distinct warts and scrupose protuberances. The type specimen is sterile and darker than fresh material.

**Daedaleopsis styracina** (P. Hennings & Shirai) Imazeki

Bull. Tokyo Sci. Mus. 6:78, 1943. - *Daedalea styracina* P. Hennings & Shirai, Bot. Jb. 28:269, 1900.

**Basidiocarps** annual, effused-reflexed to resupinate, imbricate or a few pilei fused laterally in orbicular patches, pileus flat, flexible, up to 4 cm long, 2 cm wide and 3

thin, black cuticle.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 2.5-4 Fm wide; skeletal hyphae thick-walled, those in lower context pale greenish-brown in KOH, those in the upper dark layer darker brown in KOH, 2.5-4 Fm wide, frequently branched, branches with straight walls.

**Dendrohyphidia** branched and contorted, present in the dissepiments, 1.5-3 Fm wide, often difficult to find in dry specimens.

**Cystidia** absent; fusoid, thin-walled cystidiols embedded or slightly projecting, 25-30 x 4-5 Fm; hyphal pegs present.

**Basidia** clavate, 25-30 x 5-6.5 Fm, with four sterigmata.

**Basidiospores** cylindrical, 10-12 x 3-4 Fm.

**Substrata.** On numerous dead hardwoods, very rarely on *Abies* and *Pinus*.

**Distribution.** Cosmopolitan, temperate species recorded from all continents. In East Asia known from China, Japan, and Far East Russia.

**Remarks.** The large, irregular pores and the black layer separating the upper tomentum from the lower context are distinctive field characters for *D. mollis*.

***Datronia scutellata*** (Schwein.) Gilb. & Ryvarden

Mycotaxon 22:364, 1985. - *Polyporus scutellatus* Schwein., Trans. Am. Phil. Soc. II, 4:157, 1832.

**Basidiocarps** annual, pileate to almost pendant to effused-reflexed, dimidiate or unguulate, tough when fresh, hard when dry, up to 3 cm long, 1.5 cm wide, and 1 cm thick; pilear surface at first whitish, but soon dark brown to black, with a lighter margin, at first velutinous, but soon glabrous and often slightly sulcate in zones; pore surface white to buff or pale brown with age, pores round to slightly angular, 4-5 per mm, dissepiments often finely farinose, tubes up to 7 mm long, cork- to wood-coloured; context 1-3 mm thick, dense, wood-coloured to pale brown, with a distinct black crust.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline in the context and trama, 2.5-4 Fm wide, pigmented hyphae with clamps present on the pilear surface; skeletal hyphae arboriform, solid, pale yellowish, frequently branched, 2-4.5 Fm wide.

**Cystidia** absent, fusoid cystidiols present, 20-28 x 5-6 Fm.

**Basidia** broadly clavate, 20-30 x 7-10 Fm, with four sterigmata.

**Basidiospores** cylindrical, 8-12 x 3-4.5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Cosmopolitan species and widespread in the tropical zone. In East Asia known along the Pacific coasts of China, Japan, Far East Russia, and Vietnam.

**Remarks.** The species is relatively easy to recognize by the small basidiocarps, the black pileus, and the pale pore surface. Microscopically the large cylindrical basidiospores are diagnostic. Other *Datronia* species are separated by much thinner and flexible basidiocarps and a persistently velutinous to tomentose pileus.

East Russia).

**Remarks.** This species is closely related to *D. confragosa* and may be interpreted as a southern ecotype. The main characters separating it from *D. confragosa* are the occurrence of lamellae, and the often rather small basidiocarps with an almost completely reddish pileus.

### **DATRONIA** Donk

Persoonia 4:337, 1966.

Basidiocarps annual, resupinate to effused-reflexed; pilear surface brown to black, tomentose to glabrous; pore surface whitish to pale brown, pores large to small, circular to daedaleoid; context pale brown, tough-fibrous, with a black line; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae hyaline to pale brown, straight, with abundant, straight branches from the main body; dendrohyphidia present in the dissepiments in some species; sterile cystidiols present or absent; basidiospores cylindrical, hyaline, smooth, negative in Melzer's reagent. On dead hardwoods, causing a white rot.

**Type species:** *Daedalea mollis* Sommerf.: Fr.

**Remarks.** The deep brown context and the dimitic hyphal system distinguish *Datronia* species from *Corioloopsis* which have a cream to olivaceous context and a trimitic hyphal system with binding hyphae.

### **Key to species**

1. Basidiocarps corky to hard, pileus glabrous, black..... **D. scutellata**
1. Basidiocarps tough-fibrous and flexible, pileus velutinous, dark brown..... 2
2. Pores regular to irregular, labyrinthiform, 1-2 per mm..... **D. mollis**
2. Pores hexagonal, regular, 4-5 per mm..... **D. stereoides**

### **Datronia mollis** (Sommerf.:Fr.) Donk

Persoonia 4:338, 1966. - *Daedalea mollis* Sommerf.:Fr., Elench. Fung. p.71, 1828. - *Daedalea mollis* Sommerf., Suppl. Fl. Lapp. p. 271, 1826.

**Basidiocarps** annual, usually effused-reflexed, occasionally resupinate or pileate, fused laterally, pilei up to 2 cm wide; pilear surface dark brown to black, tomentose to glabrous, concentrically zonate and sulcate; pore surface buff to umber brown, pores angular to daedaleoid, 1-2 per mm, some over 1 mm wide, dissepiments becoming thin and lacerate, tubes pale buff, up to 3 mm long; lower context pale buff, firm-fibrous, azonate, up to 1 mm thick, separated from the upper tomentum by a

1. Skeletal hyphae dextrinoid, tropical to subtropical species on hardwoods..... 2  
 1. Skeletal hyphae non-dextrinoid, boreal species on conifers..... **D. squalens**
2. Hyphal pegs common on the tube walls, dendrohyphidia absent..... **D. setulosus**  
 2. Hyphal pegs absent, dendrohyphidia present along the dissepiments.... **D. cavernulosus**

**Dichomitus cavernulosus** (Berk.) Masuka & Ryvarden

Mycol. Research. 103:1127, 1999. - *Polyporus cavernulosus* Berk., Hooker's J. Bot. 8:235, 1856.

**Basidiocarps** annual, resupinate, coriaceous, separable from the substrate, up to 2 mm thick, margin narrow, white to cream; pore surface concolorous or becoming pale woody brown in age, pores angular, 2-4 per mm, dissepiments finely fimbriate in actively growing specimens, tubes shallow, up to 1 mm long; context white to ochraceous, less than 1 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled and 2-4 Fm wide; skeletal hyphae common, hyaline to pale yellowish, thick-walled to solid, unbranched and flexuous, 2-4 Fm wide, strongly dextrinoid; binding hyphae strongly branched, solid, dextrinoid, mostly confined to the context.

**Dendrohyphidia** present, but difficult to find in old and dry specimens, delicately thin-walled and variably branched in the upper part, most common in the dissepiments, up to 25 Fm long from the clamp at the base.

**Basidia** clavate, 25-35 x 5-8 Fm, with four sterigmata.

**Basidiospores** subellipsoid, (10)12-16 x 5-7 Fm.

**Substrata.** On hardwoods, usually on hanging and exposed dead branches.

**Distribution.** Pantropical species, also known from subtropical and warm-temperate Eastern North America and Asia (Zhejiang in China, Okinawa and Honshu in Japan, and Far East Russia).

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

**Dichomitus setulosus** (Henn.) Masuka & Ryvarden

Mycol. Research 103:1130, 1999. - *Poria setulosa* Henn., Engl. Bot. Jahrb. 28:321, 1901.

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

**Datronia stereoides** (Fr.:Fr.) Ryvardeen

Flora over Kjuker p. 42, 1968. - *Polyporus stereoides* Fr.:Fr., Syst. Mycol. 1:369, 1821. - *Trametes sendaiensis* Yasuda, Bot. Mag. Tokyo 36:21, 1922.

**Basidiocarps** annual, resupinate to discoid with a lifted margin or effused-reflexed, pileus up to 1 cm wide and shelf-like elongated, rarely dimidiate with a contracted base; pilear surface brown, usually azonate, tomentose to radially strigose; pore surface pale pinkish-buff, with an ashy tint, pores circular to hexagonal, regular, 4-5 per mm, dissepiments thick, entire, farinose, tubes concolorous and continuous with the lower context, up to 1 mm long; context thin, duplex, up to 2 mm thick, lower portion pale brown, firm-fibrous, separated from the dark upper tomentum by a thin, black cuticle.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, 2-2.5 Fm wide; skeletal hyphae thick-walled, 2-4 Fm wide, multibranched, straight, in the lower context pale greenish brown in KOH, in the dark upper layer dark brown.

**Dendrohyphidia** richly branched and contorted, abundant in the dissepiments, 1.5-2 Fm wide.

**Cystidia** absent; cystidiols fusoid, not projecting, 20-25 x 5-6 Fm.

**Basidia** clavate, 25-40 x 7-8.5 Fm, with four sterigmata.

**Basidiospores** cylindrical, 8-12 x 3.5-4.5 Fm.

**Substrata.** On dead hardwoods, also found on *Picea*.

**Distribution.** Circumpolar species but rare, known from North America, Europe, and East Asia (China, Japan, and Far East Russia).

**Remarks.** The farinose dissepiments are due to abundant dendrohyphidia. The thin basidiocarps and the smaller pores separate *D. stereoides* from the much more common *D. mollis*.

**DICHOMITUS** D.A. Reid

Rev. Biol. 5:149, 1965.

Basidiocarps annual to perennial, resupinate to effused-reflexed; pilear surface white to blackish; pore surface white, cream to pale greyish, in some specimens with a darkened margin, pores small to large; context white to cream; hyphal system dimitic; generative hyphae with clamps; arboriform hyphae with a main, straight stem and branches with tapering ends; cystidia absent; basidiospores cylindrical to oblong ellipsoid, hyaline, thin-walled, negative in Melzer's reagent. On dead conifers and hardwoods, causing a white rot. Widespread genus.

**Type species:** *Trametes squalens* P. Karst.

**Remarks.** The arboriform skeletal hyphae and the white rot separates this genus from similar *Antrodia* species. The genus is related to *Polyporus* s. str. because of the typical binding hyphae and the cylindrical basidiospores.

**Key to species**

Basidiocarps annual, resupinate to effused-reflexed, white to light-coloured; pores circular to angular, medium to small; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae hyaline, thick-walled, negative in Melzer's reagent to weakly amyloid; cystidia absent or present; basidiospores allantoid to ellipsoid, thin-walled, smooth, negative in Melzer's reagent. On dead conifers and hardwoods. Causes a white rot.

**Type species:** *Trametes flavescens* Bres.

**Remarks.** The genus is similar to *Antrodia* and is separated mainly because all *Antrodia* species produce a brown rot. The borderline towards *Antrodiella* is vague as both genera include species with the same hyphal system, type of basidiospores and type of rot. However, the basidiospores of *Antrodiella* species are small and ellipsoid, and the basidiocarps are usually dense and cartilaginous.

*Diplomitoporus lindbladii* differs from the other species described here by having a softer basidiocarp, and amyloid skeletal hyphae which partly dissolve or become gelatinized in 3% KOH. Since the type of rot, the hyphal system and the basidiospores are of the same length and type, we feel that the deviating characters mentioned above do not justify a separate genus.

### Key to species

(For a synoptic key, see *Antrodia*)

1. Pore surface whitish to pale grey, skeletal hyphae amyloid, dissolving partly (gelatinizing) in KOH, basidiospores 1.5-2 Fm.....**D.**

#### **lindbladii**

1. Pore surface cream to straw-coloured, skeletal hyphae unchanged in Melzer's reagent and KOH, basidiospores 2-3 Fm wide .....2

2. Basidiocarps strictly resupinate although slightly curling when dry; pore surface deeply cracked in polygons, pores 3-4 per mm; boreal species on *Picea* ..... **D.**

#### **crustulinus**

2. Basidiocarps usually effused-reflexed, not curling when dry; pore surface even, pores 1-3 per mm; widespread species on *Pinus*..... **D. fla-**

#### **vscens**

**Diplomitoporus crustulinus** (Bres.) Domanski

Acta Soc. Bot. Pol. 39:192, 1970. - *Poria crustulina* Bres., Mycologia 17:75, 1925.

**Basidiocarps** annual, resupinate, up to 4 mm thick, separable, tough when fresh, woody hard when dry, margin narrow, white to pale yellowish brown; pore surface cream to very pale straw-coloured, with age and drying straw-coloured to pale yellowish brown, mostly cracking up in irregular pieces 1-4 cm long and wide as the

**Hyphal system** dimittic; generative hyphae with clamps, thin-walled and 1.5-3.5 Fm wide; skeletal hyphae straight, unbranched or sparingly branched, thick-walled to solid, dextrinoid, 1.5-6 Fm wide.

**Cystidia** absent; hyphal pegs abundant, hyaline, 40-160 x 15-40 Fm, often acute, covering the dissepiments.

**Basidia** clavate, often guttulate, 18-30 x 7-10 Fm.

**Basidiospores** cylindrical, 10-14 x 4-6 Fm.

**Substrata.** On hardwoods, usually in exposed localities.

**Distribution.** Pantropical, known from South East United States, and subtropical to warm-temperate China (Yunnan), Japan (Okinawa), Far East Russia, and Taiwan.

**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.

**Dichomitus squalens** (P. Karst.) D.A. Reid

Rev. Biol. 5:149, 1965. - *Trametes squalens* P. Karst. in Rab., Wint., Fungi Eur. no. 3528, 1886.

**Basidiocarps** annual to biennial, pileate, effused-reflexed or resupinate, single to imbricate, individual pilei usually triquetrous, up to 3 cm wide, 1-7 cm long, 3-1.5 cm thick at the base, tough and corky when fresh, hard when dry; pilear surface white to cream, with age discoloured and ultimately bay to almost blackish from the base and then with a very thin cuticle, at first finely tomentose, later glabrous, azonate or slightly concentrically zonate, in dry condition often slightly wrinkled radially, margin white, narrow to glabrous, discoloured with age; pore surface white to wood-coloured, with age more yellowish or discoloured in light brown and grey shades, often unevenly, pores circular to angular, 4-5 per mm, with thin dissepiments, tubes concolorous with the pore surface or paler, up to 1 cm long; context white, tough-fibrous to corky, azonate, 1-4 mm thick.

**Hyphal system** dimittic; generative hyphae with clamps, thin-walled, hyaline, 1.5-4 Fm wide; arboriform hyphae dominant, hyaline, thick-walled to solid, up to 7 Fm wide in the main stem, branching and tapering at the apices.

**Cystidia** absent, fusoid cystidiols present, 20-30 x 5-7 Fm.

**Basidia** clavate, 15-22 x 6-8 Fm, with four sterigmata.

**Basidiospores** cylindrical to oblong-ellipsoid, 7-10 x 2.5-3.5 Fm.

**Substrata.** On living and dead conifers.

**Distribution.** Circumpolar in the coniferous zone. In East Asia known from Northern China (Changbai), Japan (Hokkaido), and Far East Russia.

**Remarks.** Macroscopically the species can be taken for an *Antrodia* species, particularly *A. serialis*, especially when young and whitish. However, the arboriform hyphae and the white rot will be diagnostic.

**DIPLOMITOPORUS** Domanski

Acta Soc. Bot. Pol. 39:191, 1970.

this species. *Antrodia primaeva* is rather similar macroscopically, but causes brown rot, its basidiospores are larger and the context is almost monomitic.

**Diplomitoporus lindbladii** (Berk.) Gilb. & Ryvarden

Mycotaxon 22:364, 1985. - *Polyporus lindbladii* Berk., Grevillea 1:54, 1872.

**Basidiocarps** annual, resupinate, becoming widely effused, soft to tough, up to 6 mm thick, separable, margin white, narrow to wide; pore surface white to greyish, pores circular, 3-5(-6) per mm, tubes up to 5 mm long, greyish towards the surface, more white towards the context, hyphal pegs variably present; context white and cottony, azonate, up to 3 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, 3-5.5 Fm wide; skeletal hyphae hyaline, straight to sinuous, thick-walled to solid, rarely branched, 3-8 Fm wide, gelatinizing in KOH, weakly amyloid in Melzer's reagent, sometimes dextrinoid, most easily seen in hyphal masses; binding hyphae hyaline, narrow and richly branched, observed only in the context, 2-4 Fm wide, apparently rare.

**Cystidia** absent; fusoid, non-projecting cystidiols occur scattered among the basidia.

**Basidia** clavate, 15-20 x 4-6 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 5-7 x 1.5-2 Fm.

**Substrata.** On conifers and hardwoods of many kinds.

**Distribution.** Circumpolar in the coniferous zone. In East Asia known from Northern China (Changbai), Japan (Hokkaido), and Far East Russia.

**Remarks.** The greyish pore surface is usually diagnostic for a field determination. Microscopically the gelatinized, slightly amyloid skeletal hyphae will be sufficient for a determination. The species is the type of *Cinereomyces* Jülich, available for those who prefer a more narrow generic concept.

**DONKIOPORIA** Kotl. & Pouzar

Persoonia 7:214, 1973.

Basidiocarps perennial, resupinate, woody, dark brown; pores small; context brown, separated from the substrate by a black line; hyphal system trimitic; generative hyphae with clamps; skeletal hyphae pale brown; binding hyphae hyaline; cystidia absent; basidiospores ellipsoid, thin-walled and hyaline, negative in Melzer's reagent. On hardwoods, preferably *Quercus*, causing a white rot. Monotypic and circumpolar genus.

**Type species:** *Boletus expansus* Desm.

**Remarks.** Superficially the type species resembles a resupinate *Phellinus* sp., but the clamps on the generative hyphae immediately exclude this genus. The brown tissue and clamped generative hyphae are characters also found in *Gloeophyllum*. However, *Gloeophyllum* species cause a brown rot, have cylindrical basidiospores and, in most species, also cystidia.

basidiocarp contracts during drying, pores angular, 3-4 per mm, with thin dissepiments, tubes as if soaked with some light yellowish resinous substance, but consistency rather hard, up to 3 mm long; context white to pale straw-coloured, soft to more compressed in old specimens.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, 2-4 Fm wide; skeletal hyphae dominant, solid to thick-walled, hyaline, negative in Melzer's reagent, 2-6 Fm wide, straight, rarely branched.

**Cystidia** absent; pointed, non-projecting cystidiols occur scattered among the basidia, 12-20 x 5-7 Fm.

**Basidia** clavate, 15-20 x 4-6 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 5-7 x 2-2.5 Fm.

**Substrata.** On conifers.

**Distribution.** Circumboreal in the coniferous zone. In East Asia known from Japan.

**Remarks.** Usually easy to recognize because of the deeply cracked basidiocarps with the even straw-coloured pore surface. Microscopically the relatively large allantoid basidiospores, separate it from other macroscopically similar species. *Diplomitoporus lindbladii* has somewhat similar basidiospores but its basidiocarps are normally greyish, and rather soft and cottony when dry and with amyloid skeletal hyphae.

***Diplomitoporus flavescens* (Bres.) Domanski**

Acta Soc. Bot. Pol. 39:191, 1970. - *Trametes flavescens* Bres., Ann. Mycol. 1:81, 1903.

**Basidiocarps** annual, adnate, resupinate to effused-reflexed with a narrow pileus, up to 3 cm wide and 2 cm thick at the base, tough, margin white and finely floccose; pilear surface (when present) finely tomentose, azonate, at first whitish, but soon cream to pale straw-coloured; pore surface cream to straw-coloured, pores angular, 2-4 per mm, often glancing when fresh, with thin dissepiments, tubes concolorous with the pore surface, up to 5 mm long; context white to cream-coloured, 1-3 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin- to slightly thick-walled, hyaline, 2-4 Fm wide; skeletal hyphae common only in the trama, thick-walled to solid, hyaline, 2.5-6 Fm wide.

**Cystidia** absent; hyaline, pointed cystidiols often present in the hymenium, 16-23 x 4-5 Fm.

**Basidia** clavate, 15-22 x 5-6 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 5-7 x 2-3 Fm.

**Substrata.** Known only from *Pinus* species.

**Distribution.** Eurasian species common in continental coniferous forests, in East Asia known from Changbai (China) and Japan.

**Remarks.** The fairly large allantoid basidiospores, the pale straw-coloured basidiocarp, and the restriction to *Pinus* are diagnostic characteristics for identification of

**Basidiocarps** resupinate, effused-reflexed to more rarely distinctly pileate, often widely effused along fallen logs, tough and coriaceous; pilear surface glabrous, widely concentrically zonate, first white to cream, soon covered by a reddish cuticle starting from the base, in old specimens covering almost the whole surface, in young reflexed specimens often visible only as a very narrow zone next to the substrate, when dry the cuticle is often slightly wrinkled, individual pilei up to 1 cm thick at the base and rarely more than 4 cm wide; pore surface white to cork-coloured, pores sinuous to semidaedaloid, especially on sloping parts of the basidiocarp, 2-3 per mm, but individual elongated pores up to 6 mm long, tubes concolorous, up to 5 mm long; context white, tough, up to 3 mm thick, in section with a distinct dark line where covered with the reddish cuticle.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 1.5-4 Fm wide, often difficult to find in dry specimens; skeletal hyphae dominant, thick-walled to solid, hyaline, 3-6 Fm wide; binding hyphae as skeletal hyphae but branched with tapering side-branches.

**Basidia** clavate, 15-22 Fm long, with four sterigmata.

**Basidiospores** cylindrical to oblong-ellipsoid, 7-10.5 x 3-4 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Widespread and common in tropical and subtropical areas, especially in open and degraded forests. In East Asia known from China, Japan, Taiwan, Far East Russia, Northern Thailand, and Vietnam.

**Remarks.** Normally this species is easy to recognize because of the effused-reflexed, tough basidiocarps with a reddish cuticle and irregular, elongated and sinuous pores. Resupinate specimens can look like *Dichomitus cavernulosus*, but this species has dextrinoid hyphae.

## **ECHINOCHAETE** D.A. Reid

Kew Bull. 17:283, 1963.

Basidiocarps annual, flabelliform to spatulate with a short stipe-like base, pileus velutinous especially near the attachment, more glabrous when old, whitish-pink when fresh, reddish to brown when dry, pores angular to hexagonal, small to large; hyphal system dimitic; generative hyphae with clamps, hyaline and thin-walled; skeleto-binding hyphae thick-walled, golden to rusty brown, strongly dextrinoid; cystidia spinulose, present on the pilear surface, in the hymenium or in the dissepiments; basidiospores cylindrical to ellipsoid, hyaline, smooth and thin-walled. Tropical genus on hardwoods and causing a white rot.

**Type species:** *Polyporus megaloporus* Mont. = *P. brachyporus* Mont.

**Remarks.** The genus is characteristic with the setoid cystidia on the pilear surface, in the hymenium or in the dissepiments, and the strongly dextrinoid hyphae in the context. There are very small differences between the hyphal structure and basidiospore size of the species in the genus, which are mainly separated by macroscopic differences and shape of the setoid elements.

**Donkioporia expansa** (Desm.) Kotl. & Pouzar

Persoonia 7:214, 1973. - *Boletus expansus* Desm., Cat. Pl. Omis. pl. 18, 1823.

**Basidiocarps** perennial, resupinate, widely effused, tough when fresh, brittle when dry, up to 2 cm thick, margin often abrupt, pale brown; pore surface dark sienna to umber brown, pores round to angular, 4-5 per mm, tubes long and regular, especially on sloping substrates, up to 2 cm long, umber brown; context rusty to golden brown, 1-3 mm thick, often separated from the substrate by a distinct black layer, the whole basidiocarp black in KOH.

**Hyphal system** trimitic; generative hyphae with clamps, in the trama hyaline, 2-5 Fm wide, in the context pale golden brown, thick-walled and 3-6 Fm wide; skeletal hyphae mostly in the context, golden brown, 3-7 Fm wide; close to the context and in pits in the attacked wood often branched hyaline and narrow hyphae, 1-4 Fm wide.

**Cystidia** absent; some subulate cystidiols may occur.

**Basidia** clavate, up to 30 Fm long, often slightly constricted in the upper part, with four sterigmata.

**Basidiospores** ellipsoid, 4.5-6 (7) x 3.2-3.7 Fm.

**Substrata.** Usually on *Quercus* used as structural timber, also reported on *Castanea* and *Ulmus*.

**Distribution.** Eastern North America, Central Europe, and recently cited for temperate China (Dai 1996a).

**Remarks.** The clamped generative hyphae should easily separate this species from *Phellinus*.

**EARLIELLA** Murrill

Bull. Torr. Bot. Cl. 32:478, 1905.

Basidiocarps annual to biennial, resupinate, effused-reflexed to pileate, tough; pilear surface, when present, glabrous, first white to cream, then with a reddish cuticle spreading from the base; pore surface white to cork-coloured, pores elongated and sinuous; context white to wood-coloured; hyphal system trimitic; generative hyphae with clamps; skeletal and binding hyphae hyaline; cystidia absent; basidiospores cylindrical to oblong ellipsoid, hyaline and negative in Melzer's reagent. Causes a white rot in hardwoods. Monotypic, tropical genus.

**Type species:** *Earliella cubensis* Murrill = *Polyporus scabrosus* Pers.

**Remarks.** The genus is undoubtedly related to *Trametes*, sharing the same type of hyphal system and basidiospores. The basidiocarp, however, is deviating as it is frequently resupinate to effused-reflexed, and has sinuous pores.

**Earliella scabrosa** (Pers.) Gilb. & Ryvarden

Mycotaxon 22:364, 1985. - *Polyporus scabrosus* Pers. in Gaudich., Voy. aut. Monde p. 172, 1827.

(Guangxi), Japan (Okinawa), and Vietnam.

**Remarks.** The species resembles *Polyporus tenuiculus* when fresh, by its flabelliform basidiocarps with hexagonal pores. Instead of being pure white, *E. brachyporus* always has pinkish spots, especially when bruised.

**Echinochaete ruficeps** (Berk & Broome) Ryvardeen

Norw. J. Bot. 19:231, 1972. - *Favolus ruficeps* Berk. & Broome, J. Linn. Soc. Bot. 14:57, 1873.

**Basidiocarps** annual, pileate, often caespitose, dimidiate to flabelliform or spatulate with a tapering base or with a distinct stipe 1-5 cm wide, 1-4 cm measured radially and 2-5(7) mm thick, thinning out towards the margin, consistency brittle to hard when dried; pilear surface flat to convex, pale to dark reddish brown, first minutely tomentose, when old smoother to rough with tomentum only near the stipe, sometimes radially striate, margin deflexed when dry, even or lobed; stipe short, 1 cm long, 2-5 mm wide, with decurrent pores on the lower side, tomentose on the upper side; pore surface pinkish ochraceous to dark brown, pores angular to hexagonal, 1-2 per mm, often elongated radially towards the stipe, dissepiments thin, entire to fimbriate, tubes up to 4 mm long, usually paler than the pore surface, but darker than the context which is brittle to fibrous, 0.5-3 mm long, straw to ochraceous.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline and thin-walled, 2.5-4 Fm wide; skeleto-binding hyphae golden, thick-walled to solid, 2.5-6 Fm wide, context hyphae dextrinoid in mass, hyaline to pale yellow, relatively thin-walled, 2-11 Fm wide; the tomentum consists of yellowish, slightly thick-walled generative hyphae with large clamps and skeleto-binding hyphae with secondary simple septa, up to 10 Fm wide.

**Cystidia** thick-walled and dark brown, up to 35 x 12 Fm, spines up to 9 Fm long, in the dissepiments more hyphoid, on the pileus abundant and up to 90 Fm long, brown, thick-walled and with occasional lateral, pointed spines near the top, some of them are without spines and with secondary septation towards the apex.

**Basidia** broadly clavate, 20-22 x 6-8 Fm, with four sterigmata.

**Basidiospores** subcylindrical to ellipsoid, 8.5-12(13.5) x 3.2-4 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Paleotropical species, extending to subtropical Japan (Okinawa).

**Remarks.** Macroscopically *E. ruficeps* is close to *E. brachyporus*, but the former is often smaller and with a darker pilear surface due to the abundant cystidia in the pilear tomentum.

**Echinochaete russiceps** (Berk. & Broome) D.A. Reid

Kew Bull. 17:285, 1963. - *Polyporus russiceps* Berk. & Broome, J. Linn. Soc. Bot. 14:48, 1873.

**Basidiocarps** annual, usually solitary, 2-6 cm wide and long, 1-4 mm thick, spatulate to flabelliform, narrowing behind to a flattened stipe-like base, 4-1 cm wide,

### Key to species

1. Pores small, 4-6 per mm..... **E. rus-**  
**siceps**  
 1. Pores larger, 1-2 per mm.....  
 .... 2
2. Basidiocarps up to 10 cm wide, cystidia few or lacking on pileus..... **E. brachy-**  
**porus** 2. Basidiocarps 1-5 cm wide, cystidia common pileus.....  
**E. ruficeps**

### **Echinochaete brachyporus** (Mont.) Ryvarden

Bull. Jard. Bot. Nat. Belg. 48:101, 1978. - *Polyporus brachyporus* Mont., Ann. Sci. Nat. ser. 4, 1:131, 1854.

**Basidiocarps** annual, usually solitary, dimidiate, often with a distinct tapering stipe, up to 12 cm wide and long and 7 mm thick, consistency brittle when dry; pilear surface whitish to pinkish, darker when bruised, dark-cinnamon to rust-coloured when dry, azonate, first sparsely tomentose, soon more glabrous except the area near the stipe where the tomentum persists, towards the stipe the surface can be reticulated with a system of raised, vein-like ribs, margin entire, often depressed when dried; stipe usually short, solid, up to 1 cm long and broad, often darker than the pileus, upper part finely tomentose, on the lower side partly covered with pores or radiate ribs; pore surface whitish with pinkish spots when fresh, wood to rust-coloured when dry, pores angular, 1-2 per mm, but measuring 1-2 mm in radial direction, especially near the stipe, dissepiments thin, fimbriate to lacerate, tubes concolorous or paler than the pore surface, up to 5 mm long; context pale wood-coloured to umber, up to 3 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline and thin-walled, 2.5-3.5 Fm wide; skeleto-binding hyphae moderately to heavily branched, thick-walled, yellow to pale brown, up to 8 Fm wide, contextual hyphae weakly dextrinoid; upper tomentum consists of thick-walled to almost solid hyphae, up to 5 Fm wide, with yellowish walls, some of them have a few lateral spines and also a few simple septa.

**Cystidia** abundant in the hymenium, few or lacking in the pileus tomentum, thick-walled, yellow to brown, those of the hymenium spinulose with acute to rounded side-branches, those of the pileus unbranched or occasionally with a few acute, lateral protuberances, occasionally with adventitious septa.

**Basidia** broadly clavate, 16-22 x 6-8 Fm, with four sterigmata.

**Basidiospores** cylindrical, hyaline, 9.5-13 x 3.5-5.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Pantropical and rather common. Also known from subtropical China

1. Context brick red, on conifers..... **E.**  
**tsugicola**  
 1. Context cinnamon to olivaceous, on *Quercus*..... **E.**  
**japonicum**

**Echinodontium japonicum** Imazeki

J. Jap. Bot. 11:520, 1935.

**Basidiocarps** perennial, effused-reflexed to almost resupinate, pileus irregular to lacking, up to 4 mm wide; pilear surface almost glabrous with a black cuticle, smooth to slightly rough, concentrically sulcate; pore surface hydroid with sordid white to pale buff, rigid, conical spines up to 1 cm long and 0.5 mm wide, often flattened or forked; context woody hard, cinnamon to olivaceous, up to 1 mm thick, with a black cuticle next to the substrate.

**Hyphal system** dimitic; generative hyphae simple-septate, some with scattered clamps, hyaline to pale yellow, 2-4 Fm wide; skeletal hyphae thick-walled, pale brown, occasionally encrusted at the apex, 3-6 Fm wide.

**Metuloid cystidia** abundant, clavate, pale brown, thick-walled and apically encrusted, 30-50 x 7.5-10.5 Fm, mostly embedded in the trama.

**Gloeocystidia** present, mostly embedded and tubular, thin-walled and with a granular to oily content, up to 120 Fm long.

**Basidia** clavate, 20-25 x 6-8 Fm, with four sterigmata.

**Basidiospores** ellipsoid, finely echinulate, hyaline, strongly amyloid, 5.5-7.5 x 3.2-4.5 Fm.

**Substrata.** Parasitic on *Quercus*.

**Distribution.** Known from warm-temperate Japan (Kyushu and Southern Honshu), and India (Khadrala).

**Remarks.** *Echinodontium japonicum* is related to the East American *E. ballouii* (Banker) Gross, also with a cinnamon context, but growing on conifers (Gross 1964).

**Echinodontium tsugicola** (Henn. & Shirai) Imazeki

Jap. J. Bot. 11:517, 1935. - *Hydnofomes tsugicola* Henn. & Shirai, Bot. Jb. 28:268, 1900.

**Basidiocarps** perennial, pileate to effused-reflexed, solitary or 2-3 imbricate, flat, 1-8 cm long x 1-4 cm broad, 1-2 cm thick; pilear surface dark brown to black, zonate, rimose-rugose, margin brown, undulating, pubescent; hymenophore irpicoid, light buff, spines scattered to adjacent, conical, up to 1.5 cm long and 1-2 mm thick, inner trama brick orange, apices acute to blunt, fertile; context brick red, woody, zonate, 0.5-1 cm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, 3.5-4.5 Fm wide, hyaline, smooth, regularly branched; skeletal hyphae orange to rusty brown,

consistency coriaceous to brittle; pilear surface whitish-pink when fresh, mostly reddish brown to golden brown with an ochraceous tint when dry, minutely tomentose and often with dark, radiating lines and some dark, erect scales (more prominent when fresh); pore surface whitish when fresh, ochraceous-buff to dark brown when dry, pores angular, 4-6 per mm, easily seen with the naked eye, dissepiments thin and papery, tubes up to 1.5 mm long, concolorous with the pore surface; context up to 4 mm thick near the stipe, thin towards the margin, whitish when fresh, ochraceous buff when dry, usually paler than the tubes.

**Hyphal system** dimittic; generative hyphae with clamps, hyaline and thin-walled, 2-3 Fm wide; skeleto-binding hyphae dominant, yellow and thick-walled, 1-8 Fm wide, contextual skeleto-binding hyphae strongly dextrinoid in mass, up to 10 Fm wide.

**Cystidia** thick-walled and golden to dark brown, lanceolate, with projecting spines near the top, present in groups in the hymenium, but very scanty, up to 35 x 10 Fm, also present on the pilear surface where they are extremely abundant and larger than in the hymenium, up to 100 Fm long, appearing as golden to dark-brown spiny hyphae.

**Basidia** broadly clavate, 18-20 x 6-8 Fm, with four sterigmata.

**Basidiospores** subcylindrical to ellipsoid, 8-11 x 3.5-4.75 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Paleotropical species, rare in Africa, in East Asia known from subtropical Japan, Vietnam, and Taiwan.

**Remarks.** The species is easily recognized by the small pores and the long and slender cystidia with spines near the apex.

### **ECHINODONTIUM** Ellis & Ev.

Torrey Bot. Club. Bull. 27:49. 1900.

Basidiocarps perennial, pileate to effused-reflexed; pilear surface becoming black and rimose; hymenophore poroid to daedaleoid at the margin, tubes splitting soon after differentiation to form a distinctly hydneous hymenophore; context hard, woody, cinnamon or brick-red; hyphal system dimittic; generative hyphae with clamps; skeletal hyphae thick-walled, brown, scarcely branched; cystidia thick-walled, apically encrusted; basidiospores ellipsoid, minutely echinulate, amyloid. Causing white heartrot of living conifers and hardwoods.

**Type species:** *Fomes tinctorium* Ellis & Ev.

**Remarks.** Gross (1964) monographed the family Echinodontiaceae Donk emend. Gross and recognized six species, which he placed in the genus *Echinodontium*.

Three of these, *E. tinctorium*, *E. tsugicola*, and *E. japonicum* have strongly hydneous hymenophores that develop from splitting of the dissepiments. The latter two are known from Japan.

Key to species

**Hyphal system** mono-dimitic; generative hyphae with distinct clamps, thin- to thick-walled, moderately branched, 2.5-4 Fm wide; skeletal hyphae in the context and the core of the conidia-producing spines, thick-walled, hyaline to faintly yellowish with age, 2.5-5 Fm wide.

**Cystidia** of two types: 1) hymenial lagenocystidia, 15-20 x 8-10 Fm, encrusted at the apex, 2) bulbous to pyriform, thick-walled skeletocystidia in the context and dissepiments, arising laterally, head up to 10 Fm wide.

**Arthroconidia** thick-walled, oblong-ellipsoid to citriform, 8-13 x 4-6 Fm, arising terminally on slightly thick-walled generative hyphae.

**Basidia** broadly clavate, 10-16 x 5-7 Fm, with four sterigmata.

**Basidiospores** globose, 5-5.5 x 4-5 Fm.

**Substrata.** Reported from *Theobroma* and other hardwoods.

**Distribution.** Paleotropical species, in Asia reported from Sri Lanka, Malaysia, Indonesia, and subtropical Japan (Okinawa).

**Remarks.** The arthroconidia produced on hydroid processes along the margin make this a distinct species.

**ELMERINA** Bres.

Ann. Mycol. 10:507, 1912.

Basidiocarps substipitate, pileate or resupinate; pilear surface, when present, smooth, tomentose or scrupose; pore surface creamy buff, pinkish or pale brown, hymenophore poroid with angular to hexagonal pores, or lamellate, usually with conspicuous hyphal pegs; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae unbranched, hyaline to pale yellowish, thick-walled but usually with a lumen; cystidia present or absent; probasidia initially ovate to obpyriform, aseptate, when mature septate in the upper part (epibasidium), leaving a basal, aseptate hypobasidium; basidiospores thin-walled, ovoid, smooth, negative in Melzer's reagent. On hardwoods. Mainly a tropical genus.

**Type species:** *Hexagonia cladophora* Berk.

**Synonym:** *Protodaedalea* Imazeki.

**Remarks.** The genus belongs in Tremellales, but is included here because of its poroid hymenophore. The other poroid heterobasidiomycete genus, *Protomerulius*, has globose, septate probasidia.

Key to species

1. Basidiocarps resupinate, poroid, brownish, basidiospores 8-10 Fm long... **E.**

**borneensis**

1. Basidiocarps pileate..... 2

2. Hymenophore poroid, basidiocarps applanate, white..... **E. hexagonioides**

thick-walled to solid, 3.5-4.5 Fm wide, rarely branched.

**Cystidia** subulate to fusiform, encrusted in the upper half, 30-40 x 6-10 Fm, protruding up to 15 Fm, at first thin-walled and hyaline, becoming thick-walled and orange brown.

**Basidia** clavate, 20-30 x 6-8 Fm, with four sterigmata.

**Basidiospores** ellipsoid, thick-walled, hyaline, strongly amyloid, minutely echinulate, 6-8 x 4-6 Fm.

**Substrata.** Known on *Tsuga diversifolia*, *T. sieboldii*, and *Abies firma*.

**Distribution.** Only known from cold-temperate Japan (Nagano and Tochigi in Honshu).

**Remarks.** The species is very similar to the North American *E. tinctorium* (Ellis & Everh.) Ellis & Everh., but this species is triquetrous and up to 10 cm thick, and with flat to conical spines with fibrous, sterile dissepiments, darker than the rest of the spine (Gross 1964).

### **ECHINOPORIA** Ryvarden

Prelim. Polyp. Fl. East Africa p.325, 1980.

Basidiocarps resupinate to pileate, at the margin or on the pileus with hydroid conidiophores, pore surface white to cream; hyphal system mono-dimitic; generative hyphae thick-walled, with clamps, in the dissepiments ending in bulbous cystidia-like organs; arthroconidia ovate, thick-walled and produced from hyphal ends; basidiospores hyaline, thin-walled and globose, negative in Melzer's reagent. Tropical to subtropical genus with two species.

**Type species:** *Polyporus hydnochorus* Berk. & Broome

**Remarks.** The genus is characterized by its conidial state that mostly occurs along the margin in resupinate basidiocarps or on the pileus in pileate basidiocarps. The hyphal system indicates *Schizopora* as the closest relative, but a conidial state is unknown in this genus.

### **Echinoporia hydnochora** (Berk. & Broome) Ryvarden

Prelim. Polyp. Fl. East Africa p. 326, 1980. - *Polyporus hydnochorus* Berk. & Broome, J. Linn. Soc. 14:54, 1873.

**Basidiocarps** annual, effused-reflexed to resupinate, pilei up to 2 cm long and 5 mm wide, when resupinate mostly pulvinate with a distinctly thickened centre, up to 4 mm thick, rather soft and fragile when dry; pilear surface white to ochraceous, azonate and finely pubescent; pore surface white to ochraceous, pores angular and variable, mostly 3-5 per mm, tubes up to 3 mm long, white; context white and soft, 1-2 mm thick; conidial stage as hydroid to slightly clavate, white to ochraceous conidiophores arising on the pileus or along the margin on the fertile basidiocarp, often recorded without a fertile stage, each tooth up to 0.5 mm high and about 100 Fm wide, slightly widened towards the apex, finely pulverulent on the surface due to numerous conidia.

hyphal pegs 100 x 30 mm, in the context up to 6 mm wide, pilear hairs formed by clavate hyphal ends 20 x 6 mm arranged in hyphal tufts 100 x 60 mm.

**Probasidia** clavate, thin-walled, aseptate, 30-32 x 8-9 mm.

**Epibasidia** 9-12 x 8 mm, septate when mature and with four basidiospores.

**Basidiospores** ellipsoid to slightly allantoid, with a prominent lateral apiculus, 10.5-12.5 x 4.5-5.5 mm, usually glued in pairs.

**Substrata.** On hardwoods.

**Distribution.** Described from Singapore and later collected at Kyushu.

**Remarks:** Basidiocarps of *E. cladophora* are flabelliform to substipitate, brown to reddish-brown when dry, and have radially arranged pores, up to 1 mm wide. *E. hexagonioides* has dimidiate basidiocarps, cream to buff when dry, and hexagonal to irregular pores without any arrangement, usually up to 2 cm wide.

**Elmerina holophaea** (Pat.) Parmasto

Nova Hedw. 39:107, 1984. - *Lentinus holophaeus* Pat., Bull. Soc. Mycol. Fr. 23:76, 1907. - *Protodaedalea hispida* Imazeki, Rev. Mycol. 20:159, 1955.

**Basidiocarps** pileate, solitary or 2-3 imbricate, dimidiate to flabelliform, sessile or rarely with a short lateral stipe 1.5 cm long and 1 cm thick; pilei appanate to triquetrous, 4-10 x 5-18 x 2-4 cm, fleshy and hygrophanous when fresh, resinous and cartilaginous when dry; pilear surface pinkish-cinnamon when fresh, scrupose at the base with thick, branched hairs 2-3 mm long, radially arranged, shrinking when dry and then cinnamon to bay, strigose, the margin deflexed; hymenophore mostly lamellate, poroid at the margin which is sterile up to 3 mm, lamellae rosy buff, 3-5 per cm, up to 8 mm long when fresh, with a thick edge up to 2 mm, drying horny and blackish; context hygrophanous, pinkish and up to 1 cm when fresh, shrinking considerably when dry and then up to 3 mm, resinous in section.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, 3-5 Fm wide; skeletal hyphae agglutinated, yellowish with thickened walls but almost always with a lumen, up to 6 Fm wide, straight, some apically widened, up to 8 Fm wide; hairs of the pileus formed of densely agglutinated, yellowish hyphae with gelatinized walls.

**Cystidia** absent; hyphal pegs frequent, up to 180 x 55 Fm, formed by parallel, agglutinated skeletal hyphae.

**Basidia** broadly clavate and aseptate when immature, 30-38 x 9-12 Fm, then apically septate with four epibasidia 6 Fm long, leaving an aseptate hypobasidium below.

**Basidiospores** ellipsoid, with one side slightly flattened, (9.5)10-14 x 5.5-8 Fm, with a prominent apiculus.

**Substrata.** On deciduous trees, mainly on *Quercus*, but also on *Betula* and *Populus*.

**Distribution.** Asian species, known from Philippines, Vietnam, Northern China (Changbai), Japan (Honshu, Hokkaido), and Far East Russia.

**Remarks.** The species is recognized by its rosy, fleshy, lamellate basidiocarps when fresh that shrink considerably and become brown to bay and horny when dry.

2. Hymenophore lamellate, basidiocarps triquetrous, pinkish..... E.  
**holophaea**

**Elmerina borneensis** (Jül) D.A. Reid.

Persoonia 14:469, 1992. - *Aporpium borneensis* Jül., J. Linn. Soc. (Bot.) 81:45, 1980.

**Basidiocarps** resupinate, forming irregular to orbicular, adnate patches to 6 cm wide with an abrupt margin; pore surface buff brown, pores 1-2 mm wide, slightly smaller towards the margin, conspicuously angular to hexagonal, with numerous hyphal pegs projecting from the tube walls, dissepiments lacerate, tubes concolorous with the pore surface, shallow, up to 3 mm long; context very thin, up to 0.5 mm.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, difficult to find, 2-4 Fm wide; skeletal hyphae hyaline to yellowish, unbranched, 2-5.5 Fm wide, with a lumen, widening at the apex up to 8.5 Fm.

**Cystidia** usually abundant in the hymenium as thin-walled, fusoid or utriform cells, 20-35 x 4.5-6 Fm; hyphal pegs composed of heavily encrusted skeletal hyphae with a clavate apex.

**Basidia** initially clavate and aseptate, 16-20 x 8-9 Fm, becoming longitudinally septate in the apical portion (epibasidium), leaving an aseptate hypobasidium below.

**Basidiospores** ellipsoid to pyriform, 8-10 x 5-6 Fm.

**Substrata.** On hardwoods.

**Distribution.** Australasian species, known from Australia, Malaysia, and warm-temperate Japan (Kyushu).

**Remarks.** The species is recognized by its resupinate, brownish basidiocarps with wide hexagonal pores.

**Elmerina hexagonioides** (A. David) Núñez

Flora Botanica Estonica 33:100, 1998. - *Aporpium hexagonioides* A. David, Gard. Bull. 29:151, 1976.

**Basidiocarps** annual, pileate, dimidiate with a narrow base or broadly attached and with a resupinate part, 6 x 3 cm wide, up to 4 mm thick, flexible when fresh, not shrinking when dry, but becoming rigid, pilear surface cream to straw-coloured, darker at the base, azonate or with a light brown band close to the margin, covered by antler-like hairs up to 1 mm long, most abundant at the base, radially arranged forming crests towards the margin, margin undulate to lobate, and then deeply divided, seeming several pilei fused together; pores angular to hexagonal, cream when fresh, drying straw-coloured, 1-3 mm wide, not radially arranged, 1-3 mm wide, dissepiments lacerate, tubes up to 4 mm long, densely covered with hyphal pegs, which are easily seen with a lens; context thin, fibrose, straw-coloured, up to 2 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, dextrinoid in the trama and up to 3 mm wide; skeletal hyphae abundant, hyaline, thick-walled, parallel and straight, dextrinoid and up to 4 mm wide in the trama, forming

**Basidiospores** ovoid to amygdaliform, 3.5-4.5 x 2.5-3 Fm.

**Substrata.** On living and dead hardwoods, mainly at or close to the base of *Quercus*.

**Distribution.** Cosmopolitan in temperate hardwood forest ecosystems, in East Asia known from China and Japan.

**Remarks.** Together with *Laetiporus sulphureus* this species is the main cause for the inner decay of large oak trees, making them hollow in the end. The species seems to need a long period of decay before basidiocarps are produced and thus, they are invariably seen only on large and old trees.

### **FLABELLOPHORA** Cunn.

New Zeal. Dept. Sci. Industr. Res. Bull. 164:88, 1965.

Basidiocarps annual, caespitose to solitary, pileate to stipitate, arising from a submerged pseudosclerotium or lignicolous; pilei unilateral or superimposed upon a common stipe, with or without a crust; pores minute to small, mostly entire; context coriaceous; hyphal system mono- to dimitic; generative hyphae with clamps; skeletal hyphae variably present; cystidia absent; basidiospores cylindrical to globose, hyaline, negative in Melzer's reagent, smooth and thin-walled. Tropical genus, extending from Papua New Guinea to subtropical East Asia, and in South America.

**Type species:** *Polyporus superpositus* Berk.

**Remarks.** The genus is heterogeneous as defined here, and in need of revision. It is close to *Microporellus*, which has cystidia and dextrinoid skeletal hyphae.

### **Key to species**

- 1. Basidiospores broadly ellipsoid to subglobose..... **F. obovata**
- 1. Basidiospores cylindrical to allantoid..... **F. licmophora**

### **Flabellophora licmophora** (Masse) Corner

Nova Hedw. Beiheft 86:32, 1987. - *Polystictus licmophorus* Masee, Kew Bull. Misc. Inform. 153-54:171, 1899.

**Basidiocarps** annual, solitary or caespitose, stipitate to semisessile, pileus applanate, flabelliform, up to 7 x 3 cm wide and 3 mm thick, tough when dry; pilear surface camel, leather tan or cognac, darker brown towards the margin, smooth with uneven surface, faintly concentrically zonate towards the margin which is thin and acute, entire or lobed; stipe if present lateral, cylindrical and conspicuously expanded in a mycelial disc at the base, up to 4.5 cm long and 4 mm thick, smooth; pore surface pale yellowish when fresh, darkening to orange cream when dry, pores angular to regular, 9-12 per mm, with thin dissepiments, tubes pale orange cream, more brightly coloured than the context, 1.5 mm long, not stratified; context cream to light greyish, 1-2 mm thick, compact fibrous.

**FISTULINA** Bull:Fr.

Syst. Mycol. 1:396, 1821. - Hist. Champ. France p. 313, 1791.

Basidiocarps annual, sessile to laterally stipitate; pileus surface reddish to brown, scurfy to tomentose; context reddish and fleshy with a red sap, or white to ochraceous and firm-fibrous; tubes separate but closely packed, 4-6 per mm; hyphal system monomitic; clamps present or absent; cystidia present in the dissepiments; trichocysts present or absent; basidiospores ovoid, hyaline, negative in Melzer's reagent, 3-4.5 x 2-3 Fm. Causing a brown rot of dead and living hardwoods. Cosmopolitan genus with two species, one in East Asia.

**Type species:** *Boletus hepaticus* Schaeff.

**Remarks.** The genus belongs in the Cyphellaceae *sensu lato* due to the individual tubes lined with basidia. However, because of its superficial similarity to a polypore, the genus is normally included in mycotas of poroid fungi, and this tradition is also followed here.

**Fistulina hepatica** (Schaeff.:Fr.) Fr.

Syst. Mycol. 1:396, 1821. - *Boletus hepaticus* Schaeff., Fungi Bavar. 4:82, 1774.

**Basidiocarps** annual, sessile or laterally stipitate, single or several from a branched base or stipe; pileus dimidiate to reniform, up to 20 cm wide and 6 cm thick, at first soft and fleshy and readily exuding a reddish blood-like sap when squeezed or bruised, eventually more fibrous and tough in older specimens; pileus surface pinkish brown to more reddish or purplish brown, finely hispid to scurfy with hyphae aggregating in crowded papillate tufts, these wearing away to expose a relatively smooth, slimy, reddish to pale purplish brown cuticle with minute darker scales or radial striations, margin rounded to rather acute, concolorous; stipe lateral, scurfy with papillate tufts, these merging with tubes on the decurrent tubes, reddish at first, darkening to blackish-brown on the basal portion, up to 5 cm long and 3 cm wide or some sessile specimens with a broad, tapering base up to 8 cm wide; pore surface white at first, bruising darker and becoming dull brown with age and drying, pores about 4-6 per mm consisting of individual, crowded but easily separable tubes, white to pale buff, bruising dark reddish brown, drying pale brown, up to 1 cm long; context reddish, fleshy and juicy when fresh, with a blood-like exudate where cut or broken, mottled to marmorate, in older specimens or on drying becoming soft-fibrous, pale wood-brown, up to 5 cm thick.

**Hyphal system** monomitic; generative hyphae with simple septa and clamps, thin-walled, rarely branched, mostly 4-10 Fm wide, but with inflated portions up to 20 Fm wide; gloeoplerous hyphae present in the context; tramal hyphae hyaline, thin-walled, agglutinated and difficult to separate in sections from dried specimens, with rare branching, with abundant clamps, 2-5 Fm wide.

**Cystidia** in the dissepiment, cylindrical, thin-walled, 75 x 6-7 Fm.

**Basidia** clavate, 15-20 x 5-6 Fm, with four sterigmata.

Vietnam.

**Remarks.** The flabelliform basidiocarp, normally narrowly zonate in ochraceous to grey colours, and the minute pores are good field characters. Typical is the parallel wide generative hyphae with scattered large clamps in the context.

**FOMES** (Fr.) Fr.

Summa Veg. Scand. 2:319, 1849.

Basidiocarps perennial, sessile, unguulate; pilear surface gray to blackish, glabrous, with a hard and smooth crust; pore surface pale brown, pores small, regular, tubes brown, stratified; context pale brown, tough-fibrous; hyphal system trimitic; generative hyphae with clamps; binding and skeletal hyphae pale brownish; sclerids present in the context; cystidiols fusoid, embedded or slightly projecting; basidiospores cylindrical, large, hyaline, smooth, negative in Melzer's reagent. Causes a white rot of living or dead hardwoods. Small genus with two species, one in East Asia.

**Type species:** *Polyporus fomentarius* L.: Fr.

**Remarks.** The genus can be characterized as a perennial counterpart to *Hexagonia* which has the same hyphal system, large cylindrical basidiospores and coloured vegetative hyphae. The sclerids and the mycelial core so characteristic for *Fomes*, however, are not seen in *Hexagonia*.

**Fomes fomentarius** (L.:Fr.) Kickx

Flore Crypt. Flandres 2:237, 1867. - *Polyporus fomentarius* L.: Fr., Syst. Mycol. 1:374, 1821. - *Boletus fomentarius* L., Spec. Plant. p.1176, 1753.

**Basidiocarps** perennial, pileate, unguulate, up to 15 cm wide, tough, woody; pilear surface quickly developing a hard, glabrous crust, older part grey, zonate and shallowly sulcate, marginal part light brown, also zonate, minutely tomentose; pore surface concave, pale brown, pores circular, 4-5 per mm, with thick, entire dissepiments, tubes indistinctly stratified, comprising most of the interior tissue of the basidiocarp, light brown and becoming stuffed with white mycelium; context yellowish brown, tough-fibrous, azonate, up to 1 cm thick, granular core of varying size developing in the upper part of the context next to the substrate, mottled with a mixture of pale and darker areas.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, 2-4 Fm wide, inconspicuous; skeletal hyphae thick-walled, pale yellowish brown, 3-8 Fm wide; binding hyphae thick-walled, much-branched, 1.5-3 Fm wide; granular core a mixture of binding hyphae, narrow skeletal hyphae, and irregularly shaped, brown, thick-walled sclerids.

**Cystidia** absent; cystidiols often present in the hymenium, thin-walled, fusoid, 24-37 x 3.5-7.5 Fm, also hyphoid-like elements in the dissepiment, these up to 120 Fm long and 3-5 Fm wide, projecting to 55 Fm, some slightly encrusted.

**Basidia** with a swollen base, 23-25 x 7-9 Fm, with four sterigmata.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thick-walled, frequently branched at acute angles, up to 4.5 Fm wide; skeletal hyphae sparse in the context, hyaline, thick-walled but with a lumen, unbranched, up to 5.5 Fm wide, dextrinoid in mass.

**Dendrohyphidia** few, but present in the dissepiments.

**Basidia** clavate, 10-12 x 5 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly allantoid, 3.5-5 x 1.5-2 Fm.

**Substrata.** On dead wood.

**Distribution.** Tropical Asia, but not common. In East Asia known from tropical and subtropical China (Sichuan, Fujian, Hainan).

**Remarks.** This is a deviating species in *Flabellophora* because of the allantoid basidiospores and a dimitic hyphal system. Macroscopically the species reminds of *Microporus*, besides it has dendrohyphidia in the dissepiments and cylindrical to allantoid basidiospores, but lacks binding hyphae. *Microporellus* species have a dimitic hyphal system with dextrinoid skeletal hyphae, but basidiospores are invariably subglobose to broadly ellipsoid. We follow Corner (1987) and keep this species in *Flabellophora* until more material is available.

**Flabellophora obovata** (Jungh.) Nunez & Ryvarden comb. nov.

Basionym: *Polyporus obovatus* Jungh., Verh. Batav. Genootsch. 17:65, 1838.

Previous combination by Corner (Nova Hedwigia Beiheft 86:36) is illegitimate, basionym not mentioned.

**Basidiocarps** annual, solitary to gregarious, usually laterally stipitate or with a tapering base, more rarely sessile to centrally stipitate, pileus round, reniform, spatulate or flabelliform, 1-7 cm wide and broad, usually papery along the margin, up to 4 mm thick close to the stipe, rather brittle and hard when dry; pilear surface first white, then cream, ochraceous to straw-coloured often with some slightly darker greyish to amber zones, first finely tomentose to velvety striate, zonate, often also somewhat radially striate, with age becoming glabrous, first zonewise and then totally fulvous to bay; stipe 0-7 cm long, 1-5 mm wide, first finely velvety, then glabrous, usually concolorous with the pileus, with age somewhat wrinkled or scrupose by warts and agglutinated tufts of hyphae, at the base expanded into a mycelial disc, consistency hard; pore surface white, cream to pale straw-coloured, pores angular, thin-walled, 6-8 per mm, tubes up to 3 mm long; context white, up to 2 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled and agglutinated, in the context distinctly thick-walled and with a distinct lumen, 2.5-4.5 Fm wide; skeletal hyphae thick-walled to solid, 3-6 Fm wide, only present in the trama.

**Basidia** clavate, 18-20 x 6-8 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subglobose, 3.5-5 x 2-4.5 Fm.

**Substrata.** Dead hardwoods, but once collected on *Pinus* in Okinawa.

**Distribution.** Widespread in the tropical zone, more common in Asia, where it spreads to subtropical China (Guangxi and Yunnan), Taiwan, Japan (Okinawa), and

3. Basidiocarps applanate, pileus light brown, tropical species, on hardwoods..... **F. feei**

4. Basidiocarps perennial, becoming large and columnar to ungulate..... 5

4. Basidiocarps annual to biennial, applanate, often in imbricate clusters..... 7

5. Basidiocarps white, with a chalky, crumbly texture..... **F. officinalis**

5. Basidiocarps with a black cuticle and a tough texture..... 6

6. Temperate to boreal species, pileus red, then black and dull, on conifers.... **F. pinicola**

6. Tropical to subtropical species, pileus black and glossy, on hardwoods..... **F. pseudopetchii**

7. Pileus white to ochraceous..... 8

7. Pileus with a dark brown to black crust..... **F. rhodophaeus**

8. Basidiospores broadly ellipsoid, usually on *Quercus* or *Castanea*..... **F. spraguei**

8. Basidiospores cylindrical, on various substrates..... 9

9. Pores 6-8 per mm, tropical to subtropical species..... **F. nivosa**

9. Pores 2-6 per mm, temperate species..... 10

10. Pores 2-4 per mm, basidia 25-37 Fm long, cystidiols absent..... **F. palustris**

10. Pores 5-7 per mm, basidia 12-20 Fm long, cystidiols present..... **F. meliae**

**Fomitopsis cajanderi** (P. Karst.) Kotl. & Pouzar

Ceska Mykol. 11:157, 1957. - *Fomes cajanderi* P. Karst., Finska Vet. Soc. Öfv. Forh. 46(11):8, 1904.

**Basidiospores** cylindrical, 12-18 (20) x 4-7 Fm. They are produced only early in the spring, often in enormous numbers covering the vicinity of the basidiocarps as a white powder.

**Substrata.** Producing a mottled heartrot on living and dead trees in several genera of hardwoods, particularly common on *Betula* in the north and *Fagus* in the south, rarely on conifers like *Larix*.

**Distribution.** Very common species, circumboreal through Asia to North America and southward to North Africa. In East Asia known from China, Japan, and Far East Russia.

**Remarks.** The species is easy to recognize in the field by its unguulate, usually greyish basidiocarps with a hard and glabrous, sulcate crust. The granular core at the base of the context will immediately separate it from *Ganoderma* species.

### FOMITOPSIS P. Karst.

Medd. Soc. Fl. Fauna Fenn. 6:9, 1881.

Basidiocarps perennial or rarely annual, sessile to effused-reflexed, tough to woody; pore surface and context white to tan or pinkish, pores mostly small, regular; hyphal system di-trimitic; generative hyphae with clamps; cystidia present or absent; basidiospores subglobose to cylindrical, hyaline, smooth, negative in Melzer's reagent. Causing a brown cubical rot of living or dead conifers and hardwoods. Cosmopolitan genus, but most species are found in the boreal and temperate zones.

**Type species:** *Polyporus pinicola* Swartz: Fr.

**Remarks.** *Fomitopsis* includes species with a perennial or rarely annual basidiocarp and a dull to laccate, glabrous pileus. The brown rot and the perennial basidiocarp are the main characters that separate it from *Trametes*, which has the same type of basidiospores and hyphal system. Carranza-Morse & Gilbertson (1986) have a survey of all *Fomitopsis* species with a pink context.

### Key to species

1. Pore surface, context and tubes rose-pink to pinkish brown..... 2
1. Pore surface, context and tubes white, yellowish or pale buff, not pink .....4
2. Basidiospores allantoid, cystidiols present..... **F. cajanderi**
2. Basidiospores subcylindrical, straight, cystidiols absent..... 3
3. Basidiocarps unguulate, pileus black, boreal species, on conifers..... **F. rosea**

res.

**Fomitopsis meliae** (Underw.) Gilb. & Ryvar den

North Am. Polyp. 1:273, 1986. - *Polyporus meliae* Underw., Torrey Bot. Club Bull. 24:85, 1897.

**Basidiocarps** annual or biennial, sessile; pilei single to imbricate, up to 5 x 10 x 3 cm, dimidiate, pilear surface ivory to tan or cinereous, glabrous to minutely tomentose or scrupose, azonate; pore surface ochraceous, pores circular to angular, with thick to thin, entire dissepiments, 5-7 per mm, tubes single or indistinctly stratified, concolorous with the context, up to 5 mm long; context pale buff, azonate, drying tough-corky, up to 2.5 cm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 2-3 Fm wide; skeletal hyphae thick-walled, hyaline, with rare branching, 2-8 Fm wide; binding hyphae thick-walled, hyaline, much branched, 2-4 Fm wide.

**Cystidia** absent; fusoid cystidiols present, thin-walled, not projecting, 15-23 x 4-5 Fm.

**Basidia** clavate, 13-21 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly fusiform, tapering, 6-8 x 2.5-3 Fm.

**Substrata.** Mainly on hardwoods but occasionally on conifers. Important as a heartrot fungus in living peach trees and decay of processed wood.

**Distribution.** Mainly an Eastern North American species, there is an unconfirmed record from Northern China (Dai 1996a).

**Remarks.** *Fomitopsis meliae* is similar to *F. palustris*, but they are intersterile (McKay 1967).

**Fomitopsis nivosa** (Berk.) Gilb. & Ryvar den

North Am. Polyp. 1:275, 1986. - *Polyporus nivosus* Berk., Hooker's J. Bot. 1:196, 1856.

**Basidiocarps** annual to biennial, sessile, dimidiate, single to imbricate, rarely effused-reflexed, 15 x 7 x 6 cm, tough when fresh, woody when dry; pilear surface at first white, soon sordid brown, often unevenly, in old specimens with a resinous dark cuticle spreading from the base, glabrous, smooth to rough or slightly wrinkled, azonate; pore surface cream to pale sordid brown or tan, pores round to angular, 6-8 per mm, often glancing, tubes up to 1 cm long, concolorous with the pore surface; context white to cream, dense and hard, slightly fibrous, paler than the tubes, up to 2 cm thick at the base.

**Hyphal system** trimitic; generative hyphae with clamps, 2.5-4 Fm wide; skeletal hyphae hyaline, thick-walled to solid, 2-5 Fm wide; binding hyphae observed only in the context, branched, often twisted and irregular, solid, 2-4 Fm wide; gloeopleorous hyphae occasionally present in tubes, yellowish, thin-walled.

**Cystidia** absent; fusoid cystidiols present, thin-walled, not projecting, 15-20 x 4-5 Fm. **Basidia** clavate, 14-27 x 5-6 Fm, with four sterigmata.

**Basidiocarps** perennial, pileate to effused-reflexed or occasionally resupinate, solitary or imbricate, up to 20 x 7 x 10 cm; pilear surface light brown to pale pinkish in young specimens, darkening to pinkish brown or gray to blackish with age, tomentose to fibrillose or glabrous; pore surface pink, pores circular to angular, with thick, entire dissepiments, 4-5 per mm, tubes stratified, paler than the context, up to 2 cm long; context corky, light pinkish brown, azonate, up to 1 cm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, 2-4 Fm wide; skeletal hyphae pale brown in KOH, rarely branched, thick-walled, 2.5-6 Fm wide.

**Cystidiols** fusoid, thin-walled, not projecting, 15-20 x 3.5-5 Fm.

**Basidia** clavate, 14-23 x 4-6 Fm, with four sterigmata.

**Basidiospores** allantoid, 5-7 x 1.5-2 Fm.

**Substrata.** Mostly on conifers, rarely on hardwoods including *Populus tremuloides*, *Betula* spp. and *Prunus* spp.

**Distribution.** Widely distributed in temperate forest regions in Mongolia, Far East Russia, Northern China (Changbai), Japan (Hokkaido), and North America. One record was made from southern Europe and one in Morocco (Ryvarden & Gilbertson 1993).

**Remarks.** The species is similar to *F. feii*, which is a tropical to subtropical species with cylindrical basidiospores.

**Fomitopsis feii** (Fr.) Kreisel

Univ. Habana ser. 4, Cienc. Biol. 16:83, 1971. - *Polyporus feii* Fr., Linnaea 5:518, 1830.

**Basidiocarps** annual or perennial, sessile, solitary or imbricate, dimidiate, up to 15 x 10 x 1 cm; pilear surface pale rose brown on young specimens and at the margin on older ones, becoming pale wood brown or darkening to blackish-brown, glabrous, smooth to shallowly sulcate, mycelial pads variably present at the base of the pileus, margin acute, narrowly sterile below; pore surface pink to rose brown with age, pores circular to angular, regular, 5-6 per mm, with entire dissepiments, tubes single or indistinctly stratified, up to 3 mm long, whitish within; context rose brown, tough fibrous to corky, azonate, up to 7 mm thick, trama concolorous with the context.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, 2.5-3.5 Fm wide, difficult to find in mature specimens; skeletal hyphae thick-walled, hyaline to pale brownish, with rare ranching, 2-5 Fm wide; binding hyphae thick-walled, hyaline, branched, 1.5-3 Fm wide

**Basidia** clavate, 16-21 x 5-7.5 Fm, with four sterigmata.

**Basidiospores** short-cylindrical to oblong, 5-6.5 x 2-2.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Throughout subtropical and tropical America and Asia. In East Asia known from China, Japan, Northern Thailand, and Vietnam.

**Remarks.** *F. feii* is recognized a smooth buff to pink pileus and oblong basidiospo-

the genus *Laricifomes* (Kotlaba & Pouzar 1957).

**Fomitopsis palustris** (Berk. & M.A. Curtis) Gilb. & Ryvardeen

Mycotaxon 23:364, 1985. - *Polyporus palustris* Berk. & M.A. Curtis, Grevillea 1:51, 1871.

**Basidiocarps** annual to biennial, sessile to effused-reflexed, dimidiate, single to imbricate, individual pilei appanate to triquetrous, up to 10 cm long, 5 cm wide and 3 cm thick; pilear surface white to cream-coloured, becoming pale buff on age or drying, smooth to faintly zonate and shallowly sulcate, minutely tomentose to glabrous, margin concolorous; pore surface white to cream-coloured, pale buff on age or drying, pores circular to angular, mostly 2-4 per mm, but some up to 1 mm wide, dissepiments thin, entire to lacerate, tubes concolorous with the context, up to 1 cm long; context cream-coloured, azonate, firm-fibrous to corky, up to 2 cm thick; fresh basidiocarps malodorous like garbage.

**Hyphal system** dimitic; generative hyphae with clamps, thin- to thick-walled, hyaline, rarely branched, 2.5-4 Fm wide; skeletal hyphae thick-walled, hyaline, with rare branching, 3-6 Fm wide.

**Basidia** clavate, 24-28 x 6-7 Fm, with four sterigmata.

**Basidiospores** cylindrical, often slightly curved towards the apiculus, 6.5-8 x 2.5-3 Fm.

**Substrata.** On dead hardwoods and conifers.

**Distribution.** Subtropical and warm-temperate Eastern North America and Asia (Fujian in China, and Japan).

**Remarks.** *F. palustris* can be distinguished by its large basidia and large, cylindrical basidiospores. *F. nivosa* and *F. meliae* have fusiform tapering basidiospores.

**Fomitopsis pinicola** (Sw.:Fr.) P. Karst.

Krit. Finl. Basidsv. p. 306, 1889. - *Boletus pinicola* Swartz, Svenska Vetensk.-Akad. Handl. 1810:88, 1810. - *Polyporus pinicola* Sw.:Fr., Syst. Mycol. 1:372, 1821.

**Basidiocarps** perennial, usually sessile, rarely effused-reflexed or resupinate, woody, appanate to unguate, up to 38 x 20 x 15 cm; pilear surface at first with a sticky yellowish to reddish brown resinous layer, this often persisting at the margin, becoming glabrous, sometimes laccate, greyish to brown, or dull blackish, smooth to sulcate; pore surface cream-coloured becoming citric yellow when bruised in fresh condition, pores circular, 5-6 per mm, with thick, entire dissepiments, tubes indistinctly stratified, concolorous with the context, up to 6 cm long, sometimes separated by a thin layer of context; context cream-coloured to buff, corky to woody, azonate to zonate, up to 12 cm thick; when fresh with an unpleasant acid scent.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 2-5 Fm wide; skeletal hyphae thick-walled, hyaline, rarely branched, 3-6 Fm wide; binding hyphae thick-walled, much branched, 1.5-4 Fm wide.

**Cystidia** hyphoid, often thick-walled at the base, thin-walled towards the apex, tape-

**Basidiospores** cylindrical, 6-9 x 2-3 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Tropical and subtropical America and Asia. In East Asia known from subtropical China (Guangxi, Sichuan) and Japan.

**Remarks.** Basidiocarps of *F. nivosus* are generally white, like those of *Tyromyces*, but are microscopically easily separated by the trimitic hyphal system. The pileus is white, but soon becomes soiled and dark from the base. The pores are very tiny, barely visible to the naked eye. Basidiospores are, in contrast to many other *Fomitopsis* species, abundantly present, but often collapsed and difficult to observe at once.

**Fomitopsis officinalis** (Vill.:Fr.) Bondartsev & Singer

Ann. Mycol. 39:55, 1941. - *Polyporus officinalis* Vill.: Fr., Syst. Mycol. 1:365, 1821.- *Boletus officinalis* Vill., Hist. Plant Dauph. 3:1041, 1789.

**Basidiocarps** perennial, sessile, solitary, ungulate to columnar, up to 15 x 23 x 45 cm; pilear surface chalky white or discolouring to tan, glabrous, azonate, often sulcate, becoming rimose, consistency becoming chalky, margin concolorous, glabrous, rounded; pore surface white to tan, usually rough, pores circular to angular, typically 4-5 per mm but up to 1 mm wide in some specimens, with thick, entire dissepiments that become lacerate with age, tubes concolorous with the context or pale brownish, indistinctly stratified, each layer up to 1 cm thick; context pure white, cheesy when fresh, chalky and crumbly when dry, azonate, up to 10 cm thick; taste extremely bitter.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 2.5-7 Fm wide; skeletal hyphae thick-walled, hyaline with rare branching, 3-6 Fm wide; gloeoplerous hyphae abundant, thin-walled, up to 13 Fm wide, some with simple septa, often sinuous or branching, cyanophilous; sclerids also present in the context, contorted and irregularly shaped, often lobed, thick-walled, hyaline, walls up to 9 Fm thick.

**Cystidia** absent; inconspicuous fusoid cystidiols present, 13-18 x 4-5.5 Fm.

**Basidia** clavate, 18-25 x 6-8 Fm, with four sterigmata.

**Basidiospores** subellipsoid, 6-9 x 3-4 Fm.

**Substrata.** On living conifers, usually *Larix spp.* producing a brown cubical heartrot commonly called brown trunk rot. Thick, white mycelial felts develop in shrinkage cracks in the decayed wood.

**Distribution.** Known from Morocco in North Africa, South and Central Europe through Siberia to China, Japan, and Korea, also known from Western North America.

**Remarks.** *Fomitopsis officinalis* has been known since antiquity as the source of agaricin, a pharmaceutical compound used as a febrifuge in the treatment of diseases such as tuberculosis. It is commonly known as the quinine fungus or the larch fungus. The chalky white pileus and context, the crumbly consistency, and the extremely bitter taste are diagnostic field characteristics. The species is the type species of

Bull. Tokyo Sci. Mus. 6:92, 1943. - *Polyporus rhodophaeus* Lév., Ann. Sci. Nat. Ser. 3, 2:190, 1844.

**Basidiocarps** annual to perennial, pileate, solitary to imbricate, applanate, broadly attached to somewhat tapering, up to 10 cm broad and 8 cm wide, 0.5-2 cm thick near the base, consistency woody hard when dry; pileus flat to slightly convex, pilear surface cinereous, dirty brown, bluish to ashy grey, becoming black when old, regularly to irregularly concentrically zonate and sulcate, with age glabrous, slightly glossy and with a distinct crust, margin thick, round, entire or slightly lobed, cinnamon to bay, darker than the pore surface; pore surface ochraceous to pinkish buff, often with a greyish tint, darker towards the margin, pores round, 7-8 per mm, dissepiments thick and entire, slightly velvety, tubes non-stratified or with few layers, total length up to 5 mm, each layer up to 2.5 mm, concolorous with the pore surface or with a more rosy tint, margin sterile, up to 5 mm wide; context ochraceous to light fulvous, fibrous, slightly zonate reflecting different growth stages, up to 4 mm thick, darkening in KOH.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline and thin-walled, 2-3 Fm wide, often difficult to find in the tubes; skeletal hyphae abundant in the whole basidiocarp, yellow, thick-walled to almost solid, 4-6 Fm wide, in the context slightly wider; binding hyphae slightly yellow, thin- to thick-walled, 1.5-3 Fm wide, with short tapering branches, often difficult to find in the tubes.

**Basidia** small, 16-18 x 5.5-6 Fm, forming a palisade.

**Basidiospores** oblong ellipsoid, 3.5-4.5(5) x 2.5(3) Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Mostly a tropical species, in East Asia also known from subtropical and warm-temperate China (Guangxi), Japan, Taiwan, Northern Thailand, and Vietnam.

**Remarks.** The pinkish buff basidiocarps and the pilear outgrowths are typical.

*Daedalea aurora* (Cesati) Aoshima, a tropical Asian species, has also pinkish tints and pilear outgrowths, but few and only at the base, which also has a purple cuticle, while the rest of the pilear surface is smooth and concentrically zonate (type examined).

**Fomitopsis rosea** (Alb. & Schwein.:Fr.) P. Karst.

Krit. Finl. Basidsv. P. 306, 1889. - *Boletus roseus* Alb. & Schwein., Consp. Fung., P. 251, 1805. - *Polyporus roseus* Alb. & Schwein.:Fr., Syst. Mycol. 1:372, 1821.

**Basidiocarps** perennial, sessile, unguulate, tough-woody, up to 12 cm wide; pilear surface at first velutinous, pale rose-pink, becoming glabrous and crustose with age, darkening to brownish black, becoming rimose; pore surface pale rose pink to pinkish brown, pores circular to angular, 3-5 per mm, tubes stratified, up to 2 cm long, sometimes separated by a thin layer of context tissue; context pinkish brown, azonate to faintly zonate, tough-woody or fibrous, up to 3 cm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, 2-3.5

ring at the apex or not, up to 150 x 3-10 Fm, projecting up to 90 Fm.

**Basidia** clavate, 17-24 x 7-8.5 Fm, with four sterigmata.

**Basidiospores** cylindrical-ellipsoid, 6-9 x 3.5-4.5 Fm.

**Substrata.** Common on living and dead conifers, especially on *Picea*, and *Pinus*, but also recorded from numerous living and dead hardwoods. Conspicuous white mycelial felts develop in shrinkage cracks of the decayed wood.

**Distribution.** The species is circumboreal in the coniferous zone and extends southward to the pine forests in subtropical Central America and East Asia, such as the mountains of Thailand, Vietnam, Taiwan, India, Nepal, and Guatemala.

**Remarks.** *Fomitopsis pinicola* is one of the most conspicuous and widely distributed polypores in coniferous forests. It is a major factor in the production of brown rot residues, a stable soil component in coniferous forest ecosystems.

**Fomitopsis pseudopetchii** (Lloyd) Ryvar den

Norw. J. Bot. 19:231, 1972. - *Fomes pseudopetchii* Lloyd, Mycol. Writ. 7:1202, 1923. - *Fomitopsis sanminguensis* Zhao, Acta Mycol. Syn. 10:113, 1991.

**Basidiocarps** perennial, solitary, broadly attached to dimidiate, applanate to semi-ungulate, somewhat conchate in large specimens, when semiungulate often attached by a tapering base, up to 10 cm wide, 15 cm long and 3 cm thick at the base, woody hard when dry; pilear surface glabrous, first ochraceous but soon deep reddish brown to black, first glossy laccate, later more dull as the glossy crust in parts is covered with a duller greyish pruina, but in section the laccate crust is easily visible below the pruina, distinctly sulcate in concentric narrow zones, margin sharp and acute; pore surface white to pale cream, pores round and entire, almost invisible to the naked eye, 8-10 per mm, tubes concolorous with the pore surface, stratified, up to 4 mm in each layer; context white to wood coloured, rather thin, 1-3 mm thick, woody to fibrous hard.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled and hyaline, 1-2.5 Fm wide; skeletal hyphae dominant, narrow, thick-walled to solid, hyaline to very pale cream, 2-3.5 Fm wide.

**Basidia** not seen.

**Basidiospores** only scantily observed in the type, oblong ellipsoid, 3.5-4.5 x 2 Fm.

**Substrata.** On hardwoods.

**Distribution.** Mainly a tropical Asian species, in East Asia known from subtropical China (Fujian) and Northern Thailand.

**Remarks.** The species is easy to recognize by the blackish, laccate and glossy crust even if it becomes somewhat dull in old specimens. Further, the white to cream pore surface, tubes and context separate it from species like *F. rhodophaea* which has ochraceous to buff pore surface and context. Although *F. pseudopetchii* is tropical, it is included here as it may be found in subtropical East Asia in the future.

**Fomitopsis rhodophaea** (Lév.) Imazeki

or rosette-shaped, tough to woody; pilear surface deep brown to greyish with age, glabrous to hispid, often zonewise; hymenophore poroid, daedaleoid to lamellate, rusty to deep umber brown, trama and context dark rusty to umber brown; hyphal system di-trimitic; generative hyphae with clamps; skeletal hyphae yellowish brown and dominant in the basidiocarps; binding hyphae rare and scattered in the context; cystidia present or absent, smooth or with an apical crown of crystal; basidiospores smooth, cylindrical, thin-walled, negative in Melzer's reagent, generally longer than 7  $\mu\text{m}$ . On dead wood, in the Northern hemisphere mostly on conifers, but in the tropics on numerous hardwood genera. Causes a brown rot and basidiocarps of all investigated species contain trametine or closely related chemical compounds.

**Type species:** *Daedalea sepiaria* Fr.

**Remarks.** The generic concept accepted here is based on the colour of the basidiocarps, the hyphal system, the cylindrical, basidiospores, the presence of trametine, and the brown rot.

### Key to species

1. Basidiocarps effused-reflexed to resupinate, always on burnt wood..... **G. carbonarium**
1. Basidiocarps pileate, not on burnt wood..... 2
2. Hymenophore poroid or with only a few elongated to sinuous pores..... 3
2. Hymenophore lamellate to daedaleoid, occasionally mixed with poroid areas..... 4
3. Basidiocarps with strong scent of anise when fresh, often pulvinate and effused, pileus tomentose to hispid, dark brown to black, usually on *Picea*..... **G. odoratum**
3. Basidiocarps without scent of anise, pileate, pileus soon glabrous with radial lines and sulcate zones, pale brown, greyish to black from the base, usually on *Pinus*..... **G. protractum**
4. Lamellae and/or daedaleoid pores mostly 3-4 per mm..... **G. trabeum**
4. Lamellae and/or daedaleoid pores 1-2 per mm or larger..... 5
5. Pileus grey, glabrous to slightly scrupose ..... **G. subferrugineum**

Fm wide; skeletal hyphae yellowish to light brown, thick-walled, with rare branching, 4-6 Fm wide; binding hyphae yellowish, thick-walled, much branched, 2-3.5 Fm, inconspicuous.

**Basidia** clavate, 15-18 x 5-6 Fm, with four sterigmata.

**Basidiospores** subellipsoid to slightly ovoid, 5.5-7.5 x 2-2.5 Fm.

**Substrata.** On conifers, especially *Picea*, but also noted on *Abies*. In North America reported from hardwoods.

**Distribution.** Circumboreal in the continental coniferous forests in Europe, North America, and East Asia (China, Japan, and Far East Russia). Also appearing on processed wood.

**Remarks.** *F. rosea* is the type species of *Rhodofomes* Kotl. & Pouz 1990. We feel that the pink colour of the context is insufficient as a base for a new genus.

**Fomitopsis spraguei** (Berk. & M.A. Curtis) Gilb. & Ryvardeen

Mycotaxon 21:364, 1985. - *Polyporus spraguei* Berk. & M.A. Curtis, Grevillea 1:50, 1872.

**Basidiocarps** annual to biennial, pileate to effused-reflexed, pilei solitary or imbricate, dimidiate, applanate, up to 7.5 x 9 x 2 cm; pilear surface ivory white to ochraceous, azonate, appressed-strigose to glabrous, smooth or rugose, margin concolorous, rounded to acute, sterile or fertile below; pore surface cream-coloured to buff or pale brown, smooth, pores circular to angular, 3-6 per mm, with thick, entire dissepiments that may become thin and slightly lacerate, tubes concolorous and continuous with the context, up to 5 mm long; context white to ochraceous, azonate, tough-corky, up to 3.5 cm thick; taste slightly acid.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 2.5 Fm wide, others sclerified and thick-walled, up to 5 Fm wide; skeletal hyphae thick-walled, hyaline, rarely branched, 3.5-5 Fm wide; binding hyphae thick-walled, hyaline, much branched, 2.2-3.5 Fm wide.

**Cystidia** absent; cystidiols fusoid, thin-walled, not projecting, 18-22 x 4-7 Fm.

**Basidia** clavate, 22-28 x 7-8 Fm, with four sterigmata.

**Basidiospores** ovoid to broadly ellipsoid, hyaline, smooth, negative in Melzer's reagent, 5.5-7 x 4-5 Fm.

**Substrata.** On dead hardwoods, also producing a butt rot in living trees.

**Distribution.** Temperate species in Europe, North America, and East Asia (Hubei, Jiangsu, and Guangxi in China, and Japan).

**Remarks.** *Fomitopsis spraguei* is characterized by a tough, annual but persistent basidiocarp, trimitic hyphal system, and ovoid to broadly ellipsoid basidiospores.

**GLOEOPHYLLUM** P. Karst.

Bidr. Känned. Finl. Natur Folk 37:79, 1882.

Basidiocarps annual to perennial, resupinate to pileate, dimidiate to broadly attached

**Distribution.** Temperate species, not common in North America. In East Asia known from warm-temperate China, Japan, Far East Russia, and Taiwan.

**Remarks.** *G. abietinum* is separated from *G. sepiarium* by the warm brown basidiocarps while those of the latter mostly are bright rusty brown, often with a yellowish margin. Furthermore, the lamellae of *G. sepiarium* are far more irregular than those of *G. abietinum*. The tropical *G. striatum* is macroscopically very similar, but its basidiospores are shorter on average.

***Gloeophyllum carbonarium*** (Berk. & M.A. Curtis) Ryvar den

Mycotaxon 20:334, 1984. - *Hexagonia carbonaria* Berk. & M.A. Curtis, Grevillea 1:68, 1872.

**Basidiocarps** resupinate to effused-reflexed or nodulose, easily detached from the substrate, soft and flexible, 10 cm long, up to 1 cm wide, and 5 mm thick; pilei developed along the upper edge of effused basidiocarps which can cover large areas on the lower side of logs; pilear surface umber brown and slightly zonate, tomentose to velutinous, soft, margin rounded; pore surface grey brown to deep brown, pores thin-walled, angular to hexagonal, 1-2 per mm, up to 5 mm long, tubes in section with a dark brown trama, darker than the pore surface which may be covered with a paler pruina; context thin, soft and dark brown, rarely more than 2 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, 2-4 Fm wide; skeletal hyphae dominant, yellowish to rusty brown, thick-walled, unbranched to occasionally dichotomously branched, 2-4 Fm wide.

**Cystidia** absent.

**Basidia** narrowly clavate, 30-38 x 5-6.5 Fm, with four sterigmata.

**Basidiospores** cylindrical to subballantoid, 7-9 x 2-3 Fm.

**Substrata.** On burnt wood of conifers.

**Distribution.** Widespread in North America and Asia. Very rare in Europe, in East Asia known from China (Xizang) and Far East Russia.

**Remarks.** The species is usually easy to recognize by the soft and resupinate, umber brown basidiocarps with relatively large hexagonal pores and its preference for burned wood. It is the type of Ginns.

***Gloeophyllum odoratum*** (Wulf.:Fr.) Imazeki

Bull. Tokyo Sci. Mus. 6:75, 1943. - *Polyporus odoratus* Wulf.: Fr., Syst. Mycol. 1:37, 1821. - *Boletus odoratus* Wulf., Pl. rar. Carinth. In Jacq. Collect. II:150, 1788.

**Basidiocarps** perennial, pileate, single, up to 15 cm broad and long, broadly attached, semicircular to unguulate, especially on vertical substrates, or as pulvinate basidiocarps on stumps, hard or corky, with a strong scent of anise when fresh; pilear surface ochraceous to light brown, later dark brown to almost black, usually with one or two strongly sulcate zones and a rounded margin, coarse and scrupose, at first tomentose to slightly hispid, with age becoming glabrous; pore surface cinnamon to dark brown, usually with a rather broad sterile margin, pores regular and angular,

5. Pileus brown, velutinous, hirsute, warted to scrupose..... 6
6. Hymenophore with lamellae and pores..... **G.**  
**sepiarium**  
 6. Hymenophore with mostly wavy lamellae and without pores .....7
7. Tropical species, pileus usually velutinous, soon becoming appressed to smooth or glabrous, basidiocarps often single and slightly contracted at the base, but also laterally elongated, on hardwoods and *Juniperus*, basidiospores 6-9 Fm long ..... **G.**  
**striatum**  
 7. Temperate species, pileus hirsute to velutinous and usually persistently so, basidiocarps mostly laterally elongated, on conifers, basidiospores 9-12 Fm long..... **G.**  
**abietinum**

**Gloeophyllum abietinum** (Bull.:Fr.) P. Karst.

Finl. Hattsv. 2:79, 1879. - *Daedalea abietina* Bull.:Fr., Syst. Mycol. 1:334, 1821. - *Agaricus abietinus* Bull., Herb. Fr. Pl. 442, 1789.

**Basidiocarps** perennial, pileate, sessile and broadly attached, mostly laterally elongated, rarely more than 1 cm wide, 2-8 cm long, and 1-7 mm thick at the base; pilear surface deep umber brown, becoming paler as if slightly washed out, but very old basidiocarps become black as the upper hyphae become compacted, first finely velutinous to tomentose, in age zonate and often more scrupose to warted or even smooth in old specimens, usually narrowly zonate and slightly sulcate, margin wavy and sharp; hymenophore lamellate with anastomosing, wavy lamellae, 8-12 per cm measured tangentially along the margin, individual lamellae about 1 mm thick, deep brown to pale brown, in section with a dark brown trama, at the base up to 1 cm long; context dark and fibrous, up to 2 mm thick, dense close to the lamellae, looser towards the pilear surface.

**Hyphal system** trimitic; generative hyphae with clamps, thin- to slightly thick-walled, 2-4 Fm wide; skeletal hyphae yellowish to pale rusty brown, thick-walled, sinuous, abundant, 3-6 Fm wide; binding hyphae rare, tortuous, twisted and yellowish brown, 2-4 Fm wide.

**Cystidia** abundant in the hymenium, golden to rusty brown, subulate to rounded, thick-walled, smooth or with a small apical crown of crystals, 25-40 x 4-7 Fm, not or only slightly projecting.

**Basidia** clavate, 26-32 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, 9-12 x 3-4 Fm.

**Substrata.** Dead conifers and hardwoods.

**Basidiospores** cylindrical, 8.5-11(12) x 3-4 (4.5) Fm, often difficult to observe.

**Substrata.** On conifers, rarely on hardwoods. Mostly on decorticated logs in open habitats.

**Distribution.** Circumpolar in the coniferous zone. In East Asia known from Japan and Far East Russia.

**Remarks.** Small specimens may be confused with *G. trabeum* which has a softer, more glabrous pilear surface, and normally more lamellae in the hymenophore, where the dissepiments in general are thinner and pores smaller (3-4 per mm). From *G. odoratum* it is separated by a lack of anise scent, thinner basidiocarps with a sharp margin, and normally more glabrous and zonate pilear surface.

**Gloeophyllum sepiarium** (Wulf.:Fr.) P. Karst.

Finl. Hattsv. 2:80, 1879. - *Daedalea sepiaria* Fr., Syst. Mycol. 1:333, 1821. - *Agaricus sepiarius* Wulf., Pl. rar. Carinth. In Jacq. Coll. 1:347, 1786.

**Basidiocarps** annual to perennial, pileate, broadly sessile, dimidiate or rosette-shaped, often imbricate to elongated, up to 12 cm long, 7 cm wide and 6-8 mm thick at the base, tough and flexible, margin sharp and slightly wavy; pilear surface first bright yellowish brown, then darker reddish brown and finally greyish to black, when young and along the margin finely tomentose, in age the hyphae agglutinate and the surface becomes tufted, hirsute to hispid or scrupose with coarse protuberances, finally more or less smooth in zones in different colours mixed with narrow, more persistent hispid bands, narrowly to broadly zonate reflecting different stages of growth; hymenophore lamellate with anastomosing, dense lamellae, 15-20 per cm behind the margin, more rarely mixed with poroid areas with rounded to irregular, sinuous, radially elongated pores, about 1-2 per mm, edges of lamellae light golden yellow in active growth, side surface of lamellae ochraceous to pale brown, usually distinctly lighter than the context and trama, up to 7 mm long; context dark brown, denser next to the tubes than towards the pilear surface, up to 5 mm thick, black in KOH.

**Hyphal system** trimitic; generative hyphae with clamps, thin- to thick-walled, 2.5-4 Fm wide; skeletal hyphae dominant, especially in the upper context and trama, golden brown, unbranched, thick-walled, up to 6 Fm wide; binding hyphae few, tortuous and with relatively short branches, only seen in older parts of the context, light golden brown, up to 4.5 Fm wide at the base.

**Cystidia** abundant in the hymenium, subulate to obtuse, thin- to thick-walled, some extremely elongated, not or only slightly projecting, 25-45 x 3-7 Fm, usually smooth, more rarely slightly encrusted at the apex.

**Basidia** subclavate, 18-30 x 4.5-7 Fm, with four sterigmata.

**Basidiospores** cylindrical, 9-13 x 3-5 Fm.

**Substrata.** Usually on dead conifers, especially on exposed, decorticated logs, rarely on hardwoods. Often on processed wood.

**Distribution.** Cosmopolitan in the boreal zone, in East Asia known from China,

more rarely somewhat split and slightly sinuous, 1-2 per mm, tubes ochraceous and lighter than both the context and the pore surface, up to 1.5 cm long, often with a few weak, darker, horizontal zones; context fibrous and hard, at first rusty brown, later dark brown, black with KOH.

**Hyphal system** di-trimitic; generative hyphae with clamps, thin-walled, 2.5-4 Fm wide; skeletal hyphae dominant, light yellowish brown, thick-walled, 3-5 Fm wide; binding hyphae in the context very rare and found in only a few collections, mostly close to the base, rather thin, 1.5-3 Fm wide, solid.

**Cystidia** present in the hymenium, thin-walled, tapering, 20-30 x 3-6 Fm, usually collapsed in dried specimens, and thus very difficult to observe. We have seen them in freeze-dried specimens.

**Basidia** clavate, 18-35 x 5-8 Fm, with four sterigmata.

**Basidiospores** cylindrical, thin-walled, 7.5-10.5(11) x 3-4.5 Fm.

**Substrata.** On dead conifers.

**Distribution.** Rare in North America, in Europe and Asia found in boreal and temperate forests, in East Asia known from China, Taiwan, Japan (Hokkaido), and Far East Russia.

**Remarks.** The anise odour of basidiocarps when fresh is characteristic, besides the pulvinate, basidiocarps, often on top of stumps with a wide and round margin.

***Gloeophyllum protractum* (Fr.) Imazeki**

Bull. Tokyo Sci. Mus. 6:75, 1943. - *Trametes protracta* Fr., Vet. Akad. Forhand. 1851:52, 1851.

**Basidiocarps** annual to biennial, pileate, broadly sessile and distinctly elongated along fallen logs, often slightly triquetrous in section, tough and coriaceous, without a scent of anise when fresh; pilear surface at first ochraceous to brown, with age greyish to black in old parts, concentrically sulcate, glabrous and semiglossy when young, with age often radially striate, slightly scrupose and uneven with a few cracks near the base, margin rather sharp; pore surface ochraceous when actively growing, darker when touched, yellowish brown to fulvous, pores entire and angular to weakly elongated radially, 1-2 per mm, up to 3 mm long and 0.5-1 mm wide, tubes up to 1 cm long, in old specimens with a distinct black cuticle.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin- to slightly thick-walled, often with a guttulate protoplasm, 2-4 Fm wide; skeletal hyphae thick-walled to solid, golden to rusty brown, 3.5-5.5 Fm wide; binding hyphae solid, moderately branched, rather thin, 1.5-3 Fm wide, light yellowish, rather rare, mainly in old parts of the context; context umber brown, corky-coriaceous, up to 5 mm thick.

**Cystidia** scattered in the hymenium, fusiform to convex, up to 55 x 4-8 Fm, slightly thick-walled and light yellowish in KOH, these cystidiols are more variable and less common than in *G. odoratum* and in some cases they are difficult to distinguish from immature basidia.

**Basidia** clavate, 25-42 x 7-8 Fm, with four sterigmata.

1854.

**Basidiocarps** annual, pileate, dimidiate, solitary or imbricate, up to 7 cm long, 3 cm wide and 5-9 mm thick, margin deflexed; pilear surface greyish brown, clay brown at the base, broadly sulcate, glabrous, smooth to slightly scrupe, lighter towards the margin which is usually grey; hymenophore lamellate, lamellae sinuous, mostly entire, 1-2 per mm, light brown and covered with a white pruina when fertile, up to 3 mm long, edge entire to crenate; context fibrous to corky, light ferruginous brown, up to 6 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, up to 3 Fm wide; skeletal hyphae abundant, light brown, thick-walled, straight to sinuous, unbranched, 5-6 Fm wide.

**Cystidia** scarce, cylindrical to fusiform, hyaline, thin-walled, 30-56 x 5-8 Fm, not projecting.

**Basidia** clavate, 22-26 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical to allantoid, 8.5-9(10) x 2.5-3.5 Fm.

**Cultural characteristics.** Unknown.

**Substrata.** On dead temperate and tropical conifers.

**Distribution.** Asian species described from the Himalayas, in East Asia known from Japan and China (Jiangxi), also known from Sri Lanka and the Philippines.

**Remarks.** The species is recognized by its grey glabrous pileus and its lamellate hymenophore. It looks similar to *Trichaptum laricinum*, a brown, lamellate species which however has thick-walled, encrusted hymenial cystidia and a white rot.

### **Gloeophyllum trabeum** (Pers.:Fr.) Murrill

N. Am. Fl. 9:129, 1908. - *Daedalea trabea* Pers.:Fr., Syst. Mycol. 1:335, 1821. - *Agaricus trabeus* Pers., Syn. Fung. p.29, 1881.

**Basidiocarps** annual or perennial, pileate, sessile, rosette-shaped or elongated along cracks in the wood, frequently fused laterally, up to 3 cm broad, 8 cm long, rarely above 8 mm thick at the base, coriaceous and tough; pilear surface warm sepia to umber brown, greyish when old, lighter along the margin in growing specimens, weakly zonate to almost azonate, at first finely velutinous to appressed tomentose, later more or less glabrous and smooth, or with very small scrupe protuberances, more rarely hispid and with coarse and large tufts of hyphae at the base, these seem to occur most frequently in rosette-like basidiocarps; hymenophore irregular, semilamellate or labyrinthine to partly poroid, with quite thin walls, 2-4 per mm (in lamellate specimens up to 4 lamellae per mm along the margin), ochre to umber brown, tubes or lamellae up to 4 mm long, mostly distinctly lighter than the context; context sepia to umber brown, denser towards the tubes, but without a distinct delimitation towards the looser and cottony upper part, up to 4 mm thick.

**Hyphal system** di-trimitic; generative hyphae with clamps, hyaline, 2.5-5 Fm wide, wider in the context than in the trama; skeletal hyphae dominant, golden brown, thick-walled, unbranched, up to 6 Fm wide; in the older parts of the context also a

Japan, Taiwan, Far East Russia, Northern Thailand, and Vietnam.

**Remarks.** Recognized by its yellowish to rusty colours and the lamellate hymenophore. *Gloeophyllum sepiarium* is a major factor in the decay of dead conifers as well as in the formation of brown rot residues.

***Gloeophyllum striatum*** (Swartz:Fr.) Murrill

Torrey. Bot. Cl. Bull. 32:370, 1905. - *Daedalea striata* Swartz.:Fr., Syst. Mycol. 1:334, 1821.

**Basidiocarps** annual, single to imbricate or rosette-shaped, dimidiate to flabelliform with a contracted stipe-like base, up to 8 cm wide and broad, mostly smaller, up to 5 mm thick at the base, tough and coriaceous and easily bent without cracking, whole basidiocarp black with KOH; pilear surface tobacco to umber brown, flat, at first finely appressed velutinous, usually with distinct narrow, concentric zones, often slightly sulcate, later the tomentum becomes agglutinated and the surface then smooth and pale brown to grey, margin papery thin and usually deflexed, often split in lobes or weakly undulating; hymenophore dark brown to greyish brown with age, with thin lamellae in parts forking and anastomosing, often fimbriate and irregular along the edges and even deeply split in parts to an almost hydroid hymenophore with elongated, flattened teeth, 10-15 per cm along the margin, lamellae 1-5 mm long; context thin, 0.5-1.5 mm, dark rusty brown, lower part dense and mostly with horizontal hyphae, the upper part looser and hyphae mostly bent upwards, but no distinct line between the two parts.

**Hyphal system** di-trimitic; generative hyphae with clamps, hyaline and thin-walled to slightly thick-walled, 2.5-4 Fm wide; skeletal hyphae golden yellow, thick-walled and straight, up to 6 Fm wide; binding hyphae very rare, only seen in the context.

**Cystidia** numerous to scattered, fusoid, slightly thick walled, arising in the subhymenium from generative hyphae, projecting above the hymenium, naked or with a few crystals (observe in Melzer's or cotton blue), 30-60 x 5-7 Fm.

**Basidia** narrowly clavate, 30-48 Fm, with four sterigmata.

**Basidiospores** oblong ellipsoid to cylindrical, 6-10 x 2.5-3.5 Fm.

**Substrata.** Most common on hardwoods and in the tropics noted on many genera, more rarely on conifers.

**Distribution.** Pantropical, also present in warm-temperate and subtropical North America and Asia, in East Asia known from several provinces in China (Teng 1996), Taiwan, and Vietnam.

**Remarks.** Superficially *G. striatum* strongly resembles *G. abietinum*, but the latter is a distinct temperate taxon and the basidiocarps are elongated and more shelf-like while those of *G. striatum* are often more flabelliform or slightly dimidiate and have shorter basidiospores.

***Gloeophyllum subferrugineum*** (Berk.) Bondartsev & Singer

Ann. mycol. 39:64, 1941. - *Lenzites subferruginea* Berk., Hooker's J. Bot. 6:134,

**Gloeoporus dichrous** (Fr.:Fr.) Bres.

Hedwigia 53:75, 1912. - *Polyporus dichrous* Fr.:Fr., Syst. Mycol. 1:364, 1821. - Observ. Mycol. 1:125, 1815.

**Basidiocarps** annual, resupinate to pileate, often effused-reflexed, mostly imbricate with several small, narrow and elongated pilei, soft when fresh, resinous and hard when dry, pilei rarely above 4 cm wide, 10 cm long and 5 mm thick at the base; pilear surface white to cream, at first finely tomentose, later more scurpous to smooth or hispid with tufts of hyphae according to weathering and active periods of growth, with concentric zones in different shades, margin sharp and undulating; pore surface at first light reddish, soon dark purplish, more brown when old, when actively growing often pruinose and white along the dissepiments, margin white, wide and byssoid, strongly contrasting with the dark pore surface, pores circular to angular, 4-6 per mm, often merely a reticulate pattern, up to 1 mm long, hymenium developed over the dissepiments, tubes gelatinous when fresh, resinous to horny when dry and old, above the tubes there is a thin and distinct zone of the same colour and consistency as the tubes; context pure white, up to 4 mm thick, cottony to loose, distinctly thicker than the tubes.

**Hyphal system** monomitic; generative hyphae with clamps, in the context distinct and thick-walled, up to 6 mm wide, moderately branched, in the tubes and the resinous zone above the tubes strongly agglutinated, thin-walled, mostly collapsed in dry specimens, up to 3.5 Fm wide.

**Cystidia** absent.

**Basidia** clavate, 14-20 x 3-4 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 3.5-5.5 x 0.7-1.5 Fm.

**Substrata.** Reported from dead hardwoods, occasionally on conifers (*Abies*) and on or near dead polypores such as *Inonotus* spp. and *Fomes fomentarius*.

**Distribution.** Cosmopolitan species, in East Asia known from China, Japan, Taiwan, Far East Russia, and Vietnam.

**Remarks.** Usually this species is easy to recognize because of the deep reddish pore surface and the white, cottony context and pileus. It is separated from both *G. taxicola* and *G. thelephoroides* by the clamps on its generative hyphae. In fresh condition the gelatinous tubes are rather characteristic and may be peeled off the context with a finger nail.

**Gloeoporus taxicola** (Pers.:Fr.) Gilb. & Ryvarden

Mycotaxon 22:364, 1985. - *Xylomyzon taxicola* Pers.:Fr., Elench. Fung. 1:62, 1828.

**Basidiocarps** annual, resupinate, often widely effused, up to 4 mm thick, tough and waxy when fresh, brittle and hard when dry, separable to slightly adnate, margin white and wide, contrasting with the coloured pore surface; pore surface reddish to deep purplish or almost black, pores angular, 2-4 per mm, tubes with continuous hymenium over the dissepiments, up to 1 mm long; context white and fibrous, up to 2 mm thick.

very few branched, thick-walled golden yellow hyphae which may represent poorly developed binding hyphae.

**Cystidia** thin-walled and mostly embedded in the hymenium, fusoid to slightly clavate, obtuse or conical with an acute end, a few with resinous excretions as small globules, hyaline or slightly golden yellow, especially at the base where they may be more thick-walled, up to 30 x 5.5 Fm.

**Basidia** clavate, 20-25 x 6-7 Fm, with four sterigmata.

**Basidiospores** cylindrical, thin-walled, 6.5-9.5 x 3-4.5 Fm.

**Substrata.** Most common on deciduous trees of many kinds, but also noted on coniferous wood, especially in structural timbers.

**Distribution.** Cosmopolitan species, most common in temperate areas, in East Asia known from China, Japan, Taiwan, Korea, and Far East Russia.

**Remarks.** Basidiocarps of *G. trabeum* are easy to recognize because of their dense lamellae or small pores, by far the smallest in the genus. The pileus is also usually smooth and softer than in the other species treated here, the cystidia are normally more thin-walled than those of *G. sepiarium*, which also has coarser lamellae and/or larger pores.

### **GLOEOPORUS** Mont.

Ann. Sci. Nat. Bot. Ser. 2, 17:126, 1842.

Basidiocarps annual, resupinate to pileate; pilear surface, when present, white to greyish and tomentose, pore surface pinkish white, orange to deep bay or reddish, pores small, shallow and round to angular, with a continuous layer of basidia over the dissepiments, tubes gelatinous in fresh condition, resinous and dense to cartilaginous when dry, darker and denser than the white and cottony context; hyphal system monomitic; generative hyphae with clamps or simple septa; cystidia present or absent; basidia cylindrical, forming a dense palisade, basidiospores allantoid to cylindrical, thin-walled, smooth and negative in Melzer's reagent. On both hardwoods and conifers, causing a white rot. Cosmopolitan genus.

**Type species:** *Gloeoporus conchoides* Mont. = *G. theleporoides* (Hooker) Cunn.

**Remarks.** The genus belongs in Corticiaceae *sensu lato* because of the continuous layer of basidia over the dissepiments, a common feature in *Merulius*, *Byssomerulius* and other fungi with a meruloid hymenophore. The genus is included here because its poroid species will naturally be looked for in a polypore mycota.

### Key to species

1. Generative hyphae with simple septa, on conifers..... **G. taxicola**
1. Generative hyphae with clamps, on hardwoods or dead polypores..... **G. dichrous**

lid, olivaceous to light brown in KOH, dextrinoid in Melzer's reagent, 3-6 Fm wide, unbranched or rarely with short side branches.

**Dendrohyphidia** present especially along the dissepiments, arising from generative hyphae, apically moderately to strongly branched.

**Cystidia** absent, but sterile hyphal ends often occur in the hymenium.

**Basidia** clavate, 20-25 x 4-7 Fm, with four stout sterigmata up to 6 Fm long.

**Basidiospores** cylindrical to slightly allantoid, 7-9 x 2.5-3.5 Fm.

**Substrata.** Exclusively on monocotyledons such as bamboo, palms, etc.

**Distribution.** Pantropical and quite common when the right hosts are examined. Found in subtropical Japan (Okinawa).

**Remarks.** The species is usually easily recognizable in the field because of the hosts and the glaucous to blackish colour. It does not redden the substrate as *Porogramme albocincta*, that grows on hardwoods and has often been confused with *G. fuligo*.

### GRIFOLA S.F. Gray

Nat. Arr. Brit. Plants 1:643, 1821.

Basidiocarps annual, stipitate, caespitose; pilear surface grey to brownish, finely tomentose to glabrous; stipe multibranched, giving rise to large numbers of stipitate, reniform pilei; pore surface white to cream-coloured, pores angular, 2-4 per mm, tubes decurrent on stipe; context white to pale buff; hyphal system dimitic; generative hyphae with clamps; cystidia absent; basidiospores ovoid to ellipsoid. Mostly on the ground, causing a white rot of buried hardwoods and conifers.

**Type species:** *Boletus frondosus* Dicks.

**Remarks.** The genus is characterized by its large compound basidiocarps growing on the ground at the base of trees or stumps. It may be related to *Meripilus*, which however has simple-septate generative hyphae and sclerified generative hyphae instead of skeletal hyphae proper. Their basidiospores are almost identical and both cause a white rot in the attacked wood.

### *Grifola frondosa* (Dicks.: Fr.) S.F. Gray

Nat. Arr. Brit. Plants 1:643, 1821. - *Boletus frondosus* Dicks., Plant Crypt. Brit., fasc. 1:18, 1785. - *Polyporus frondosus* Dicks.: Fr., Syst. Mycol. 1:355, 1821. - *Grifola albicans* Imazeki, J. Jap. Bot. 19:386, 1943.

**Basidiocarps** annual, caespitose, with laterally stipitate pilei, entire structure up to 40 cm wide; pilear surface pale lavender-grey at first, becoming darker and finally dull dark brown in older specimens, azonate, very finely tomentose to glabrous, smooth or radially rugose, margin concolorous, thin, often undulate, deflexed; stipe much branched from a thick base, cream-coloured, up to 10 cm or wider at the base, giving rise to large numbers of imbricate, petaloid or flabelliform and often confluent pilei up to 8 cm wide and 8 mm thick; pore surface ivory white, pores angular, 2-4 per mm, with thin, lacerate dissepiments, tubes decurrent on the stipe, often to the ground line, distinct from the context, pale tan on older dried specimens, brittle

**Hyphal system** monomitic; generative hyphae simple-septate, those of the context slightly thick-walled, up to 6 Fm wide, often encrusted, in the trama more delicately thin-walled, smooth and up to 4 Fm wide, branching often at right angles, loosely interwoven in the context, more parallel and compact in the trama.

**Cystidia** absent; subulate, smooth cystidiols 15-30 x 3-4 Fm, not projecting, quite common in the hymenium.

**Basidia** clavate, 15-25 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 4.5-6 x 1-1.5 (2) Fm.

**Substrata.** On conifers, in Eastern North America and Asia also on hardwoods.

**Distribution.** Cosmopolitan and rather common in boreal coniferous forests. Also known from New Zealand and Australia. In East Asia known from China, Japan, and Far East Russia.

**Remarks.** *Gloeoporus taxicola* can be confused with *G. dichrous*, but is easily distinguished as the latter species has clamped generative hyphae. *Ceriporia purpurea* has a lighter reddish colour, and longer basidiospores (5-7.5 Fm).

#### **GRAMMOTHELE** Berk. & M.A. Curtis

J. Linn. Soc. Bot. 10:327, 1868.

Basidiocarps annual, resupinate, adnate, effused, up to 3 mm thick; hymenophore irregularly irpicoid to poroid and then with labyrinthine to sinuous pores, pore surface cream, bluish-grey to almost black, with age or time pale brownish pinkish to pale amber brown, hymenium restricted to the base of the tubes; context light and thin; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae thick-walled to solid, dextrinoid; dendrohyphidia present or absent; basidiospores ellipsoid to cylindrical, thin-walled, smooth, negative in Melzer's reagent. On hardwoods and monocotyledons. Mostly a tropical genus.

**Type species:** *Grammothele lineata* Berk. & M.A. Curtis

**Remarks.** The genus belongs in the Corticiaceae because the hymenium is restricted to the base of the tubes, never on the tube walls. The dextrinoid reaction in the hyphae separates this genus from *Theleporus* Fr., which also has dendrohyphidia.

#### **Grammothele fuligo** (Berk. & Broome) Ryvarden

Trans. Br. Mycol. Soc. 73:15, 1979. - *Polyporus fuligo* Berk. & Broome, J. Linn. Soc. Bot. 14:53, 1875. - *P. ravenalae* Berk. & Broome, op. cit. 1875.

**Basidiocarps** annual, resupinate, widely effused, strongly adnate, hard and brittle, margin wide to narrow, bluish white when fresh; pore surface bluish white, grey or glaucous, darkening with age to almost black, pores angular, thin-walled and entire, 8-16 per mm, tubes shallow, up to 400 Fm deep, variable from specimen to specimen, tube walls whitish under a lens, but trama dark brown, hymenium restricted to the base of the tubes; context dark brown and very thin.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, 2-4 Fm wide; skeletal hyphae dominating in the context and sterile tube walls, thick-walled to so-

**sibiricus**

3. Basidiocarps cinnamon, usually up to 4 cm wide, basidiospores 3.5-5 x 2-3 mm, on different hard woods..... **H. nidulans**
3. Basidiocarps orange-reddish, up to 20 cm wide, basidiospores 4-7 x 3-4.5 mm, growing on *Quercus* spp. .... **H. croceus**

**Hapalopilus croceus** (Pers.:Fr.) Bondartsev & Singer

Ann. Mycol. 39:52, 1921. - *Boletus croceus* Pers., Obs. Mycol. 1:87, 1796. - *Polyporus croceus* Pers.:Fr., Syst. Mycol. 1:364, 1821.

**Basidiocarps** annual, pileate, broadly attached, up to 20 x 20 cm wide and 6 cm thick, sometimes triquetrous, soft and watery when fresh, shrinking considerably under drying and finally hard and resinous; pilear surface first bright orange and finely velutinous, later more brownish orange and smooth to scurpouse with tufts of agglutinated hyphae, purplish when touched with KOH; pore surface bright reddish-orange when fresh, brownish when dry, pores angular, 2-3 per mm, tubes concolorous with the pore surface, up to 1 cm long, when dry as soaked with resinous substances; context bright orange, spongy and watery when fresh, darker orange to brownish resinous and hard when dry, but distinctly lighter than the tubes, up to 3 cm long at the base; taste slightly bitter.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, throughout the basidiocarp often covered with grains, crystals and granules of a golden substance, and then agglutinated, moderately branched, in the context partly as agglutinated strands of hyphae or more branched, up to 4 Fm wide, in the trama more irregularly organized and up to 6 Fm wide.

**Basidia** clavate, 15-25 x 4-7 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid, 4-7 x 3-4.5 Fm.

**Substrata.** On hardwoods, mainly on *Quercus*.

**Distribution.** Cosmopolitan in the temperate zone in Eastern North America, Europe, and Asia. In East Asia known from China and Japan (Honshu, Hokkaido).

**Remarks.** The orange colour and the often large size of the basidiocarps is typical. On drying the basidiocarps become darker and shrink, especially the tubes.

**Hapalopilus nidulans** (Fr.) P. Karst.

Rev. Mycol. 3:18, 1881. - *Polyporus nidulans* Fr., Syst. Mycol. 1:362, 1821.

**Basidiocarps** annual, pileate, broadly sessile to effused-reflexed, mostly convex, often triquetrous, up to 10 cm wide and long, but usually smaller, up to 4 cm thick at the base, soft and watery when fresh, light and somewhat brittle when dry, all parts of the basidiocarp purplish with KOH; pilear surface cinnamon to ochraceous, first

when dried, up to 5 mm long; context ivory white, up to 2 mm thick in individual pilei, up to several cm thick at the base and in the main branches of the stipe; odour pleasant, nut-like.

**Hyphal system** mono-dimitic; generative hyphae with clamps, hyaline, thin-walled, rarely branched, 2.5-5 Fm wide; skeletal hyphae hyaline, moderately thick-walled, with infrequent branching, 2.5-6 Fm wide.

**Basidia** clavate, 22-26 x 7-8 Fm, with four sterigmata.

**Basidiospores** ovoid to ellipsoid, 6-7 x 4-4.5 Fm.

**Substrata.** On the ground from roots at the base of living hardwoods and conifers. Fruiting may continue at the base of dead trees and stumps.

**Distribution.** Temperate species, in East Asia known from China, Far East Russia, and Japan.

**Remarks.** *Polyporus umbellatus* also forms large, caespitose basidiocarps, but differs from *G. frondosa* by having centrally stipitate basidiocarps, skeleto-binding hyphae, and cylindrical basidiospores.

## HAPALOPILUS P. Karst.

Rev. Mycol 3:18, 1881.

Basidiocarps annual, resupinate to pileate and then broadly sessile to dimidiate, soft when fresh, brittle when dry, whole basidiocarp orange, salmon, or reddish brown, purplish or cherry red in contact with KOH; pores round to angular, small to medium; hyphal system monomitic; generative hyphae with clamps; cystidia absent; basidiospores ellipsoid to cylindrical, smooth, hyaline and thin-walled, negative in Melzer's reagent. On hardwoods and conifers, causing a white rot.

**Type species:** *Polyporus nidulans* Fr.

**Remarks.** The genus as circumscribed here may include species with different phylogenetic background. However, the reddish coloration with KOH and the monomitic hyphal system with clamped generative hyphae make the genus rather distinct.

### Key to species

1. Basidiocarps resupinate .....2
1. Basidiocarps pileate, on hardwoods ..... 3
2. On conifers, basidiocarp wine coloured and resinous dense when dry, basidiospores oblong 3.5-5.5 um long ..... **H. salmoticolor**
2. On hardwoods, basidiocarp vividly orange and tough when dry, basidiospores cylindrical 5-6 um long..... **H.**

**Remarks.** The species is usually easy to recognize when fresh because of the resupinate, salmon pink basidiocarps and its reaction with KOH. The species is the type of *Sarcoporia* P. Karst.

**Hapalopilus sibiricus** Nunez, Parmasto & Ryvardeen

Fungal Div. 6:107, 2001.

**Basidiocarps** resupinate, annual, hard and fragile when dry, up to 2 cm wide and long, 2-3 mm thick; pore surface deep orange and cherry red with KOH, pore invisible to the naked eye, 7-8 per mm, tubes concolorous, 1.5 mm deep, context almost absent, pale orange, and sharply delimited toward a white rotted wood.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled, 3-5 mm wide, smooth to covered with a yellowish resinous deposits which makes the hyphae pale cherry red in masses when mounted in KOH.

**Basidia** clavate, 4-sterigmate, 12-15 x 4-5 Fm.

**Basidiospores** cylindrical to somewhat allantoid smooth, 5-6 (6.5) x 2-2.3 mm.

**Substrata.** Known only from very rotten hardwood.

**Distribution.** Known only from the type locality.

**Remarks.** The species is characterized by its deep orange colour, the very small pores and the cylindrical to allantoid basidiospores, larger than in any other resupinate *Hapalopilus* species. *H. albocitrinus* (Petch) Ryvardeen, a tropical species, has a more chrome yellow basidiocarp and shorter basidiospores, i.e. 4-5 Fm long. For a description, see Ryvardeen & Johansen (1980:359). *H. salmonicolor* (Berk. & W. A. Curtis) Pouzar has a wine-coloured basidiocarp, grows only on coniferous wood and has shorter basidiospores, i.e. 3.5-5.5 Fm long.

**HAPLOPORUS** Singer

Mycologia 35:66, 1944.

Basidiocarps perennial, pileate, cream-coloured to pale buff, with a strong scent of anise; hyphal system trimitic; generative hyphae with clamps; skeletal and binding hyphae hyaline; cystidia absent; basidiospores globose to ellipsoid, hyaline, asperulate, dextrinoid. Mostly on *Salix* sp. Monotypic genus, circumpolar in the boreal zone and causing a white rot.

**Type species:** *Polyporus odorus* Sommerf.:Fr.

**Remarks.** The genus is well characterized by its dextrinoid asperulate basidiospores, its host, i. e. *Salix* spp. and the strong scent of anise.

**Haploporus odorus** (Sommerf.:Fr.) Singer

Mycologia 36:68, 1944. - *Polyporus odorus* Sommerf.:Fr., Suppl. Florae Lapp. p. 275, 1826. - *P. odorus* Sommerf.: Fr., Elench. Fung. p. 90, 1828.

**Basidiocarps** perennial, sessile or effused-reflexed, mostly triquetrous, up to 6 x 15 x 8 cm; pilear surface cream to pale buff, darkening to dingy brown, finely tomen-

finely tomentose to scrupose, soon completely smooth, azonate or with a few broad, weakly sulcate zones, the inner ones usually smoother than the distal ones, margin acute and entire; pore surface ochraceous to cinnamon brown, usually rimose and with a distinct sterile margin, pores thin-walled and angular, 2-4 per mm, tubes up to 1 cm long, ochraceous or white due to cottony sterile hyphae; context light cinnamon, mostly distinctly lighter in colour towards the pileus, soft and fibrous and quite brittle, up to 4 cm thick at the base.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, in the trama straight and narrow, up to 6 Fm wide, in the context large, up to 10 Fm wide and with conspicuous clamps, distinctly thick-walled and richly branched, mostly smooth, but also covered partly with amorphous substances mixed with polygonal, light pinkish to brownish crystals.

**Cystidia** absent; fusoid cystidiols present, 18-22 x 4-5 Fm.

**Basidia** clavate, 18-22 x 5-6.5 Fm, with four sterigmata.

**Basidiospores** ellipsoid to cylindrical, 3.5-5 x 2-2.5(3) Fm.

**Substrata.** On dead hardwoods in numerous genera.

**Distribution.** Cosmopolitan in the cold-temperate zone. In East Asia known from many provinces in China, Japan, and Far East Russia.

**Remarks.** The species is usually easy to recognize by its small, cinnamon, sappy basidiocarps with a vivid purplish reaction with KOH.

**Hapalopilus salmonicolor** (Berk. & M.A. Curtis) Pouzar

Ceska Mykol. 21:205, 1967. - *Polyporus salmonicolor* Berk. & M.A. Curtis, Hooker J. Bot. 1:104, 1849.

**Basidiocarps** annual, resupinate, moderately large to small, rarely above 10 cm wide, up to 8 mm thick, soft when fresh, resinous and hard when dry, mostly adnate, margin wide to narrow, light orange and byssoid; pore surface bright orange to salmon pink when fresh, drying orange brown, pores entire, mostly thin-walled and angular, 3-5 per mm, often partly split in basidiocarps growing on oblique substrates, tubes up to 7 mm long, orange when fresh, reddish brown to purplish and soaked with resinous substances when dry, azonate or with a few narrow zones in section; context thin, light orange to pink.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to slightly thick-walled, moderately to richly branched both dichotomously and as H-connections, deeply embedded in crystalline and amorphous substances, diameter often somewhat variable, mostly 2-4 Fm, but also some up to 7 Fm wide.

**Basidia** clavate 20-30 x 5-6.5 Fm, with four sterigmata.

**Basidiospores** oblong to subellipsoid, 3.5-5.5 x 2-2.5 Fm, quite variable even within the same basidiocarp.

**Substrata.** On conifers.

**Distribution.** Circumpolar in coniferous forests including those in subtropical mountains. In East Asia known from Japan, Far East Russia, and Northern Thailand.

**Heterobasidion annosum** (Fr.) Bref.

Unters. Gesamtg. Mykol. 8:154, 1888. - *Polyporus annosus* Fr., Syst. Mycol. 1:373, 1821.

**Basidiocarps** annual to perennial, sessile, effused-reflexed or often resupinate; pilei dimidiate to narrowly elongated, irregular in shape, imbricate or single, up to 9 x 15 x 5 cm; pilear surface tomentose to glabrous, becoming encrusted, purplish black with age, very rough and irregular, indistinctly concentrically zonate and sulcate, margin usually lighter, often undulating, rounded, sterile below; pore surface ivory white to orange cream, glancing, smooth, pores circular to angular, 4-5 per mm, dissepiments at first thick, entire, becoming thin and lacerate with age, tubes concolorous and continuous with the context, indistinctly stratified, up to 3 mm long each year; context ivory, corky, azonate, up to 1 cm thick, upper encrusted layer showing as a thin black line in section.

**Hyphal system** dimitic; generative hyphae simple-septate, hyaline, thin-walled, with occasional branching, 2.5-5 Fm wide; skeletal hyphae hyaline, thick-walled, dextrinoid, with occasional branching, 3-5.5 Fm wide.

**Basidia** clavate, 16-22 x 5-6 Fm, with four sterigmata.

**Basidiospores** subglobose to ovoid, hyaline, minutely echinulate or appearing smooth under the light microscope, negative or slightly amyloid in Melzer's reagent, 4.5-6.5 x 3.5-8 Fm.

**Cultural characteristics.** See Nobles 1848, 1958, 1965; Stalpers 1978; Korhonen 1978; Chase & Ullrich 1983. The species produces an easily recognized anamorph in culture which is now placed in the genus *Spiniger*.

**Substrata.** Living and dead conifers, rarely on hardwoods. *Heterobasidion annosum* is one of the major root rot pathogens on conifers.

**Distribution.** Common in the boreal zone in North America, Europe, and Siberia, less common in East Asia, but known from China, Japan (Honshu to Kyushu), and Far East Russia.

**Remarks.** Basidiocarps of *H. annosum* have a darker cuticle than those of *H. insulare*, where the cuticle is orange to light red. Also the first species forms resupinate to effuse-reflexed basidiocarps at the base of trunks and even on roots, while *H. insulare* forms clearly pileate basidiocarps on the sides of fallen logs.

**Heterobasidion insulare** (Murrill) Ryvarden

Norw. J. Bot. 19:237, 1972. - *Trametes insularis* Murrill, Bull. Torrey Bot. Club 35:405, 1908.

**Basidiocarps** annual, pileate to effused-reflexed with a broad resupinate base, broadly attached, solitary to 2-3 imbricate basidiocarps, up to 10 cm long, 4-5 cm broad and 1 cm thick; pilear surface glabrous, with an orange to reddish cuticle which is darker towards the base, cream to light brown towards the margin, broadly concentrically zonate, slightly radially striate, margin wide; pore surface cream to

tose to almost glabrous, azonate, greyish, glabrous and with a black cuticle in older, larger specimens, margin concolorous, rounded, sterile below; pore surface whitish when fresh, then pale buff, pores circular, 4-5 per mm, with thick, entire dissepiments, tubes stratified, light buff, up to 1.5 cm long; context concolorous with the tubes, corky, faintly zonate or layered in appearance, up to 7 cm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, rarely branched, 2-3.5 Fm wide; skeletal hyphae thick-walled, hyaline, rarely branched, 3-5 Fm wide; binding hyphae thick-walled, hyaline, much branched, 1.5-2.5 Fm wide.

**Basidia** clavate with a sharply narrowed base, 19-27 x 7-9 Fm, with four sterigmata.

**Basidiospores** ovoid to ellipsoid, hyaline, minutely but distinctly echinulate, slightly dextrinoid, 4.5-6 x 3-4.5 Fm.

**Substrata.** Mostly on living *Salix*, often high above the ground, also found on *Fraxinus* and *Tilia*.

**Distribution.** Temperate species, in East Asia known from northern China (Changbai), Japan (Honshu and Hokkaido), and Far East Russia.

**Remarks.** Fresh basidiocarps have a strong anise odour as those of *Trametes suaveolens*. Microscopically, the minutely echinulate, dextrinoid basidiospores are distinctive.

#### **HETEROBASIDIUM** Bref.

Unters. Gesamtg. Mykol. 8:154, 1888.

Basidiocarps perennial, resupinate to pileate, widely effused and tough; pileus first cream and finely tomentose, soon smooth with a distinct red to dark purplish, thin cuticle; pore surface light cream with an orange shade, pores regular, round to angular, mostly small; context white to light cream, dark reddish brown with Melzer's reagent; hyphal system dimitic; generative hyphae simple-septate and delicately thin-walled; skeletal hyphae dominant, dextrinoid, unbranched or with a few branches; cystidia absent; basidiospores broadly ellipsoid to globose, hyaline, thin- to slightly thick-walled and finely asperulate, negative in Melzer's reagent. Causes a white rot on living and dead trees, dominantly conifers. Temperate to boreal genus in both hemispheres.

**Type species:** *Polyporus annosum* Fr.

**Remarks.** The dextrinoid skeletal hyphae, the red cuticle on the pileus and above all the finely asperulate basidiospores make *Heterobasidium* a distinct genus.

#### **Key to species**

1. Basidiocarps resupinate to effused-reflexed, pores regular,  
parasitic at the base of trees ..... **H. annosum**
1. Basidiocarps pileate, pores elongated to lacerate, saprophytic on dead logs **H. insulare**

**Hexagonia apiaria** (Pers.) Fr.

Epicr. p.497, 1838. - *Polyporus apiarius* Pers., Bot. Voyage Uranie Frey. p.169, 1826.

**Basidiocarps** annual to biennial, solitary, applanate, mostly dimidiate with a tapering base, up to 11 cm long, 8 cm wide, and 2 cm thick at the base, corky and coriaceous; pileus reniform, semicircular to flabelliform, applanate to concave, dark cinnamon to umber, almost blackish with age, sometimes distinctly reddish brown, covered with scattered to crowded antler-like, erect black hairs frequently forked in the upper part, with age they wear away and leave a concentrically zonate surface with scattered radial striae, margin sharp and even; pore surface beige to yellowish brown becoming greyish-brown with age, pores angular, somewhat variable, mostly 2-5 mm wide (2-4 per cm), often larger in the centre towards the base of the basidiocarp, tubes beige to greyish, up to 1 cm long; context cinnamon to ferruginous-brown, black in KOH, 1-3 mm thick, no cuticle present in young specimens, in glabrous ones the upper hyphae agglutinate to a thin, dark cuticle.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, 1.5-2.5 Fm wide; skeletal hyphae dominant, yellowish to pale rusty brown, unbranched, thick-walled but mostly with a distinct lumen, 2.5-6 Fm wide; binding hyphae hyaline to yellowish, thick-walled to solid, much branched, 1.5-3 Fm wide.

**Cystidia** absent; cystidia-like hyphae often projecting into the hymenium, arising from skeletal hyphae, but difficult to distinguish properly; hyphal pegs present or absent, cylindrical to conical, 50-200 x 30-80 Fm, yellowish brown to rusty brown.

**Basidia** mostly collapsed, clavate, 20-30 Fm long, with four sterigmata.

**Basidiospores** cylindrical, hyaline, 11-15 x 6-8 Fm.

**Substrata.** On hardwoods of all kinds.

**Distribution.** Asian species, known from India and eastward to subtropical China (Guangdong, Guangxi), and Japan, the Philippines, some islands in the Pacific, and Australia.

**Remarks.** The species is easy to recognize because of the large, brown basidiocarps with large, angular pores.

**Hexagonia glaber** (P. Beauv.) Ryvarden

Mycotaxon 72:216, 1999.- *Favolus glaber* P. Beauv. Fl. Oware et Benin 2:76, 1819. - *Boletus tenuis* Hook. in Kunth, Syn. Pl. 1:10, 1822.

**Basidiocarps** annual to biennial, solitary or gregarious, pileate, dimidiate to almost stipitate, flabelliform to semicircular, flat when fresh, wavy when dry, 2-10 cm broad and wide and 1-3 mm thick, often almost only papery thin, consistency flexible and coriaceous when dry; pilear surface glabrous, usually strongly concentrically zonate in shades of brown from ochraceous to pale snuff-brown or pale umber to darker bay to even sepia, some specimens have a red to dark purplish cuticle spreading from the base towards the margin, margin papery thin, acute, slightly wavy, entire to lobed; pore surface snuff-brown, hazel to milky-coffee, often with a greyish to ashy-bluish

light orange when fresh, darkening to yellowish orange, pores 2-3 per mm, irregular to lacerate in the resupinate part, tubes up to 6 mm long, with an orange tint; context fibrous, woody hard when dry, radially striate, up to 7 mm thick.

**Hyphal system** di-trimitic; generative hyphae simple-septate, hyaline, in the trama thin-walled and up to 2.5 Fm wide, in the context thick-walled, with a lumen, up to 5 Fm wide; skeletal hyphae dextrinoid, thick-walled, hyaline, unbranched, sinuous, up to 4 Fm in the trama and 6 Fm in the context; pilear surface composed of light brown, straight skeletal hyphae forming a cutis.

**Basidia** clavate, 18-20 x 6-7 Fm, guttulate, with four sterigmata.

**Basidiospores** ovoid, with a fine ornamentation which is inconspicuous in KOH, hyaline, 5-6 x 4-4.5 Fm, uniguttulate, dextrinoid.

**Substrata.** Saprophytic on dead conifers.

**Distribution.** Australasian species known from Nepal to Far East Russia, China, Japan (from Kyushu to Hokkaido) to Australia.

**Remarks.** The species differs from *H. annosum* by its tendency to develop distinctly pileate basidiocarps, its larger basidiospores (5-7.5 x 4-5, *H. annosum* 3.5-5 x 3-4), and in being a saprophyte.

### HEXAGONIA Fr.

Epicrisis Syst. Mycol. P.496, 1838.

Basidiocarps annual to perennial, pileate, dimidiate, flabelliform to semicircular, coriaceous, corky to woody hard; pilear surface smooth, tomentose or densely hirsute with long, dark hairs; pores entire, angular and large; context usually thin and dark brown, blackening in KOH; hyphal system trimitic; generative hyphae with clamps, thin-walled, hyaline; skeletal and binding hyphae thick-walled to almost solid, yellow to golden brown, endings of both types often project into the hymenium, which then becomes a catahymenium; true cystidia absent; basidiospore hyaline, cylindrical, smooth, thin-walled, negative in Melzer's reagent, longer than 10 Fm. Causes a white rot on hardwoods. Mainly a tropical genus, only one species is temperate.

**Type species:** *Hexagonia crinigera* Fr.

**Remarks.** The important characteristics in the genus are the pileate basidiocarps, the large, angular to hexagonal pores, the trimitic hyphal system with coloured hyphae, and the large basidiospores.

### Key to species

1. Basidiocarps up to 1 cm thick, pileus with erect hairs,  
tubes up to 1 cm long..... **H.**  
**apiaria**
1. Basidiocarps up to 3 mm thick, pileus glabrous, tubes up to 2 mm long ..... **H.**  
**glaber**

wide and 5 mm thick; pilear surface white to cream or pale buff, densely tomentose to hirsute, azonate to faintly zonate, smooth or shallowly sulcate, margin concolorous; pore surface white to cream, pores angular, 2-3 per mm near the margin, with thin dissepiments that split deeply at an early stage to form a hydroid hymenophore, tubes concolorous and continuous with the context, up to 3 mm long; context white to pale tan, soft-fibrous, azonate, up to 2 mm thick.

**Hyphal system** mono-dimitic; generative hyphae simple-septate, thin-walled to solid, with frequent branching, 2-4 Fm in wide; skeletal hyphae hyaline, thick-walled, occasionally simple-septate, with rare branching, 2.5-6 Fm wide.

**Cystidia** conspicuous, abundant, thick-walled, acute, heavily encrusted apically, 50-110 x 5-10 Fm, projecting up to 40 Fm, originating from tramal skeletal hyphae.

**Basidia** clavate, developing in intricately branched candelabra, 20-30 x 4-6 Fm, with four sterigmata.

**Basidiospores** oblong to cylindrical, straight to slightly curved, 5-7 x 2-3 Fm.

**Substrata.** On dead hardwoods, frequently on dead standing trees, occasionally on dead conifers such as *Juniperus*.

**Distribution.** Cosmopolitan species, in East Asia known from China, Japan, Taiwan, and Far East Russia.

**Remarks.** The strongly hydnceous hymenophore, conspicuous encrusted cystidia, and simple-septate hyphae are the diagnostic characters of *I. lacteus*. Many *Steccherinum* species have confusingly similar basidiocarps, especially the pileate *S. oreophilum* which however is separated by clamped generative hyphae. *Steccherinum cremeoalbum* Hjortst. and *S. crinale* (Peck) Ryvarden have both simple-septate hyphae and make the borderline between *Irpex* and *Steccherinum* rather vague. However, both the latter species are strictly resupinate and have ellipsoid basidiospores.

### ISCHNODERMA P. Karst.

Med. Soc. Fauna Fl. Fenn. 3:38, 1879.

Basidiocarps annual, pileate, applanate, dimidiate to semicircular to almost circular; pilear surface tomentose to smooth, dark brown to almost black; pore surface white, darkens when touched or dried, pores entire and small, tubes concolorous with the pore surface; context ochraceous to light brown and separated from the tomentum by a distinct thin black zone that becomes the pilear crust when the tomentum wears away; hyphal system mono-dimitic; generative hyphae with clamps; skeletal hyphae hyaline to light yellowish, thick-walled; basidiospores cylindrical to allantoid, thin-walled, smooth and negative in Melzer's reagent. On conifers and hardwoods, causing a white rot.

**Type species:** *Boletus resinosus* Schrad.

**Remarks.** The genus is fairly well recognized by its dark brown and tomentose pileus, becoming black and glabrous with age, usually wrinkled radially. The tomentum and the context are monomitic and consist of very thick-walled generative

tint, pores angular to hexagonal, very variable, mostly 0.5-2 per mm, dissepiments thin, entire, tubes up to 2 mm long, with or without hyphal pegs; context 0.1-1 mm thick, dark brown, rusty brown to hazel, blackening in KOH.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline and thin-walled, 1.5-3 Fm wide, often collapsed; skeletal hyphae yellow to pale brown, thick-walled with a distinct lumen, 3-7 Fm wide; binding hyphae hyaline to yellowish, thick-walled with indistinct lumen, often swollen in KOH, 3- 6 Fm wide, coralloid to little branched, the tapering branches often break off so binding hyphae can sometimes be difficult to demonstrate.

**Basidia** clavate, with a long base, 40 x 16 Fm, immersed in the trama, sterigmata not seen.

**Basidiospores** cylindrical, thick-walled, 14-18 x 4.5-6 Fm, unripe basidiospores are often found in sections.

**Substrata.** On hardwoods of all kinds, preferably in open and seasonally dry localities.

**Distribution.** Pantropical, also known from subtropical and warm-temperate China (Guangdong, Guangxi, Guizhou), Japan (Okinawa, S. Honshu), Taiwan, Northern Thailand, and Vietnam.

**Remarks.** Because of its persistent basidiocarps this species is one of the most collected polypores in the tropics. It is a very variable species which has repeatedly been redescribed because of the variable pore size and the reddish cuticle which is variably present, even within one single collection.

#### **IRPEX** Fr.

Elench. Fung. 1:142, 1828 - Syst. Orb. Veg. p.81, 1825.

Basidiocarps annual, sessile, effused-reflexed or resupinate; pileus surface tomentose to hirsute, white to pale buff; hymenophore becoming strongly hydneous; hyphal system mono-dimitic; generative hyphae simple-septate; cystidia thick-walled, encrusted; basidiospores cylindrical, negative in Melzer's reagent. Causing a white rot of dead hardwoods, more rarely in conifers.

**Type species:** *Hydnum lacteum* Fr.:Fr.

**Remarks.** Previously the genus was used to accommodate all types of hydneoid basidiomycetes with an effused-reflexed basidiocarp. Today the genus is either treated as monotypic or includes a few more species besides the type species. For a survey of species previously placed in the genus, see Maas-Geesteranus (1974).

#### **Irpex lacteus** (Fr.:Fr.) Fr.

Elench. Fung. p.145, 1828. - *Sistotrema lacteum* Fr., Obs. Mycol. 2:226, 1818 - *Hydnum lacteum* Fr.:Fr., Syst. Mycol. 1:412, 1821.

**Basidiocarps** annual, usually effused-reflexed or resupinate at first, occasionally sessile, pilei usually imbricate, dimidiate or laterally fused, up to 7 cm long, 1 cm

**Distribution.** Holarctic through North America to Europe and East Asia (China, Japan, Far East Russia).

**Remarks.** Whether there are two species, or if they are forms of the same, has to be settled by DNA investigations.

**Ischnoderma resinosa** (Fr.) P. Karst.

Soc. Fauna Fl. Fenn. 5:38, 1879. - *Polyporus resinosa* Fr., Syst. Mycol. 1:361, 1821.

**Basidiocarps** as described for *I. benzoinum*, except for the pores, that are cream-coloured, lacerate and resinous when mature and 3-5 per mm, and the context, which in the hard late phase is cream to light brown.

**Hyphal system, basidia**, as described for *I. benzoinum*.

**Basidiospores** allantoid with a tapering apex, 5-7 x 1.5-2 Fm.

**Substrata.** On hardwoods.

**Distribution.** Temperate species, in East Asia known from China, Japan, Far East Russia, and Vietnam.

**Remarks.** In early stages, *I. benzoinum* is difficult to separate from *I. resinosa*, and the diagnostic characters are the whitish to light brown context and the resinous pore surface of the last species in the late phase.

**JAHNOPORUS** Nuss

Hoppea 39:176, 1980.

Basidiocarps annual, stipitate; pilear surface grey to pale purplish brown, hispid to tomentose, becoming glabrous; pore surface white to cream, pores angular; context white; hyphal system monomitic; generative hyphae with clamps; cystidia absent; basidiospores spindle-shaped, 12.5-17 Fm long; monotypic, temperate genus, usually fruiting on the ground from buried wood, probably causing a white rot.

**Type species:** *Fomes hirtus* Cooke

**Remarks.** The genus is characterized by its large spindle-shaped basidiospores, very different from those of *Albatrellus*, whose species also have terrestrial, stipitate basidiocarps and a monomitic hyphal system.

**Jahnoporus hirtus** (Cooke) Nuss

Hoppea 39:176, 1980. - *Fomes hirtus* Cooke, Grevillea 13:118, 1885.

**Basidiocarps** annual, centrally to laterally stipitate, solitary or caespitose, pilei circular, up to 15 cm wide; pilear surface grayish to pale purplish-brown, azonate, hispid or scurfy to tomentose or becoming glabrous, rugose or smooth, margin concolorous; stipe simple or branched, tan to pale purplish-brown, tomentose to glabrous, up to 10 cm long and 4 cm thick; pore surface white to cream-coloured, pores angular, 1-2 per mm, with thin, entire or lacerate dissepiments, tubes concolorous and continuous with the context, decurrent on the stipe, up to 8 mm long; context whitish, azonate, corky, up to 1 cm thick; odour pleasantly fragrant, nut-like.

hyphae with large and conspicuous clamps. Skeletal hyphae proper have been seen only in the trama of the tubes. Two species are recognized, one mostly confined to conifers (*I. benzoinum*) and one mostly on hardwoods (*I. resinosum* s. str.). David et al. (1983) have demonstrated that the two taxa are intersterile.

### Key to species

1. Trama and context finally dark brown, on conifers..... **I. benzoinum**

1. Trama and context cream to pale brown, on hardwoods..... **I. resinosum**

**Ischnoderma benzoinum** (Wahlenb.:Fr.) P. Karst.

Acta Soc. Fauna Fl. Fenn. 2:32, 1881. - *Polyporus benzoinus* Wahlenb.:Fr., Elench. Fung. 1:100, 1828. - *Boletus benzoinus* Wahlenb., Flora Suecica 2:1076, 1826.

**Basidiocarps** annual, single or rarely imbricate, usually dimidiate with a tapering base or broadly attached, fairly large, up to 12 cm wide, 15 cm long and up to 3 cm thick at the base, first fleshy and sappy, later hard and brittle; pilear surface first finely tomentose and dark brown, when fresh more or less even, later the tomentum disappears in concentric zones, exposing a slightly glossy black resinous crust that shrinks when dried and has numerous radial furrows and some broad sulcate bands, margin even or lobed to incised; pore surface first whitish, darker when touched, later pale brown, pores angular to circular, 4-6 per mm, tubes concolorous, up to 1 cm long; context first soft and whitish, with drying and age dark brown in the hard late phase, up to 1 cm thick at the base, darker than the tubes, separated from the tomentum by a black line.

**Hyphal system** mono-dimitic; generative hyphae with clamps, in the trama straight and slightly thick-walled, 3-5 Fm wide, in the brown pilear tomentum tortuous, brownish and very thick-walled with a few large, scattered clamps, moderately branched, 4-10 Fm wide, the context dominated by the same type of hyphae, but hyaline and more frequently clamped, in parts swollen up to 12 Fm wide in KOH; skeletal hyphae partly mixed with the generative hyphae in the context, straight or slightly flexuous, very thick-walled and unbranched, 3-10 Fm wide, whether or not they are long segments of sclerified generative hyphae or not is difficult to decide, as few clamps were observed in these hyphae; distinctive skeletal hyphae observed only in the trama, unbranched, thick-walled to solid and light yellowish at maturity, 3-10 Fm wide, projecting into the hymenium.

**Cystidia** absent; hyaline, clavate to fusoid cystidiols variably present in the hymenium.

**Basidia** clavate, 12-18 x 4.5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly allantoid, 5-7 x 1.5-2 Fm.

**Substrata.** On dead conifers, very rarely on hardwoods.

- pores 3-4 per mm, basidiospores cylindrical to allantoid ..... **J. collabens**
3. Basidiospores 2-2.4 Fm wide, gloeocystidia present..... **J. japonica**
3. Basidiospores 1.5-2 Fm wide, gloeocystidia absent..... **J. luteoalba**
4. Basidiocarps effused-reflexed with narrow pileus..... 5
4. Basidiocarps strictly resupinate..... 6
5. Basidiospores ellipsoid to subglobose, pores 5-6 per mm ..... **J. semisupiniforme**
5. Basidiospores ellipsoid, pores 2-3 per mm ..... **J. pseudozilingiana**
6. Margin without rhizomorphs..... 7
6. Margin rhizomorphic ..... 8
7. Pore surface white to cream, with fimbriate dissepiments and cystidia protruding in the tubes, tropical species ..... **J. crustacea**
7. Pore surface pinkish, mostly with entire dissepiments and smooth tubes, cosmopolitan species..... **J. nitida**
8. Basidiospores oblong to ovoid, 3-3.5 x 1.5-2 mm ..... **J. fimbriatella**
8. Basidiospores ovoid to ellipsoid, 3.5-5 x 2-3.5 mm ..... **J. separabilima**

**Junghuhnia collabens** (Fr.) Ryvarden

Personia 7:18, 1972. - *Polyporus collabens* Fr., Hymen. Europ. p.572, 1874.

**Basidiocarps** resupinate, adnate and often widely effused for meters on lying trunks, up to 2 mm thick, soft when fresh, hard when dry, margin wide to narrow, white to light pinkish, contrasting with the pore surface; pore surface cocoa-brown to brick-red to rufescent when touched in fresh condition, pores angular, mostly 4-6 per mm, on oblique parts of the basidiocarp often elongated to more irregular and larger,

**Hyphal system** monomitic; generative hyphae with abundant clamps, hyaline in KOH, in the trama thin-walled, 2.5-4 Fm wide, in the context moderately thick-walled, with occasional branching, 5-11 Fm wide or with inflated parts up to 16 Fm wide.

**Basidia** clavate, 32-43 x 9-12 Fm, with four stout sterigmata swollen up to 2.5 Fm wide.

**Basidiospores** fusiform or spindle-shaped, 12.5-17 x 4.5-5.5 Fm.

**Substrata.** Usually fruiting on the ground under conifers, apparently from buried wood.

**Distribution.** Circumpolar in temperate areas in the Northern Hemisphere. In East Asia known from Japan and Far East Russia.

**Remarks.** The large pores, hispid or scurfy pilear surface, and the large, fusiform basidiospores are the distinctive features of *J. hirtus*.

### **JUNGHUHNIA** Corda emend. Ryvarden

Anl. Stud. Mycol. p.195, 1842 - Persoonia 7:17-21, 1972.

Basidiocarps annual to perennial, resupinate to effused-reflexed; pore surface white, cream or yellow-pink to cocoa-brown, pores mostly small and slightly irregular; context thin, white to ochraceous; hyphal system dimitic; generative hyphae with clamps, thin-walled, hyaline, often difficult to find in old basidiocarps; skeletal hyphae dominant, hyaline, thick-walled to almost solid; cystidia present, both in the trama and slightly projecting into and beyond the hymenium, arising from skeletal hyphae and encrusted in the upper part, mostly blunt; basidiospores hyaline, smooth, thin-walled, cylindrical to ellipsoid. On dead conifers and hardwoods, causing a white rot. Cosmopolitan genus.

**Type species:** *Laschia crustacea* Jungh.

**Remarks.** The genus is closely related to *Steccherinum* and is in principle only distinguished by the hymenophore which is hydroid in *Steccherinum*, poroid in *Junghuhnia*. We prefer to put all the poroid species in one genus and leave the hydroid ones in *Steccherinum*.

### **Key to species**

1. Basidiospores cylindrical to suballantoid..... 2
1. Basidiospores ovoid to broadly ellipsoid ..... 4
2. Pore surface cream to yellow, pores 4-8 per mm, basidiospores cylindrical, straight to slightly curved..... 3
2. Pore surface cinnamon to cocoa coloured,

**Remarks.** The species is easily recognized by its shallow, irregular pores with projecting cystidia.

**Junghuhnia fimbriatella** (Peck) Ryvarden

Persoonia 7:18, 1972. - *Polyporus fimbriatellus* Peck, N.Y. State Mus. Rept. 38:91, 1885.

**Basidiocarps** annual, resupinate, effused to 10 cm, soft, easily separable, margin white to cream-coloured, conspicuously fimbriate and rhizomorphic, rhizomorphs white; pore surface cream to pale buff, pores angular, 3-5 per mm, with thin dissepiments that become deeply lacerate, tubes concolorous and continuous with the context, up to 2 mm long; context less than 1 mm thick, cream-coloured, soft-fibrous.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, rarely branched, 3-5.5 Fm wide; skeletal hyphae thick-walled, hyaline, rarely branched, 3-5 Fm wide.

**Cystidia** abundant, thick-walled, almost completely to apically encrusted, clavate, 60-100 x 6-9 Fm, originating in the trama as skeletal hyphae ends.

**Basidia** clavate, 10-20 x 3-4.5 Fm, with four sterigmata.

**Basidiospores** oblong to ovoid, 3-3.5 x 1.5-2 Fm.

**Substrata.** On dead hardwoods, particularly *Populus*.

**Distribution.** Apparently a boreal fungus, known North America, Europe, and East Asia (China, Hokkaido in Japan, and Far East Russia).

**Remarks.** The white, rhizomorphic margin of *J. fimbriatella* basidiocarps is a conspicuous field character. This is a distinctive, but evidently rare fungus.

**Junghuhnia japonica** Núñez & Ryvarden

Fungal Div. 3:112, 1999.

**Basidiocarps** annual, resupinate, tough, 10 x 2 cm in the holotype and 3 mm thick; pore surface yellowish, pores circular to angular, 6-8 per mm, tube layer and subiculum concolorous, tubes up to 2 mm deep; subiculum less than 1 mm thick.

**Hyphal system** dimitic; generative hyphae thin-walled, with clamps, rarely branched, 2-4 mm wide; skeletal hyphae thick-walled, straight, hyaline, 2-4 mm wide.

**Cystidia** of two types: 1) abundant to infrequent, thick-walled, heavily encrusted, clavate to fusoid, 40-70 x 9-15 mm, completely imbedded to projecting to 30 mm, usually most abundant near the dissepiment edges and originating from subhymenial tramal skeletal hyphae, 2) tubular, smooth, thin-walled gloeocystidia present in the hymenium, projecting up to 10 mm, 20-35 x 4-8 mm.

**Basidia** clavate, 4-sterigmate, 15-22 x 4-5.5 mm.

**Basidiospores** cylindric, straight to slightly curved, 4-5 x 2-2.4 mm.

**Substrata.** Dead wood of *Castanopsis*.

**Distribution.** Known only from the type locality.

**Remarks.** The species is undoubtedly closely related to *Junghuhnia luteoalba* (P. Karst) Ryvarden which however, has narrower basidiospores (1.5-2 mm) and where

tubes concolorous, up to 2 mm long; context very thin, pinkish to cocoa-brown.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, in the trama slightly thick-walled, in the subhymenium thin-walled, 2-4.5 Fm wide; skeletal hyphae dominating in the trama and context, rather straight, thick-walled to solid, hyaline to very slightly coloured, cyanophilous, 2-5 Fm wide.

**Cystidia** abundant to scattered, arising in the trama, both embedded and projecting above the hymenium, thick-walled and widened in the upper part which is normally strongly encrusted, up to 150 x 12-20 Fm, narrower in the lower part tapering to about 5 Fm near the clamp.

**Basidia** clavate, 10-15 x 4-5 Fm, with four sterigmata.

**Basidiospores** cylindrical to weakly allantoid, 3-4.5(5) x 1-1.5 Fm.

**Substrata.** On conifers in temperate and boreal areas, in Africa and warm-temperate Japan noted only on hardwoods.

**Distribution.** Circumpolar species, in East Asia known from warm-temperate to boreal China, Japan (Kyushu to Hokkaido) and Far East Russia. Also known from Africa.

**Remarks.** The cocoa pore surface contrasting with the white margin, besides the cylindrical basidiospores, makes this species recognizable.

### **Junghuhnia crustacea** (Jungh.) Ryvardeen

Persoonia 7:18, 1972. - *Laschia crustacea* Jungh., Verh. Batav. Genootsch. 17:75, 1838.

**Basidiocarps** annual, resupinate, mostly small, but effused specimens have been seen from tropical areas, up to 2 mm thick, soft when fresh, rather brittle when dry, margin thin and narrow to absent; pore surface white to cream, later more ochraceous, hymenophore first irregularly hydroid as the tubes arise from separate plates which grow laterally and then develop into a poroid surface, usually with rather fimbriate dissepiments, pores angular, 4-6 per mm, along the tubes dotted with numerous projecting cystidia (strong lens), tubes shallow, concolorous with the pore surface; context very thin and whitish.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 1-3 Fm wide, often very difficult to find in dry and old specimens; skeletal hyphae dominant, hyaline, frequently mixed with crystalline material which makes the trama and context very compact, thick-walled to solid, 1.5-3 Fm wide.

**Cystidia** numerous, thick-walled, arising from skeletal hyphae, widened to 6-12 Fm in the upper part and strongly encrusted, either embedded and partly bent into the hymenium, or projecting along the tubes, encrustation 20-40 Fm long.

**Basidia** clavate, 12-18 Fm long, with four sterigmata.

**Basidiospores** oblong ellipsoid, 4-5 x 2.5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Paleotropical species, entering the subtropical areas of Japan and Northern Thailand.

**Basidia** clavate, 10-13 x 4-5 Fm, with four sterigmata.

**Basidiospores** oblong-ellipsoid, 3-4.5 x 2-3 Fm.

**Substrata.** On hardwoods.

**Distribution.** Cosmopolitan species. In East Asia known from tropical to temperate China, Japan, Korea, Far East Russia, and Northern Thailand.

**Remarks.** The species is usually easy to recognize because of the numerous and conspicuous cystidia. With some experience it is possible to recognize it in the field because of the distinct buff-pinkish pore surface with a white margin.

***Junghuhnia pseudozilingiana*** (Parmasto) Ryvarden

Personia 7:18, 1972. - *Chaetoporus pseudozilingiana* Parmasto, Eesti NSV Tead. Akad. Toim. Biol. Ser. 2, 8:113, 1959.

**Basidiocarps** annual, resupinate to effused-reflexed; pileus when present up to 1 cm long, projecting up to 5 mm from the substrate, up to 3 mm thick, margin acute, entire or lobed; pilear surface glabrous, ochraceous; pore surface pale straw-coloured to ochraceous when dry, pores angular, 2-3 per mm, somewhat sinuous and irregular on sloping substrates, tubes up to 4 mm long in nodulose specimens, with lacerate dissepiments; context cream to pale ochraceous, dense, homogeneous, 1-3 mm thick at the base.

**Hyphal system** dimitic; generative hyphae with clamps, 2-4 Fm wide, often difficult to observe; skeletal hyphae abundant, hyaline, thick-walled, 2-5 Fm wide.

**Cystidia** arising from tramal skeletal hyphae, clavate, apically encrusted, embedded in the trama, in parts obliquely penetrating into the hymenium, up to 140 Fm long from the basal clamp, 5-15 Fm wide in the apical encrusted part, tapering towards the base.

**Basidia** clavate, 14-16 x 4-6 Fm, with four sterigmata.

**Basidiospores** oblong-ellipsoid, 3.5-4.5 x 2-2.5 Fm.

**Substrata.** Dead hardwoods, also reported from old basidiocarps of species of *Inonotus* and *Phellinus*.

**Distribution.** Rare Eurasian species, in East Asia known from Northern China (Changbai).

**Remarks.** The species is characterized by the narrow pileus, the angular pores and the ochraceous to cream pore surface. The basidiospores are identical with those of *J. nitida* and *J. separabilima*, both of which have a pinkish pore surface and strictly resupinate basidiocarps. *J. semisupiniforme* differs in its almost globose basidiospores.

***Junghuhnia semisupiniforme*** (Murrill) Ryvarden

Mycotaxon 23:195, 1985. - *Tyromyces semisupiniformis* Murrill, Bull. New York Bot. Gard. 8:148, 1912.

**Basidiocarps** annual, resupinate to effused-reflexed; pileus when present up to 3 cm long and 2 mm thick, often fused with adjacent pilei to form more complex, lobed

gloeocystidia are absent.

***Junghuhnia luteoalba*** (P. Karst.) Ryvarden

Persoonia 7:18, 1972. - *Physisporus luteoalbus* P. Karst., Rev. Mycol, 9:10, 1887.

**Basidiocarps** annual, resupinate, tough, fragile when dry, effused up to 20 cm, margin fertile or sterile, then ivory white, slightly fimbriate, up to 1 mm wide; pore surface cream-coloured when fresh, drying pale buff, pores circular to angular, 4-8 per mm, with thin dissepiments that become lacerate, tubes concolorous and continuous with the context or slightly darker, up to 3 mm long; context cream-coloured to pale buff, tough-fibrous, less than 1 mm thick; taste mild.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, rarely branched, 2-4 Fm wide; skeletal hyphae thick-walled, hyaline, rarely branched, 2-4 Fm wide.

**Cystidia** abundant to infrequent, thick-walled, heavily encrusted, clavate to fusoid, 40-70 x 9-14 Fm, completely embedded to projecting 30 Fm, most abundant near the dissepiments and originating from tramal skeletal hyphae; fusoid cystidiols also present, thin-walled, 13-27 x 4-5 Fm; hyphal pegs usually abundant.

**Basidia** clavate, 13-20 x 4-5.5 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly curved, 4-5 x 1.5-2 Fm.

**Substrata.** Dead wood of numerous genera of conifers, causing a white pitted and laminated rot.

**Distribution.** Circumpolar in the coniferous zone. In East Asia known from boreal and temperate China, Japan (Honshu and Kyushu), and Korea.

**Remarks.** Diagnostic characters of *J. luteoalba* include the cylindrical to slightly curved basidiospores. *Junghuhnia collabens* differs in its distinctive orange-cocoa colouration and its more allantoid basidiospores.

***Junghuhnia nitida*** (Pers.:Fr.) Ryvarden

Persoonia 7:18, 1972. - *Polyporus nitidus* Fr., Syst. Mycol. 1:379, 1821.

**Basidiocarps** annual, first orbicular, then coalescing and widely effused 15 cm wide or more, usually separable from the substrate, margin sterile, narrow to wide, white to cream-coloured, distinctly paler than the pore surface, consistency corky to brittle when dry; pore surface cream with a pinkish tint or dirty pink, often glancing, pores round to angular 5-7 per mm, dissepiments papery, entire to fimbriate, tubes up to 1.5 mm long; context thin, cream-coloured or somewhat darker in old specimens, continuous with the tubes.

**Hyphal system** dimitic; generative hyphae with clamps, in the dissepiments thin-walled, hyaline, up to 3 Fm wide, often difficult to find; skeletal hyphae yellow, thick-walled to solid, up to 3.5 Fm wide, in the context up to 4 Fm wide.

**Cystidia** present in the hymenium, trama and lower part of the context, numerous, appearing as heavily encrusted endings of skeletal hyphae, up to 50 x 5-13 Fm, embedded, but also partly projecting.

**Remarks.** The main difference with *J. nitida* is the irregular pores of *J. separabilima*. Otherwise both species are very similar.

**LACCOCEPHALUM** McAlp. & Tepper

Proc. Roy. Soc. Victoria II, 7:166, 1895.

Basidiocarps annual, centrally to laterally stipitate; pileus more or less circular to reniform, tough, white grey to deep bay or brown; stipe cylindrical, arising from a sclerotium when growing on the ground; pores round to angular, context white to ochraceous; hyphal system dimitic; generative hyphae with clamps; binding hyphae present, often dominant, thick-walled to solid, negative in Melzer's reagent; cystidia absent, cystidiols rarely present; basidiospores hyaline, thin-walled, cylindrical to ellipsoid, negative in Melzer's reagent. Australasian genus causing a brown rot. Only one species is known in Asia.

**Type species:** *Laccocephalum basilapiloides* McAlp. & Tepper.

**Remarks.** The genus is morphologically like *Polyporus*, but is separated by causing a brown rot and lacking skeleto-binding hyphae.

**Laccocephalum hartmannii** (Cooke) Núñez & Ryvardeen

Synopsis Fung. 10:30, 1995. - *Polyporus hartmannii* Cooke, Grevillea 12:14, 1883. - *Piptoporus ulmi* Bondartsev & Ljub., Bot. Mater. 14:198, 1961. - *Polyporus subliginosus* Zhao, Acta mycol. Sin. 10:269, 1991.

**Basidiocarps** annual, centrally or eccentrically stipitate, solitary or in groups of 3-4, either on wood or directly developing from a terrestrial pseudosclerotium; pileus circular to reniform, convex, 5-15 cm in diameter, up to 1 cm thick; pilear surface reddish brown with an orange margin, scurfy to finely velutinous, concentrically areolate when old; stipe up to 4 cm long and 3 cm thick, single to bifurcate, orange to brick-coloured, even or finely velutinous, with a brownish cuticle; pore surface cream to orange, pores angular, 3 to 6 per mm, tubes brittle with papery dissepiments; context white to cream, up to 1.5 cm thick, corky, with resinous zones.

**Hyphal system** dimitic; generative hyphae with clamps, 3-4 Fm wide, filled with brown contents in the pilear surface where they form a cutis, inflated in the context; binding hyphae solid, up to 1 Fm wide, present only in the context and stipe.

**Basidia** 16-20 x 4-5 Fm, embedded in mucilage, with four sterigmata.

**Basidiospores** narrowly cylindrical to fusiform, (6.5)7-9 x 2.5-3.5 Fm.

**Substrata.** On the ground, arising at the base of trees or even on wood. In Japan found under *Abies firma*.

**Distribution.** Australia, Tasmania, recently found in Japan (Shikoku, Honshu), and China.

**Remarks.** The species is easy to recognize by the orange tints of the pileus and stipe. This is probably the same species cited by Zhao & Zhang (1992) as *Polyporus mylittae* Cooke & Masee. We have borrowed the material from Peking, but it consi-

basidiocarps; pilear surface cream to pale brownish yellow, more or less glabrous or with radiating streaks or fibrils, in the end agglutinated to a thin cuticle; pore surface white to pale ochraceous, pores angular and thin-walled, 5-6 per mm, with finely fimbriate dissepiments, tubes concolorous with the pore surface, up to 1 mm long; context pale ochraceous, homogeneous, tough, up to 1 mm thick.

**Hyphal system** dimittic; generative hyphae with clamps, hyaline, moderately branched, 3-5 Fm wide; skeletal hyphae abundant, hyaline to pale yellow, thick-walled, straight, 2-5 Fm wide, in the trama more sinuous, narrower and occasionally branched, 2-4 Fm wide.

**Cystidia** abundant in the trama, arising from skeletal hyphae, cylindrical to slightly clavate, apically encrusted, occasionally projecting into the hymenium, 40-100 x 7-10 Fm.

**Basidia** clavate, 17-25 x 5-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subglobose, 3.5-4.5 x 2.5-3.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Temperate holarctic species, but rare. In East Asia only known from Japan.

**Remarks.** The species is characterized by being effused-reflexed to pileate, the other pileate representative of the genus in East Asia is *J. pseudozillingiana* which has oblong-ellipsoid basidiospores. The pores are almost identical with those of *J. separabilima*, which however is consistently resupinate and has larger basidiospores and a more pinkish pore surface.

### **Junghuhnia separabilima** (Pouzar) Ryvarden

Persoonia 7:18, 1972. - *Chaetoporus separabilima* Pouzar, Ceska Mykol. 21:210, 1967.

**Basidiocarps** annual, resupinate, effused up to 5 cm, fragile, easily separable, margin cream-coloured, fimbriate to rhizomorphic; pore surface pale buff to pinkish buff, pores angular, irregular, 2-5 per mm, with thin dissepiments that become lacerate, tubes concolorous with the pore surface, up to 1 mm long; context less than 1 mm thick, ivory white, fibrous.

**Hyphal system** dimittic; generative hyphae with clamps, thin-walled, rarely branched, 1.5-5 Fm wide; skeletal hyphae thick-walled, hyaline, with rare branching, 2-4 Fm wide.

**Cystidia** abundant, thick-walled, clavate to fusoid, completely to apically encrusted, 60-80 x 8-15 Fm, completely embedded to projecting 30 Fm, originating in the trama as ends of skeletal hyphae.

**Basidia** clavate, 14-20 x 4-6 Fm, with four sterigmata.

**Basidiospores** ovoid to ellipsoid, 3.5-5 x 3-3.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** A rare species in North America and Europe, in East Asia known from China (Hebei), Korea, Far East Russia, and Japan.

wide in the main body, branches straight, sinuous, up to 8 Fm wide.

**Basidia** clavate, 20-25 x 6-9 Fm, with four sterigmata.

**Basidiospores** ovoid to ellipsoid, 5-8 x 4-5 Fm.

**Anamorph.** *Ceriumyces aurantiacus* (Jahn 1970).

**Substrata.** In Europe mainly on hardwoods, commonly on *Quercus*. In North America and Asia also common on conifers. On hardwoods of many kinds in the tropical areas. It causes a brown cubical butt rot of both living and dead trees.

**Distribution.** Cosmopolitan species except in the extreme north. In East Asia known from China, Japan, Taiwan, Far East Russia and Vietnam.

**Remarks.** The orange, imbricate basidiocarps make the species easy to recognize.

*Piptoporus soloniensis* is similar but is usually brighter orange and has clamps on the generative hyphae instead of simple septa.

**Laetiporus versisporus** (Lloyd) Imazeki

Bull. Tokyo Sci. Mus. 6:88, 1943. - *Calvatia versispora* Lloyd, Mycol. Writ. 4, letter 57:7, 1915. - *Polyporus calvatioides* Imazeki, J. Jap. Bot. 16:269, 1940.

**Basidiocarps** annual, pileate, single to confluent, semiglobose to irregular or applanate, sessile, up to 20 cm long and 5 cm thick; pileus at first whitish to sulphur yellow, later brownish, velutinous to glabrous, azonate; pores usually not developed, whitish to yellow if present, angular 2-3 per mm, tubes usually shallow; context at first white, sappy, later becoming brownish and brittle, finally dark brown and powdery.

**Hyphal system** dimitic; generative hyphae simple-septate, thin-walled, hyaline to pale yellow, 2-6 Fm wide in the trama, up to 12 Fm wide in the context; binding hyphae thick-walled to almost solid, hyaline to pale yellow, with abundant lateral branches narrower than the main body and usually branching at right angles, in the trama up to 6 Fm wide, in the context up to 20 Fm wide.

**Chlamydospores** abundant in the context, ovoid to citriform, thick-walled, pale brown to olivaceous brown, 6-15 x 4-7.5 Fm, appearing as a brown powder inside or on the basidiocarps.

**Basidia** subclavate, 15-20 x 5-7.5 Fm, with four sterigmata.

**Basidiospores** ovoid, 4-5 x 3-3.5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Known from temperate China (Zhejiang), Japan (Honshu and Hokkaido), and Far East Russia (Primorsk).

**Remarks.** The species is recognized by its globose basidiocarps, usually devoid of pores and with abundant chlamydospores. For a more detailed information of its anamorph and its relation with *L. sulphureus*, see Stalpers (1984) and Hattori (1995).

**LENZITES** Fr.

Fl. Scand. p.339, 1835.

Basidiocarps annual to biennial, pileate; pilear surface white to greyish or yellowish

sted only of a sterile sclerotium.

### LAETIPORUS Murrill

Bull. Torrey Bot. Club 31:607, 1904.

Basidiocarps annual, pileate to stipitate, soft and fleshy, friable and light in weight on drying; pilear surface orange to pinkish brown, becoming glabrous; pore surface yellow to pinkish cream, pores regular, 3-4 per mm; context white to pinkish buff, soft, zonate to azonate; hyphal system dimitic; generative hyphae simple-septate; binding hyphae hyaline, thick-walled, consisting of a straight central body with a wide lumen from which parallel, lateral, single branches arise at almost right angles; cystidia absent; basidiospores ovoid to broadly ellipsoid, negative in Melzer's reagent. Causing a brown cubical rot of living hardwoods and conifers.

**Type species:** *Agaricus speciosus* Batt. = *Polyporus sulphureus* Bull.: Fr.

**Remarks.** The type species is easy to recognize in the field due to the brightly coloured, imbricate basidiocarps in yellow to pale orange colours and a soft consistency. The binding hyphae with a wide lumen and single branches aid in the identification.

#### Key to species

1. Basidiocarps applanate and usually imbricate, basidiospores 5-8 x 4-5 Fm  
..... **L. sulphureus**
1. Basidiocarps semiglobose to partly irregular, anamorph usually present, basidiospores 4-5 x 3-3.5 Fm ..... **L. versisporus**

### **Laetiporus sulphureus** (Bull.:Fr.) Murrill

Mycologia 12:11, 1920. - *Boletus sulphureus* Bull., Herb. Fr., pl. 429. 1788. - *Polyporus sulphureus* Bull.:Fr., Syst. Mycol. 1:357, 1821.

**Basidiocarps** annual, laterally substipitate to pileate, single to imbricate and then up to a square meter in extent, single pilei dimidiate to flabelliform, up to 40 cm wide; pilear surface citric yellow to orange when fresh, fading to pale brownish with age or drying and bleaching to white in old, deteriorating specimens, minutely tomentose to glabrous, azonate to faintly zonate, radially furrowed, margin concolorous, often undulate, round, sterile or fertile below; pore surface sulphur yellow when fresh, fading to pale tan on drying, pores angular, 3-4 per mm, with thin dissepiments that quickly become lacerate, tubes sulphur yellow when fresh, drying pale buff, distinct, up to 4 mm long; context white, azonate, brittle and sappy or succulent when fresh, drying crumbly or chalky, up to 2 cm thick, taste and odour nut-like, pleasant.

**Hyphal system** dimitic; generative hyphae simple-septate, thin-walled, hyaline, with rare branching, 4-6 Fm wide, in the context up to 12 Fm wide; binding hyphae thick-walled with a wide lumen, hyaline, branching usually at right angles, 3-20 Fm

persists even when the pilear surface has become white and dirty grey; hymenophore extremely variable, in some specimens poroid with 1-4 mm-wide pores, mostly angular, but frequently zonewise poroid, mixed with daedaleoid to sinuous lamellae up to 5 mm wide. In other specimens purely lamellate up to 6 mm wide, lamellae straight or wavy, especially towards the base where they are longer, dissepiments or lamellae edges even or dentate, becoming grey, tubes or lamellae up to 12 mm long; context cream to tan-coloured or distinctly yellowish, up to 8 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, 1.5-3 Fm wide; skeletal hyphae unbranched, thin-walled and pale yellowish, up to 8 Fm wide, with a wide lumen; binding hyphae common, richly branched, solid or with a lumen, up to 6 Fm wide in the main trunk, with acute ends.

**Cystidia** absent, but binding hyphae project into the hymenium and simulate subulate to rounded cystidia.

**Basidia** not seen.

**Basidiospores** cylindrical, 6-8 x 2-3 Fm.

**Substrata.** On dead hardwoods, mostly in open and sunny localities.

**Distribution.** Pantropical, but more common in Asia than on other continents, common from Pakistan to China, Japan, Far East Russia, Thailand to tropical South East Asia and Australia, especially in areas with seasonal drought.

**Remarks.** The species has repeatedly been described as new because of the very variable hymenophore. The typical character is the yellowish to tan context and trama. The pileus are often grayish in zones and patches in older specimens. *L. elegans* has smaller pores and denser lamellae and a purely white to pale cream trama and context.

**Lenzites betulina** (L.:Fr.) Fr.

Epicr. p. 405, 1838. - *Daedalea betulina* L.:Fr., Syst. Mycol. 1:333, 1821. - *Agaricus betulinus* L., Spec. Plant. p. 1176, 1753.

**Basidiocarps** annual, pileate, single to a few imbricate, dimidiate to semicircular with a partly resupinate part, 2-8 cm long, 1-5 cm wide and up to 2 cm, corky and coriaceous, margin even to lobed or incised; pilear surface tomentose to hispid in concentric, partly sulcate zones, first white, later greyish to light brown, old specimens often have a greenish tint because of algae in the tomentum; hymenophore lamellate with thin, radial lamellae, towards the margin new lamellae arise by dichotomous forking of old ones, but also individually between older ones, when young and along the margin straight, 10-15 per cm measured tangentially, about 100-200 Fm thick, in older parts and when dry, mostly undulating or flexuous, thus the distance between individual lamellae may vary considerably, first white, later cream to ochraceous, lamellae up to 1 cm long at the base; context thin, 1-2 mm thick, fibrous and white, distinctly lighter than the lamellae.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, in the trama 2-4 Fm wide and thin-walled, in the context rather scattered, somewhat thick-walled,

with age, glabrous to hirsute, often in distinct zones; hymenophore lamellate to daedaleoid, white to yellowish; context concolorous, tough and moderately thick; hyphal system trimitic; generative hyphae with clamps, thin-walled and hyaline; skeletal hyphae hyaline, thick-walled to solid; binding hyphae hyaline, strongly branched and tortuous, in the trama with long, sword-like side-branches with parallel walls and pointing apices, partly bending into the hymenium; basidiospores cylindrical, smooth, thin-walled, hyaline and negative in Melzer's reagent. On dead wood of hardwoods, causing a white rot. Cosmopolitan genus.

**Type species:** *Daedalea betulina* L.:Fr.

**Remarks.** The genus is undoubtedly close to *Trametes*, and from above basidiocarps of *L. betulina* and *T. hirsuta* are almost indistinguishable. However, the lamellate hymenophore and the characteristic catahymenium with pointed skeletal hyphae make *Lenzites* a distinct genus.

### Key to species

1. Pileus tomentose to hispid..... 2  
 1. Pileus mostly glabrous..... 3
2. Hymenophore lamellate, lamellae 10-15 per cm, temperate species. .... **L. betulina**  
 2. Hymenophore poroid-lamellate, lamellae 5-10 per cm, tropical species..... **L. vespacea**
3. Context and trama pale yellow..... **L. acuta**  
 3. Context and trama white..... **L. elegans**

**Lenzites acuta** Berk.

London J. Bot. 1:146, 1842.

**Basidiocarps** annual to biennial, pileate, solitary or with few imbricate pilei, applanate, broadly attached to dimidiate, in some cases substipitate; pileus up to 15 cm wide, 25 cm long, and 3-4 cm thick at the base, coriaceous when fresh, flexible when dry; pilear surface first cream, then leather-coloured or dirty brownish, dirty greyish when old, first very finely velutinous and soft, with age becoming glabrous, azonate to concentrically zonate, weakly sulcate, smooth or with small protuberances especially close to the base, margin sharp, flat or deflexed in thin specimens, entire or lobed; pore surface warm buff to tan, mostly with a yellowish tint and this colour

**Basidia** clavate, 8-15 x 4-6 Fm, with four sterigmata, arising through the catagymenium formed by the ends of the binding hyphae.

**Basidiospores** cylindrical to oblong ellipsoid, 5-7 x 2-3 Fm.

**Substrata.** On hardwoods of many genera.

**Distribution.** Widespread and very common in tropical areas, also in subtropical China, Japan, Taiwan, North Thailand and Vietnam.

**Remarks.** In their typical aspect, basidiocarps of this species are easy to recognize because of the white, glabrous basidiocarps with an irregular hymenophore, often changing from the base to the margin. The colour and shape are very variable and have caused descriptions of numerous synonyms.

**Lenzites vespacea** (Pers.) Ryvarden

Norw. J. Bot. 19:232, 1972. - *Polyporus vespaceus* Pers., Voy. au. Monde:170, 1827. - *Trametes kusanoana* Imazeki, Bull. Tokyo Sci. Mus. 6:73, 1943.

**Basidiocarps** annual, pileate, sessile, broadly to narrowly attached, mostly rather small, but up to 8 cm wide, 10 cm broad and 1 cm thick near the base, consistency flexible and corky when dry; pileus dimidiate to semicircular or flabelliform, applanate to slightly convex, pilear surface pure white, pale straw-coloured to ochraceous, first finely velvety tomentose, soon the hyphal strands agglutinate to typical asperulate zones with small hispid tufts, usually concentrically sulcate and often striate especially towards the margin, margin even to lobed, often wavy; pore surface concolorous with the pilear surface or somewhat darker, very variable from poroid with hexagonal to sinuous pores, daedaleoid or labyrinthine to purely lamellate even within the same collection, 5-11 lamellae per cm, the lamellae are papery thin, often forked and split to flattened teeth, up to 2 cm long; context very thin, concolorous with the pileus, about 0.5-2 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, in tubes and context thin-walled, hyaline, 2-4 wide, heavily branched; skeletal hyphae abundant, thick-walled, hyaline to pale yellow, 3-7 Fm wide, swelling strongly in KOH; binding hyphae 2-5 Fm wide, moderately branched with tapering ends; the pilear tomentum is dominated by pale yellow, thick-walled skeletal hyphae.

**Cystidia** absent; thick-walled pointed skeletal hyphae project into the hymenium as cystidial organs 25 x 6 Fm, sometimes covered by very fine crystals.

**Basidia** cylindrical, inconspicuous, embedded in the trama, 8-10 x 3-4 Fm.

**Basidiospores** broadly ellipsoid, 4-5 x 2.5 Fm.

**Substrata.** On hardwoods of many kinds.

**Distribution.** Pantropical to subtropical species, more common in the paleotropics. In East Asia known from China, Japan, Taiwan, Northern Thailand, and Vietnam.

**Remarks.** The finely tomentose surface often becoming scrupose and tufted, and the often irregular hymenophore are good field characteristics. From *L. acuta* it may be separated by the asperulate pileus, the white context and smaller basidiospores.

up to 5 Fm wide; skeletal hyphae solid to thick-walled, 3-7 Fm wide, dominating in the tomentum, in the trama with a more distinct lumen; binding hyphae very common, hyaline, thick-walled to solid, tortuous and much branched, up to 10 Fm wide, in the context with thin and whip-like branches, in the trama with stouter branches and below the subhymenium with straight, thick-walled, acute branches more or less parallel, partly pointing into the lower part of the hymenium, but in fertile specimens never above the dense palisade of basidia.

**Cystidia** absent; in collapsed hymenia the acute branches of the binding hyphae may easily be mistaken for thick-walled cystidia unless a careful examination is undertaken.

**Basidia** clavate, 15-20 Fm long, with four sterigmata.

**Basidiospores** cylindrical, often slightly bent, 5-6 x 2-3 Fm.

**Substrata.** On hardwoods, preferably on *Betula* spp., but recorded from many genera.

**Distribution.** Cosmopolitan species, but much rarer in the tropical zone than in temperate-boreal areas.

**Remarks.** The species is easy to recognize because of the hirsute to tomentose zonate pileus and the lamellate hymenophore.

***Lenzites elegans*** (Spreng.:Fr.) Fr.

Epicr. Syst. Mycol. p. 492, 1838. - *Daedalea elegans* Spreng.:Fr., Syst. Mycol.

1:335, 1821. - *Daedalea elegans* Spreng., Sv. Vetensk. Akad. Handl. 1820:51, 1820.

**Basidiocarps** annual to perennial, often gregarious, flabelliform, dimidiate or circular, sessile or with a short stipe-like base, 1-35 cm wide and long and 0.2-3 cm thick, corky and flexible when fresh, more rigid when dry; pilear surface white, cream, or buff ochraceous, very finely tomentose, soon glabrous, smooth or concentrically sulcate, often warted or with slightly uneven elevated areas, margin thin, even or lobed; stipe when present up to 3 cm long, 1.5 cm thick, 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-daedaleoid 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 long; context white to pale cream, up to 1.5 cm thick near the base, woody hard when dry.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 Fm wide; skeletal hyphae dominating, yellow to golden, thick-walled to solid, 3-7 Fm wide; binding hyphae hyaline to pale yellow, thick-walled, up to 5 Fm wide, irregularly or dichotomously branched, and then acute at the apex.

**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.

hardwoods and ferns. Causes a white rot.

**Type species:** *Trametes irpicoides* Pilát.

**Remarks.** The genus is close to *Oxyporus* with its globose to ovoid basidiospores, the monomitic hyphal system with simple-septate hyphae, and the large, smooth cystidia. However, cystidia are thin-walled and never encrusted, besides the basidiospores are thick walled in *Leucophellinus* and thin-walled in *Oxyporus*.

***Leucophellinus irpicoides*** (Pilát) Bondartsev & Singer

Mycologia 36:68, 1944. - *Trametes irpicoides* Pilát, Bull. Soc. Mycol. France 52:311, 1937.

**Basidiocarps** resupinate to effused-reflexed, rarely pileate, light in weight, variable in size and thickness, 5-15 cm long, 3-10 cm wide and 1-5 cm thick, consistency soft and watery when fresh, fibrous and loose in texture when dry; pilear surface white to cream when fresh, ochraceous buff when dry, greyish to greenish at the base, densely tomentose to hispid in old specimens, azonate, cuticle absent; pore surface concolorous with the pileus or somewhat paler, pores angular, irregular to labyrinthine, 0.5-1 per mm, often varying in size within the same basidiocarp, dissepiments thin and papery, tubes indistinctly stratified, 0.5-7 cm long; context thin, concolorous with the pileus, concentrically zonate with bands of denser and lighter consistency, up to 3 cm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, mostly golden and thick-walled with a lumen, more seldom hyaline and thin-walled, mostly 4-5 Fm wide, sparingly branched, more agglutinated in the context, pileus hairs consist of almost unbranched, golden hyphae up to 7 Fm wide, in old specimens the hyphae become heavily encrusted, and the whole basidiocarp then turns more brownish.

**Cystidia** oblong to cylindrical, up to 110 x 15 Fm, projecting up to 30 Fm above the hymenium, hyaline, thin to slightly thick-walled, often with a swollen apex with one to three simple septa, and sometimes encrusted with an amorphous matter; hymenial, ventricose, thin-walled cystidiols variably present.

**Basidia** clavate, 22-27 x 6-8 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to ovoid, thick-walled, appearing yellow and refractive in KOH, 6.5-8.5 x 5-5.5 Fm.

**Substrata.** Generally on rotten wood, but also found on damaged living trees.

**Distribution.** Widespread in temperate Australasia, but rare. In East Asia known from Northern China, Japan (Honshu and Kyushu), Taiwan, Northern Thailand, and Vietnam.

**Remarks.** The distinctly thick-walled basidiospores and the often septate, smooth cystidia separate species of *Leucophellinus* from *Oxyporus* species. *Leucophellinus hobsonii* (Cooke) Ryvardeen is a tropical species, almost always pileate, and with larger basidiospores (8-11 x 5.5-7 Fm, Ryvardeen 1988a).

**LIGNOSUS** Torrend

**LEPTOPORUS** Quél.

Ench. Fung. p.175, 1886.

Basidiocarps annual, sessile to effused-reflexed; pilear surface white to pale reddish at first, becoming dark reddish purple to purplish brown with age or drying; pore surface becoming purplish brown; hyphal system monomitic; generative hyphae simple-septate; cystidia absent; basidiospores allantoid, hyaline, negative in Melzer's reagent. Causes a brown cubical rot of dead conifers in boreal forests. Monotypic genus.

**Type species:** *Polyporus mollis* Pers.:Fr.

**Remarks.** The genus is close to *Oligoporus*, sharing the same hyphal system, type of basidiospores and a brown rot, but is separated by its simple-septate hyphae and the striking reddish pigments.

**Leptoporus mollis** (Pers.:Fr.) Quél.

Ench. Fung. P. 176, 1886. - *Boletus mollis* Pers., Ann. Bot. (Usteri) 15:22, 1795. - *Polyporus mollis* Pers.:Fr., Syst. Mycol. 1:360, 1821.

**Basidiocarps** annual, pileate, effused-reflexed or rarely resupinate; pilei solitary, dimidiate to elongate, up to 3 x 1 cm wide and 2 cm thick; pilear surface pinkish white or pale reddish purple at first, becoming purplish brown, faintly tomentose to glabrous, azonate, becoming rugose with age, margin concolorous or cream-coloured next to the substratum on resupinate or effused-reflexed specimens; pore surface white to pale reddish purple, becoming dark purplish brown, pores circular to angular, 3-4 per mm, with thick, entire dissepiments, tubes drying dark purplish-brown and brittle, distinct from the context, up to 1 cm long; context cream-coloured to pinkish buff, becoming pale pinkish brown, faintly zonate or azonate, soft and felty, up to 7 mm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, thin- to thick-walled, with rare to frequent branching, 2.5-5 Fm wide; gloeoplerous hyphae also present.

**Basidia** clavate, 16-20 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid, 5-6 x 1.5-2 Fm.

**Substrata.** On dead conifers.

**Distribution.** Circumboreal in coniferous forests. In East Asia known from Japan.

**Remarks.** The simple-septate hyphae and the pinkish to purplish colours are diagnostic characters for this species. It may be taken microscopically for a *Ceriporia*, all species of which are resupinate and white rot fungi.

**LEUCOPHELLINUS** Bondartsev & Singer

Mycologia 36:68, 1944.

Basidiocarps resupinate to pileate, light of weight; pilear surface if present densely tomentose; pores angular, cream to light brown; context cream; hyphal system monomitic; generative hyphae simple-septate; cystidia clavate, sinuous, thin- to thick-walled, basidiospores broadly ellipsoid to oval, thick-walled. On living or dead

thick-walled to solid, 1.5-6 Fm wide, in the lower part of context and in the trama mixed with strongly branched, tortuous binding hyphae, thick-walled to solid, 2-6 Fm wide, the core of the stipe consists mainly of unbranched or slightly branched skeletal hyphae mixed with some hyaline generative hyphae, the sclerotium consists mainly of skeletal hyphae; hyphal pegs composed of more or less parallel skeletal hyphae mixed with some generative hyphae.

**Basidia** subcylindrical, 7-11 x 4-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 3-4 x 1.7-2.5 Fm.

**Substrata.** Growing from an sclerotium either buried in the ground or in very rotten wood.

**Distribution.** Tropical Asian species, but appearing in subtropical China and Japan, and in Australia.

**Remarks.** The species is easily identified by the sclerotium and the tall, centrally stipitate basidiocarp.

### MELANOPORIA Murrill

North Am. Flora 9:14, 1907.

Basidiocarps perennial, resupinate to pileate, purplish black to fuliginous; pores small; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae pale to dark brown; cystidia absent; basidiospores ellipsoid, smooth and negative in Melzer's reagent. On hardwoods, causing a brown rot. Temperate genus with two species in East Asia and Eastern North America.

**Type species:** *Polyporus niger* Berk.

**Remarks.** The genus is easy to recognize by its black to purplish basidiocarps with clamped generative hyphae and producing a brown rot. Its closest relative is *Fomitopsis*, only differing by a white to pink context and pore surface, and larger basidiospores.

### *Melanoporia castanea* (Imazeki) Hattori & Ryvarden

Mycotaxon 50:29, 1994. - *Fomitopsis castanea* Imazeki, Bull. Gov. Forest Exp. St. Tokyo 42:1, 1949. - *Phellinus quercinus* Bondartsev & Ljub., Novo. Sist. Nizsh. Rast. 1965:141, 1965.

**Basidiocarps** perennial, pileate, occasionally resupinate; pileus triquetrous, ungluate or irregular, up to 30 cm long and 15 cm thick, margin thick and dull; pilear surface chestnut brown and velutinate in young specimens, almost black and glabrous when old, scrupose at the base, broadly concentrically sulcate; pore surface dark umber to purplish black, pores circular, 5-6 per mm, tubes stratified, purplish brown; context fibrous-corky, purplish brown, up to 3 cm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, 1.5-4 Fm wide, in the trama hyaline to pale yellow; skeletal hyphae olivaceous brown in KOH, almost

Broteria Ser. Bot. 18:121, 1920.

Basidiocarps annual, centrally stipitate, arising from a sclerotium; pilear surface brown to white, glabrous to very finely tomentose; stipe white to brown, with a crust; pores small to large; context white; hyphal system trimitic; generative hyphae with clamps; skeletal and binding hyphae hyaline, only present in the context, sclerotium and stipe; cystidia absent; basidiospores smooth, ellipsoid, hyaline, negative in Melzer's reagent. On the ground arising from a sclerotium, paleotropical and Australian genus, one species in Asia.

**Type species:** *Polyporus sacer* Fr.

**Remarks.** The genus is separated from *Microporus*, also a trimitic genus, by the shape of the basidiospores and the presence of a sclerotium. Besides, most *Microporus* species have dendrohyphidia in the dissepiments.

**Lignosus rhinocerus** (Cooke) Ryvarden

Norw. J. Bot. 19:232, 1972. - *Polyporus rhinocerus* Cooke, Trans. Bot. Soc. Edinburgh 13:150, 1879.

**Basidiocarps** annual, mostly solitary, centrally stipitate with a more or less circular pileus up to 10 cm in diameter and 5 mm thick in the centre, tough to coriaceous, in larger specimens often somewhat lobed or incised; pilear surface hazel to snuff brown becoming greyish, first very finely tomentose, sometimes distinctly sulcate, but soon more or less glabrous in narrow concentric bands, dry specimens usually wrinkled radially, in large specimens the margin may become strongly radially folded with narrow furrows, margin thin and sharp, lighter than the pileus; stipe more or less centrally attached, single or a few from the same sclerotium, rarely forked in the upper part, light brown to greyish and finely velvety tomentose, becoming smoother and finally glabrous with age, below the very short tomentum there is a distinct thin and light brown cuticle, stipe first solid, but soon hollow, somewhat tough when fresh, easy to break when dry; sclerotium irregular, round to somewhat elongated, longest dimension up to 5 cm in diameter, pure white, but usually dirty and soiled, very finely tomentose, smooth to slightly folded when fresh, wrinkled, partly collapsed and bony hard in dry and old specimens, rhizomorphs or cords of mycelium richly to scarcely present, white to light ochraceous, hollow, 1-3 mm thick, up to 7 cm long, usually growing radially out from where the stipe is attached, which is 1-2 cm below ground or inside rotten wood; pore surface white to light cream with a narrow brown sterile margin, pores circular, 7-8 per mm, tubes short, up to 3 mm long, with hyphal pegs; context pure white, tough, up to 5 mm thick, contrasting with the dark pilear cuticle.

**Hyphal system** trimitic; generative hyphae with clamps, in the trama thin-walled and hyaline, 2-3 Fm wide, the tomentum both on the pileus and the stipe consists of such hyphae, up to 10 Fm wide and slightly thickened to semisolid, light yellowish, moderately branched; in the cuticle strongly agglutinated, 30-50 Fm wide; skeletal hyphae dominating the upper part of the context, straight to flexuous, hyaline and

base of individual pilei.

**Hyphal system** monomitic; generative hyphae mostly simple-septate, but a few clamps present, in the trama more or less parallel, thin-walled and with numerous septa, 3-5 Fm wide, these hyphae make the trama distinctly more brittle than the context, in the context and stipe generative hyphae unbranched or sparingly branched, thick-walled to almost solid, with scattered to almost no septa, 6-14 Fm wide, to an untrained observer 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 Fm, in swollen parts and around points of branching up to 15 Fm wide.

**Cystidia** absent, fusoid cystidiols present, 18-40 x 5-8 Fm.

**Basidia** clavate, 22-40 x 7-8 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to subglobose, 6-7 x 4.5-6 Fm.

**Substrata.** On hardwoods, rarely on conifers, usually growing from roots.

**Distribution.** Widespread in boreal and temperate zones. In East Asia known from China and Japan.

**Remarks.** The species is easy to recognize in the field because of the large, multi-pleate basidiocarps and the pore surface that becomes rapidly blackish when bruised or cut. *Grifola frondosa* basidiocarps are more clearly stipitate, have a greyish pilear surface, and abundant clamps on the generative hyphae.

### MICROPORUS Kuntz.

Rev. Gen. Pl. 3:494, 1898.

Basidiocarps annual, centrally to laterally stipitate; pilei circular, flabelliform to spatulate, smooth to hirsute, often zonate; stipe round, usually with an expanded foot at the base, white to black, smooth or hirsute; pore surface white to cream, pores round and entire, very small, 5-10 per mm; context in the pileus and the stipe white and tough; hyphal system trimitic; generative hyphae with clamps; skeletal and binding hyphae hyaline, thick-walled; coralloid dendrohyphidia present in the dissepiments; cystidia absent; basidiospores allantoid to cylindrical, smooth, thin-walled, hyaline, negative in Melzer's reagent. On hardwoods, causing a white rot. Paleotropical genus spreading to warm-temperate areas in Asia.

**Type species:** *Polyporus xanthopus* Fr.

**Remarks.** The genus is distinct among those with stipitate basidiocarps because of its trimitic hyphal system with hyaline hyphae, small, allantoid to cylindrical basidiospores, and coralloid dendrohyphidia in the dissepiments.

### Key to species

1. Basidiocarps centrally stipitate, infundibuliform..... **M. xanthopus**

unbranched, thick to almost solid, 3-5 Fm wide.

**Basidia** clavate, 15-20 x 4.5-5.5 Fm, with four sterigmata.

**Basidiospores** subellipsoid, 4-5 x 1.8-2.5 Fm.

**Substrata.** On hardwoods, especially *Quercus*.

**Distribution.** Temperate Asian species known from China, Far East Russia, Japan, and Taiwan.

**Remarks.** This species is related to *Melanoporia nigra* from East North America, which however is resupinate with smaller basidiospores (3-4 x 2-3 Fm, Gilbertson & Ryvarden 1987).

### **MERIPILUS** P. Karst.

Bidr. Känn. Finl. Nat. Folk 37:33, 1882.

Basidiocarps annual, large, pileate and heavily imbricate with flabelliform or spatulate pilei from a common short stipe or base; pilear surface brown with radial lines, smooth and mostly with concentric zones; pore surface white, darkening when touched or dried, pores small, dissepiments entire, tubes white and short; context white and fibrous; hyphal system monomitic; generative hyphae mostly simple-septate, thin- to thick-walled, smooth, hyaline; cystidia absent; basidiospores subglobose, thin-walled, smooth, hyaline, negative in Melzer's reagent. Growing on hardwoods, often from buried roots or close to stumps, causes a white rot. Cosmopolitan genus.

**Type species:** *Polyporus giganteus* Fr.

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

### **Meripilus giganteus** (Pers.:Fr.) P. Karst.

Bidr. Känn. Finl. Nat. Folk 37:33, 1882. - *Polyporus giganteus* Pers.:Fr., Syst. Mycol. 1:356, 1821. - *Boletus giganteus* Pers., Syn. Fung. p.521, 1821.

**Basidiocarps** annual, large and pileate with numerous imbricate, flabelliform to spatulate pilei from a common base or stem, single pilei 5-20 cm wide and long with a tapering base, up to 2 cm thick, the basidiocarp as a whole up to 30 cm wide and long, fleshy when fresh; pilei hard and brittle when dry, glabrous, smooth, ochraceous to brown when old, often somewhat concentrically zonate, when dry the thinner parts of the pileus often become radially wrinkled or rimose, 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 3-5 per mm, dissepiments entire, tubes up to 8 mm long, concolorous with the pore surface; context whitish to cork-coloured, paler than the tubes, distinctly fibrous and up to 1.5 cm thick near the

**Substrata.** On hardwoods.

**Distribution.** Common species in the paleotropics, also found in subtropical and warm-temperate China, Japan, Taiwan, North Thailand, and Vietnam.

**Remarks.** This is a most variable species and it has repeatedly been described as new based on variation in colour and tomentum on the pileus. It has always a lateral stipe and a concentrically zoned, mostly spatulate to semicircular pileus varying from yellow to bay or chestnut.

**Microporus ochrotinctus** (Berk. & M.A. Curtis) O. Kuntze

Rev. Gen. Pl. 3:496, 1898. - *Polyporus ochrotinctus* Berk. & M.A. Curtis, Proc. Am. Acad. Arts Sci. 4:122, 1860.

**Basidiocarps** annual, laterally stipitate, flabelliform, hard to flexible, up to 5 cm long and wide, 2-4 mm thick; pileus dark ochre with a cream margin, glabrous, semiglossy, concentrically sulcate, margin sharp, entire to lobed; stipe lateral, yellowish to light brown, glabrous and semiglossy, short, up to 1 cm long and 7 mm thick, clearly delimited towards the pore surface, attached to the substrate by a discoid base; pore surface cream with a light orange tint, semiglossy, pores regular, 8-10 per mm, tubes concolorous, up to 2 mm long; context cream, homogeneous, fibrous, concolorous with the tubes, up to 2 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled; skeletal hyphae hyaline, straight to sinuous, in the trama thick-walled and solid, up to 4 Fm wide, in the context with a lumen and up to 5 Fm wide; binding hyphae scarce, mostly present in the trama, hyaline, tortuous, with long branches, up to 3 Fm wide; pilear surface as a cuticle of brown, parallel skeletal hyphae.

**Dendrohyphidia** abundant in the dissepiments, projecting about 6 Fm, multi-branched, up to 1 Fm wide.

**Basidia** subglobose, 8-10 x 4-5 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly allantoid, 4-4.5 x 1.5-2 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Asian species only known from subtropical Japan (Okinawa and Bonin Islands).

**Remarks.** The species is recognized by its glabrous, semiglossy, dark ochre pileus.

**Microporus vernicipes** (Berk.) Kunt.

Rev. gen. Pl. 3:494, 1898. - *Polyporus vernicipes* Berk., J. Linn. Soc. Bot 16:50, 1878.

**Basidiocarps** annual, solitary or gregarious, laterally stipitate, pileus semicircular, often with the rear parts grown backwards so they almost meet over the stipe, or flabelliform to spatulate, up to 10 cm wide, thin, flexible and tough, rarely more than 2 mm thick; pilear surface light brown to chestnut in narrow concentric zones, usually lighter towards the margin, semiglossy, glabrous, smooth to strongly veined radially, from the base there is a distinct ochraceous pad spreading towards the margin further

1. Basidiocarps laterally stipitate..... 2
2. Pores 5-7 per mm, mycelial outgrowths spreading from base..... **M. vernicipes**
2. Pores 8-10 per mm, no mycelial outgrowth at base of pileus ..... .. 3
3. Pilear surface and stipe ochre to light brown, glabrous..... **M. ochrotinctus**
3. Pilear surface chestnut brown to black, velvety zonewise, stipe black..... **M. affinis**

**Microporus affinis** (Fr.:Blume & Nees) Kunt.

Rev. Gen. Pl. 3:494, 1898. - *Polyporus affinis* Fr.:Blume & Nees, Elench. Fung. p.126, 1828. - *Polyporus affinis* Blume & Nees, Nova Acta Acad. Caes. Leop. Car. 13:18, 1826.

**Basidiocarps** annual, solitary or gregarious, laterally stipitate or more rarely subsessile, flabelliform, spatulate, semicircular, dimidiate, mostly flat, pileus up to 10 cm long and 8 cm wide, up to 6 mm thick, margin thin and entire; pileus variable from light yellowish to brown and chestnut and bay to almost black, usually darker at the center than along the margin, strongly zonate, tomentose becoming glabrous zonewise; stipe lateral, up to 4 cm long and prominent to almost lacking, 2-8 mm wide, usually expanded both towards the base and the pore surface, round to slightly flattened, first greyish and finely appressed tomentose, later glabrous in parts and then almost black with a distinct crust over a white context; pore surface light cream, later pale ochraceous and even greyish in some specimens with the grey colour spreading from the base, margin 1-3 mm wide and pure white, pores round and entire, very small, 7-10 per mm, tubes light cream, up to 1 mm long; context pure white and dense, up to 5 mm thick near the base, in old specimens covered with a distinct dark cuticle from which the tomentum develops.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, 1.5-3 Fm wide; skeletal hyphae hyaline, in the context straight to slightly flexuous, 3.5-6 Fm wide, thick-walled to almost solid, in the tomentum with a more distinct lumen and up to 10 Fm wide; binding hyphae common in the context and trama, tortuous and much branched, mostly 1.5-3 Fm wide, but near the base thicker and up to 6 Fm wide and here with fewer side branches.

**Dendrohyphidia** coralloid, present along the dissepiments and partly occluding them.

**Basidia** clavate, 8-10 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid to short cylindrical, 3-4 x 1.5-2 Fm.

up to 6 Fm wide; binding hyphae tortuous and mostly broken in preparations, thick-walled to apparently solid, up to 1-3 Fm wide.

**Dendrohyphidia** often present along the dissepiments, coralloid, very finely branched and often partly covered with crystalline deposits, easily broken in preparations.

**Basidia** apparently very short-lived, collapsing very rapidly into a honeycomb pattern.

**Basidiospores** cylindrical, 6-7.5 x 2(2.5) Fm.

**Substrata.** On dry hardwoods, often in open habitats like savannah, river beds, or hanging branches.

**Distribution.** Paleotropical species, in East Asia known from subtropical China, Taiwan, Japan, North Thailand, and Vietnam.

**Remarks.** Usually easy to recognize in the field because of the infundibuliform basidiocarps with a glossy and strongly zonate pileus, the yellowish, glabrous stem and the very minute pores. The basidiocarps are often used in Europe for Christmas decorations.

### **NIGROFOMES** Murrill

Bull. Torrey Bot. Club. 31:425, 1904.

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 the pore surface; context dense, purplish black; hyphal system dimitic; generative hyphae with simple septa, hyaline to dark brownish, densely agglutinated; cystidia ventricose, thick-walled, acute, scattered to very rare, umber brown; basidiospores broadly ellipsoid, hyaline, negative in Melzer's reagent. Apparently causing a white rot on hardwoods. Monotypic tropical genus.

**Type species:** *Polyporus melanoporus* Mont.

**Remarks.** The species is easy to recognize in the field because of the blackish to dark purplish, dense perennial basidiocarps with minute pores and a black cuticle. Microscopically the simple-septate generative hyphae distinguish this species from *Nigroporus* or *Melanoporia* species.

### **Nigrofomes melanoporus** (Mont.) Murrill

Bull. Torrey Bot. Club. 31:425, 1904. - *Polyporus melanoporus* Mont., Ann. Sci. Nat. Ser. 2, 17:127, 1842.

**Basidiocarps** perennial, pileate, applanate, sessile to resupinate, mostly semicircular, up to 20 cm wide and long and 5 cm thick, very hard; pilear surface first finely velutinate and dark brown, then glabrous and purplish black, often with sulcate zones becoming tuberculate and slightly rimose 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,

down the upper side of the stipe, usually strongly contrasting with the much darker pilear surface, margin entire to lobed; stipe short and lateral, rarely above 3 cm long, 2-8 mm wide, sometimes appearing as a contracted base, cream to ochraceous, on the lower side either covered with decurrent pores or with a light yellowish, smooth and glabrous cuticle, distinctly delimited towards the upper mycelial pad, at the base expanded into a broad, smooth disc, up to 3 mm wide; pore surface cream to light brownish, often discoloured by dark spots, lighter towards the margin, sterile margin very narrow and white if present, pores round and entire, 5-7 per mm, tubes concolorous with the pore surface or lighter, up to 1 mm long; context pure white, up to 1 mm thick, with a distinct dark cuticle which also is present under the pad of appressed mycelium.

**Hyphal system** trimitic; generative hyphae with clamps, 2-3 Fm wide; skeletal hyphae dominating in the basidiocarp, hyaline, thick-walled to solid, 3-7 Fm wide; binding hyphae few, tortuous and tapering, 1-4 Fm wide; dendrohyphidia coralloid, present along the dissepiments.

**Basidia** clavate, 8-10 x 4-5 Fm, with four sterigmata.

**Basidiospores** cylindrical to allantoid, 5-7 x 2(2.5) Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Paleotropical species, in East Asia extending to subtropical and temperate China, Japan (Hokkaido, Honshu), Far East Russia, North Thailand, and Vietnam.

**Remarks.** The species is usually easy to recognize because of the semicircular to spatulate brown basidiocarps with a lateral stipe and a distinct light mycelial pad at the base of the pileus. Its pores are the largest in the genus.

**Microporus xanthopus** (Fr.) Kunt.

Rev. gen. Pl. 3:494, 1898. - *Polyporus xanthopus* Fr., Syst. Mycol. 1:350, 1821.

**Basidiocarps** annual, solitary or gregarious, centrally or more rarely laterally stipitate, usually infundibuliform, sometimes two or more basidiocarps may grow together to more complicated basidiocarps with several stipes and with imbricate pilei, margin wavy and lobed, deflexed when dry, often deeply incised; pileus up to 10 cm wide and 1-3 mm thick, glabrous and glossy, yellowish brown to chestnut in numerous narrow concentric zones, often with alternating dark and light colours; stipe round, glabrous, covered with a thin, light yellowish to light brown cuticle, up to 6 cm high and 3-9 mm thick, slightly expanded upwards, and expanded to a disc-like base up to 1 cm wide, the base is covered with a very finely appressed tomentum which slowly wears away with age; pore surface cream to pale buff, almost pure white towards the margin, becoming grey in old specimens, pores entire and very minute, almost invisible to the naked eye 8-10 per mm, tubes up to 1 mm long; context pure white, very thin and covered with a distinct cuticle.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 2-3.5 Fm wide, moderately branched; skeletal hyphae dominating, hyaline and thick-walled,

Ann. Bot. Fennici 32:218, 1995. - *Phellinus ussuriensis* Bondartsev & Ljub., Novosti Sist. Nizsh. Rast. 1965:143.

**Basidiocarps** annual to perennial, pileate to resupinate, woody hard, margin blunt; pilear surface dirty brown, slightly sulcate, velvety; pore surface rosy brown, pores round, felty, 5-7 per mm, dissepiments thick, tubes concolorous with the pores, corky, up to 2 mm long; context brown, corky, azonate, up to 4 mm thick.

**Hyphal system** dimitic; generative hyphae clamped, hyaline, very frequently branched, thin- to slightly thick-walled, up to 3 Fm wide; skeletal hyphae brown ferruginous, straight, thick-walled, mostly unbranched, 3-5 Fm wide.

**Basidia** clavate, 8-12 x 4-5 Fm, with four sterigmata.

**Basidiospores** subellipsoid with a tapering end, 4-5 x 2-2.5 Fm.

**Substrata.** On dead deciduous wood.

**Distribution.** Cold-temperate Asian species, known from China (Changbai) and Far East Russia (Primorsk).

**Remarks.** At sight, *N. ussuriensis* reminds of *Abundisporus pubertatis* because of the overall pink colour. The basidiospores of the latter are coloured, ellipsoid, and thick-walled, very different from those of *N. ussuriensis*. All pinkish *Fomitopsis* species have larger basidiospores than the species treated here. Besides, *N. ussuriensis* seems to cause a white rot (Dai & Niemelä 1995).

### **Nigroporus vinosus** (Berk.) Murrill

Bull. Torrey Bot. Club. 32:361, 1905. - *Polyporus vinosus* Berk., Ann. Mag. Nat. Hist. ser. 2, vol. 11:195, 1852.

**Basidiocarps** annual, pileate to rarely resupinate, broadly attached to dimidiate, semicircular to elongated along the substratum, up to 6 cm wide, 10 cm long in reflexed specimens, up to 5 mm thick, rigid to flexible when dry, coriaceous when fresh, margin deflexed when dry; pilear surface pale violaceous to vinous brown, first felty to velutinate, becoming glabrous and purplish brown to dark violet, azonate or with distinct narrow sulcate zones towards the sharp margin; pore surface purplish brown to dark violet, pores circular, 7-8 per mm, tubes concolorous, up to 3 mm long; context umber to vinous brown, often paler with age, up to 5 mm thick at the base.

**Hyphal system** dimitic; generative hyphae with clamps, 2-4 Fm wide, hyaline in the trama, in the context pale vinous, sometimes multi-branched and thick-walled, resembling binding hyphae; skeletal hyphae thick-walled to solid, fuliginous to pale pinkish brown, 2-6 Fm wide, straight and unbranched or with rare dichotomous branching.

**Basidia** clavate, 6-10 x 3-4 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 3.5-4.5 x 1-1.5 Fm.

**Substrata.** Mainly on dead hardwoods, occasionally on conifers.

**Distribution.** Widespread in the tropics, in East Asia from Jiangsu, Guangdong and Guangxi in China, Okinawa and Kyushu in Japan, Korea, North Thailand, and

6-9 per mm, almost invisible to the naked eye, tubes concolorous, often stratified and up to 4 cm long; context dark chestnut to purplish black, often glossy, hard and intergrading with the cuticle.

**Hyphal system** dimitic; generative hyphae simple-septate, thin- to very thick-walled, hyaline to straw-coloured, 1-5 Fm 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 Fm wide, pale olivaceous brown in KOH.

**Cystidia** ventricose, thick-walled, acute and dark fuscous brown, similar in shape to those seen in many species of Hymenochaetaceae, but distinctly olivaceous brown, 10-30 x 5-12 Fm.

**Basidia** clavate, 12-15 x 4-5 Fm, often very difficult to observe, with four sterigmata.

**Basidiospores** broadly ellipsoid, 4-5 x 3-3,5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Widespread in the tropics, north to subtropical China, Japan, North Thailand, and Vietnam.

**Remarks.** The species is easy to recognize because of the very hard, purplish black, pileate basidiocarps.

### **NIGROPORUS** Murrill

Bull. Torrey Bot. Club. 32:361, 1905.

Basidiocarps annual, pileate to resupinate; pileus when present, glabrous, azonate to concentrically zonate, vinous-brown to pink or violet; pore surface concolorous with the pileus, pores usually small, entire, round to angular; context vinous-brown to pink and purplish; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae fuliginous brown, thick-walled to solid; cystidia absent; basidiospores mostly small, up to 5 Fm long, hyaline, smooth and thin-walled, allantoid to broadly ellipsoid, negative in Melzer's reagent; on hardwoods, causing a white rot.

**Type species:** *Polyporus vinosus* Berk.

**Remarks.** The dimitic hyphal system with the fuliginous skeletal hyphae which give the basidiocarps the pinkish, violet colours, is the diagnostic characteristic.

### **Key to species**

1. Basidiocarps, pinkish, basidiospores 4-5 x 2-2.5 Fm, temperate species.. **N. ussuriensis**
1. Basidiocarps vinaceous, basidiospores 3.5-4.5 x 1-1.5 Fm, tropical species.. **N. vinosus**

**Nigroporus ussuriensis** (Bondartsev & Ljub.) Dai & Niemelä

## sius

5. Basidiocarps unevenly brown when bruised..... 6  
 5. Basidiocarps unchanged when bruised..... 7
6. Basidiospores 1-1.5 Fm wide, widespread, usually on *Picea*..... **O. fragilis**  
 6. Basidiospores 1.2-1.6 Fm wide, rare boreal species, usually on *Pinus*.. **O. lateritius**
7. Gloeocystidia present..... **O. leucomallus**  
 7. Gloeocystidia absent..... 8
8. Pores 3-7 per mm, margin more or less flat..... 9  
 8. Pores 1-3 per mm, margin distinctly undulating, wavy..... **O. undosus**
9. Pileus usually scrupose to warted, taste very bitter..... **O. stipticus**  
 9. Pileus glabrous to hirsute , taste mild ..... 10
10. Pileus whitish to grey, pores angular to slightly irregular 2-5 per mm  
 no black line between tubes and context ..... **O. tephroleucus**  
 10. Pileus white, pores regular 3-4 per mm, thin black line present between tubes  
 and context, rare species ..... **O. lowei**
11. Basidiocarps pendant to dorsally attached, up to 2.5 cm wide..... **O. cerifluus**  
 11. Basidiocarps substipitate, sessile to effused-reflexed, exceeding 2 cm in width.12
12. Less than 1-3 pores per mm, pilear surface pitted by excreted drops,  
 gloeopleurous hyphae present in the context. .... **O. guttulatus**  
 12. Pores smaller than 3 per mm, no pits on the pilear surface, no gloeopleurous  
 hyphae in the context ..... 13
13. Basidiocarps sessile, pilear surface becoming pale brown to grey with fine  
 radial lines, cystidia present in the hymenium ..... **O. balsameus**  
 13. Basidiocarps substipitate with a tapering base, pilear surface white to

Vietnam.

**Remarks.** The thin, purplish to violet basidiocarps with small pores make the species distinctive in the field.

### **OLIGOPORUS** Bref.

Untersuch. Gesamtgebiet. Mykol. 8:114, 1888.

Basidiocarps annual, resupinate to pileate, fleshy when fresh, brittle to hard when dry, mostly white to light coloured, sometimes becoming darker by drying; hyphal system monomitic; generative hyphae with clamps, thin- to thick-walled; cystidia mostly absent, present in a few species; basidiospores thin-walled, smooth, hyaline, allantoid to ellipsoid, negative in Melzer's reagent; chlamydospores absent or present. Causes a brown rot, mostly on conifers, more rarely on hardwoods.

**Type species:** *Oligoporus farinosus* Bref. = *Oligoporus rennyi* (Berk. & Broome) Kotlaba.

**Remarks.** Previously most of the species included in the genus were placed 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. For a discussion about *Postia* Fr. 1874 as the valid name for *Oligoporus* species, see Ryvarden & Gilbertson (1994).

The internal parasite *Tremella polyporina* D. Reid with globose basidiospores, is known from several *Oligoporus* species, especially *O. tephroleucus*.

### **Key to species**

1. Basidiocarps pileate..... 2
1. Basidiocarps resupinate.....  
15
2. Basidiospores allantoid-cylindrical, up to 2 Fm wide..... 3
2. Basidiospores cylindrical-ellipsoid, wider than 2 Fm.....  
11
3. Basidiocarps with distinct grey to bluish tints, tubes pale grey .....  
.4
3. Basidiocarps white, cream to yellow, occasionally grey, tubes white to cream... 5
4. Basidiospores cylindrical, 1.5-2 Fm wide, on conifers..... **O. cae-**  
**sius**
4. Basidiospores allantoid, 1-1.5 Fm wide, on hardwoods..... **O. subcae-**

or laterally fused and elongated, up to 5 cm wide and 5 mm thick; pilear surface whitish when fresh, usually becoming pale brownish on drying, faintly zonate, finely radially fibrillose, smooth or slightly sulcate, margin concolorous, reflexed or undulate; pore surface whitish when fresh, usually becoming cream-coloured to pale buff on drying, pores angular, 5-6 per mm, with thin dissepiments that soon become lacerate, tubes concolorous with the context or becoming darker, up to 5 mm long; context white to buff, azonate, corky, up to 3 mm thick; odour pleasant, nut-like, taste slightly resinous.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled, some with frequent branching, 2-3 Fm wide, others with infrequent branching, rather long, thick-walled fragments frequently present, 3-7 Fm wide.

**Cystidia** numerous to rare, fusiform, thin-walled, embedded or rarely projecting, smooth to apically encrusted, 11-22 x 5-7 Fm.

**Basidia** clavate, 15-20 x 4-4.5 Fm, with four sterigmata.

**Basidiospores** oblong to short cylindrical, 4-5 x 2.5-3 Fm.

**Substrata.** On living and dead conifers, causing a cubical butt or trunk rot.

**Distribution.** Circumpolar species, in East Asia known from China, Japan, Korea, and Far East Russia.

**Remarks.** The pale buff hymenophore when dry and the fusiform, thin-walled cystidia are typical of this species.

**Oligoporus caesius** (Schrad.:Fr.) Gilb. & Ryvardeen

Mycotaxon 22:365, 1985. - *Boletus caesius* Schrad., Spic. Flora Germ. p.167, 1794. - *Polyporus caesius* Schrad.:Fr., Syst. Mycol. 1:360, 1821.

**Basidiocarps** annual, pileate to effused-reflexed, usually solitary, dimidiate to narrow, up to 5 x 6 x 1.5 cm; pilear surface greyish to bluish, often in spots or streaks, sometimes bruising intensely blue, finely tomentose to strigose, sometimes glabrous; pore surface white, pale grey to bluish, becoming bluish when bruised, dull, pores angular, 3-6 per mm, with thin dissepiments, becoming lacerate, tubes white to grey, soft, fragile when dry, up to 6 mm long; context up to 1 cm thick, white to bluish, soft.

**Hyphal system** monomitic; generative hyphae with clamps, thin- to thick-walled, hyaline, often branched, 2.5-7 Fm wide; gloeoplerous hyphae also present, staining brightly in phloxine.

**Basidia** clavate, 16-25 x 4.5-7 Fm, with four sterigmata, weakly amyloid when fresh.

**Basidiospores** cylindrical to allantoid, slightly amyloid in masses, 4.5-6 x 1.5-2 Fm, spore print bluish.

**Substrata.** On dead conifers.

**Distribution.** Widely distributed throughout the coniferous forests, in East Asia known from China, Japan (in Okinawa on *Pinus*), and Far East Russia.

**Remarks.** *Oligoporus caesius* can be recognized in the field by the bluish tints on

- slightly discoloured, no radial lines, cystidia absent..... 14
14. Pores 3-5 per mm, basidiocarps drying bone hard, basidiospores 5-6.5 Fm long  
..... **O. ob-**  
**ductus**
14. Pores 5-6 per mm, basidiocarps tough when dry, basidiospores 3.5-4.5 Fm long  
..... **O. florifor-**  
**mis**
15. Cystidia present in the hymenium.....  
16
15. Cystidia absent from the hymenium.....  
18
16. Cystidia hyphoid, cylindrical, thin-walled, smooth or with a small apical crown  
of crystals, basidiospores allantoid, up to 1.5 Fm wide..... 17
16. Cystidia ventricose, thin- to thick-walled and with an apical crown of coarse  
crystals, basidiospores ellipsoid, 2-2.5 Fm wide..... **O. sericeomol-**  
**lis**
17. Pores 5-6 per mm, basidiospores narrowly allantoid, 4-5 x 0.8-1.2 Fm,  
cystidia usually abundant..... **O.**  
**simani**
17. Pores (2)3-4 per mm, basidiospores allantoid, 5-6 x 1.0-1.5 Fm wide,  
cystidia scarce..... **O. hiberni-**  
**cus**
18. Basidiospores 1-1.5 Fm wide..... **O. hiber-**  
**nicus**
18. Basidiospores 2-3 Fm wide.....  
19
19. Basidiospores 4-5 Fm long, basidiocarps usually very fragile, frequently with  
yellow pulverulent chlamydospores beneath or along the margin..... **O. rennyii**
19. Basidiospores 5.5-7 Fm long, basidiocarps tough to brittle when dry,  
chlamydospores absent..... **O. placen-**  
**tus**

**Oligoporus balsameus** (Peck) Gilb. & Ryvarde

Mycotaxon 22:364, 1985. - *Polyporus balsameus* Peck, N.Y. State Mus. Ann. Rept. 30:46, 1878.

**Basidiocarps** annual, pileate to effused-reflexed, solitary or imbricate, dimidiate

**Substrata.** Mainly on *Picea* and *Pinus*, rarely on hardwoods.

**Distribution.** Circumboreal, in East Asia known from China (Hebei, Hubei), Japan (Hokkaido), and Far East Russia.

**Remarks.** Basidiocarps of this species resemble those of *Antrodiella semisupina*, which differ in a dimitic hyphal system, mild taste, and slightly smaller basidiospores.

**Oligoporus fragilis** (Fr.) Gilb. & Ryvardeen

Mycotaxon 22:365, 1985. - *Polyporus fragilis* Fr., Elench. Fung. 1:86, 1828.

**Basidiocarps** annual, sessile or effused-reflexed, solitary, dimidiate or elongated, up to 6 cm long, 4 cm wide and up to 1 cm thick; pilear 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 reddish brown on bruising or drying, pores circular to angular, 5-6 per mm, with thin, entire dissepiments that become thin and lacerate with age, tubes darker than the context, up to 4 mm long; context white, drying brownish, fibrous, azonate, up to 1.5 cm thick.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled, occasionally branched, 2.5-4 Fm wide in the trama, up to 7 Fm wide in the context.

**Basidia** clavate, 13-20 x 4.5-5.5 Fm, with four sterigmata.

**Basidiospores** allantoid, hyaline, 4-6 x 1-1.5 Fm.

**Substrata.** On dead conifers, mostly *Picea*.

**Distribution.** Circumpolar species in boreal coniferous forests. In East Asia known from China (Jilin, Heilongjiang, Hubei), Japan (Hokkaido), and Far East Russia.

**Remarks.** This species has previously been confused with *Oligoporus lateritius*, which has distinctly narrower basidiospores and seems to be restricted to *Pinus*.

Basidiocarps of *Amylocystis lapponica* resemble robust specimens of *O. fragilis* and also show the reddish brown colour change on bruising, but the amyloid cystidia make the first species distinct microscopically.

**Oligoporus guttulatus** (Peck) Gilb. & Ryvardeen

Mycotaxon 22:365, 1985. - *Polyporus guttulatus* Peck in Sacc., Syll. Fung. 6:106, 1888.

**Basidiocarps** annual, pileate, effused-reflexed or laterally substipitate, solitary or imbricate, dimidiate to flabelliform, applanate, up to 10 cm long and wide and 2 cm thick; pilear surface white when fresh, drying buff or pale brown, azonate or faintly zonate, glabrous, smooth, pelliculose, often with small, shallow, circular depressions 1-3 mm wide, margin concolorous; pore surface white to cream-coloured, drying pale buff, pores circular to angular, 4-6 per mm, with thin dissepiments that become lacerate with age, tubes with a pale greenish tint in fresh specimens, drying cream-coloured, continuous and concolorous with the context, up to 5 mm long; context white to cream-coloured, azonate, firm-fibrous, up to 1.5 cm thick; taste bitter.

the pileus and pore surface, and the coniferous host. All basidiocarps collected on hardwood in Japan, despite their similarity to *O. caesius*, were incompatible with those collected on conifers (pers. data).

**Oligoporus cerifluus** (Berk. & M.A. Curtis) Gilb. & Ryvardeen

Europ. Polyp. 2:406, 1994. - *Polyporus cerifluus* Berk. & M.A. Curtis, Grevillea 1:50, 1872.

**Basidiocarps** annual, pendant, with a narrowed basal attachment or rarely sessile, inconspicuous and easily overlooked unless logs are torn apart, up to 7 mm wide, cream-coloured to pale ochraceous; hymenophore consisting of as few as 2 to 20-30 tubes; pore surface white to cream-coloured, soft-fibrous, pores angular to slightly sinuous, 3-5 per mm, tubes concolorous with the context, up to 3 mm long; entire basidiocarp very soft and fragile and easily shattered into fragments when dry.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 3-5 Fm wide.

**Cystidia** absent; fusoid cystidiols present, not projecting, thin-walled, 22-35 x 5-6 Fm.

**Basidia** narrowly clavate, 25-36 x 5-6.5 Fm, with four sterigmata.

**Basidiospores** oblong to short-cylindrical, 4-5 x 2-2.5 Fm.

**Substrata.** In crevices and hollows of very rotten conifers, rarely on *Alnus*, *Corylus*, and *Quercus*.

**Distribution.** Probably circumpolar in the boreal coniferous forest ecosystems but rarely collected, in East Asia known from China and Japan.

**Remarks.** The species can be recognized by its small, dorsally attached basidiocarps on very rotten wood.

**Oligoporus floriformis** (Quèl.) Gilb. & Ryvardeen

Mycotaxon 22:365, 1985. - *Polyporus floriformis* Quèl. in Bres., Fungi. Trid. 1:61, 1884.

**Basidiocarps** laterally substipitate to sessile or effused-reflexed, often laterally fused or in a rosette, single pilei dimidiate or tapering to a narrow petal-like base, up to 3 cm wide and 4 mm thick; pilear surface white when fresh, drying straw-coloured, azonate, glabrous, margin concolorous; pore surface white, drying yellowish, pores angular, 6-8 per mm, with thick, entire dissepiments that become lacerate with age, tubes white, becoming yellowish, very brittle when dry, up to 2 mm long; context white, drying ivory, azonate, firm-corky, up to 2 mm thick; taste bitter.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled, occasionally branched, 2.5-5.5 Fm wide.

**Cystidia** absent; hyphal pegs rare.

**Basidia** clavate, 15-18 x 4-6 Fm, with four sterigmata.

**Basidiospores** oblong to short-cylindrical, often slightly allantoid, 3.5-4.5 x 2-2.5 Fm.

Europ. Polyp. 2:417, 1994. - *Postia lateritia* Renvall, Karstenia 32:44, 1992.

**Basidiocarps** annual, resupinate, effused-reflexed, or sessile, usually with a narrow elongated pileus, up to 10 cm long, rarely above 1 cm wide and up to 1 cm thick at the base, usually single, more rarely fused with adjacent basidiocarps, soft when fresh, fragile when dry; pilear surface soft, tomentose, azonate, at first cream-coloured, soon developing brownish to rusty brown spots or bruising rusty brown where touched, margin floccose, white and distinct, especially in resupinate specimens; pore surface white to cream-coloured, rusty brown when bruised, pores circular to angular and somewhat variable, (2)3-4 per mm, with rather thin dissepiments that become deeply lacerate with age, tubes concolorous with the pore surface, up to 5 mm long; context white to cream-coloured, soft, up to 2 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps although some scattered simple septa may occur, thin- to thick-walled, hyaline, 2-5 Fm wide; gloeoplerous hyphae scattered throughout the basidiocarp; hyphae of the pileus slightly pigmented and usually thick-walled.

**Cystidia** absent.

**Basidia** clavate to cylindrical, 13-22 x 3-5.5 Fm, with four sterigmata.

**Basidiospores** allantoid, 4.5-6 x 1.2-1.6 Fm.

**Substrata.** Known only from *Pinus*.

**Distribution.** Probably circumpolar in the boreal zone. In East Asia only known from Far East Russia.

**Remarks.** In the field it is difficult to distinguish from *O. fragilis* which has more or less the same brownish discolouration. Microscopically it is separated by far more allantoid basidiospores. *Oligoporus leucomallellus*, a species with gloeocystidia, usually becomes yellowish to slightly brown when bruised.

### **Oligoporus leucomallellus** (Murrill) Gilb. & Ryvardeen

Mycotaxon 22:364, 1985. - *Tyromyces leucomallellus* Murrill, Bull. Torrey Bot. Club 67:63, 1940.

**Basidiocarps** annual, pileate to rarely resupinate, mostly effused-reflexed with narrow, elongated pilei, up to 1 cm wide and 5 cm long, up to 1 cm thick at the base measured vertically, soft when fresh, tough to brittle when dry; pilear surface white to cream, often discoloured by drying to straw-coloured or dirty brownish, often somewhat unevenly and in radial lines, at first finely velutinate to finely fibrillose, in age becoming finely scrupose to smooth, mostly azonate to weakly zonate, margin wavy and yellowish; pore surface white to dark cream, pores angular, mostly 3-4 per mm, in parts somewhat larger when dry, dissepiments in oblique parts of the pore surface partly split, sinuous to irregular, tubes concolorous with the pore surface, up to 1 cm long; context white, 1-2 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to slightly thick-walled, 2-4.5 Fm wide, in the trama narrower than in the context.

**Gloeocystidia** present in the hymenium, rare to abundant, hyaline to yellow,

**Hyphal system** monomitic; generative hyphae with clamps, in the trama thin-walled and up to 4 Fm wide, in the context extremely thick-walled and with a narrow, capillary lumen, commonly branching opposite the clamp, 4-8(-12) Fm wide; gloeoplerous hyphae also present, staining bright red in phloxine, thin-walled, with occasional distorted clamps, sinuous and with constrictions and swellings, 5-10 (-14) Fm wide.

**Cystidia** absent; cystidiols fusoid, not projecting beyond basidia, 13-18 x 4-5 Fm.

**Basidia** clavate, 15-20 x 5-6 Fm, with four sterigmata.

**Basidiospores** short-cylindrical to oblong, 4-5 x 2-2.5 Fm.

**Substrata.** On dead conifers, rarely on hardwoods.

**Distribution.** Circumboreal, in East Asia known from China, Japan, Korea, and Far East Russia.

**Remarks.** The circular depressions on the pilear surface, the thin, occasionally substipitate basidiocarps, and the bitter taste are good field characteristics for *O. guttulatus*.

**Oligoporus hibernicus** (Berk. & Broome) Gilb. & Ryvarden

Mycotaxon 22:364, 1985. - *Polyporus hibernicus* Berk. & Broome, Ann. Mag. Nat. Hist. Ser. 4 vol. 7:428, 1871.

**Basidiocarps** annual, resupinate, separable, in age often with a loosened margin, widely effused to small, often elongated along the wood grain, up to 1.5 mm thick, soft when fresh, fragile to slightly tough when dry, margin wide to narrow, white and finely pubescent; pore surface white to cream on drying, pores round to angular, variable in size, in parts 3-4 per mm, but also some larger and 2-3 per mm, even a few about 1 mm wide, tubes concolorous with the pore surface, up to 3 mm long; context white and very thin; taste bitter.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled in the trama and context, 2-4(5) Fm wide.

**Cystidia** variably present in the hymenium and usually rare, clavate to hyphoid, embedded or projecting, smooth or with a small apical crown of crystals, 10-25 x 3-5 Fm, most easily seen in Melzer's reagent in sections which should be mounted carefully as the apical crystals fall off easily, and dissolve rapidly in KOH.

**Basidia** clavate, 10-15 x 3-4(5) Fm, with four sterigmata.

**Basidiospores** allantoid, 5-6 x 1-1.5 Fm.

**Substrata.** On dead conifers.

**Distribution.** Temperate species, known from few records in North America and Europe, in East Asia common in China, Japan, and Far East Russia.

**Remarks.** The hyphoid cystidia and the allantoid basidiospores are diagnostic. The former are sometimes difficult to observe in old specimens. *O. simanii* is similar, but has shorter basidiospores.

**Oligoporus lateritius** (Renvall) Gilb. & Ryvarden

mm long; context white, azonate, tough when fresh, hard and brittle when dry, up to 2.5 cm thick.

**Hyphal system** monomitic; generative hyphae with clamps, thick-walled, some apparently solid, tightly interwoven, with frequent branching, 3-4 Fm wide, in the context up to 12 Fm wide.

**Basidia** narrowly clavate, 15-32 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly tapering at one end, 5-6.5 x 2-2.5 Fm.

**Substrata.** On dead conifers, rarely on hardwoods as *Betula*, *Padus*, and *Quercus*.

**Distribution.** Circumpolar in the coniferous zone, but rare. Known from Northern China (Jilin, Heilongjiang, Beijing) and Japan in East Asia.

**Remarks.** *Oligoporus obductus* is the type species of the monotypic genus *Osteina* Donk (1966). The hard consistency of the dried basidiocarps is not in our opinion, a character of enough taxonomic significance to warrant generic distinction.

### **Oligoporus placentus** (Fr.) Gilb. & Ryvardeen

Mycotaxon 22:365, 1985. - *Polyporus placentus* Fr., Øfers. K. Vet. Akad. Förh., 1861 p. 30, 1861.

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

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled, often branched, with clamps, 2-4.5 Fm wide; gloeoplerous hyphae present.

**Basidia** clavate, 17-25 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 5-7 x 2-2.5 Fm.

**Substrata.** Almost exclusively on dead wood of *Picea*, rarely on *Larix* and *Pinus*.

**Distribution.** Circumpolar in the boreal coniferous zone, but rare. In East Asia known from Northern China (Changbai) and Japan.

**Remarks.** The salmon pink basidiocarps of *Oligoporus placentus* is a striking character and serves to identify the species in the field.

### **Oligoporus rennyii** (Berk. & Broome) Donk

Persoonia 6:214, 1971. - *Polyporus rennyii* Berk. & Broome, Ann. Mag. Nat. Hist. ser 4, vol 15:31, 1871. - Imperfect stage: *Ptychogaster citrinus* Boud., J. Bot. 3:8, 1887.

**Basidiocarps** annual, resupinate, usually rather small and elongated along the wood, rarely above 10 cm in longest dimension, up to 4 mm thick, soft when fresh, very

thin-walled, clavate and sinuous, 10-35 x 4-8 Fm, mostly embedded, rarely projecting, arising in the subhymenium.

**Basidia** clavate, 12-18 x 4-6.5 Fm, with four sterigmata.

**Basidiospores** allantoid, 4.5-6 x 1-1.7 Fm.

**Substrata.** On dead conifers, especially on *Pinus*, also noted a few times on *Arbutus* and *Eucalyptus*.

**Distribution.** Widespread in the boreal coniferous forests, in East Asia known from Northern China (Changbai) and Far East Russia.

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

**Oligoporus lowei** (Pilát) Gilb. & Ryvar den

Mycotaxon 22:364, 1985. - *Leptoporus lowei* Pilát, Atl. Champ. Europe 3:205, 1938.

**Basidiocarps** annual, sessile to effused-reflexed, soft when fresh, brittle when dry, up to 6 cm long and 3 cm wide, 5 mm thick at the base; pilear surface at first white, then cream to unevenly pale brown with some radial streaks or lines, at first finely velutinate, becoming glabrous with age and drying, mostly azonate; pore surface white to cream, often 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 long; context very thin with a denser darker zone just above the tubes, white, fleshy, becoming friable and fragile.

**Hyphal system** monomitic; generative hyphae with clamps, 2-4 Fm wide, thin- to thick-walled, partly swelling in KOH to 6 Fm, in the upper context (i.e. above the darker zone) more distinctly thick-walled.

**Basidia** clavate, 15-20 x 5-7 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 4.8-5.2 x 1.8-2.2 Fm.

**Substrata.** Known only from conifers like *Abies* and *Picea*.

**Distribution.** A rare species apparently following *Picea* in its natural area. In East Asia known from Northern China (Changbai) and Far East Russia.

**Remarks.** The distinct black line above the tubes is the only character that with certainty separates this species from *O. cerifluus*.

**Oligoporus obductus** (Berk.) Gilb. & Ryvar den

Mycotaxon 22:365, 1985. - *Polyporus obductus* Berk., Lond. J. Bot. 4:304, 1845.

**Basidiocarps** annual, usually laterally stipitate or substipitate with a narrowed base, rarely sessile, solitary to imbricate, dimidiate to flabelliform, up to 12 x 13 x 2 cm; pilear surface white to dark greyish brown, pale buff, azonate, glabrous, smooth or rugose, margin concolorous, often deflexed or undulate; stipe whitish to grey-brown, usually simple, glabrous, up to 5 cm long and 3 cm thick; pore surface white to yellowish, pores angular, 3-5 per mm, with entire dissepiments that become thin and lacerate with age, tubes darker than the context, hard and horny when dry, up to 3

**Substrata.** On living and dead conifers, especially on *Picea*, rarely on hardwoods.

**Distribution.** Circumboreal, in East Asia known from China, Japan, and Far East Russia.

**Remarks.** The extremely bitter taste and the encrusted, thick-walled cystidia characterize this species.

**Oligoporus simani** (Pilát) Bernicchia

Polypor. Italia p. 338, 1990. - *Leptoporus simani* Pilát, Atl. Champ. Europ. p.181, 1938.

**Basidiocarps** annual, resupinate or effused-reflexed with a narrow pileus, up to 4 mm thick, soft when fresh, fragile when dry, margin white and finely floccose; pilear surface concolorous with the margin; pore surface at first white, soon pale cream to pale straw-coloured, pores circular to angular with thin dissepiments, 5-6(7) per mm, tubes concolorous with the pore surface; context soft and white, often with lumps of crystals, up to 1 mm long; taste slightly bitter.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled, branched, 2-4 Fm wide.

**Cystidia** hyphoid, thin-walled, usually abundantly present, cylindrical to clavate with a small apical crystalline crown that is easily dislodged if the microscopical preparations are crushed too hard, 15-30 x 2-5 Fm.

**Basidia** clavate, 10-18 x 2-4 Fm, with four sterigmata.

**Basidiospores** allantoid, 4-5 x 0.8-1.2 Fm.

**Substrata.** Most common on hardwoods, but also on conifers.

**Distribution.** Apparently a rare Eurasian species, often confused with *O. hibernicus* and its exact distribution is unknown. Cited for Northern China (Changbai) by Dai (1996a).

**Remarks.** This species is closely related to *O. hibernicus* and they may be forms of the same species. However, it seems that the basidiospores of *O. hibernicus* are wider and longer (up to 6 x 1.2-1.5 Fm), grows preferably on conifers, and cystidia are usually absent. For a survey of the different names used for this taxon, see Grosse-Brauckmann (1980).

**Oligoporus stipticus** (Pers.: Fr.) Gilb. & Ryvardeen

North Am. Polypores 2:485, 1987. - *Polyporus stipticus* Pers.: Fr., Syst. Mycol. 1:359, 1821. - *Boletus stipticus* Pers., Synopsis Meth. Fung. p. 525, 1801.

**Basidiocarps** annual, sessile or effused-reflexed, dimidiate to elongated, solitary or imbricate, up to 6 x 11 x 2 cm; pilear surface ivory to pale buff, azonate, often rough, glabrous, often with small black spots, margin concolorous; pore surface white to ivory, pores circular to angular, 5-6 per mm, with thin dissepiments that become lacerate with age, tubes concolorous and continuous with the context, up to 8 mm long; context white, azonate, up to 1 cm thick; taste very bitter.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, occasionally

fragile when dry and then easily broken or crushed; pore surface at first white, then cream and finally discoloured pale brown with collapsed tubes, pores angular, 3-4 per mm, but larger and smaller pores occur, dissepiments thin, when collapsed pores difficult to distinguish, tubes up to 5 mm long, very fragile when dry; context very thin, white to pale brown.

**Imperfect stage** often, but not always present, usually preceding the perfect stage and at a later stage may be found at the margin or below the poroid basidiocarp, fluffy and powdery, a few cm wide, pale citric yellow, consisting totally of thick-walled chlamydospores, these ellipsoid to slightly angular, pale yellow in masses, usually uniguttulate, negative or weakly dextrinoid in Melzer's reagent, 4.5-7 x 3.5-5 Fm.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled, rapidly collapsed and glued together, 2-5 Fm wide.

**Basidia** narrowly clavate, 20-28 x 5-6 Fm, with four sterigmata, seen only in young specimens, difficult to observe in old specimens as if the hymenium is totally collapsed and in microscopic preparations only fragments of hyphae and numerous free-floating basidiospores are seen.

**Basidiospores** abundantly present, oblong ellipsoid, thin- to slightly thick-walled, 4-5(5.5) x 2-2.5 Fm.

**Substrata.** Only on rotten conifers, frequently on timber in buildings, mines etc.

**Distribution.** Widespread in Europe, known also from Northern China (Changbai) and Far East Russia.

**Remarks.** The species is usually easy to recognize because of the very fragile basidiocarps with papery thin tubes and the numerous basidiospores in preparations where basidia usually are conspicuously absent. If the citric yellow chlamydosporic stage is present, it is diagnostic in the field.

**Oligoporus sericeomollis** (Romell) M. Bondartzeva

Mikol. Fitopatol. 17:279, 1983. - *Polyporus sericeomollis* Romell, Arkiv. f. Bot. 11(3):22, 1912.

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

**Hyphal system** monomitic; generative hyphae with abundant clamps, hyaline, thin- to thick-walled, with occasional branching, 2-4 Fm wide.

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

**Basidia** clavate, 18-20 x 5-6 Fm, with four sterigmata.

**Basidiospores** oblong to subellipsoid, 4-5 x 2-2.5 Fm.

**Hyphal system** monomitic; generative hyphae with abundant clamps, thin- to moderately thick-walled, some with frequent branching, in the trama up to 4 Fm wide, in the context 3-8 Fm wide, some thin-walled hyphae staining brightly in phloxine.

**Cystidia** absent; hyphal pegs present.

**Basidia** clavate, 14-16 x 4-5 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 4.5-6 x 1-1.5 Fm.

**Substrata.** Mainly on hardwoods, occasionally on conifers.

**Distribution.** Circumpolar in the boreal coniferous ecosystem. In East Asia known from China, Japan, and Far East Russia.

**Remarks.** The species is usually easy to recognize in the field by the angular pores, the often scrupose to hairy pileus in colours from white to pale grey. *Tyromyces chioneus* can be confusingly similar, but has normally a glabrous, often slightly yellowish wrinkled surface.

**Oligoporus undosus** (Peck) Gilb. & Ryvardeen

Mycotaxon 22:365, 1985. - *Polyporus undosus* Peck, N.Y. State Mus. Ann. Rept. 34:42, 1881.

**Basidiocarps** annual, effused-reflexed to resupinate, usually narrow, elongate, margin characteristically undulate; pilear surface white to pale buff, tomentose to glabrous, azonate, smooth to shallowly sulcate; pore surface cream-coloured, pores angular to irregular, 1-3 per mm, with thin, entire to dentate dissepiments, tubes concolorous with the context, up to 1 cm long; context whitish, soft, up to 4 mm thick.

**Hyphal system** monomitic; generative hyphae with abundant clamps, rarely to frequently branched, thick-walled, walls swelling and gelatinizing in KOH, with an irregular, narrow and sinuous lumen, 2.5-8 Fm wide.

**Cystidia** absent; hyphal pegs present.

**Basidia** clavate, 15-35 x 4.5-7 Fm, with four sterigmata.

**Basidiospores** allantoid, 4.5-6 x 1-1.5 Fm.

**Substrata.** Primarily on dead *Picea*, rarely on other conifers or hardwoods.

**Distribution.** Circumboreal, in East Asia known from China, Japan, and Far East Russia.

**Remarks.** The undulate margin and large pores are good field characteristics. Microscopically, the generative hyphae that swell in KOH help in identification.

**OXYPORUS** Donk

Med. Bot. Mus. Univ. Utrecht 9:202, 1933.

Basidiocarps annual to perennial, resupinate to pileate, in the latter case broadly attached and fibrous to woody; pilear surface white to deep cream, velutinate and often covered with mosses; pore surface white to light yellowish, pores mostly small and isodiametric, rarely large and angular, tubes single or distinctly stratified, then with layers of context between the tubes; context white to cream; hyphal system mo-

branched, in the trama thin-walled and up to 2.5 Fm wide, in the context thin- to thick-walled, 2-5 Fm wide, several swelling to 8 Fm wide in KOH.

**Cystidia** absent; fusoid cystidiols present, 15-17 x 4-4.5 Fm.

**Basidia** clavate, 12-19 x 4.5-5.5 Fm, with four sterigmata.

**Basidiospores** oblong to short-cylindrical, 3.5-5 x 1.5-2 Fm.

**Substrata.** Most commonly on conifers, occasionally on hardwoods.

**Distribution.** Circumpolar in the coniferous zone. In East Asia known from Northern China (Changbai), Japan (Hokkaido and Honshu), Korea, and Far East Russia.

**Remarks.** The small, white basidiocarps with a rough pilear surface with black spots are the principal base of separation from *O. guttulatus*, which has similar microscopic characters. *Oligoporus tephroleucus* is also similar, but has longer, more narrow suballantoid basidiospores.

**Oligoporus subcaesius** (David) Ryvardeen & Gilb.

Europ. Polyp 2:435, 1994. - *Tyromyces subcaesius* David, Bull. Soc. Linn. Lyon 43: 120, 1974.

**Basidiocarps** annual, pileate to effused-reflexed, rarely more than 3 cm wide, 0.5-2 cm thick, soft and watery when fresh, easily detached from the substrate, light when dry; pilear surface azonate, white to ochraceous with slight greyish to bluish tints in spots and streaks, pubescent; pore surface white to pale grey, usually bluish when bruised, pores circular to angular, 4-5 per mm, with thin dissepiments, tubes white to pale grey with age; context white, becoming slightly greyish towards the pilear surface, 3-12 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled, 2.5-5 Fm wide.

**Basidia** clavate, 15-25 x 4.5-6.5 Fm, with four sterigmata.

**Basidiospores** allantoid, slightly amyloid in Melzer's reagent in fresh specimens when observed in masses, the reaction disappearing with age, 4-5 x 1-1.2 Fm.

**Substrata.** On hardwoods.

**Distribution.** Temperate species distributed in Europe, North America, and East Asia (Japan, China, Taiwan, and Far East Russia).

**Remarks.** David (1974) has proved by interfertility studies that the species is genetically isolated from *O. caesius*, growing on conifers.

**Oligoporus tephroleucus** (Fr.) Gilb. & Ryvardeen

Mycotaxon 22:365, 1985. - *Polyporus tephroleucus* Fr., Syst. Mycol. 1:360, 1821.

**Basidiocarps** annual, sessile or effused-reflexed; pileus up to 5 cm long, 2 cm wide, and 2 cm thick, cream-coloured to mouse-grey, coarsely strigose to scrupose; pore surface whitish when fresh, yellowish on drying, the pores angular to slightly irregular 3-4 per mm, dissepiments thin and finely lacerate, tubes white to cream-coloured, brittle on drying, up to 8 mm long; context whitish, usually concentrically zonate, up to 1 cm thick.

**latus**

7. Pores 4-6 per mm, cystidia blunt, basidiospores broadly ellipsoid to subglobose  
 ..... **O. obdu-**  
**cens**

8. Basidiospores adhering in fours, cystidia of two types: gloeocystidia and  
 apically encrusted cystidia..... **O. corti-**  
**cola**

8. Basidiospores floating free in microscopic preparations, only encrusted cystidia  
 present..... **O. latemargi-**  
**natus**

**Oxyporus bucholtzii** (Bondartsev & Ljub.) Dai & Niemelä

Ann. Bot. Fenn. 32:218, 1995. - *Fomitopsis bucholtzii* Bondartsev & Ljub., Novosti Sist. Nizsh. Rast. 1965:137, 1965. - *Oxyporus changbaiensis* Dai & Zeng, Acta Mycol. Sin. 12:190, 1991. - *Oxyporus sinensis* Zeng, Mycotaxon 44:51, 1992.

**Basidiocarps** perennial, sessile or effused-reflexed, single to imbricate, corky to woody, 10 cm long and wide, up to 4 cm thick at the base; pilear surface buff, often darkening with age and covered with algae at the base, scabrous and scrupose, margin obtuse, sterile; pore surface cream to buff, pores circular to angular, 3-4 per mm, with thin dissepiments, tubes concolorous or slightly darker than the context, distinctly stratified, 0.5 to 1 cm long, each layer separated by context tissue; context cream-coloured, corky, azonate, up to 3 cm.

**Hyphal system** monomitic; generative hyphae simple-septate, thick walled, especially in the context, 2-4 Fm wide, rarely branched.

**Cystidia** abundant in the hymenium, thick-walled, cylindrical to clavate, 15-28 x 4-6 Fm, apically encrusted, also present in the dissepiments and then up to 50 Fm long.

**Basidia** short clavate, 7-10 x 4-5 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subglobose, 5-6(7) x 4-5 Fm.

**Substrata.** Living or dead hardwoods.

**Distribution.** Temperate Asian species known from Northern China (Changbai) and Far East Russia.

**Remarks.** This species resembles the perennial *O. populinus*, which has smaller pores (6-8 per mm) and basidiospores (3.5-4.5 x 2.5-4 Fm).

**Oxyporus cinnamomeus** Núñez & Ryvardeen

Fungal Divers. 3:114, 1999.

**Basidiocarp** annual to perennial, sessile to effused-reflexed, commonly imbricate, individual pilei up to 2 x 4 x 0.5 cm; pilear surface deep cinnamon, dull, finely adpressed velvety and soft to touch, azonate, pores angular, 6-8 per mm, pore surface, tubes and context concolorous with the pilear surface, tubes stratified, each layer up to 1 mm deep, context up to 3 mm thick at the base, homogeneous.

nomitic; generative hyphae simple-septate, mostly thick-walled, sparingly branched; apically encrusted hymenial cystidia abundantly present in most species, difficult to demonstrate in others; basidiospores globose to broadly ellipsoid, thin-walled, smooth, hyaline and negative in Melzer's reagent. On both hardwoods and conifers, causing a white rot. Cosmopolitan genus.

**Type species:** *Polyporus connatus* Weinm. = *Oxyporus populinus* (Schum.:Fr.) Donk.

**Remarks.** The genus is well defined by the monomitic hyphal system with thick-walled and hyaline generative hyphae, presence of encrusted cystidia, and globose to broadly ellipsoid basidiospores. Most species have a white pore surface, in contrast with species in *Rigidoporus*, which have orange to brown pore surfaces where also mammillate cystidiols are present among the basidia.

### Key to species

1. Basidiocarps pileate..... 2
1. Basidiocarps resupinate..... 5
2. Basidiocarps triquetrous, up to 4 cm thick ..... 3
2. Basidiocarps effused-reflexed, up to 8 mm thick..... **O. cuneatus**
3. Basidiocarp cinnamon brown..... **O. cinnamomea**
3. Basidiocarp whitish..... 4
4. Pores 5-7 per mm, basidiospores 3.5-4.5 x 2.5-4 Fm..... **O. populinus**
4. Pores 3-4 per mm, basidiospores 5-7 x 4-5 Fm..... **O. bucholtzii**
5. Pores 5-7 per mm, basidiocarps perennial..... **O. populinus**
5. Pores less than 6 per mm, basidiocarps annual..... 6
6. Basidiospores up to 5 Fm long..... 7
6. Basidiospores 5-7 Fm long..... 8
7. Pores 1-2 per mm, cystidia conical, basidiospores ovoid to subellipsoid..... **O. subu-**

thick; pilear surface white, becoming grey or yellowish, tomentose to appressed-fibrillose, azonate, smooth, margin concolorous; pore surface white to ivory, pores circular to angular, 3-4 per mm, with thick, entire dissepiments that become thin and lacerate with age, tubes concolorous and continuous with the context, up to 4 mm long; context white, soft-fibrous, azonate, up to 5 mm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, thin- to thick-walled, frequently branched, 2.5-6 Fm wide.

**Cystidia** of two types, some abundant, narrowly clavate to cylindrical, apically encrusted, 17-40 x 4.5-6 Fm; gloecystidia embedded, arising from the subhymenium, with refractive contents, cylindrical to clavate, 19-30 x 5.5-9 Fm.

**Basidia** clavate, 13-18 x 5-6 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to subglobose, 4-5.5 x 3-4 Fm.

**Substrata.** On conifers, in East Asia common on *Chamaecyparis*, *Cryptomeria*, and *Cunninghamia*.

**Distribution.** Known from temperate North America and East Asia (Zhejiang in China, Hokkaido in Japan, and Korea).

**Remarks.** Macroscopically, basidiocarps of *O. cuneatus* are similar to those of *Trametes pubescens* or *T. hirsuta*, but easily separated by the simple-septate hyphae and the cystidia.

***Oxyporus latemarginatus*** (E.J. Durand & Mont.) Donk

Persoonia 4:342, 1966. - *Polyporus latemarginatus* E.J. Durand & Mont., Syll. Crypt. p.163, 1856.

**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 cream-coloured, pores angular, 1-3 per mm, with dissepiments that quickly become thin and lacerate, tubes concolorous and continuous with the context, often drying brittle, up to 7 mm long; context white to ivory, azonate, soft-fibrous, up to 1 mm thick; taste mild.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, thin-walled, often branched, 3-8 Fm wide, in the context thick-walled, but always with a lumen.

**Cystidia** rare to frequent, in some specimens apparently absent, narrowly clavate to cylindrical, apically encrusted, 20-28 x 4.5-6 Fm.

**Basidia** clavate, 16-20 x 5-7 Fm, with four sterigmata.

**Basidiospores** narrowly ellipsoid, 5.5-7 x 3-4 Fm.

**Substrata.** On decayed hardwoods of many kinds.

**Distribution.** Cosmopolitan species, in East Asia known from China, Japan, and North Thailand.

**Remarks.** *O. corticola* is similar, but has gloecystidia, its basidiospores often glued together in groups and is almost always found on *Populus* spp.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline to faintly brown, thin- to thick-walled, 2-5  $\mu\text{m}$  wide.

**Cystidia** abundant, arising in the subhymenium and bending into the hymenium, thick-walled, cylindrical to slightly widened apically and coarsely encrusted in the upper part, 30-60 x 5-9  $\mu\text{m}$  measured from the septum from which they arise.

**Basidia** ovoid to broadly clavate, 15-22 x 4-6  $\mu\text{m}$ , 4-sterigmate, simple-septate at the base.

**Basidiospores** subglobose, 4-5 x 3.8-4.5  $\mu\text{m}$ .

**Substrata.** Unknown hardwood tree.

**Distribution.** Known only from the type locality.

**Remarks.** The species is clearly related to *Oxyporus populinus* (Fr.) Donk, which however has almost white basidiocarps, with numerous strata in the tubes and slightly smaller basidiospores, i.e. 3.5-4.5 x 2.5-4  $\mu\text{m}$ .

***Oxyporus corticola*** (Fr.) Ryvarden

Persoonia 7:19, 1872. - *Polyporus corticola* Fr., Syst. Mycol. 1:385, 1821. - *Oxyporus phellodendri* Bondartsev & Vassil., Bot. Mater. 16:114, 1963.

**Basidiocarps** annual to biennial, resupinate, effused up to 12 cm, soft and leathery when fresh, drying friable, margin fertile, or sterile and then whitish to cream-coloured, soft, fimbriate, up to 7 mm wide; pore surface cream-coloured to pale tan, pores circular to angular, 2-4 per mm, with dissepiments that quickly become thin and deeply lacerate, tubes concolorous and continuous with the context, up to 3 mm long; context ivory, azonate, soft-fibrous, up to 1 mm thick; taste mild.

**Hyphal system** monomitic; generative hyphae simple-septate, thin- to very thick-walled, hyaline, often encrusted, 2-5  $\mu\text{m}$  wide.

**Cystidia** of two types; a) cylindrical, apically encrusted, 17-30 x 3-6  $\mu\text{m}$ , b) gloeocystidia cylindrical to fusiform, thin-walled, with refractive contents, arising in the subhymenium and often projecting beyond the hymenium, 33-45 x 6-10  $\mu\text{m}$ .

**Basidia** clavate, 15-18 x 5-7  $\mu\text{m}$ , with four sterigmata.

**Basidiospores** ovoid to broadly ellipsoid, 5-7 x 3-4.5  $\mu\text{m}$ , usually adhering in fours.

**Substrata.** Dead wood of hardwoods, almost exclusively on *Populus*.

**Distribution.** Circumpolar boreal species, in East Asia known from temperate China, Japan, and Far East Russia.

**Remarks.** The smaller basidiospores and pores of *O. obducens* will differentiate this species from *O. corticola*. *O. latemarginatus* is softer, has wider hyphae and no gloeocystidia.

***Oxyporus cuneatus*** (Murrill) Aoshima

Trans. mycol. Soc. Japan 8:3, 1967. - *Coriolellus cuneatus* Murrill, North Amer. Flora 9:28, 1907.

**Basidiocarps** annual, effused-reflexed or resupinate, soft; pileus solitary or imbricate, dimidiate or much elongated along bark crevices, up to 6 x 1 cm wide and 8 mm

**Remarks.** *Oxyporus populinus* is well differentiated from the other species in the genus by its perennial, sessile basidiocarps with tiny pores.

***Oxyporus subulatus* Ryvarden**

Nord. J. Bot. 2:280, 1982.

**Basidiocarps** resupinate, adnate, up to 15 cm long and 6 cm wide; pore surface cream to rosy, pores angular to irregular, 1-2 mm wide, in parts even larger, dissepiments entire to lacerate, tubes up to 2 mm long, concolorous with the pore surface; context very thin, pale cream.

**Hyphal system** monomitic; generative hyphae simple-septate, in the trama mostly 2-4 Fm wide and with slightly thickened walls, in the context up to 6 Fm wide and thick-walled, frequently branched, mostly at acute angles.

**Cystidia** abundant both in hymenium and trama, subulate and slightly thick-walled (Melzer?s), somewhat swollen in KOH, upper part covered with a finely grained encrusted matter, 30-60 x 5-7 Fm, in a few cases with a single septum.

**Basidia** 15-20 x 4-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 4-5 x 2-2.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Known from North Thailand, and Okinawa islands in subtropical Japan.

**Remarks.** This species may well be a member of Corticiaceae s.l., as the dissepiments are fertile and the tubes are irregular and shallow. No other *Oxyporus* species has such subulate cystidia. The tropical *O. pellicula* is macroscopically similar, but has larger basidiospores (4.5-7 x 3-4.5 Fm).

**PACHYKYTOSPORA** Kotl. & Pouzar

Ceska Mykol. 17:27, 1963.

Basidiocarps annual to perennial, resupinate, adnate; pore surface white to wood-coloured, pores medium to small, frequently with a pinkish tint; hyphal system di-trimitic, generative hyphae with clamps, hyaline; binding and skeletal hyphae hyaline, dextrinoid in mass; cystidia absent; basidiospores oblong-ellipsoid, ornamented with elongated rounded ridges or echinulate, thick-walled, hyaline and negative in Melzer?s reagent. On hardwoods or conifers, causing white rot. Small, cosmopolitan genus.

**Type species:** *Polyporus tuberculosus* Fr.

**Remarks.** The striate basidiospores are unique in Polyporaceae. The genus is probably related to *Polyporus s. str.*

**Key to species**

1. Pores 4-5 per mm, basidiospores 8.5-12 x 4-6 Fm..... **P. ala-**

**Oxyporus obducens** (Pers.) Donk

Med. Bot. Mus. Univ. Utrecht 9:202, 1933. - *Polyporus obducens* Pers., Mycol. Europ. 2:104, 1825.

**Basidiocarps** annual, resupinate, effused up to 15 cm, soft, slightly leathery, easily separable, 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 that become thin and slightly lacerate, tubes continuous and concolorous with the context, soft, up to 1.5 mm long; context cream-coloured to pale buff, azonate, soft, less than 1 mm thick; taste mild.

**Hyphal system** monomitic; generative hyphae simple-septate, mostly thick-walled, with occasional branching, 2-4 Fm wide.

**Cystidia** abundant, clavate, arising from tramal hyphae, heavily encrusted over the apical portion, 25-55 x 7-8 Fm, wall thickened towards the apex.

**Basidia** clavate, 12-17 x 3-5 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 4-5 x 2.5-3 Fm.

**Substrata.** On dead hardwoods, rarely on conifers.

**Distribution.** Temperate and quite common species, in East Asia known from Northern China (Changbai), Japan (Honshu), and Far East Russia.

**Remarks.** *O. corticola* is quite similar but differs in its larger pores and basidiospores. Resupinate specimens of *O. populinus* can be separated by subglobose basidiospores.

**Oxyporus populinus** (Schum.:Fr.) Donk

Med. Bot. Mus. Univ. Utrecht 9:204, 1933. - *Polyporus populinus* Schum.:Fr., Syst. Mycol. 1:367, 1821.

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

**Hyphal system** monomitic; generative hyphae simple-septate, mostly thick-walled except for the trama, hyaline, 2.5-4.5 Fm wide, in the trama mostly thin-walled.

**Cystidia** abundant, thin-walled, cylindrical to capitate, 20-35 x 3-4.5 Fm, apically to entirely encrusted, encrustation dissolving rapidly in KOH, encrusted portion 6-12 Fm wide.

**Basidia** ovoid to broadly clavate, 8-12 x 5-5.5 Fm, with four sterigmata.

**Basidiospores** subglobose, 3.5-4.5 x 2.5-4 Fm.

**Substrata.** On living hardwoods, often fruiting in stem depressions.

**Distribution.** Temperate species in North America, Europe, and East Asia (Hebei, Jilin, Shaanxi in China, Hokkaido in Japan, Far East Russia, and North Thailand).

Brid. Finl. Nat. Folk 32:96, 1879.

**Type species:** *Agaricus stipticus* Bull:Fr.

**Remarks.** The genus *Panellus* belongs in Tricholomataceae and most species are gilled, although a few are poroid. *P. pusillus* is included here because many students may take it for a polypore at first sight.

**Panellus pusillus** (Lév.) Burds. & O.K. Miller

Nova Hedwigia Beih. 51:85, 1978. - *Gloeoporus pusillus* Lév., Ann. Sci. Nat. Bot. III, 2:195, 1844.

**Basidiocarps** annual, always gregarious, up to 6 mm long and wide and 1 mm thick, laterally stipitate, pileus round, flabelliform to spatulate; pileus pinkish buff to cinnamon, glabrous, azonate, usually wrinkled and rimose when dry; stipe cylindrical, concolorous with the pileus, up to 3 mm long and 1.5 mm thick, sometimes reduced to a tapering base; pore surface white to cream, pores round to irregular, sometimes radially elongate in the margin, small, 3-6 per mm, with farinose dissepiments; context cream to buff, less than 1 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, up to 3.5 Fm, hyaline, dextrinoid.

**Dendrohyphidia** present along the dissepiments, dextrinoid, coralloid and covered with minute dichotomously branched projections.

**Basidia** clavate, 15-26 x 5-8 Fm, with four sterigmata.

**Basidiospores** ellipsoid, amyloid, 4-5 x 2-2.5Fm.

**Substrata.** On hardwoods, either on small branches or on standing dead trees.

**Distribution.** Pantropical, in East Asia north to subtropical China (Anhui, Yunnan, Guizhou) and Japan (Okinawa and Kyushu).

**Remarks.** The species is recognized by its small, buff basidiocarps occurring in large numbers. *Porodisculus pendulus* has also small basidiocarps, but its basidiospores are non-amyloid and allantoid.

**PARATRICHAPTUM** Corner

Beih. Nov. Hedw. 86:136, 1987.

Basidiocarps pileate, sessile, fuscous brown, spongy when fresh, drying tough; pore surface daedaloid, pores polygonal to lamellate, with thick dissepiments; hyphal system monomitic; generative hyphae with clamps, brown; cystidia narrowly clavate, thick-walled, fasciculate; basidiospores small, smooth, subglobose to amygdaliform, fuscous brown. On dead hardwoods. Monotypic Asian genus, tropical to subtropical.

**Type species:** *Paratrichaptum accuratum* Corner

**Remarks.** This is one of the few genera in Polyporaceae with brown basidiospores and its relationships are unknown.

**Paratrichaptum accuratum** Corner

Beih. Nov. Hedw. 86:137, 1987.

**bamae** 1. Pores 1-4 per mm, basidiospores 10-15 x 5-7.5 Fm..... **P.**

**papyracea**

**Pachykytospora alabamae** (Berk. & Cooke) Ryvardeen

Norw. J. Bot. 19:233. 1972. - *Polyporus alabamae* Berk. & Cooke, Grevillea 6:130. 1878.

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

**Hyphal system** di-trimitic; generative hyphae with clamps, hyaline, thin-walled, 2-2.5 Fm wide; skeletal hyphae hyaline, thick-walled, slender, with occasional branching, 1.5-3.5 Fm wide, dextrinoid.

**Basidia** broadly clavate, 15-20 x 8-11 Fm, with four sterigmata.

**Basidiospores** cylindrical to subellipsoid, minutely longitudinally striate, 9.5-12.5 x 4-5.5 Fm.

**Substrata.** On dead branches of hardwoods.

**Distribution.** Pantropical to warm-temperate species, in East Asia known from China (Jiangxi, Zhejiang) and Japan (Okinawa, Kyushu, Honshu).

**Remarks.** The striate ornamentation is most easily seen in Melzer's reagent.

**Pachykytospora papyracea** (Schwein.) Ryvardeen

Norw. J. Botany 19:233, 1972. - *Boletus papyraceus* Schwein., Natuf. Ges. Leipzig Schrift. 1:99, 1822.

**Basidiocarps** annual or biannual, resupinate, adnate, effused up to 10 cm, margin narrow and white; pore surface cream to pale straw-coloured, often with a slight pink tint, pores round to slightly angular, 2-4 per mm, dissepiments thin to thick and entire, tubes up to 3 mm long, pale buff to wood-coloured; context thin and concolorous with the tubes.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline and thin-walled, difficult to observe, 2-3 Fm wide; skeletal hyphae thick-walled to solid, hyaline to pale yellow, slightly dextrinoid, 3-4 Fm wide; binding hyphae indistinct with tapering short side-branches, twisted and interwoven, 2-4 Fm wide.

**Basidia** broadly clavate with a narrow base, 30-40 x 10-13 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subellipsoid, minutely longitudinally striate, 10-16 x 6-7.5 Fm.

**Substrata.** On dead hardwoods, usually on thin branches.

**Distribution.** Tropical and subtropical species, known to temperate areas in East North America and Asia, where it is known from China (Xizang), Japan (Okinawa), Taiwan, and Far East Russia.

**Remarks.** *P. papyracea* usually found on dead, exposed branches.

**PANELLUS** P. Karst.

**Parmastomyces taxi** (Bondartzev) Dai & Niemelä

Ann. Bot. Fennici 32:222, 1995. - *Polyporus taxi* Bondartzev, Bot. Mater. Otdel. Spor. Rast. 5:17, 1940.

**Basidiocarps** annual, sessile or laterally substipitate with a narrowed base, usually single, dimidiate, soft and spongy when fresh, drying brittle and very light in weight, up to 4 cm wide, 3 cm long, and 8 mm thick; pileus pale yellowish brown to orange brown, darker rusty brown at the base, with greenish tints towards the margin, tomentose to strigose or scrupose in spots, in the narrowed rusty brown basal part more radially appressed-strigose, margin round, with greenish tints, narrowly sterile below; pore surface olivaceous green, pores angular, mostly 2-3 per mm with occasional larger ones up to 1 mm wide, dissepiments thin, tubes pale greenish buff, up to 2 mm long; context pale greenish buff, azonate, soft-fibrous, up to 6 mm thick, instantly turning black where touched with KOH; odour strong and unpleasant like decaying plant material or garbage, persistent in dried herbarium specimens for years.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline to pale yellowish, negative in Melzer's reagent, in the trama thin- to slightly thick-walled, mostly 2-5 Fm wide, parallel, in the context thick-walled to almost solid, interwoven, some inflated up to 8-9 Fm wide, encrusted with yellow brown crystals and then looking pale brown; gloeoplerous hyphae also present.

**Cystidia** absent; fusoid cystidiols present, 13-22 x 4-5 Fm.

**Basidia** clavate, 20-24 x 5.5-6.5 Fm, with four sterigmata.

**Basidiospores** ellipsoid to oblong, slightly thick-walled, dextrinoid, 3.5-4.5 x 2-2.5 Fm.

**Substrata.** Reported from *Taxus* and *Larix*.

**Distribution.** Temperate species described from the Caucasus Mountains, in East Asia known from Northern China (Changbai), Taiwan, and Far East Russia (Khabarovsk).

**Remarks.** This species is readily identified in the field by the greenish olivaceous pore surface and the strong unpleasant odour.

**Parmastomyces transmutans** (Overh.) Ryvarden & Gilb.

Mycotaxon 19:144. 1984. - *Polyporus transmutans* Overh., Mycologia 44:226. 1952.

**Basidiocarps** annual, resupinate, effused-reflexed or pileate, soft, drying brittle; pileus white, bruising or drying reddish brown, matted-strigose, azonate; pore surface white, also turning reddish brown on drying, pores circular, 2-3 (-4) per mm, with thin dissepiments, tubes fragile, brittle when dry, 1-3 mm long; context gelatinous next to the tubes, otherwise white, soft, in most basidiocarps on conifers up to 5 mm thick but some specimens on hardwoods up to 1 cm thick, gelatinous layer darker and resinous on drying; taste slightly acid.

**Basidiocarps** annual, pileate, sessile, broadly attached, triquetrous to applanate, 17 x 23 x 2 cm; pileus dark brown, subtomentose, strigose at the base, azonate, lighter towards the very obtuse, thick, fulvous margin; hymenophore lamellate to poroid, pores 1 mm wide, hexagonal to 2-3 fused forming lamellae, tubes 2-3 cm long, with walls up to 2 mm thick at the base of the basidiocarp, with small nodules easily seen with a lens; context 3-5 cm thick, dark fuscous brown, spongy, tough when dry.

**Hyphal system** monomitic; generative hyphae with clamps, regularly branching from the clamp, in the trama hyaline and up to 3.5 Fm wide, in the context light brown, thick-walled, 3.5-6 Fm wide, interwoven.

**Cystidia** cylindrical to subclavate, straight to subflexuous, thick-walled, brown, 30-70 x 3.5-6 Fm, projecting 50 Fm, appearing in groups of 5-30 and forming the minute nodules of the tubes.

**Basidia** subclavate, 12-22 x 3.5-5 Fm, with two to four sterigmata up to 3.5 Fm long.

**Basidiospores** subglobose to amygdaliform, pale brown, 4 x 3 Fm.

**Substrata.** On dead hardwood.

**Distribution.** Asian species, mainly tropical, in East Asia known from subtropical and warm-temperate Japan up to Nara (Honshu), and in Taiwan.

**Remarks.** The species is recognized by its brown, spongy basidiocarps with a lamellate hymenophore and brown basidiospores.

#### **PARMASTOMYCES** Kotl. & Pouzar

Feddes Rep. 69:138, 1964.

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 absent; basidiospores cylindrical, smooth, hyaline, slightly thick-walled and dextrinoid in Melzer's reagent. On conifers and hardwoods, causing a brown rot.

**Type species:** *Tyromyces kravtzevianus* Bondartsev & Parmasto = *Parmastomyces transmutans* (Overh.) Ryvardeen & Gilb.

**Remarks.** The genus is well defined by its monomitic hyphal system, dextrinoid basidiospores, and producing a brown rot.

#### **Key to species**

1. Basidiocarps substipitate to pileate, with greenish tints,  
basidiospores 3.5-4.5 x 2-2.5 Fm ..... **P.**

#### **taxi**

1. Basidiocarps resupinate to effused-reflexed, with brownish tints  
basidiospores 5-7 x 2.5-4 Fm..... **P. transmu-**

#### **tans**

4. Basidiocarps 0.5-3 cm thick, watery and soft when fresh..... **P. robiniophila**
4. Basidiocarps 2-8 cm thick, woody..... 5
5. Dendrohyphidia present in the dissepiments and hymenium,  
only known from Taiwan..... **P. formosana**
5. Dendrohyphidia absent, holartic species..... **P. fraxinea**
6. Chlamydospores present in the context and trama..... **P. detrita**
6. Chlamydospores absent..... 7
7. Basidiospores 6.5-9 x 5-7 Fm, pores 6-8 per mm..... **P. truncatospora**
7. Basidiospores longer than 9 Fm, pores up to 7 per mm..... 8
8. Pileus cream ochraceous..... **P. ochroleuca**
8. Pileus brown, reddish or black..... 9
9. Pileus reddish and waxy, context white..... **P. minutissima**
9. Pileus black, context cinnamon to light brown.....  
10
10. Basidiocarps up to 5 cm wide, pores 5-7 per mm..... **P. ohien-sis**
10. Basidiocarps up to 10 cm wide, pores 3-4 per mm..... **P. fraxinophila**
11. Pore surface bright yellow.....  
12
11. Pore surface white, cream or brown.....  
13
12. Basidiocarps perennial, with a red margin, pores 5-8 per mm..... **P. maackiae**
12. Basidiocarps annual, with a cream to buff margin, pores 4-5 per mm..... **P. tenuis**

**Hyphal system** monomitic; generative hyphae with clamps, thin- to thick-walled, frequently branched, 3-6 Fm wide.

**Basidia** clavate, 20-27 x 5-7 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subellipsoid, strongly dextrinoid in Melzer's reagent, (4) 5-7 x 2.5-4 Fm.

**Substrata.** On dead conifers and hardwoods, in East Asia only known on conifers, mainly *Abies*.

**Distribution.** Circumboreal in the coniferous forest, in East Asia quite common in Hokkaido (Japan) and Primorsk (Far East Russia).

**Remarks.** This is a common fungus on conifers. Basidiocarps on hardwoods, especially on black cherry, tend to have a thicker context but otherwise are indistinguishable from those on conifers.

### PERENNIPORIA Murrill

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 woody hard; hyphal system trimitic; generative hyphae with clamps, thin-walled, hyaline, often difficult to observe; skeletal hyphae dominating in the basidiocarps, solid to thick-walled, unbranched to moderately branched, non-dextrinoid to strongly dextrinoid; cystidia absent; basidiospores thin- to thick-walled, globose to ellipsoid, amygdaliform 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:** *Polyporus medulla-panis* Jacq.:Fr.

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

#### Key to species

- |   |                  |
|---|------------------|
| 1. Basidiocarps pileate to effused-reflexed .....                           | 2                |
| 1. Basidiocarps resupinate.....   | 11               |
| 2. Basidiospores amygdaliform to subglobose.....                            | 3                |
| 2. Basidiospores truncate.....  | 6                |
| 3. Basidiospores amygdaliform, encrusted cystidia present.....              | <b>P. latis-</b> |
| <b>sima</b>   |                  |
| 3. Basidiospores globose, although markedly apiculate, cystidia absent..... | 4                |

**Basidiocarps** perennial, pileate, dimidiate to semicircular, applanate to effused-reflexed with several narrow pilei from a common decurrent pore surface, variable in size, up to 20 cm wide, 30 cm long and 3.5 cm thick at the base, but usually smaller, when effused-reflexed single pilei usually up to 2-3 cm wide and then with and oblique surface, woody hard when dry; pileus first white ochraceous to wood-coloured, dull and soft to touch, then becoming darker and more smooth or slightly tuberculate to warted with reddish spots or streaks that become bay and spread from the base as the upper hyphae agglutinate, finally black and with a thin, but distinct cortex, margin lighter; pore surface white to ochraceous, pores round and small, 4-5 per mm, more irregular on effused specimens growing on oblique substrata, tubes concolorous with the pore surface, up to 8 mm long; context white to pale cream, woody hard, up to 2 cm thick at the base.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 Fm wide, often difficult to observe; skeletal hyphae dominating in the basidiocarp, in the context unbranched, thick-walled and strongly dextrinoid, 3-8 Fm wide, swelling in KOH to 11-12 Fm, in the dissepiments narrower and mixed with more branched hyphae, either binding hyphae as such, or upper part of arboriform skeletal hyphae, down to 2 Fm at the apices.

**Cystidia** absent; clavate to ventricose cystidiols present in the hymenium, thin-walled and easily collapsed, up to 25 x 6-12 Fm.

**Basidia** not seen.

**Basidiospores** globose to truncate, thick-walled and variably dextrinoid, 5.5-8(9) x 5-6 Fm.

**Chlamydospores** usually present, both in the trama and the context, strongly dextrinoid, mostly globose, 9-13 Fm in diameter or more oblong and 8-17 x 9-12 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Pantropical species, in East Asia known from China and North Thailand.

**Remarks.** When old and well developed, the dark pileus with a thin cortex is a good field character. However, young specimens are white and can easily be confused with an *Antrodia* sp. or a badly developed *Trametes* sp. The dextrinoid reaction of the basidiospores and skeletal hyphae will reveal it as a *Perenniporia* sp. The chlamydospores are diagnostic for the species and the basidiospores are larger than those found in *P. medulla-panis* and related species.

***Perenniporia ellipsospora*** Ryvarden & Gilb.

Mycotaxon 19:140, 1984.

**Basidiocarps** annual, resupinate, adnate, effused, up to 4 mm thick, hard when dry, margin narrow and white; pore surface whitish, drying pale straw-coloured or very pale yellowish brown, pores round to angular, some often partly collapsed, brittle, thin-walled, 3-4 per mm, dissepiments fimbriate, tubes concolorous with the pore surface; context ochraceous and dense, about 1 mm thick.

13. Skeletal hyphae amyloid, basidiospores ellipsoid..... **P. narymica**
13. Skeletal hyphae dextrinoid or negative in Melzer's reagent, basidiospores truncate, subglobose to ellipsoid.....
- 14
14. Basidiospores ellipsoid to globose.....
- 15
14. Basidiospores truncate.....
- 18
15. Tubes dark when dry .....
- 16
15. Tubes light coloured when dry .....
- 17
16. Pores 3-4 per mm, basidiospores ellipsoid..... **P. ellipsospora**
16. Pores 2-3 per mm, basidiospores subglobose..... **P. variegata**
17. Pore surface often glancing, tramal skeletal hyphae 3-7 Fm wide, basidiospores 4.5-6 x 3-5 Fm..... **P. subacida**
17. Pore surface dull, tramal skeletal hyphae 2-3.5 Fm wide, basidiospores 6-7 x 4-5 Fm..... **P. tenuis** var. **tenuis**
18. Basidiocarps dark brown..... **P. tephropora**
18. Basidiocarps cream to ochraceous.....
- 19
19. Margin black to rhizomorphic, basidiospores 4-5 Fm long .....
- P. japonica**
19. Margin cream, entire, basidiospores 5-6.5 Fm long..... **P. medullapanis**

**Perenniporia detrita** (Berk.) Ryvarden

Prel. Polyp. Fl. East Africa p. 467, 1980. - *Polyporus detritus* Berk., Hooker's J. Bot. 8:197, 1856.

wide, 16 cm long and 2-8 cm thick at the base, often triquetrous in section, woody when dry, more corky when fresh; pileus at first ochraceous, becoming unevenly reddish brown to grey, often with reddish spots, and finally grey to black with a very thin crust, first velutinate, but soon glabrous, slightly zonate, often with small warts or thin ridges, margin rounded darkening when touched; pore surface cork or wood-coloured, darkening when touched, pores 4-6 per mm, tubes stratified, ochraceous to cork-coloured, up to 6 cm long in old specimens; context cottony, isabelline to pale cork-coloured, later becoming cinereous to pale brown, up to 3 cm thick at the base, concentrically zonate.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, rather variable in width, mostly 2-6 Fm wide; skeletal hyphae dominating in the context, dextrinoid, straight to flexuous, only very rarely branched, 5-10 Fm wide (in KOH), in the trama arboriform, 2.5-6 Fm wide, branching at the dissepiments; the crust in old specimens consists of a palisade of straight or branched, agglutinated skeletal hyphae up to 15 Fm wide in swollen parts.

**Basidia** clavate, 15-22 x 5-7 Fm, with four sterigmata.

**Basidiospores** subglobose to amygdaliform, distinctly apiculate, thick-walled, variably dextrinoid, 6-8 x 5-6.5 Fm.

**Substrata.** On living hardwoods.

**Distribution.** Temperate forests in Eastern North America, Europe, and warm-temperate East Asia (Taiwan; Jiangxi to Hebei in China; Kyushu and Honshu in Japan).

**Remarks.** The perennial, often cork-coloured and very hard basidiocarp at the base of living trees, the strongly dextrinoid skeletal hyphae, and the amygdaliform basidiospores are diagnostic.

**Perenniporia fraxinophila** (Peck) Ryvar den

Norw. J. Bot. 19:143, 1972. - *Polyporus fraxinophilus* Peck, Bot. Gaz. 7:43-44, 1882.

**Basidiocarps** sessile to effused-reflexed or resupinate, solitary or imbricate, unguulate, up to 7 x 9 x 7 cm; pileus usually greyish-black, sometimes reddish brown in younger specimens, encrusted, glabrous, becoming rimose and sulcate, margin even, concolorous with the pileus; pore surface ivory to buff, pores circular to angular, 3-5 per mm, with thick, entire dissepiments, tubes concolorous and continuous with the context or somewhat lighter, each layer up to 5 mm thick; context buff to pale yellowish brown, corky, azonate, up to 1 cm thick, sometimes with white mycelial strands.

**Hyphal system** dimitic; generative hyphae with conspicuous clamps, thin-walled, 2-3 Fm wide; skeletal hyphae hyaline, thick-walled, with occasional branching, 2.5-5 Fm wide.

**Basidia** broadly clavate, 20-25 x 9-11 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to subglobose, thick-walled, dextrinoid, 9-11 x 6.5-8 Fm, at maturity with a germ pore at the truncate apex.

**Hyphal system** trimitic; generative hyphae with clamps, 2-4 Fm wide; arboriform hyphae unbranched in the long axis, dichotomously branched near the outer ends, thick-walled and dextrinoid, 2-4 Fm wide.

**Cystidia** absent; cystidiols present in the hymenium, pointed, smooth, 10-15 x 4-6 Fm, often difficult to observe in dry specimens.

**Basidia** clavate, 15-20 x 5-7 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subglobose, thick-walled and variably dextrinoid, 4-5.5 x 3-4 Fm.

**Substrata.** On dead hardwoods and conifers.

**Distribution.** Temperate species in East United States and Japan.

**Remarks.** Microscopically this species is similar to *P. subacida* which however is dimitic with parallel and strongly dextrinoid skeletal hyphae and smaller pores (5-6 per mm).

### **Perenniporia formosana** Chang

Mycol. Res. 98:954, 1994.

**Basidiocarps** annual, pileate to effused-reflexed, often imbricate, corky to woody; pileus up to 12 cm in diameter, 1-2 cm thick, semicircular to dimidiate, flat to convex; pileus at first white to cream, soon covered by a reddish brown cuticle from the base, glabrous, concentrically zonate, sulcate, margin acute to obtuse, sometimes deflexed, entire to undulate; pore surface wood brown to tawny olive, pores round to angular, 4-6 per mm, tubes 3-9 mm long, light buff; context 3-11 mm thick, concolorous with the tubes.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 1.5-4 Fm wide; arboriform hyphae dominant, thick-walled to solid, hyaline to light brown, dextrinoid, up to 8 Fm wide, branching at the apex.

**Dendrohyphidia** abundant in the hymenium and dissepiments, coralloid, hyaline, thick-walled, not encrusted.

**Basidia** clavate, 20-36 x 6-11, with four sterigmata.

**Basidiospores** broadly amygdaliform to globose, thin-walled, dextrinoid, 5.5-7 x 4.5-5.5 Fm.

**Substrata.** On *Prunus mume*.

**Distribution.** Only known from the type locality in Taiwan.

**Remarks.** This species is close to *P. fraxinea*, sharing more or less the same characters, except for the dendrohyphidia and the annual basidiocarps. Several *Perenniporia* spp. can develop dendrohyphidia in culture, even if they do not appear in basidiocarps (C. Decock, pers. comm.).

### **Perenniporia fraxinea** (Bull.:Fr.) Ryvarden

Polyp. N. Europe p. 307, 1978. - *Polyporus fraxineus* Bull.: Fr., Syst. Mycol. 1:374, 1821. - *Boletus fraxineus* Bull., Herb. France 2, pl. 433, 1789.

**Basidiocarps** perennial, pileate, broadly attached, single or imbricate, up to 12 cm

**Hyphal system** dimitic; generative hyphae with clamps, 1-3 Fm wide, hyaline, thin-walled; skeletal hyphae straight, hyaline to brownish, up to 5 Fm wide in the context, sparingly branched, dextrinoid; pileus a cutis with brown, strongly agglutinated hyphae.

**Cystidia** abundant, clavate to mucronate, encrusted at the apex, 12-36 x 6-7 Fm, thick-walled, dextrinoid.

**Basidia** not seen, as they are embedded in the trama and collapse soon after releasing the basidiospores.

**Basidiospores** ellipsoid to amygdaliform, smooth, thick-walled, 5-7.5 x 3.5-5 Fm, dextrinoid.

**Substrata.** On dead hardwoods.

**Distribution.** Paleotropical species found in primary forests. In East Asia known from subtropical China and Japan.

**Remarks.** The species is similar to *P. martius*, but this species has less conspicuous cystidia and larger basidiospores. Compatibility tests may eventually reveal whether the taxa are conspecific.

**Perenniporia maackiae** (Bondartsev & Ljub.) Parmasto

Ann. Bot. Fennici 32:223, 1995. - *Fomitopsis maackiae* Bondartsev & Ljub., Bot.

Mater. Otd. Spor. Rast. 15:103, 1962. - *Fomitopsis mellea* Bondartsev & Ljub., Ibid. p.108, 1962. - *Antrodia luteola* Zhang & Zhao, Acta Mycol. Sin. Suppl. 1:277, 1987.

**Basidiocarps** annual to perennial, resupinate to effused-reflexed, soft to leathery, corky when dry, margin sterile, glabrous, red to bay, up to 5 mm wide; pileus cream to reddish when young, becoming dark grey with age, rough, with concentric zones, in resupinate specimens present as a wide margin; pore surface bright yellow, becoming dark straw-coloured with age, pores round to elongated in vertical surfaces, 5-8 per mm, dissepiments thick, entire, tubes in one layer or stratified, concolorous with the pore surface, up to 2 mm long; context pale yellow, corky, up to 2 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, frequently branched, up to 2.5 Fm wide; skeletal hyphae dominant, thick-walled, with a distinct lumen, frequently branched, up to 3 Fm in the trama, some inflated in the context up to 10 Fm wide, dextrinoid.

**Basidia** broadly clavate, 9-15 x 4-7 Fm, with four sterigmata.

**Basidiospores** ellipsoid, thick-walled, slightly truncate, dextrinoid, 5-7 x 3-5 Fm.

**Substrata.** On hardwoods, mainly on *Maackia amurensis*, but also known from *Castanopsis* and *Padus*.

**Distribution.** Temperate East Asian species, known from Northern China (Chang-bai), Japan (Kyushu), and Far East Russia.

**Remarks.** The species reminds *P. tenuis* var. *pulchella* by the yellow pore surface. However, this species has larger pores (up to 4-5 per mm) and lacks the characteristic red margin of *P. maackiae*.

**Substrata.** Mainly on living *Fraxinus*, also a few records on other hardwood genera and *Juniperus*.

**Distribution.** Throughout the whole range of *Fraxinus*.

**Remarks.** *P. fraxinophila* is quite similar to *P. fraxinea*, which however has smaller basidiospores.

**Perenniporia japonica** (Yasuda) Hattori & Ryvar den

Mycotaxon 50:36, 1994. - *Trametes japonica* Yasuda, Bot. Mag. Tokyo 32:356, 1918.

**Basidiocarps** annual to perennial (2-3 years), resupinate, adnate, up to 10 cm wide in longest dimension, up to 4 mm thick in the center, margin pale cinnamon, darker in old basidiocarps, thick, usually sulcate; pore surface whitish to isabelline, pores circular, 6-7 per mm, with thick and entire dissepiments, tubes up to 3 mm long, stratified, concolorous with the pore surface; context cream to pale cinnamon, about 1 mm thick, sometimes with cordons or rhizomorphs in the abhymenial surface.

**Hyphal system** dimitic (trimitic?); generative hyphae with clamps, hyaline, thin- to thick-walled, 2.5-4 Fm wide; skeletal hyphae abundant, thick-walled, unbranched to slightly branched, 1.5-2 Fm wide, interwoven in the trama; binding hyphae (?) strongly branched with whip-like branches, present in the context close to the substrate, probably representing the same type of hyphae as those often seen in old closed tubes of many polypores.

**Basidia** clavate, 9-12 x 5.5-7 Fm, with four sterigmata.

**Basidiospores** ellipsoid to truncate, hyaline to pale yellow, thick-walled, dextrinoid, 4-5 x 2.5-3.5 Fm.

**Substrata.** Usually on hardwoods, once also found on *Pinus*.

**Distribution.** Warm-temperate species, known from Europe, India, Nepal, Japan (Kyushu and Honshu), and Far East Russia (Primorsk).

**Remarks.** The species is similar to *P. medulla-panis* but easily separated by the dark brown margin of the basidiocarps, frequently with rhizomorphs, and smaller basidiospores.

**Perenniporia latissima** (Bres.) Ryvar den

Mycotaxon 33:314, 1988. - *Fomes latissimus* Bres., Ann. Mycol. 8:588, 1910.

**Basidiocarps** annual, broadly effused-reflexed to resupinate, pileus when present becoming unguulate, up to 26 cm wide and 12 cm thick; pileus dull brown with fuscous zones, then fuscous brown becoming dull black, with a narrow, bright brown zone near the thick, obtuse, light margin, at first velutinate, soon glabrous, uneven, slightly sulcate, often rimose; pore surface glancing white, drying dingy and dull, pores 4-5 per mm, dissepiments thick and entire, tubes up to 11 cm long, stratified, each layer up to 9 mm long, separated by thin context layers; context corky, drying woody, pale buff to wood colour, up to 1 cm thick at the base, becoming pale fuscous in old parts, darker beneath the thick, black pilear cuticle.

context thin, cream-coloured to yellowish.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 2-4 Fm wide; skeletal hyphae hyaline, thick-walled, 2.5-5 Fm wide, variably dextrinoid, strongly interwoven in the trama; binding hyphae hyaline, thick-walled, much-branched, 1.5-2 Fm wide, dextrinoid.

**Cystidia** absent; cystidiols often present, 15-22 x 7-8 Fm; hyphal pegs present.

**Basidia** broadly clavate with a narrow base, 19-27 x 7-11 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid and truncate, thick-walled, weakly to strongly dextrinoid in Melzer's reagent, 5-6.5 x 3.5-4.5 Fm.

**Substrata.** Dead wood of numerous hardwood genera, in Eastern North America and Asia also on conifers.

**Distribution.** Cosmopolitan species, in East Asia known from China, Korea, Japan, Far East Russia, Taiwan, and Vietnam.

**Remarks.** *Perenniporia medulla-panis* is characterized by the truncate, dextrinoid basidiospores, skeletal and binding hyphae. Macroscopically, the tough, perennial or persistent basidiocarps with a cream to ochraceous pore surface are distinctive.

### **Perenniporia minutissima** (Yasuda) Hattori & Ryvar den

Mycotaxon 50:37, 1994. - *Trametes minutissima* Yasuda, Bot. Mag. Tokyo 34:29,

1920. - *Trametes symploci* Yasuda, Bot. Mag. Tokyo 37:84, 1923.

**Basidiocarps** annual, pileate, solitary; pileus dimidiate, triquetrous to applanate, up to 10 cm long and 2 cm thick in fresh condition, margin thick and dull; pileus reddish brown, almost white near the margin, glabrous, irregularly rough to almost smooth, occasionally rimose; pore surface white, pores circular to angular, 3-4 per mm, tubes white, 5 to 10 mm long; context white, waxy and fragile with hygrophanous spots when fresh, up to 1 cm thick, concentrically zonate, woody hard when dry.

**Hyphal system** di-trimitic; generative hyphae with clamps, hyaline, thin- to slightly thick-walled, in the trama agglutinated; skeletal and binding hyphae hyaline, dextrinoid in mass, thick-walled, 2.5-5 Fm wide.

**Cystidia** absent.

**Basidia** clavate, 20-30 x 9-12.5 Fm, with four sterigmata.

**Basidiospores** ellipsoid, truncate, thick-walled, dextrinoid, 10-13 x 6-7.5 Fm.

**Substrata.** On hardwoods, especially *Symplococos* spp., also found on *Pinus densiflora*.

**Distribution.** Only known from Japan.

**Remarks.** When fresh, the species is easy to recognize by its reddish and waxy basidiocarps. Microscopically, the large basidiospores are similar to those in *Perenniporia ochroleuca*.

### **Perenniporia narymica** (Pilát) Pouzar

Ceska Mykol. 38:204, 1984. - *Trametes narymica* Pilát, Bull. Soc. Mycol. Fr.

**Perenniporia martia** (Berk.) Ryvarden

Norw. J. Bot. 19:143, 1972. - *Polyporus martius* Berk., Hooker's J. Bot. 8:198, 1856. - *Fomitopsis hainanensis* Zhao & Zhang, Acta Mycol. Sin. 10:114, 1991.

**Basidiocarps** perennial, solitary, pileate, semicircular to dimidiate, mostly broadly attached, up to 15 cm long, 10 cm wide and 8 cm thick, consistency very hard and heavy when dry; pileus appanate to ungluate, glabrous, usually irregularly concentrically sulcate, dark bay, dirty brown to black with a distinct crust up to 2 mm thick, rimose with age, margin obtuse, usually cream to dirty white; pore surface cream to dirty ochraceous, pores round, 4-5 per mm, dissepiments thick and entire, almost as thick as the pore openings, tubes totally up to 6 cm long, distinct to indistinctly stratified, each layer up to 8 mm long, the younger layers often cream to cork-coloured, the upper layer pale ochraceous, snuff brown to dark brown, sterile margin 1-2 mm broad; context cream, wood-coloured, dark ochraceous to pale greyish-black in old parts, up to 3 cm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline and thin-walled, 1.5-3 Fm wide, often collapsed and difficult to find; arboriform hyphae abundant, hyaline to brownish, dominating in the whole basidiocarp, strongly dextrinoid, 2-6.5 Fm wide in the main stem, with few branches, thick-walled, dextrinoid, 2-4 Fm wide.

**Cystidia** common to apparently absent, ventricose to clavate, thick-walled, non-dextrinoid to dextrinoid, encrusted in the upper part, mostly embedded and often difficult to observe, 30-70 x 6-12 Fm, arising from skeletal hyphae.

**Basidia** embedded in the trama and soon collapsing, up to 9 Fm wide.

**Basidiospores** amygdaliform to weakly truncate with a distinct tapering end, thick-walled, variably dextrinoid, often variable within the same basidiocarp 5-9(10) x 3-6 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Pantropical, but nowhere common. In East Asia known from China (Hunan, Guangxi) and Vietnam.

**Remarks.** The species is distinct microscopically by its amygdaliform basidiospores. The cystidia seem to be more common in African and Asian specimens than in American ones. This tropical species is included here because we believe it can be found in subtropical East Asia in the future.

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

Persoonia 5:76, 1967. - *Boletus medulla-panis* Jacq., Miscel. Austr. 1:141, 1778. - *Polyporus medulla-panis* Jacq.: Fr., Syst. Mycol. 1:380, 1821.

**Basidiocarps** annual to perennial, becoming widely effused, usually resupinate but sometimes narrowly reflexed on vertical surfaces, tough to corky, margin up to 2 cm wide, cream-buff; pore surface highly variable in colour, cinereous, cream to cream-buff or bright yellow, pores circular, 4-6 per mm, with thick dissepiments, tubes concolorous with the context, distinctly stratified, each layer up to 1 mm thick;

**Basidiospores** abundant, ellipsoid, truncate, thick-walled, 12-17(20) x 7-10(11) Fm, weakly to strongly dextrinoid.

**Substrata.** On dead hardwoods, rarely on conifers.

**Distribution.** Cosmopolitan species, mainly in tropical and warm-temperate areas.

In East Asia known from Japan (Honshu and Kyushu), Far East Russia (Primorsk), and Vietnam. There is an unconfirmed record from Changbai in China (Dai 1996).

**Remarks.** The species can be identified by the small, unguulate, ochraceous pilei and the large, truncate basidiospores. The pores are also larger than in most other species in the genus.

**Perenniporia ohiensis** (Berk.) Ryvarden

Norw. J. Bot. 19:143, 1972. - *Trametes ohiensis* Berk., Grevillea 1:66, 1872.

**Basidiocarps** perennial, effused-reflexed or pileate, solitary, dimidiate, up to 2.6 x 3 x 5 cm; pileus light brown becoming blackish, glabrous, concentrically sulcate, margin ivory, round; pore surface ivory, pores circular, 5-7 per mm, with very thick, entire dissepiments, tubes cream-coloured, continuous with the context, indistinctly stratified, each layer up to 4 mm thick; context cream to tan, faintly zonate, firm-corky, up to 4 mm thick.

**Hyphal system** di-trimitic; generative hyphae with clamps, hyaline, thin-walled, rarely branched, 2-5 Fm wide; skeletal hyphae hyaline, thick-walled, rarely branched, 2.5-4 Fm wide, weakly dextrinoid in mass; some binding hyphae present.

**Cystidia** absent.

**Basidia** broadly clavate, 28-34 x 11-16 Fm, with four sterigmata.

**Basidiospores** ellipsoid to ovoid, truncate, thick-walled, dextrinoid, 13-16 x 7-10 Fm.

**Substrata.** On dead hardwoods, rarely on living trees, particularly common on oak, often on fence posts and rails.

**Distribution.** Warm- and cold-temperate areas, in East Asia known from China (Hebei), Far East Russia and Taiwan, also found in Eastern North America to southern Arizona and New Mexico. Not known from Europe.

**Remarks.** *P. ochroleuca* is similar, but has a persistent cream-coloured pileus, while it is brown to black in *P. ohiensis*.

**Perenniporia robiniophila** (Murrill) Ryvarden

Mycotaxon 17:517, 1983. - *Trametes robiniophila* Murrill, North Am. Flora 9:42, 1907.

**Basidiocarps** annual, pileate, sessile, single or imbricate, watery and soft when fresh, coriaceous when dry, individual pilei up to 15 cm wide and 20 cm long, 0.5-3 cm thick at the base, margin sharp; pileus 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 grey or pale brown, pores round to angular, 5-7 per mm, sometimes slightly split and contracting when dry, tu-

51:364, 1936.

**Basidiocarps** annual, resupinate, at first orbicular, becoming widely effused, adnate, margin white to light buff, finely fibrillose, up to 2 mm wide; pore surface cream-coloured, drying light buff to cream buff, pores circular to angular, 3-5 per mm, with thick dissepiments, tubes white to cream, up to 1 mm long; context thin, cream-coloured, up to 1 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 3-4 Fm wide; skeletal hyphae hyaline, thick-walled, with rare branching, amyloid in Melzer's reagent, 3-6 Fm wide; binding hyphae hyaline, thick-walled, amyloid, up to 4 Fm wide, swelling in KOH.

**Cystidia** absent; fusoid cystidiols present, not projecting, 14-20 x 5-7 Fm.

**Basidia** clavate, 18-30 x 6-9 Fm, with four sterigmata.

**Basidiospores** ellipsoid to ovoid, hyaline, smooth, thin-walled, negative in Melzer's reagent, 4.5-6 x 3-4 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Temperate areas in North America, Europe, and East Asia (Changbai in Northern China, from Okinawa to Hokkaido in Japan, and in Far East Russia).

**Remarks.** *Perenniporia narymica* is distinctive by its amyloid skeletal hyphae combined with ovoid, non-dextrinoid basidiospores.

***Perenniporia ochroleuca* (Berk.) Ryvarden**

Norw. J. Bot. 19:233, 1972. - *Polyporus ochroleucus* Berk., London J. Bot. 4:53, 1845.

**Basidiocarps** perennial, solitary or imbricate, sessile or dimidiate, applanate to ungulate, up to 7 cm broad and 5 cm wide, 0.3-2.5 cm thick, corky when fresh, woody hard when dry; pileus cream-ochraceous, with age discoloured, often zonewise from pale yellowish brown to pale purplish brown, glabrous, dull to semiglossy, widely concentrically zonate, sulcate to smooth, finely radially striate, margin thick, round, entire or slightly lobed, usually light-coloured; pore surface white, cream, ochraceous to discoloured, pale brownish in older specimens, pores round, 2-4 per mm, dissepiments thick and entire, tubes single-layered or weakly stratified, 3-10 mm long, straw to wood-coloured; context 1-3 mm thick, white to ochraceous, weakly zonate, with a distinct cuticle on the upper part.

**Hyphal system** trimitic; generative hyphae with irregular and few clamps, thin-walled, hyaline, 1.5-4 Fm wide, often collapsed and distorted; skeletal hyphae hyaline, thick-walled, with a distinct lumen, diameter rather variable, 2-6 Fm wide, often with secondary simple septa, straight to slightly tortuous, slightly dextrinoid, mostly abundant in the context; binding hyphae hyaline, thick-walled with a distinct lumen, irregularly and sparingly branched, 2-5 Fm wide, only present in the trama and dissepiments, more or less dextrinoid.

**Cystidia** absent; clavate, slightly projecting cystidiols are present.

**Basidia** clavate, 30-40 x 10-15 Fm, with four sterigmata.

**Perenniporia tenuis** (Schwein.) Ryvar den

Norw. J. Bot. 30:9, 1973. - *Polyporus tenuis* Schwein., Am. Phil. Soc. Trans. 2,4:159, 1832.

**Basidiocarps** annual, resupinate, adnate, margin usually sterile, cream-coloured to pale buff, floccose, up to 4 mm wide; pore surface bright lemon yellow, drying yellow to cream-coloured, pores circular to angular, 4-5 per mm, tubes concolorous with the context, up to 3 mm long; context thin, yellowish to cream, soft-fibrous.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 2-3 Fm wide; arboriform hyphae hyaline to yellowish, thick-walled but with a lumen, often branched at the apex, 2-4 Fm wide.

**Cystidia** absent; fusoid cystidiols present, not projecting, 15-17 x 4-6 Fm.

**Basidia** clavate, 15-20 x 7-8 Fm, with four sterigmata.

**Basidiospores** ellipsoid, some truncate, thin-walled, non-dextrinoid 6-7.5 x 4-5 Fm.

**Substrata.** Noted only on hardwoods.

**Distribution.** Widely distributed in cold-temperate areas. In East Asia known from China, Japan, and Far East Russia.

**Remarks.** The species is often split in two varieties where *P. tenuis* var. *pulchella* is separated by having a bright lemon yellow colour.

**Perenniporia tephropora** (Mont.) Ryvar den

Norw. J. Bot. 19:233, 1972. - *Polyporus tephroporus* Mont., Ann. Sci. Nat. Ser 3 vol. 4:358, 1845.

**Basidiocarps** perennial, usually resupinate or with a small, obliquely reflexed dark portion up to 1 cm broad, very often on vertical surfaces, effused, forming irregular areas up to 20 x 8 cm, consistency woody hard; pileus, if present, slightly developed, the reflexed portion very finely tomentose to glabrous, dirty greyish to black, often somewhat rimose and sulcate, in section with a dark crust, sterile margin thick and round, thinning out, up to 3 mm wide; pore surface clay, grey to pale umber, pores round to angular, 4-6 per mm, dissepiments thin to fairly thick, entire and farinose, tubes distinctly stratified, each layer 2-4 mm thick; context 0.5-2 mm thick, snuff brown to even dark brown, blackening in KOH.

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

**Basidia** clavate, 12-15 x 4-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid to truncate, thick-walled, hyaline to slightly yellowish, dextrinoid, 4.5-6 x 3.5-4.5 Fm.

bes concolorous with the pore surface or paler, up to 2 cm long and distinctly darker than the context which is pale ochraceous and cottony to tough.

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

**Cystidia** absent; pointed cystidiols present, up to 30 Fm long.

**Basidia** clavate, 25-30 x 6-9 Fm, with four sterigmata.

**Basidiospores** subglobose, thick-walled, dextrinoid, 5-8 x 5-7 Fm.

**Substrata.** On hardwoods of several genera, mainly on *Robinia*.

**Distribution.** East United States, Pakistan, and China (Shandong).

**Remarks.** The pileate, glabrous basidiocarps with globose basidiospores are very characteristic. This species is a good example of the close relationship between the Eastern North America and East Asian mycota.

### ***Perenniporia subacida* (Peck) Donk**

*Persoonia* 5:76, 1967. - *Polyporus subacidus* Peck, N.Y. State Mus. Ann. Rept. 38:92, 1885.

**Basidiocarps** perennial, resupinate and widely effused, tough and corky, not readily separable, about 50 cm long and 30-40 cm wide, margin whitish to ivory, soft, fimbriate, up to 2 mm wide; pore surface rich ivory, yellowish or tan, often glancing, pores circular to angular, 5-6 per mm, with thick, finely fimbriate dissepiments that eventually become thin and slightly lacerate, tubes single or distinctly stratified, cream to buff, each layer up to 2 cm thick; context pale buff, azonate, soft, less than 1 mm thick; taste mild or slightly acid.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, inconspicuous, 2-3 Fm wide; skeletal hyphae hyaline, thick-walled, rarely branched, 2.5-5 Fm wide, with a wide lumen, almost parallel in the trama, strongly dextrinoid; binding hyphae hyaline, slender, some repeatedly branched, 1-2 Fm wide, strongly dextrinoid.

**Cystidia** absent; fusoid cystidiols embedded or slightly projecting, some weakly encrusted, 13-35 x 4.5-6 Fm.

**Basidia** clavate, some with an attenuated base, 20-30 x 5.5-8.5 Fm, with four sterigmata.

**Basidiospores** ovoid to broadly ellipsoid, thin-walled, negative in Melzer's reagent, distinctly apiculate, usually uniguttulate, 4.5-7.5 x 3-5 Fm.

**Substrata.** In Europe only on conifers, in Eastern North America and East Asia also seen on dead hardwoods.

**Distribution.** Widely distributed in temperate forest regions of North America, Europe, and East Asia (China, Kyushu to Hokkaido in Japan, Korea, and Far East Russia).

**Remarks.** *Perenniporia subacida* is one of the most common and widespread polypores in coniferous ecosystems. The parallel strongly dextrinoid skeletal is a good diagnostic character.

tive in Melzer's reagent to slightly dextrinoid, 4-5 x 3.5-4 Fm.

**Substrata.** On dead hardwoods, in Japan collected on *Abies firma*.

**Distribution.** Eastern North America, Far East Russia (Primorsk), and Japan (Honshu).

**Remarks.** The species is recognized by the pale brownish and rather cartilaginous to brittle pore surface, and the relatively large pores.

**PHAEOLUS (Pat.) Pat.**

Essai Taxon. Hym. p. 86, 1900.

Basidiocarps annual, sessile to stipitate; pileus yellowish orange at first, becoming brown, strigose to fibrillose; pore surface yellowish to olive brown, pores daedaloid to circular, up to 2 mm wide; context orange to brown, fibrous to spongy; hyphal system monomitic; generative hyphae simple-septate, thin- to thick-walled; cystidia hyaline to yellowish, cylindrical, thin-walled, not encrusted; gloeoplerous hyphae also present in hymenium; basidiospores ellipsoid to cylindrical, hyaline, smooth, negative in Melzer's reagent. Causes a brown cubical butt rot of living conifers and hardwoods. Cosmopolitan monotypic genus.

**Type species:** *Polyporus schweinitzii* Fr.

**Remarks.** *Phaeolus schweinitzii* is characterized by its cystidia, simple septate hyphae and large compounded brown basidiocarps becoming black with KOH, besides being a brown rot fungus.

**Phaeolus schweinitzii (Fr.) Pat.**

Ess. Taxon. Hym. p. 86, 1900. - *Polyporus schweinitzii* Fr., Syst. Mycol. 1:351,

1821. **Basidiocarps** annual, stipitate on the ground from roots or sessile at the base of living trees, stumps or logs; pilei solitary or imbricate, circular or irregularly lobed, up to 25 cm wide; pileus yellowish at first, becoming yellowish brown at maturity, drying to dark reddish brown, tomentose to hirsute, faintly zonate; stipe central or lateral, short and stout, simple or branched, up to 5 cm thick; pore surface yellowish at first, becoming olive brown, yellowish brown to rusty brown with age, pores angular, 1-2 per mm, dissepiments thick, becoming lacerate, tubes decurrent, distinct from the context, olive to rusty brown, up to 1.5 cm long; context yellowish brown, becoming dark rusty brown with age, soft-fibrous, azonate, up to 1.5 cm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, dark brown to yellowish brown in KOH, thin-walled, 3-17 Fm wide, some with frequent branching.

**Cystidia** frequent, hyaline to yellowish, cylindrical, not encrusted, 20-90 x 7-13 Fm, projecting up to 75 Fm.

**Basidia** clavate, 20-25 x 7-8 Fm, with four sterigmata.

**Basidiospores** ellipsoid to ovoid, 6-9 x 2.5-5 Fm.

**Substrata.** On living conifers, causing cubical rot of heartwood of butt and roots, also continuing decay and fruiting on dead trees, stumps, and logs. In tropical areas it is a parasite on living hardwoods and palms.

**Substrata.** On dead hardwoods in numerous genera. In Japan also found on *Larix*.

**Distribution.** Pantropical, in North Asia from China, Japan (from Okinawa to warm-temperate Honshu), Taiwan, North Thailand, and Vietnam.

**Remarks.** *Wrightoporia tropicalis* also has a greyish to umber brown pore surface and dextrinoid vegetative hyphae, but has amyloid, ornamented basidiospores and encrusted cystidia.

**Perenniporia truncatospora** (Lloyd) Ryvardeen

Acta Mycol. Sin. 5:228, 1986. - *Trametes truncatospora* Lloyd, Mycol. Writ. 5:853, 1919.

**Basidiocarps** annual to biennial, pileate to effused-reflexed, woody, easily separated from the substrate, effused part up to 3 cm wide; pileus up to 1 cm wide, oblique, strongly sulcate in narrow rounded zones, ochraceous to brown at the margin, older parts dark brown to black, matted and dull with a distinct black crust in section, margin rounded; pore surface cork-coloured, undulating and reflecting the substrate, pores minute, 6-8 per mm, tubes up to 1 mm long, dark ochraceous; context pale brown, dense, sometimes with white mycelial strands.

**Hyphal system** trimitic; generative hyphae with clamps, 1.5-3 Fm wide; arboriform hyphae hyaline, solid to thick-walled, tortuous, weakly dextrinoid, 2-4 Fm wide, branched at the apex; narrow whip-like branches seen in the old stuffed tubes.

**Basidia** subcylindrical, 20-22 x 4-5 Fm, with four sterigmata.

**Basidiospores** truncate, thick-walled and slightly dextrinoid, 6.5-8 x 5-6 Fm in Melzer's reagent, swelling to 9.5 x 7.5 Fm in KOH.

**Substrata.** Known from *Quercus* and *Castanopsis*.

**Distribution.** Temperate Asian species known from China (Jilin, Hebei, Yunnan) and Japan.

**Remarks.** Microscopically this species is close to *P. medulla-panis* and mainly separated by a distinctly sulcate blackish pileus with a thin, black crust.

**Perenniporia variegata** Ryvardeen & Gilb.

Mycotaxon 19:140, 1984.

**Basidiocarps** annual, resupinate, effused, adnate and tough when fresh, brittle and partly cartilaginous when dry, margin narrow, white to ochraceous, finely fimbriate; pore surface white to ochraceous when fresh, darkening to yellowish brown when dry and old, pores round to angular, rather thin-walled, 2-3 per mm, tubes partly cartilaginous to brittle, concolorous and up to 8 mm long; context thin and dense, cream to yellowish brown in old specimens.

**Hyphal system** dimitic; generative hyphae with clamps, thin- to thick-walled, 2-4 Fm wide; skeletal hyphae hyaline to yellowish, thick-walled and dextrinoid, 2-4 Fm wide.

**Basidia** clavate, 10-15 x 5-7 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to subglobose, hyaline, slightly thick-walled, nega-

cartilaginous and ceraceous when fresh, rigid and brittle when dry, margin white; pore surface white when fresh, drying pale ochraceous brown, pores angular, 4-6 per mm, tubes becoming resinous and brittle, up to 3 mm long; context up to 1 mm thick, white when fresh, drying ochraceous and resinous; taste slightly bitter.

**Hyphal system** monomitic; generative hyphae with clamps, irregularly branched, hyaline, 3-6 Fm wide, thin-walled, those of the context similar, often agglutinated and difficult to separate for microscopic study.

**Cystidia** absent; fusoid cystidiols hyaline, not encrusted, 15-20 x 5-8 Fm.

**Basidia** clavate, 15-20 x 6-8 Fm, with four sterigmata.

**Basidiospores** subglobose, 4.5-5 x 4-5 Fm, unigutulate.

**Substrata.** In Europe and Asia reported from *Pinus* (David 1971, Kotiranta 1985, Dai 1996) and *Castanea*. In North America known also from *Sequoia* and *Thuja*.

**Distribution.** Temperate to subtropical species in the northern hemisphere. In East Asia only known from Changbai (Northern China).

**Remarks.** *Physisporinus rivulosus* is easily separated by its clamped hyphae. The taxonomic position of this species has been disputed. We have however, felt that it was better placed in *Physisporinus* because of the consistency of its basidiocarps, the globose basidiospores, and the fusoid cystidiols in the hymenium.

***Physisporinus sanguinolentus* (Alb. & Schwein.:Fr.) Pilát**

Atlas Champ. Europe 3:247, 1940. - *Boletus sanguinolentus* Alb. & Schwein., Consp. Fung. p.257, 1805. - *Polyporus sanguinolentus* Alb. & Schwein.:Fr., Syst. Mycol. 1:383, 1821.

**Basidiocarps** annual or biennial, effused up to 20 cm, cartilaginous and ceraceous when fresh, drying rigid, readily separable, margin fertile or narrowly sterile, drying pale tan, fimbriate, up to 1 mm wide; pore surface white or ivory when fresh, quickly showing bright rusty red blotches after collecting, eventually becoming brown, greyish to blackish on drying, pores circular to angular, 8-10 per mm, with thick, entire dissepiments, tubes ivory to pale tan, brittle when dry, up to 5 mm long; context white when fresh, pale tan when dried, cartilaginous, less than 1 mm thick; taste mild.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, thin- to thick-walled, simple-septate, in the trama 2-4 Fm wide, in the context 3.5-6.5 Fm wide, agglutinated and not easily separable on drying, rarely branched.

**Cystidia** absent; fusoid cystidiols present, 15-19 x 5-6 Fm.

**Basidia** broadly clavate, 12-14 x 6.5-8 Fm, with four sterigmata.

**Basidiospores** ovoid to subglobose, 5-6 x 4-4.5 Fm.

**Substrata.** On dead conifers and hardwoods.

**Distribution.** Cosmopolitan, but easily overlooked because of its blackish colour when dry. In East Asia known from China and Japan.

**Remarks.** The distinctive colour change after collecting facilitates ready identification of *P. sanguinolentus* in the field.

**Distribution.** Cosmopolitan species. In East Asia known from China, Japan, Taiwan, Far East Russia, and Vietnam.

**Remarks.** *Phaeolus schweinitzii* is generally considered to a major cause of butt rot in many commercial timber species, especially when they have been affected by fire. Its basidiocarps are very attractive for colouring of yarn and gives beautiful yellow to brown colours.

**PHYSISPORINUS** P. Karst.

Finl. Basidsv. p.34, 1889.

Basidiocarps annual, resupinate, soft to ceraceous, often changing colour on bruising or drying; hyphal system monomitic; generative hyphae simple-septate, mostly thin-walled, one species with clamps; cystidia absent, fusoid cystidiols present; basidiospores globose to ovoid, negative in Melzer's reagent. Causes a white rot.

**Type species:** *Polyporus vitreus* Pers.:Fr.

**Remarks.** The genus is similar to *Rigidoporus* because of the simple septate generative hyphae and globose basidiospores. However, *P. sanguinolentus* and *P. vitreus* are two species with resupinate, soft to waxy basidiocarps that often change colour when they are bruised or dried and thin-walled hyphae. *R. microporus* (Fr.) Overeem, the type species has bright reddish orange basidiocarps when fresh, fading when dry besides that the contextual hyphae are very thick-walled and easily taken as skeletal hyphae. Thus, we feel it is more natural to keep *Physisporinus* as a separate genus. The genus has of course priority if the two genera should be merged and will necessitate a massive transfer of species with name changes of the most unfortunate kind.

**Key to species**

- 1. Generative hyphae with clamps..... **P. rivulosus**
- 1. Generative hyphae simple-septate..... 2
- 2. Pore surface white, rapidly reddish to brown when bruised,  
pores 8-10 per mm. .... **P. sanguinolentus**
- 2. Pore surface bluish white, slowly becoming pale brown when bruised,  
pores 4-6 per mm ..... **P. vitreus**

**Physisporinus rivulosus** (Berk. & M.A. Curtis) Ryvarden

Mycotaxon 20:353, 1984. - *Polyporus rivulosus* Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10:318, 1868.

**Basidiocarps** annual, resupinate, usually effused in small patches, up to 3 mm thick,

1. Context brick orange, tropical hardwood species ..... **P. albomarginata**  
 1. Context brown, boreal coniferous species ..... **P. sajanensis**

**Piloporia albomarginata** (Lév.) Núñez

Mycotaxon 68:288, 1998. - *Polyporus albomarginatus* Lév., Ann. Sci. Nat. Ser. 3, Vol 2:191, 1844.

**Basidiocarps** annual to perennial, effused-reflexed to distinctly pileate and then mostly imbricate, elongated, semicircular to dimidiate, up to 8 cm wide to 20 cm long in laterally fused specimens, 2-4 cm thick at the base, coriaceous to hard when dry; pileus first light orange, azonate to zonate with a few slightly sulcate zones, appressed velutinate or slightly scrupose, with age the upper tomentum is agglutinated and a distinct dark brown to black cuticle is developed, margin often paler than the inner parts of the pileus; pore surface pale orange, glancing when turned in incident light, with age brick-red with brownish tints, and then the pore surface frequently recedes, leaving zones of sterile areas along the margin, pores 4-5 per mm, angular, tubes whitish, single-layered to stratified, single layers up to 3 mm thick, together up to 1.5 cm long, dissepiments farinose; context bright orange to brick-red, dense with age, more soft in the upper part in young specimens, frequently with thin, black lines reflecting earlier growth, purplish with KOH.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline and 2-4 Fm wide, often difficult to find; skeletal hyphae reddish brown, distinctly more cherry-red when mounted in KOH, thick-walled to solid, straight, up to 6 Fm wide, in the trama parallel and more thin-walled than in the context where they are randomly oriented, encrusted with small crystals in the dissepiments.

**Cystidia** absent; hyphoid cystidiols common in the tubes in sterile specimens.

**Basidia** clavate, 6-8 x 2.5-3.5 Fm, with four sterigmata.

**Basidiospores** allantoid, 3-4 x 0.5-0.8 Fm.

**Substrata.** On hardwoods.

**Distribution.** Pantropical, in Asia widespread from India to Australia, also in subtropical China, Japan (Okinawa), Taiwan, North Thailand, and Vietnam.

**Remarks.** The species is conspicuous by its brick red basidiocarps and is easily taken for a *Pyrofomes* species, where however all species has abundant with thick-walled round to truncate basidiospores.

**Piloporia sajanensis** (Parmasto) Niemelä

Karstenia 22:13, 1982. - *Antrodia sajanensis* Parmasto, Bot. Mater. Otdela Spor. Rast. Bot. Inst. Akad. Nauk SSSR 15:134, 1962.

**Basidiocarps** annual, pileate, effused-reflexed to resupinate, soft and pliable, up to 2.5 cm wide and 10 cm long in large effused basidiocarps, 2-5 mm thick; pileus dark brown, velutinate, soft and xanthocroic, separated from the context by a black line; pore surface at first white to cream, becoming cork-coloured to greyish pale brown, pores at first circular and regular, 4-5 per mm, with age splitting and fusing to form

**Physisporinus vitreus** (Pers.:Fr.) P. Karst.

Finl. Basidsv. p. 324, 1889. - *Polyporus vitreus* Pers.:Fr., Syst. Mycol. 1:381, 1821.

**Basidiocarps** annual, resupinate, 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 long, concolorous with the pore surface; context 2-5 mm thick, dense, pale brown when dry.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, agglutinated and difficult to separate in dried specimens, thin- to thick-walled, sparingly branched, in the trama 2-4 Fm wide, in the context 3-6 Fm wide.

**Cystidia** absent; fusoid cystidiols present, 15-20 x 5-6 Fm.

**Basidia** broadly clavate, 12-15 x 6-8 Fm, with four sterigmata.

**Basidiospores** ovoid to globose, often uniguttulate, 5-6 x 4-5 Fm.

**Substrata.** On dead wood of several genera of hardwoods, rarely on conifers, causing a pocket rot.

**Distribution.** Widely distributed in temperate forest regions in North America, Europe, and East Asia (China, Japan, and Far East Russia).

**Remarks.** This species is related to *P. sanguinolentus*, which however is more whitish when fresh and rapidly becomes reddish and then black when bruised. *Physisporinus vitreus* has distinct bluish, semitranslucent basidiocarps when actively growing and its colour changes only slowly when bruised. Its pocket rot is distinctive.

## **PILOPORIA** Niemelä

Karstenia 22:13, 1982.

Basidiocarps pileate, effused-reflexed to resupinate; pileus dark brown, developing a cuticle; pore surface whitish to cork-coloured, tubes concolorous; context duplex with a black line separating the lower from the upper part; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae hyaline to coloured, finely encrusted in the dissepiments; cystidia absent; basidiospores allantoid, hyaline, thin-walled and negative in Melzer's reagent. Causing a white rot in conifers and hardwoods, small genus with two species.

**Type species:** *Antrodia sajanensis* Parmasto

**Remarks.** The genus has characters from *Datronia* by its typical duplex consistency with a black line in the context, but has far smaller basidiospores than seen in this genus. *Skeletocutis* is probably the closest relative sharing the same small allantoid basidiospores and the encrusted skeletal hyphae.

## **Key to speciesto species**

**nus**

1. On *Quercus* and other hardwoods..... 2

2. Basidiocarps vivid orange ..... **P. soloniensis**

2. Basidiocarps cream, becoming brown when bruised ..... **P. quercinus**

**Piptoporus betulinus** (Bull.:Fr.) P. Karst.

Medd. Soc. Fauna Fl. Fenn. 6:9, 1881. - *Boletus betulinus* Bull., Herb France, Pl. 312, 1787. - *Polyporus betulinus* Bull.:Fr., Syst. Mycol. 1:358, 1821.

**Basidiocarps** annual, dimidiate to substipitate, often pendent, usually reniform, solitary, up to 15 x 25 x 6 cm; pileus whitish to mouse-coloured or brownish, usually with a thin pellicle that breaks up to give a pitted or scaly appearance, glabrous, azonate, margin concolorous, usually bending down below the pore surface; stipe short, stout, glabrous, whitish to brown, up to 6 cm long and 5 cm thick; pore surface white at first, becoming pale brownish with age, pores circular to angular, 3-5 per mm, with thick, entire dissepiments that split and clump together with age to give a hyd-naceous appearance, tubes easily separated from the context when fresh, up to 1 cm long; context white, tough when fresh, drying soft-corky, azonate, up to 5 cm thick.

**Hyphal system** di-trimitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 2.5-4 Fm wide; skeletal hyphae hyaline, thick-walled, some much branched, others with rare or occasional branching, 2.5-5 Fm wide.

**Basidia** clavate, 10-12 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 5-6 x 1.5-1.7 Fm.

**Substrata.** Restricted to *Betula*, although in culture its basidiospores germinate on other hosts (Paine 1968, Paine & Merrill 1971).

**Distribution.** As a true boreal fungus, *P. betulinus* is circumpolar throughout the range of *Betula*. In East Asia known from China, Japan, Taiwan, and Far East Russia.

**Remarks.** The restriction to birch, the smooth, usually pelliculose pileus, the easily separated tubes, and the margin extending below the pore surface are reliable field characters.

**Piptoporus quercinus** (Schrad.) Pilát

Atl. Champ. Europ. 3:124, 1937. - *Boletus quercinus* Schrad., Spicil. Fl. German. p. 157, 1794.

**Basidiocarps** annual, pileate, applanate to slightly convex, dimidiate, flabelliform to rounded, usually with a contracted base, especially when growing from necrotic depressions, up to 15 cm wide and long, 1 to 5 cm thick, fleshy and flexible when fresh, hard but friable when dry and light of weight; pileus at first whitish brown becoming darker from the base with age, finely appressed-velutinate when young, but

irregular pores, dissepiments finely pruinose and often lacerate in mature specimens, tubes up to 3 mm long, cork-coloured; lower context concolorous with the tubes, up to 1 mm thick, separated by a black line from the rusty deep brown upper context or appressed pilear tomentum.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline in the trama and lower context, yellowish brown and thick-walled in the brown part of the context, branched, 2-4 Fm wide; skeletal hyphae thick-walled, hyaline to pale yellowish, sinuous, 2-3 Fm wide, in the dissepiments covered with minute crystals over a considerable length.

**Cystidia** absent; fusoid cystidiols present, 13-17 x 4-5 Fm.

**Basidia** clavate, 15-17 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid, 3.5-4 x 0.8-1 Fm.

**Substrata.** On dead conifers, the only record in East Asia is on *Pinus*.

**Distribution.** Eurasian species but rare, in East Asia cited from Northern China (Changbai) by Dai (1996a).

**Remarks.** In the field *P. sajanensis* may easily be mistaken for *Datronia stereoides* because of the duplex context and the dark brown, appressed velutinate pileus. However, the latter species has never been found on conifers. Microscopically the small allantoid basidiospores and the encrusted hyphal ends are diagnostic. Resupinate specimens may also be mistaken for a *Skeletocutis* growing on a dead *Phellinus* since the brown part of the context is xanthocroic. The black line will help to clarify the situation and if observed, the clamps on the hyphae in this part of the context will of course rule out this possibility.

### PIPTOPORUS P. Karst.

Medd. Soc. Fauna Flora Fenn. 6:9, 1881.

Basidiocarps annual, pileate, dimidiate or reniform to broadly attached, applanate to convex, often substipitate or with a narrowed base, light in weight when dry; pileus glabrous, with or without a thin, papery cuticle, 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 hyaline, sinuous or straight, persistent or dissolving in KOH; basidiospores cylindrical or ellipsoid, hyaline, smooth, negative in Melzer's reagent. Causing a brown rot of dead hardwoods.

**Type species:** *Polyporus betulinus* Bull.: Fr.

**Remarks.** The species are recognized by causing brown rot and having quite watery basidiocarps due to its dimitic hyphal system, compared with *Fomitopsis* species, which also produce a brown rot, but have a trimitic hyphal system.

### Key to species

1. Restricted to *Betula*..... **P. betuli-**

**Basidiospores** ellipsoid, 4.5-6 x 3-4 Fm

**Substrata.** Dead hardwoods.

**Distribution.** Cosmopolitan, but rare species. In East Asia known from Fujian, Guangxi, Sichuan in China, up to Hokkaido in Japan, and North Thailand.

**Remarks.** Macroscopically the basidiocarps of this species are similar to those of *Laetiporus sulphureus*, but the clamped generative hyphae and the sinuous skeletal that dissolve in KOH are diagnostic.

## **POLYPORUS** Fr.

Syst. Mycol. 1:134, 1821. ? *Royoporus* De, Mycotaxon 60:143, 1996.

Basidiocarps annual or biennial, centrally to laterally stipitate or substipitate, pileus circular to dimidiate, convex to infundibuliform, smooth to scaly, white to deep brown or black, tough when fresh, leathery or brittle when dry; stipe cream to black, glabrous to finely tomentose, with or without a cuticle, in some species arising from a sclerotium, in other cases transformed into rhizomorphs; pore surface white to cream, or dark brown when dry, pores entire, round to angular, small to large, decurrent or not on the stipe; context white to light brown; hyphal system dimitic; generative hyphae mainly with clamps, two species with simple septa, hyaline; skeleto-binding hyphae hyaline to brown, solid or with a lumen; cystidia absent; basidiospores cylindrical to subellipsoid, thin-walled, smooth, hyaline and negative in Melzer's reagent. On living and dead hardwoods, rarely on conifers, or developing from sclerotia buried in the ground or immersed in wood. Saprophytes or parasites, producing white rot. Cosmopolitan genus.

**Type species:** *Polyporus tuberaster* Jaq.:Fr.

**Remarks.** The genus is quite well defined by the stipitate basidiocarps and the dimitic hyphal system with skeleto-binding hyphae, different from the tortuous binding hyphae in *Trametes* and related genera (Corner 1981, Pegler & Young 1983, Núñez & Ryvarden 1995). For extended synonymy of the species in the genus, see Núñez & Ryvarden (op. cit.).

## **Key to species**

1. Basidiocarps caespitose with numerous circular pilei..... **P. umbellatus**
1. Basidiocarps with single pilei..... 2
2. Basidiocarps fleshy, more than 1 cm thick, pores up to 2 per mm and basidiospores longer than 10 Fm..... 3
2. Not with this combination of characters..... 5
3. Pileus light brown, always with dark brown scales visible to the naked eye..... 4
3. Pileus with rose to purple tints, smooth..... **P.**

soon more or less glabrous and smooth, often pitted and slightly tuberculate, margin round, finely pubescent and pale brown; pore surface smooth and white in actively growing specimens and then darker when bruised, later dirty brown and rimose in old specimens, pores circular, 2-4 per mm, tubes concolorous with the pore surface, up to 4 mm long; context much thicker than the tubes, white, hard and tough, up to 4 cm thick.

**Hyphal system** dimitic in the context, monomitic in the trama; generative hyphae with large clamps, hyaline to pale brown, thin-walled, branched, 3.5-6 Fm wide; skeletal hyphae developing late, thick-walled, sparingly branched, hyaline, flexuous, 3-6 (8) Fm wide, negative in Melzer's reagent.

**Cystidia** absent; fusoid cystidiols present, 20-30 x 5-7 Fm.

**Basidia** narrowly clavate, 25-30 x 7-9 Fm, with four sterigmata.

**Basidiospores** cylindrical, fusiform, tapering to the base, usually characteristically bent close to the apex, 6-8 x 2.5-3.5 Fm.

**Substrata.** Exclusively on living or recently dead *Quercus* spp.

**Distribution.** Eurasian species found East to Japan.

**Remarks.** The species is easy to recognize by its host and the sappy, large basidiocarps with a pale brown upper surface. Its consistency when fresh is more spongy than in *P. betulinus* due to the late development of skeletal hyphae in the context.

**Piptoporus soloniensis** (Duby:Fr.) Pilát

Atl. Champ. Europe 2: 126, 1937. - *Boletus solenensis* Dub., Fl. Orl. p.177, 1803. - *Polyporus soloniensis* Dub.:Fr., Syst. Mycol. 1:365, 1821. - *P. komatsuzakii* Yasuda, Bot. Mag. Tokyo 31:329, 1917. - *Tyromyces imbricatus* Zhao & Zhang, Acta Mycol. Sin. 2:21, 1983.

**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; pileus light ochraceous salmon, to vivid orange, finely tomentose to glabrous, azonate, rugose, margin round, undulating and often deflexed, concolorous, fertile below; pore surface pale orange to dark cinnamon buff, pores circular to angular, 5-6 per mm, with thick to thin, minutely fimbriate dissepiments, tubes concolorous with the context or cream-coloured, brittle when dry, up to 1 cm long; context soft, fibrous-spongy, azonate, light buff to pinkish buff, up to 2 cm thick.

**Hyphal system** dimitic; generative hyphae with scattered, often distorted clamps, thin- to slightly thick-walled, hyaline, with rare branching, inconspicuous in Melzer's reagent but staining brightly in phloxine, in the trama up to 5 Fm wide, in the context up to 13 Fm wide; skeletal hyphae moderately thick-walled, hyaline, with rare branching, sinuous or wavy, often with irregular swellings and constrictions, conspicuous in Melzer's reagent but partially dissolving and disintegrating in KOH, 3-7 Fm, in the trama up to 4 Fm wide.

**Basidia** clavate, 15-23 x 6.5-8 Fm, with four sterigmata.

**mis**

12. Pileus greyish-brown to umber, pores 3-4 per mm, basidiocarps up to 1 cm thick and flat to centrally depressed..... **P. melanopus**
13. Basidiocarps centrally stipitate.....  
14
13. Basidiocarps laterally stipitate.....  
16
14. Pores 5-7 per mm, circular..... **P. ciliatus**
14. Pores 1-4 per mm, in some cases radially arranged..... 15
15. Pores oblong, 1-3 per mm, usually randomly arranged, basidiospores always shorter than 7 Fm..... **P. brumalis**
15. Pores rhomboid, 1 per mm, radially elongated, longer than 7 Fm..... **P. arcularius**
16. Basidiocarps flat, up to 5 mm thick..... 17
16. Basidiocarps convex to flat, thicker than 8 mm..... 19
17. Species from temperate zones..... **P. alveolaris**
17. Species from tropical or subtropical zones.....  
18
18. Pileus white when fresh, pores 1-2 per mm, basidiospores 9-12 Fm long ..... **P. tenuiculus**
18. Pileus leather-coloured when fresh, pores 3-5 per mm, basidiospores 6-8(10) Fm long..... **P. grammocephalus**
19. Basidiocarps convex, brown, becoming areolate, on *Populus* and *Salix*..... **P. pseudobetulinus**
19. Basidiocarps flat to depressed, white to ochraceous-buff, on *Quercus* and *Malus*..... **P. admirabilis**

**udus**

4. Scales usually appressed, stipe black at the base, formed by brown hyphae arranged in a palisade, basidiocarp up to 40 cm in diameter. .... **P. squamosus**
4. Scales raised, finely fimbriate and embedded in an amorphous matter that also covers the stipe base, basidiocarp up to 12 cm in diameter..... **P. tuberaster**
5. Basidiocarps with a black, endured cuticle at least on the stipe base..... 6
5. Basidiocarps without a black, endured cuticle on the stipe (a thin cuticle may be present in old specimens) ..... 1
- 3
6. Pileus white to ochre..... 7
6. Pileus dark brown, purplish or black..... 10
7. Temperate species..... 8
7. Tropical to subtropical species..... 9
8. Pores 2-4 per mm, Asian species..... **P. mikawai**
8. Pores 7-9 per mm, holarctic species..... **P. varius**
9. Pores radially arranged, 1-2 per mm..... **P. guianensis**
9. Pores 5-8 per mm..... **P. leprieurii**
10. Tropical to subtropical species..... **P. dictyopus**
10. Temperate species..... 11
11. Hyphae simple-septate..... **P. badius**
11. Hyphae with clamps..... 12
12. Pileus reddish brown to bay, pores 5-7 per mm, basidiocarps rather thin and distinctly infundibuliform..... **P. tubaeformis**

**Hyphal system** dimitic; generative hyphae with clamps, hyaline and thin-walled, rarely branched, 2.5-4 Fm wide, forming a cutis on the stipe and the pileus; skeleto-binding hyphae thick-walled, much branched, with tapering apices, others with rare branching, all 3-7 Fm wide.

**Basidia** clavate, 24-32 x 7-9 Fm, with four sterigmata.

**Basidiospores** cylindrical, 10-13(14.5) x 3.5-5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Warm-temperate species, widespread through southern Europe, Asia and North America. In East Asia known from China, Japan up to Hokkaido, Far East Russia, and Taiwan.

**Remarks.** This species is easy to recognize because of the radially aligned, diamond shaped pores and a laterally stipitate basidiocarps. The tropical to subtropical *P. tenuiculus* looks macroscopically very similar, but does not have squamules on the pileus.

**Polyporus arcularius** Batsch: Fr.

Syst. Mycol. 1:342, 1821. - *Boletus arcularius* Batsch, Elench. Fung., p. 97, 1783.

**Basidiocarps** annual, centrally stipitate, mostly solitary, pileus circular, applanate to umbilicate, up to 2.5 cm in diameter and 3 mm thick; pileus straw-coloured to dark-brown, azonate, glabrous, smooth to squamulose, margin glabrous to ciliate, acute, sterile below; stipe central, concolorous with the pileus, glabrous, up to 3.5 cm long and 4 mm thick; pore surface cream-coloured to buff, dull, rough, pores large, hexagonal, radially aligned, 1(2) per mm, with thin dissepiments that become lacerate, tubes concolorous and continuous with the context, up to 2 mm long; context whitish to buff, azonate, tough, less than 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 2.5-5 Fm wide; skeleto-binding hyphae thick-walled, with dendroid branching tapering to narrow apices, 2-11 Fm wide; hyphae on the pileus slender, thin-walled, with clamps, 1-1.5 Fm wide.

**Basidia** clavate, 25-35 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical or slightly allantoid, 7-9 x 2.5-3 Fm.

**Substrata.** Dead wood of numerous hardwood genera, very rarely on *Picea* and *Juniperus*, in the tropics on numerous other genera.

**Distribution.** Cosmopolitan species except for the boreal region. In East Asia known from China, Japan, Taiwan, North Thailand, and Vietnam.

**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 having laterally stipitate or substipitate basidiocarps, and much larger basidiospores.

**Polyporus badius** (Pers.) Schwein.

Trans. Am. Phil. Soc. II 4:155, 1832. - *Boletus badius* Pers., Syn. Meth. Fung. p.523, 1801.

**Polyporus admirabilis** Peck

Bull. Torrey Bot. Club 26:69, 1899.

**Basidiocarps** annual, single or caespitose, laterally stipitate or substipitate with a narrow base, pileus appanate to dimidiate or lobate, 6-43 cm wide, up to 4.5 cm thick; pileus white when fresh, becoming cream-coloured to pale buff on age or drying, glabrous and pelliculose, azonate or mottled with dark spots, smooth or cracking concentrically on drying, margin concolorous, rounded and narrowly sterile below; stipe mostly lateral or poorly developed, with decurrent tubes extending to half way down or nearly to the base on substipitate specimens, up to 8 cm long and 3.5 cm thick, pale buff to brown at the base, glabrous to finely tomentose; pore surface white, drying cream-coloured to pale buff, pores circular to angular, 4-5 per mm, enlarging at maturity, with thin, entire to lacerate dissepiments, pores brittle when dry, tubes concolorous with the context, 2-6 mm long, decurrent on the stipe or narrowed base; context white to cream-coloured or pale buff, azonate, firm-corky, up to 4 cm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, 3-4.5 Fm wide, obscure in mature specimens, forming a cutis on the stipe and upper surface of the pileus; skeleto-binding hyphae predominating in mature specimens, thick-walled, hyaline, often with tapering apices, 2-6 Fm wide, in the context with occasional branching, 2.5-9 Fm wide; gloeoplerous hyphae present in the context of young specimens.

**Basidia** clavate, 22-35 x 5-8 Fm, with four sterigmata.

**Basidiospores** cylindrical, (6.5)7-9 x 2.5-3.5 Fm.

**Substrata.** Living hardwoods, associated with trunk injuries or from roots mainly in *Quercus* and *Malus*.

**Distribution.** Widespread in North East U.S.A. and in temperate zones in Far East Russia, China and Japan, in Europe only known from Norway.

**Remarks.** Basidiocarps of *P. admirabilis* can be confused with those of *P. melanopus*, which can also grow at the base of trees. The last species is smaller, and also separated by a darker pileus and a black stipe.

**Polyporus alveolaris** (DC.:Fr.) Bondartsev & Singer

Ann. Mycol. 39:58, 1941. - *Cantharellus alveolaris* DC.:Fr., Syst. Mycol. 1:322, 1821.

**Basidiocarps** annual, stipitate to sessile, circular to dimidiate, up to 7 cm wide and 5 mm thick; pileus pale reddish-yellow, fibrillose to squamose with flattened, triangular squamules, with age becoming ivory to pale buff, azonate, glabrous, smooth, margin concolorous; stipe central to lateral, buff, glabrous, up to 1 cm long and 5 mm thick; pore surface white to tan, pores diamond-shaped, radially elongated, 1-2 per mm tangentially, dissepiments lacerate with age, hyphal pegs frequent, tubes continuous with the context, up to 5 mm long; context pale tan to ivory, corky, up to 1 mm thick.

China, Japan (Kyushu and Honshu), and Far East Russia down to North Thailand.

**Remarks.** *Polyporus arcularius* is similar to *P. brumalis* but the former has larger radially elongated pores and basidiospores longer than 7 Fm. *P. alveolaris* has a paler pileus, larger pores and basidiospores, and laterally stipitate basidiocarps.

**Polyporus ciliatus** Fr.

Syst. Mycol. 1:349, 1821.

**Basidiocarps** annual, centrally stipitate, pileus circular, up to 10 cm in diameter and 7 mm thick; pileus light brown, then umber, glabrous or squamulose, azonate, margin glabrous to ciliate; stipe up to 7 cm long and 8 mm thick, light ochraceous to dirty brownish, with a fine tomentum that disappears with age; pore surface light cream to tan, pores circular, 5-7 per mm, slightly decurrent on the stipe, tubes concolorous with the pore surface, distinctly darker and more dense than the context; context hard, white, 1-3 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled and hyaline, inflated to 1 cm in the context, weakly amyloid in the stipe; skeleto-binding hyphae hyaline to light brown, thick-walled, up to 8 Fm wide.

**Basidia** clavate, 16-22 x 4-6.5 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 5-7 x 2 Fm.

**Substrata.** On dead hardwoods, rarely on conifers like *Abies*, *Picea*, and *Pinus*.

**Distribution.** Widespread in the temperate zone of Eurasia. Not known from North America.

**Remarks.** The basidiocarps of this species usually appear in the summer or late spring from April to July in Europe (Jahn 1963). The species is closely related to *P. brumalis*, but this species has larger pores.

**Polyporus dictyopus** Mont.

Ann. Sci. Nat. Ser. II, 3:349, 1835.

**Basidiocarps** annual or biennial, laterally to centrally stipitate, pileus circular to flabelliform, up to 12 cm in diameter and 5 mm thick; pileus cream in young specimens, darkening to chestnut and purplish black when mature, finely tomentose to glabrous, often slightly radially striate; stipe up to 3 cm long and 1 cm thick, dark brown and velutinate when young, developing a black cuticle, glabrous when old; pore surface ochraceous to dark umber, pores round to angular, 5-7(10) per mm, slightly decurrent but sharply limited towards the stipe; context straw-coloured, dense, up to 5 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, 2-6 Fm wide, brown, forming a palisade on the stipe surface and a cutis on the pileus; skeleto-binding hyphae yellowish to dark brown, solid and tortuous, up to 15 Fm wide in the context.

**Basidia** clavate, 18-26 x 5.4-8 Fm, with four sterigmata.

**Basidiospores** ellipsoid, (6)7-8.5(9) x 2.5-4 Fm, often of variable size within the same basidiocarp.

**Basidiocarps** annual, laterally to centrally stipitate, solitary to caespitose, pileus circular or flabelliform, up to 15 cm wide and 7 mm thick; pileus light chestnut brown to dark blackish brown, often darker in the center, azonate to radially striate, glabrous, smooth or rugose on drying, margin lobate to undulate; stipe black and minutely tomentose at the base, chestnut brown, glabrous at the apex, up to 5 cm thick; pore surface white to pale buff, pores circular to angular, 5-8 per mm, tubes white when young, becoming slightly darker than the context, up to 1 mm long, decurrent on the stipe; context pale buff, azonate, corky, up to 1.5 cm thick.

**Hyphal system** dimitic; generative hyphae simple-septate, thin-walled, 3-5 Fm wide, inconspicuous in mature specimens, forming a cutis on the pileus and a palisade on the stipe surface; contextual skeleto-binding hyphae thick-walled, with branches tapering to narrow apices, 3-5 Fm wide; gloeoplerous hyphae also present.

**Basidia** clavate with a narrow base, 20-30 x 7-9 Fm.

**Basidiospores** cylindrical, 7.5-9 x 3-3.5 Fm.

**Substrata.** Dead wood of numerous hardwood genera, in East Asia and North America also found on conifers.

**Distribution.** Temperate species found in Europe, North America and Asia (from Kyushu to Hokkaido in Japan, China, and south to Northern Vietnam).

**Remarks.** *Polyporus badius* differs from the other species with a dark stipe by lacking clamps. Basidiocarps of this species are most similar to those of *P. melanopus*, which grows on the ground, has a velvety stipe and larger pores.

***Polyporus brumalis* Pers.: Fr.**

Syst. Mycol. 1:348, 1821. - *Boletus brumalis* Pers., Mag. Bot. (Neues) 1:107, 1794.

- *Polyporus mongolicus* (Pilát) Dai, Ann. Bot. Fennici 33:154, 1996.

**Basidiocarps** annual, stipitate, usually solitary, up to 6 cm in diameter and 5 mm thick; pileus bronze to greyish brown, azonate, glabrous and glossy to velutinate, margin concolorous, becoming deflexed, often appearing finely fringed or ciliate; stipe central, lighter than the pileus, up to 4 cm long and 5 mm wide; pore surface whitish or ivory, glancing, smooth, pores angular, (1)2-4 per mm, sometimes radially arranged, with thin dissepiments that become lacerate, tubes ivory, slightly decurrent on the stipe, up to 2 mm long; context white, azonate, corky, up to 3 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled and hyaline, occasionally branched, 2-4 Fm wide, forming a cutis on the stipe and the pileus, except for the hairs that emerge as tufts of parallel hyphae; skeleto-binding hyphae hyaline, thick-walled with swellings up to 13 Fm wide, mostly 4-10 Fm wide, with branches tapering to 1-2 Fm.

**Basidia** clavate, 16-22 x 5-6.5 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly allantoid, 6-7 x 2-2.5 Fm.

**Substrata.** Dead wood of numerous hardwood genera, rarely on conifers like *Cryptomeria*, *Juniperus*, *Picea*, and *Pinus*.

**Distribution.** Circumpolar species in the northern hemisphere, in East Asia from

**Remarks.** *Polyporus leprieurii* is closely related, but the pores are smaller, i.e. 3 or more per mm. Compatibility tests between the species are desirable.

**Polyporus leprieurii** Mont.

Ann. Sci. Nat. II, 13:203, 1840.

**Basidiocarps** annual to biennial, centrally to laterally stipitate, pileus flabelliform to spatulate, often partly imbricate, 2-5 cm wide, up to 2 mm thick, coriaceous when fresh, hard when dry; pileus pale tan when fresh, isabelline to ochre when dry, glabrous, azonate to radially striate; stipe up to 5 cm long and 2-4 mm thick, round, black and glabrous, usually elongating to form rhizomorphs up to 12 cm long; pore surface tan to typically greyish brown, pores round to angular, small, 5-8 per mm, strongly delimited towards the stipe; context ochraceous to beige, less than 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, up to 3 Fm wide, forming a palisade on the stipe surface and a cutis on the pileus; skeleto-binding hyphae yellowish to dark-brown, solid and tortuous, very abundant, up to 5 Fm wide.

**Basidia** clavate, 20-30 x 8-10 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subellipsoid, 4.5-7(9) x 2-2.5(3) Fm.

**Substrata.** On dead hardwood lying on the ground or on hanging branches.

**Distribution.** Tropical to subtropical species in America and East Asia, here extending to Changbai in Northern China, Chiba prefecture in Honshu, Japan, and Primorsk region in Far East Russia.

**Remarks.** The species is commonly found on hanging branches in the rain forest as long rhizomorphs that are able to develop a pileus under favourable conditions. The closest species to this taxon seems to be *P. guianensis*.

**Polyporus melanopus** Schwartz:Fr.

Syst. Mycol. 1:347, 1821. - *Boletus melanopus* Schwartz, Sv. Vetensk. Akad. Hand. 31:91, 1810. - *P. xingiangensis* Zhang, Acta Microbiol. Sin. 21:430, 1981, type contaminated.

**Basidiocarps** annual, stipitate, terrestrial, often caespitose; pileus circular, solitary, flat to undulating, slightly infundibuliform, up to 10 cm in diameter and 2 cm thick; pileus at first greyish white, but soon pale brown to greyish brown becoming blackish brown and matted, azonate, at first finely scurvy to minutely squamulose, soon glabrous and wrinkled, often irregularly in dry condition, margin concolorous, often undulating or reflexed; stipe central to slightly eccentric, simple, blackish and velvety above, dark brownish-black and glabrous below, underground portion root-like, up to 5 cm long and 2 cm thick, shrinking considerably when dry; pore surface whitish becoming cream to pale straw-coloured, distinctly delimited towards the dark-brown, velvety stipe, pores circular to angular, 3-4 per mm, with thick, entire dissepiments, tubes slightly darker, leathery, distinct from the context and separated by a faint brownish layer up to 0.5 mm thick; context white, azonate, firm, but fria-

**Substrata.** Dead hardwood.

**Distribution.** Pantropical, in East Asia also known from subtropical areas in China (Sichuan, Xizang) and Japan (Okinawa).

**Remarks.** There is a wide variation in pore and basidiospore size and our compatibility data suggest that there are several sibling species within this taxon.

**Polyporus grammocephalus** Berk.

Hooker's Lond. J. Bot. 1:148, 1842. - *Polyporus minor?* Bi & Zheng, Acta Mycol. Sin. 1:72, 1982.

**Basidiocarps** annual, laterally stipitate, pileus flabelliform, up to 7 cm wide and 4 mm thick, pileus cream to tan or pale brown, radially fibrillose, usually with darker squamules towards the base; stipe short, up to 1 cm long and 4 mm thick, concolorous with the pileus, glabrous, usually attached to the substratum by a mycelial mat; pore surface straw-coloured to pale brown, pores 2.5 to 5 per mm, round when young, elongated with age and then partly split, decurrent on the stipe; context cream to ochraceous, up to 4 mm thick.

**Hyphal system** dimitic; generative hyphae with scattered clamps, up to 4 Fm wide, forming a cutis both in the stipe and pileus; skeleto-binding hyphae hyaline to yellowish, solid or with a lumen up to 10 Fm, usually with straight walls.

**Basidia** clavate, 18-25 x 5-8 Fm, with four sterigmata.

**Basidiospores** oblong ellipsoid to subellipsoid, (4.5)6-8(10) x 2.5-3 Fm.

**Substrata.** Dead hardwood.

**Distribution.** Tropical and subtropical areas, rare in Africa, in East Asia known from China (Guangxi, Sichuan, Guizhou, Fujian), Japan (Okinawa), Taiwan, North Thailand, and Vietnam.

**Remarks.** *P. philippinensis* differs by having larger pores, up to 2 per mm.

**Polyporus guianensis** Mont.

Ann. Sci. Nat. Bot. II, 13:201, 1840.

**Basidiocarps** annual to biennial, centrally to laterally stipitate; pileus flabelliform, spatulate or infundibuliform, up to 5 cm wide and 2 mm thick, tan to beige, glabrous to slightly radially striate; stipe up to 6 cm long and 3 mm thick; pore surface tan to light brown, pores angular, often radially elongate, 1-2 per mm, slightly decurrent on the stipe; context cork-coloured, coriaceous, up to 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, up to 3.5 Fm wide, in the stipe surface forming a palisade, and a cutis in the pileus; skeleto-binding hyphae yellowish to dark brown, solid and tortuous, up to 5 Fm wide.

**Basidia** clavate, 21-27 x 8-10 Fm, with four sterigmata.

**Basidiospores** cylindrical, (7)8-12 x 2.5-4 Fm.

**Substrata.** Dead hardwood.

**Distribution.** Tropical Asia and South America, apparently not common. Also known from warm-temperate Honshu, Japan.

48:23, 1932.

**Basidiocarps** annual, attached to the substrate by a narrow base; pileus at first unguulate, then convex, dimidiate, solitary or in pairs, 6-18(24) cm broad and up to 4.5 cm thick, with an deflexed margin; pileus yellowish-white to greyish-orange, with a thin cuticle and fine brownish to greyish-orange fibrils, becoming areolate; pore surface whitish to yellowish-orange, pores circular, 1-3 per mm, tubes concolorous with the context, up to 1 cm long; context white to cream, up to 3 cm thick, fleshy, drying tough and corky.

**Hyphal system** dimitic; generative hyphae simple-septate, hyaline, thin-walled, 2.5-6 Fm wide, in the pileus embedded in an amorphous matter; skeleto-binding hyphae hyaline, thick-walled, up to 13 Fm wide, many vegetative hyphae unbranched in the upper context.

**Basidia** clavate, 18.5-40.5 x 5-7 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly fusiform, (6.5)7.2-10 x 2.5-3.4 Fm.

**Substrata.** High above the ground on standing trunks of dead *Populus* spp. in Europe and North America, on *Salix* in Japan.

**Distribution.** Known from continental areas in Finland, Russia, China, Japan, and Canada.

**Remarks.** The presence of many unbranched skeletal hyphae besides skeleto-binding hyphae in the context and the simple septate generative hyphae make *P. pseudobetulinus* a deviating species in *Polyporus*.

**Polyporus squamosus** Huds.:Fr.

Syst. Mycol. 1:343, 1821. - *Boletus squamosus* Huds., Flora Angl. 2:626, 1778.

**Basidiocarps** annual, laterally to centrally stipitate, solitary or caespitose, pilei dimidiate, reniform, or circular, up to 18 cm wide and 5 cm thick; pileus pale buff with a thin, blackish-brown pellicle that breaks up to form dark scales, azonate, margin concolorous; stipe black and minutely tomentose at the base; pore surface buff to light brown, pores angular, 1(2) per mm, dissepiments becoming lacerate, tubes concolorous with the context, up to 1 cm long, decurrent on the stipe; context pale buff, corky, azonate, up to 4 cm thick, brittle when dry.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 3-4.5 Fm wide, forming a palisade of free hyphae on the stipe surface and a cuticle on the pileus; skeleto-binding hyphae thick-walled, hyaline, with occasional branching, 4-7.5 Fm wide, swollen to 22 Fm, branches tapering to 1-2 mm, absent in the context of young specimens.

**Basidia** clavate with a narrow base, 40-70 x 9-12 Fm, with four sterigmata.

**Basidiospores** subellipsoid, 14-17 x 5-6 Fm.

**Substrata.** Living hardwoods, but frequently found fruiting on stumps or dead standing or fallen trees, also collected on dead *Larix*.

**Distribution.** Cosmopolitan species, but most common in the temperate and boreal zones. In East Asia known from China, Japan, Taiwan, Far East Russia, and Viet-

ble when dry, up to 5 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline and thin-walled, rarely branched, 3-5 Fm wide; skeleto-binding hyphae hyaline, thick-walled, but with a wide lumen, with occasional branching, 2-7 Fm wide; pilear hyphae forming a dense layer with indistinct structure.

**Basidia** clavate, 16-22 x 6-8 Fm, with four sterigmata.

**Basidiospores** cylindrical, 7-9(10) x 3-4 Fm.

**Substrata.** Usually from buried, rotten roots, rarely on exposed wood of hardwoods, rarely on conifers like *Abies*, *Picea*, and *Taxus*.

**Distribution.** Circumpolar in the temperate zone. In East Asia known from China, Korea, Japan, and Taiwan.

**Remarks.** This species has often been confused with *Polyporus tubaeformis* but is more robust with a greyish to brownish pileus, a thicker stipe which shrinks considerably when drying, a friable context, and larger pores (5-6 per mm in *P. tubaeformis*). It seems to decay rather rapidly, while basidiocarps of *P. tubaeformis* resist decay considerably better and can even be found in the spring with deep bay colours on the pileus.

### **Polyporus mikawai** Lloyd

Mycol. Writ. 4:54, 1915.

**Basidiocarps** annual, laterally stipitate to substipitate, solitary or in pairs, pileus flabelliform, often with an undulate and lobate margin, 3-5 cm in diameter, 3-5 mm thick; pileus white to leather-coloured, glabrous, faintly radially striate; stipe short, up to 6 mm long and 4 mm thick, expanded at the base, concolorous with the pileus, glabrous, usually with a black cuticle at the base; pore surface white to ochraceous, pores angular, 1-3 per mm, in parts elongated and split, decurrent on the stipe, tubes concolorous, up to 3 mm long; context cream-coloured, 1-2 mm thick, dense and azonate.

**Hyphal system** dimitic; generative hyphae with clamps, 2-3 Fm wide, forming a cutis on the pileus and a palisade on the stipe; skeleto-binding hyphae thick-walled, 2-3.5 Fm wide in the trama, up to 7 Fm in the context and the pileus.

**Basidia** clavate, 25-28 x 6-8 Fm, 4-sterigmate.

**Basidiospores** cylindrical, 7.5-9 x 2-3 Fm.

**Substrata.** On branches of hardwoods.

**Distribution.** Temperate Asian species known from China (Zhejiang) and Japan (Honshu), probably also present in Far East Russia.

**Remarks.** *Polyporus mikawai* resembles favoloid specimens of *P. varius* which, however, always has much smaller pores (7-9 per mm). Mating tests (not published) have revealed that the two species are incompatible.

### **Polyporus pseudobetulinus** (Pilát) Thorn, Kotiranta & Niemelä.

Mycologia 82:583, 1990. - *Ungulina pseudobetulina* Pilát, Bull. Soc. Mycol. Fr.

angular, dissepiments entire, 5-7 per mm, tubes concolorous, 1-2 mm long, dense and slightly cartilaginous in dry condition; context 1-2 mm thick, white and dense.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, branched, often difficult to find in dry specimens, 2-4 Fm wide, forming a palisade on the stipe and pileus surfaces; skeleto-binding hyphae subsolid with a narrow lumen, tightly interwoven, up to 6 Fm wide, tapering to 1-2 Fm at the apices.

**Basidia** clavate, 14-20 x 6-8 Fm.

**Basidiospores** cylindrical to slightly ellipsoid, 7-9 x 3-3.5 Fm.

**Substrata.** Most common on dead hardwoods, very rarely found on conifers.

**Distribution.** Boreal species, also present in cold temperate areas of Japan, China, and Far East Russia. Due to confusion with *P. melanopus*, its probable presence in North America has to be confirmed.

**Remarks.** Up to recently this species was treated as a form of *Polyporus melanopus*, but Niemelä & Kotiranta (1991) brought it back to consideration. It is recognized by growing on dead wood, often from thin sticks, a reddish brown to bay, infundibuliform pileus, small pores (3-4 per mm in *P. melanopus*), and a slender, finely wrinkled stipe (thicker, shorter and more irregular in *P. melanopus*). *Polyporus varius* has a pale ochre pileus, a black, smooth, short to almost absent stipe and longer basidiospores (9-12 Fm). Its pileus becomes white in overwintered specimens, not dark bay to almost black as in *P. tubaeformis*.

**Polyporus tuberaster** Jacq.: Fr.

Syst. Mycol. 1:347, 1821. - *Boletus tuberaster* Jacq., Collect. Bot. Suppl. pls. 8-9, 1796.

**Basidiocarps** annual, centrally to laterally stipitate, simple when growing on wood, often caespitose when growing on the ground, pileus fleshy when fresh, circular to semicircular or even flabelliform in compound basidiocarps, flat to depressed in the centre, up to 15 cm wide and 1.5 cm thick; pileus whitish, ochraceous to pale yellowish brown, covered with small, tan to dark brown, agglutinated scales especially towards the margin, in pale specimens the scales are not especially distinct, with age becoming more glabrous from the centre as the scales partly are glued to the surface, margin thin, mostly finely ciliate or lacerate, flat in fresh specimens, curved in dried specimens; stipe central to lateral, straight or curved at the base, up to 6 cm long and 1.5 cm thick, with decurrent pores, at the base with white hairs under which there is a thin, resinous 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 angular, often somewhat radially elongated, 1-2 mm long and 0.5-1 mm wide, dissepiments often lacerate or fimbriate, tubes concolorous with the pore surface, up to 5 mm long; context white, up to 1 cm thick, fleshy-tough when fresh, drying rigid and brittle.

**Sclerotium** normally present in the ground or in rotten wood, round to oval or irregular, up to 15 kg, but normally far less than that, fleshy and tough when fresh,

nam.

**Remarks.** Basidiocarps of *P. squamosus* are not equalled in size of any other polypore treated here. This and the scaly pileus are usually sufficient for a determination.

**Polyporus tenuiculus** (Beauv.) Fr.

Syst. Mycol. 1:344, 1821. - *Favolus tenuiculus* Beauv., Fl. Oware Benin Afriq. 1:74, 1806. - *Daedalea brasiliensis* Fr., Syst. Mycol. 1: 332, 1821.

**Basidiocarps** annual, solitary, imbricate or caespitose, centrally to laterally stipitate; pileus flabelliform or infundibuliform, 2-10 cm in diameter, up to 6 mm thick at the base and thinning towards the margin; pileus white when fresh, drying alutaceous to purple bay, glabrous except for the basal part of the pileus, smooth, radiate, or distinctly tessellate reflecting the pores below, light and brittle when dry; stipe up to 1 cm long and 5 mm thick, concolorous with the pileus; pore surface concolorous with the pileus, pores hexagonal to radially elongated, 1-2 per mm, rather shallow, decurrent on the stipe; context white to pale ochraceous, up to 2 mm thick.

**Hyphal system** dimitic; generative hyphae mostly with clamps but also simple-septate, hyaline, 2-4.5 Fm wide, forming a cutis in the stipe and pileus; skeleto-binding hyphae with rather straight walls, usually solid, hyaline, up to 7 Fm wide.

**Basidia** clavate, 20-30 x 4-7 Fm, with four sterigmata.

**Basidiospores** cylindrical to subnavicular, (8)9-12 x 2-3.5 Fm.

**Substrata.** On dead hardwood.

**Distribution.** Pantropical, also known from subtropical areas in China, Japan (Okinawa), North Thailand, and Vietnam.

**Remarks.** This is morphologically a very variable species. Petersen & Coleman (1997) have demonstrated that pure white and tessellate basidiocarps are compatible with bright golden yellow and radially striate basidiocarps in tropical and subtropical South America.

**Polyporus tubaeformis** (P. Karst.) Ryvar den & Gilbn.

Synop. Fung. 7:578, 1994. - *Polyporellus varius* subsp. *tubaeformis* P. Karst., Soc. Flora Fauna Fenn. Medd. 9:69, 1882.

**Basidiocarps** annual, more or less centrally stipitate, pileus up to 6 cm wide, usually deeply infundibuliform, at first greyish white and finely velutinate, soon becoming reddish brown to chestnut brown with fine, radial lines and with only scattered remains of the tomentum, with age becoming deep bay and glabrous, smooth in fresh condition, with age finely radially wrinkled, dense and hard in dry condition and then with a very thin, but distinct cuticle (lens!), margin thin and deflexed when dry; stipe slender, rarely above 5 mm wide, 1-6 cm long, dark sepia brown and finely velvety becoming glabrous and black with age, upper part often with some shallow pores, finely wrinkled when dry (lens), dense and in section with a white homogenous core and a fine black cuticle below the tomentum; pore surface at first whitish, soon becoming pale straw-coloured to ochraceous, pores round to slightly

**Polyporus umbellatus** Fr.

Syst. Mycol. 1:354, 1821.

**Basidiocarps** annual, stipitate, arising from a sclerotium with numerous, more or less circular, centrally stipitate pilei from a common, strongly branched stipe, total width and height up to 50 cm, individual pilei partly imbricate, 1-3(4) cm in diameter, flat, margin thin and entire, deflexed in dry specimens, fleshy when fresh, hard and brittle when dry; pileus ochraceous to greyish brown, with very minute appressed squamules giving the surface a fine spotty appearance (lens), smooth when fresh, wrinkled when dry; stipe up to 3 cm thick at the base, thinner towards the pilei and richly branched, white to cream or pale straw-coloured, covered with strongly decurrent pores; pore surface white, cream or straw-coloured, pores angular, elongated towards the stipe, 1-3 per mm, on the stipe more irregular, split and partly sinuous, up to 2 mm wide, tubes concolorous with the pore surface, up to 2 mm long; context white to cream, dense, up to 3 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, in the context thin to slightly thick-walled, diameter very variable, up to 12 Fm wide, in the trama more narrow and rarely above 6 Fm wide; skeleto-binding hyphae scattered and restricted to the trama, thick-walled to solid, hyaline, up to 17 Fm wide, tapering down to about 2 Fm in the apices; some gloeoplerous hyphae also present.

**Basidia** clavate, 35-45 x 6-9 Fm.

**Basidiospores** cylindrical, 7.5-10 x 3-4 Fm.

**Substrata.** On the ground from a sclerotium close to stumps of hardwoods. A few times it has also been reported under *Picea* and *Pinus*.

**Distribution.** Circumpolar, but evidently rare everywhere. Reported from India (Bakshi 1971). In East Asia, known from temperate China and Japan.

**Remarks.** The multiple circular pilei arising from a common stem make this a very distinct species. The sclerotia have been used in China for medical purposes (Zhao & Zhang 1992).

**Polyporus varius** Fr.

Syst. Mycol. 1:352, 1821.

**Basidiocarps** annual to biennial, centrally to laterally stipitate; pilei dimidiate to circular, sometimes flabelliform or infundibuliform, up to 8 cm wide and 7 mm thick, solitary or in pairs; pileus pale buff to pale leather-coloured with occasional radial lines, in some cases with black spots, becoming white in specimens surviving the winter, azonate, glabrous, margin concolorous; stipe black and minutely tomentose at the base, soon becoming glabrous and smooth, upper portion usually pale cream and covered with decurrent tubes, up to 2 cm long and 7 mm thick, the stipe keeps its colour over the winter; pore surface pale buff, pores circular to angular, 7-9 per mm, dissepiments entire, tubes concolorous with the context, up to 5 mm long, usually decurrent to the black portion of the stipe; context buff, corky, azonate, up to

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 that has been penetrated by mycelial strands.

**Hyphal system** dimittic; generative hyphae with clamps, hyaline, thin-walled, 3-9 Fm wide, dark brown on the stipe and pileus, parallel and forming tufts of hairs that are slightly amyloid in young basidiocarps; skeleto-binding hyphae hyaline, thick-walled to solid, sparingly branched, up to 12 Fm wide in the main stem; sclerotium mainly with skeleto-binding hyphae, in parts very finely branched and very thin, in most parts sparingly branched, thick-walled and variable in diameter, 3-10 Fm wide, in some cases with apical swellings.

**Basidia** clavate, 25-40 x 6-10 Fm.

**Basidiospores** cylindrical to oblong ellipsoid, 10-16 x 4.5-7 Fm.

**Substrata.** On hardwoods or on the ground from a blackish sclerotium.

**Distribution.** Temperate and subtropical zones in the Northern hemisphere and Australia. Only known from Japan (Honshu and Kyushu) in East Asia, but probably spread through the area.

**Remarks.** The species can be confused with *Polyporus squamosus*, which also has scales on the pileus, but these are not agglutinated. Besides, *P. tuberaster* seems to occur in warmer areas than *P. squamosus*, at least in Japan.

### **Polyporus udus** Jungh.

Tidschr. v. Nat. Gesch. Phys. 7:289, 1840.

**Basidiocarps** annual, laterally to centrally stipitate, pileus circular to flabelliform, flat to strongly infundibuliform, up to 12 cm in diameter and 2 cm thick; pileus greyish-brown often with pinkish to violet tints when fresh, sometimes with appressed tufts of brown hairs, glabrous and pale brown to ochraceous when dry, covered by a wrinkled, papery cuticle; stipe up to 6 cm long and 2 cm thick, light brown or concolorous with the pileus, even or with tufts of brown hairs, often with shallow, decurrent pores in the upper part; pore surface white to cream-coloured, pores irregular to angular, brittle, 1-2(3) per mm, context white, distinctly paler than the pore surface, brittle when dry, up to 2 cm thick.

**Hyphal system** dimittic; generative hyphae with clamps, up to 10 Fm wide, forming a cutis in the stipe and pileus; skeleto-binding hyphae hyaline to yellowish, up to 10 Fm wide, almost absent in the trama.

**Basidia** clavate, 35-38 x 8-10 Fm.

**Basidiospores** cylindrical to broadly ellipsoid, 10-15 x 4-6 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Pantropical, also found in subtropical and warm-temperate China (Yunnan), Taiwan, Vietnam, Japan (Kyushu), and up to Far East Russia.

**Remarks.** The species is recognized by its fleshy basidiocarps with a greyish-brown, papery cuticle with rose tints when fresh.

**Cystidia** cylindrical to subclavate, sometimes slightly capitate, thick-walled, yellowish, 30-80 x 3-8 Fm, with an apical encrustation, abundant in the dissepiments and then cylindrical and up to 120 Fm long.

**Basidia** clavate-utriform, sometimes rather irregular, 10-13 x 4-4.5 Fm, with four sterigmata.

**Basidiospores** ellipsoid with one side flattened, 3.5-4 x 1.5-2.2 Fm.

**Substrata.** On dead conifers, mainly *Abies*.

**Distribution.** Cold-temperate Asian species known from Far East Russia and China (Changbai).

**Remarks.** The species is easy to recognize because of its vinaceous colour resembling that of *Ceriporia excelsa*, but this species lacks clamps. *Schizopora roseotintgens* Hjortstam & Ryvarden (Ref.) is pinkish and microscopically is similar to *P. subvinosa*, but the hymenophore in the first species is clearly irpicoid, the basidiospores are slightly larger (4-4.5 x 2-2.2 Fm) and it occurs on hardwoods.

### **PORODISCULUS** Murrill

N. Am. Flora 9:47, 1907.

Basidiocarps pileate, pendant from a stalk-like base, 1-3 mm wide; pileus and dissepiments farinaceous, ashy white to pale brown; pore surface concave, pores 8-10 per mm; hyphal system monomitic; generative hyphae simple-septate; much branched trichocyst hyphae on pileus and dissepiments; basidia in a compact palisade, 3-4 Fm wide, with four sterigmata; cystidia absent; basidiospores allantoid, 3-4 x 1 Fm, negative in melzer's reagent. Monotypic, cosmopolitan genus associated with a white rot of dead hardwoods.

**Type species:** *Peziza pendula* Schwein.

**Remarks.** This genus has no apparent close relatives among other polypores in this flora. The small pendant basidiocarps and the distinctive coralloid trichocyst hyphae suggest relationships with the pleurotoid agarics or perhaps cyphellaceous fungi.

### **Porodisculus pendulus** (Schwein.) Murrill

N. Am. Flora 9:47, 1907. - *Peziza pendula* Schwein., Schr. Nat. Ges. Leipzig 1:92, 1822.

**Basidiocarps** annual, pileate, single but usually gregarious, up to 6 mm long and 3 mm in diameter, pendant from a dorsal stipe-like base developing from a mass of mycelium that ruptures the bark, 1-3 mm in diameter; pileus dark cinnamon to dark brown or greyish, tomentose, azonate, margin pale brown, farinaceous, rounded, fertile below; stipe with surface characters like in the pileus; pore surface convex, pores 8-10 per mm, almost obscured by thick, farinaceous dissepiments, tubes distinct and appearing cartilaginous in dried specimens, pinkish buff, up to 1 mm long; context cream-coloured with a pale brown upper layer composed of the surface tomentum, azonate, up to 1.5 mm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, thin-walled,

5 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 2.5-4 Fm wide, difficult to find in mature specimens; skeleto-binding hyphae solid, much branched, 1.5-6 Fm wide.

**Basidia** clavate, 18-30 x 7-9 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 9-12 x 2.5-4 Fm.

**Substrata.** On dead hardwoods, also found on *Picea*.

**Distribution.** Widespread and circumpolar in Europe, North America, and Asia from India to Far East Russia, China, Japan, North Thailand, and Vietnam. Reported from Malaysia by Corner (1984).

**Remarks.** Basidiocarps of *P. varius* are usually easy to recognize because of the pale ochraceous to leather-coloured pileus, often radially striate, and a smooth, blackish stipe base. Some specimens of the tropical species *P. leprieurii* resemble *P. varius* in the pilear colour. While the pore surface is ashy-brown in the former species, it is cream-coloured in the latter.

### **PORIODONTIA** Parmasto

Mycotaxon 14:103, 1982.

Basidiocarps annual, resupinate, vinaceous pink, densely cottony but rather tender, light, easily separable from the substrate when fresh, margin arachnoid, without rhizomorphs; pores angular to labyrinthine; subiculum and trama of similar texture; hyphal system monomitic; generative hyphae with clamps, thick-walled; cystidia thin- to moderately thick-walled, cylindrical to subfusoid, apically encrusted; basidiospores ellipsoid, thin-walled, hyaline, negative in Melzer's reagent, up to 4 Fm long. Causing a white rot. Monotypic Asian genus.

**Type species:** *Porodontia subvinosa* Parmasto

**Remarks.** The genus belongs in the Corticiaceae and is related to *Schizopora* and *Hyphodontia* because of the hyphal system with thick-walled hyphae and encrusted cystidia in the dissepiments.

### **Porodontia subvinosa** Parmasto

Mycotaxon 14:104, 1982.

**Basidiocarps** annual, resupinate, up to 10 cm in diameter, usually confluent, separable when fresh, adnate when dry, densely cottony, soft, margin arachnoid, white to pale pink, up to 3 mm wide, soon disappearing; pore surface pale greyish pink to pink vinous, pores round to angular, usually irregular, 2-3 per mm, often confluent and daedaleoid, with dentate dissepiments; subiculum up to 0.5 mm thick, densely cottony, pale lilac or with a brownish tint.

**Hyphal system** monomitic; generative hyphae with clamps, hyphodontioid, in the trama thin-walled and up to 3.5 Fm wide, densely woven, richly branched, encrusted with resinous material; in the subiculum loosely woven, with thickened yellowish walls, branched, up to 4 Fm wide.

Kyushu to Hokkaido), and Far East Russia.

**Remarks.** The pale pinkish brown colour when bruised, the lighter margin and the restriction to hardwoods are distinctive field characters.

**PSEUDOFVOLUS** Pat.

Essai. Tax. Hymen. p. 80, 1900.

Basidiocarps annual or biennial, solitary or imbricate, flabelliform to spatulate, narrowing behind to a stipe-like base; pileus glabrous, smooth or tessulate, sometimes radially striate; pores large to rather small, angular to hexagonal, dissepiments thin to moderately thick, frequently covered with whitish to grey granular crystals, tubes short; context thin; hyphal system dimitic; generative hyphae with clamps; skeleto-binding hyphae arboriform and thick-walled, hyaline and with a variable dextrinoid reaction; cystidia absent, but dendrohyphidia present among the basidia, especially towards the dissepiments, moderately branched with a few conical protuberances, apparently arising in the subhymenium, but some branches of the skeleto-binding hyphae also penetrate into the hymenium; basidiospores cylindrical, smooth, large and negative in Melzer's reagent. Tropical genus causing a white rot.

**Type species:** *Polyporus miquelii* Mont.

**Remarks.** The genus is undoubtedly related to *Polyporus* s. str. by its large cylindrical basidiospores and its skeleto-binding hyphae. The branched hyphidia seen in the dissepiments and partly in the hymenium are not known in *Polyporus*. The basidiocarps are in general much smaller than seen in *Polyporus* and the pores often only shallow depressions.

**Pseudofavolus cucullatus** (Mont.) Pat.

Ess. Tax. P. 81, 1900. - *Favolus cucullatus* Mont., Ann. Sci. Nat. Ser. Vol. 2, 17:125, 1842.

**Basidiocarps** annual, pileate, up to 8 cm wide and 3-4 mm thick, laterally attached with a small disc or a small stipe, dimidiate to flabelliform, consistency rigid to cartilaginous when dry; pileus glabrous and smooth to tessulate, 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 grey and farinose, entire to weakly fimbriate, tubes about 2 mm long, concolorous with the pore surface; context straw-coloured to pale ochraceous, 1-2 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, 2-4 Fm wide, often collapsed in dried specimens; skeleto-binding hyphae thick-walled and hyaline, 3-5 Fm wide, dominating in the context and the trama, moderately branched to strongly arboriform with tapering branches, variably dextrinoid, usually

2-3 Fm wide, hyphal walls swelling greatly in KOH and lumen staining brightly in phloxine; vesicular, chlamyospore-like structures present in the trama, ellipsoid to globose, moderately thick-walled, 15-20 x 12-15 Fm; pileus and dissepiments with coralloid dendrohyphidia, branches minute, dichotomous, often with coarse crystalline material, those on the pileus strongly amyloid.

**Basidia** packed in a dense palisade, difficult to separate, narrowly clavate to cylindrical, 12-17 x 3-4 Fm, with four sterigmata.

**Basidiospores** allantoid, 4-6 x 1-1.5 Fm.

**Substrata.** On the bark of dead hardwood branches.

**Distribution.** Temperate East U.S.A. and Asia, reported from Japan, China, Taiwan, and widely distributed in the South Hemisphere.

**Remarks.** This species commonly occurs in large numbers on recently killed branches or logging slash. *Dyctiopus pusillus*, also a small species with gregarious basidiocarps, differs by its cream-coloured, appanate and orbicular pilei besides its micromorphology.

### **PROTOMERULIUS** A. Møller

Protobasidiomyceten: p.129, 1895.

Basidiocarps annual to biennial, pileate to resupinate; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae with a wide lumen and dominant; basidia longitudinally septate and four-celled; basidiospores hyaline, allantoid and negative in Melzer's reagent. Causes a white rot in hardwoods. Cosmopolitan genus, but rare.

**Type species:** *Protomerulius brasiliensis* A. Møller

**Remarks.** *Protomerulius* belongs to Tremellaceae and is one of the two polypore genera with septate basidia. The generative hyphae are often frustratingly difficult to find and basidia seem to collapse rather rapidly after basidiospore discharge.

### **Protomerulius caryae** (Schwein.) Ryvarden

Synopsis Fung. 5:212, 1991. - *Polyporus caryae* Schwein., Trans. Am. Phil. Soc. II 4:159, 1832.

**Basidiocarps** annual, resupinate, up to 5 mm thick, margin whitish to pale buff, usually less than 1 mm wide, floccose; pore surface cream-coloured, often spotted, turning pale pinkish brown when bruised, pores regular, 3-5 per mm, tubes concolorous with the context, up to 3 mm long; context about 0.5 mm thick, pale buff.

**Hyphal system** dimitic; generative hyphae with clamps, inconspicuous, thin-walled, 2-3 Fm wide; skeletal hyphae dominating, hyaline, thick-walled, 2-4 Fm wide.

**Cystidia** absent, hyphal pegs present.

**Basidia** cruciately septate, globose, already septate as probasidia, 10-15 x 5-7.5 Fm, epibasidia divided in four parts up to 12 Fm long at maturity.

**Basidiospores** allantoid, 5.5-7 x 2-2.5 Fm.

**Substrata.** On hardwoods, also observed on old basidiocarps of *Fomes fomentarius*.

**Distribution.** Cosmopolitan species, in East Asia known from China, Japan (from

and acute; pore surface white to cream when fresh, then dirty wood-coloured, pores round to slightly elongated, 3-4 per mm, tubes fragile, resinous pale brown to straw-coloured and distinctly darker than the context, up to 1 cm long; context pale ochraceous to cork-coloured, crumbly and cheesy of structure like that of a dry *Laetiporus sulphureus*, up to 4 cm thick at the base, becoming bluish black in Melzer's reagent.

**Hyphal system** dimitic; generative hyphae with clamps, in the context thin-walled, up to 8 Fm wide, usually collapsed, and their shrinking probably give the context the rather loose structure, in the tubes which are monomitic, they are more agglutinated and moderately branched, mostly 3-5 Fm wide; skeletal hyphae hyaline, only present in the context, lower part unbranched in sections of up to 150 Fm, in the upper part arboriform with thickened and tapering side branches, amyloid, 2-5 Fm wide; gloeoplerous hyphae present in the context, up to 12 Fm wide, thin-walled and filled with a grainy to fluid brown material, these hyphae arise from a generative hyphae.

**Basidia** not seen.

**Basidiospores** ovoid to broadly ellipsoid or truncate, very variable within the same basidiocarp, thick-walled, pale yellow, and dextrinoid, 5.5-7(8) x 4-5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Described from Mozambique, rediscovered at Mt. Fuji, Japan.

**Remarks.** See the generic description.

### **PYCNOPORELLUS** Murrill

Torrey Bot. Club Bull. 32:489. 1905.

Basidiocarps annual, resupinate to pileate, and then broadly attached and semicircular or somewhat elongated; pileus bright orange to rust-coloured, tomentose and zonate; pore surface orange, pores medium to large, angular, tubes concolorous with the pore surface; context orange to orange-buff, soft and fibrous; all tissues purplish in KOH; hyphal system monomitic; generative hyphae simple-septate, thin- to thick-walled, mostly encrusted; cystidia present in the hymenium, not encrusted, mostly thin-walled, tubular and projecting; basidiospores cylindrical to oblong ellipsoid, thin-walled, smooth, hyaline and negative in Melzer's reagent. On dead conifers and hardwoods, causing a brown rot. Small genus with two species.

**Type species:** *Polyporus fibrillosus* P. Karst. = *P. fulgens* (Fr.) Donk.

**Remarks.** The species are recognized by their vividly coloured basidiocarps with simple-septate hyphae. The purplish reaction of basidiocarps with KOH is similar to that in *Hapalopilus* species, but they have all clamps and are white-rot fungi.

### **Key to species**

1. Basidiocarps pileate, pores 2-3 per mm, basidiospores ellipsoid..... **P. fulgens**
1. Basidiocarps resupinate to reflexed, pores 1-3 mm,  
basidiospores cylindrical ..... **P. albolu-**

strongest dextrinoid reaction in the dissepiments.

**Dendrohyphidia** moderately branched, these hyaline, often difficult to observe, most common towards the dissepiments.

**Basidia** clavate, 60-100 x 12-20 Fm, with four large and stout sterigmata.

**Basidiospores** cylindrical, (11.5)13-16 x 4-6 Fm.

**Substrata.** Hardwoods of many genera.

**Distribution.** Tropical species extending to subtropical Japan (Iriomote Island in Okinawa).

**Remarks.** Superficially the basidiocarps resemble small ones of some laterally stipitate *Polyporus* species, but are separated by the cartilaginous consistency and the presence of dendrohyphidia.

### **PSEUDOPIPTOPORUS** Ryvardeen

Prelim. Polyp. Fl. East Africa p.523, 1980.

Basidiocarps pileate, sessile, dimidiate, smooth, glabrous, whitish, ochraceous to dirty lurid-brown, papery cuticle present with age; pores wood-coloured to dirty straw-coloured, tubes agglutinated and fragile; context pale, crumbly and fragile; hyphal system dimitic in the context, tubes monomitic; generative hyphae with clamps; skeletal hyphae unbranched to distinctly arboriform, thick-walled and amyloid; basidiospores subglobose to ovate, thick-walled, pale yellowish, dextrinoid.

**Type species:** *Polyporus devians* Bres.

**Remarks.** *Pseudopiptoporus devians* is a remarkable species in many respects. In macromorphology it is similar to a *Piptoporus* species with its papery-thin cuticle, dimidiate basidiocarps and a loose and crumbly context, probably punky in fresh condition. However, the microscopical characteristics are different from those of *Piptoporus* as the skeletal hyphae are amyloid, conducting hyphae are present and the basidiospores are thick-walled and dextrinoid. In the latter characteristic *P. devians* reminds of a *Perenniporia* species and Reid (1975:54-55) transferred it to *Vanderbylia* D.A. Reid, a genus we consider to be a synonym of *Perenniporia*. There are several characteristics that would make *P. devians* a deviating element in *Perenniporia*. The different hyphal system in the tubes and the context, and the coloured basidiospores are unknown in *Perenniporia*.

### **Pseudopiptoporus devians** (Bres.) Ryvardeen

Prelim. Polyp. Fl. East Africa p. 524, 1980. - *Polyporus devians* Bres., Ann. Mycol. 18:32-33, 1920.

**Basidiocarps** annual, solitary, pileate, dimidiate to substipitate with a contracted base, semicircular in outline, up to 14 cm long, 10 cm wide and 1-4 cm thick at the base, probably somewhat punky and soft when fresh, suberose to chalky and fragile when dry; pileus dirty white to ochraceous when young, when old and weathered dark brown to lurid yellow-brown to more alutaceous, smooth, azonate, glabrous and with a thin cuticle, easily dented with a nail, margin ochraceous to greyish-isabelline

ching, 4-9 Fm wide, with a very narrow, sinuous lumen.

**Cystidia** frequent, narrowly cylindrical, 45-60 x 4-6 Fm, projecting up to 35 Fm.

**Basidia** clavate, 25-30 x 5-5.5 Fm, with four sterigmata.

**Basidiospores** subellipsoid, 6-7 (9) x 2.5-4 Fm.

**Substrata.** Mainly on coniferous logs and slash but also occasionally on hardwoods.

**Distribution.** Circumboreal species in well preserved coniferous forests, in East Asia known from Changbai, Heilongjiang in Northern China, Hokkaido in Japan, Primorsk, Khabarovsk and Sakhalin in Far East Russia).

**Remarks.** *Pycnoporellus fulgens* differs from *P. alboluteus* by having smaller pores, basidiospores, and cystidia, and by being commonly sessile or effused-reflexed.

### **PYCNOPORUS** P. Karst.

Rev. Mycol. 3(9):18, 1881.

Basidiocarps annual, sessile to effused-reflexed, dimidiate; pilear and pore surface orange-red to cinnabar, colour fading on weathering; pores regular, circular to angular, 3-4 per mm; context reddish orange, coriaceous; hyphal system trimitic; generative hyphae with clamps; tramal hyphae with dextrinoid contents; cystidia absent; basidiospores cylindrical, hyaline, smooth, negative in Melzer's reagent. Causing a white rot of dead hardwoods, rarely on conifers. Cosmopolitan genus.

**Type species:** *Polyporus cinnabarinus* Jacq.:Fr.

**Remarks.** *Pycnoporus* is very similar to *Trametes* in all characters except the bright reddish-orange colour. We have not been able to demonstrate *P. coccineus* (Fr.) Bondartsev & Singer, a New Zealand species with bright red basidiocarps, in Japan, although Imazeki et al. (1988) cite the species for this country. The species photographed as *P. coccineus* in their publication is *P. cinnabarinus*.

### **Key to species**

1. Basidiocarps up to 1.5 cm thick, boreal to temperate species..... **P. cinnabarinus**
1. Basidiocarps up to 0.5 mm thick, tropical to subtropical species.. **P. sanguineus**

### **Pycnoporus cinnabarinus** (Jacq.:Fr) P. Karst.

Rev. Mycol. 3(9):18, 1881. - *Boletus cinnabarinus* Jacq., Fl. Aust. 4:2, 1776. - *P. cinnabarinus* Jacq.:Fr, Syst. Mycol. 1:371, 1821.

**Basidiocarps** annual, sessile to effused-reflexed, leathery when fresh, dimidiate to elongated, up to 7 x 13 x 4 cm; pileus ochraceous salmon to apricot orange, becoming pale with age or blackening, glabrous, azonate; pore surface bright orange to coral red, retaining the red colours longer than the pileus, pores 3-4 per mm, circular to angular, with thick 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 colourless in KOH.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, rarely bran-

teus

***Pycnoporellus alboluteus*** (Ellis & Ev.) Kotl. & Pouzar

Ceska Mykol. 17:174, 1963. - *Fomes alboluteus* Ellis & Ev., Acad. Nat. Sci. Phila. Proc. 1895:413, 1895.

**Basidiocarps** annual, resupinate or slightly reflexed to nodulose, often effused for 1 m or more, projecting 1-2 cm from the substrate, 0.5-1 cm thick; pileus bright orange when fresh, soft and spongy, loosely strigose; pore surface orange, pores angular, mostly wider than 1 mm, dissepiments splitting to form a hydnceous hymenophore, tubes concolorous and continuous with the context, up to 2 cm long, slightly paler within; context pale orange, soft-felty, up to 2 mm thick, azonate; all tissues quickly turning purplish in KOH.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline to deep orange red, thin- to thick-walled, in the trama up to 5 Fm wide, in the context 2-10 Fm wide, with frequent branching, appearing rough because of a thin encrustation.

**Cystidia** frequent in the hymenium, cylindrical, thin-walled, hyaline, not encrusted, 60-120 x 5-10 Fm.

**Basidia** narrowly clavate, 30-45 x 6-7 Fm, with four sterigmata.

**Basidiospores** cylindrical, 9-12 x 3-3.5 Fm.

**Substrata.** On dead conifers, especially *Picea*, occasionally on *Populus* and other hardwoods.

**Distribution.** Throughout the boreal coniferous zone in North America and Europe. Reported for China (Guangxi) by Teng (1996).

**Remarks.** The basidiocarps of *Pycnoporellus alboluteus* 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 coniferous forest ecosystems.

***Pycnoporellus fulgens*** (Fr.) Donk

Persoonia 6:216, 1971. - *Hydnum fulgens* Fr., Ofvers. Kung. Vet. Akad. Forh. 9:130, 1852.

**Basidiocarps** annual, sessile or effused-reflexed, solitary or imbricate, dimidiate to laterally elongated, up to 6 x 9 cm wide and 2.5 cm thick; pileus pale orange to rust-coloured, tomentose or glabrous in young specimens to hispid or radially fibrillose with age, often zonate; pore surface pale orange, pores circular to angular, 2-3 per mm, dissepiments thin, becoming lacerate with age, tubes concolorous with the context or sometimes paler orange, up to 6 mm long; context light orange, up to 5 mm thick, sometimes duplex, lower layer firm, corky, upper layer soft, fibrous; tissue of context and tubes purplish in KOH.

**Hyphal system** monomitic; generative hyphae simple-septate, in the trama thin- to moderately thick-walled, hyaline, with frequent branching, 2.5-4 Fm, in the context pale reddish to brownish in KOH, mostly very thick-walled, with occasional bran-

**RIGIDOPORUS** Murrill

Bull. Torrey Bot. Club 32:478, 1905.

Basidiocarps annual to perennial, resupinate to pileate, coriaceous to bony hard when dry; pilear surface ochraceous, isabelline, reddish-orange or pinkish, tomentose to glabrous, usually zonate; pore surface concolorous, in some species becoming grey to almost black on drying; context dense and fibrous; hyphal system monomitic to apparently dimitic; generative hyphae simple-septate, variable in width and wall thickness, in some species strongly sclerified; skeletal hyphae hyaline, not branched, thick-walled to solid; encrusted cystidia absent or present; mucronate, smooth cystidiols present among basidia in all species; basidiospores ovoid to globose, thin-walled and negative in Melzer's reagent. Mostly on hardwoods, rarely on conifers, producing a white rot. Cosmopolitan genus.

**Type species:** *Polyporus micromegas* Mont. = *R. microporus* (Fr.) Overeem.

**Remarks.** Microscopically the genus comes close to *Oxyporus* Donk, which has the same type of generative hyphae. However, most species in *Oxyporus* are light-coloured. Furthermore, the mucronate cystidiols of *Rigidoporus* are unknown in *Oxyporus*.

**Key to species**

1. Basidiocarps pileate..... 2
1. Basidiocarps resupinate..... 5
2. Basidiocarps usually large, up to 6 cm thick, growing at the base of trees, pileus buff to cream, basidiospores 7-10 x 6.5-10 Fm..... **R. ulmarius**
2. Basidiocarps rarely above 1 cm thick, elongated on logs, pileus reddish to grey, basidiospores 3.5-6 Fm in diameter..... 3
3. Encrusted cystidia present..... **R. lineatus**
3. Encrusted cystidia absent ..... 4
4. Pileus fibrillose and grey, basidiospores 5-6 Fm in diameter..... **R. cinereus**
4. Pileus glabrous and reddish, basidiospores 3.5-5 Fm in diameter ..... **R. microporus**
5. Cystidia present, tropical to temperate species ..... 6
5. Cystidia absent, temperate species ..... **R. crocatus**
6. Cystidia clavate, some apically finely encrusted and usually forked..... **R. furcatus**

ched, 3-5 Fm wide; skeletal hyphae hyaline to yellowish, thick-walled, rarely branched, 2.5-10 Fm wide; binding hyphae profusely branched, thick-walled, 1.5-5 Fm wide; hyphal contents in some areas of the trama strongly dextrinoid.

**Cystidia** absent; hyphal pegs frequent.

**Basidia** clavate, 18-25 x 5-7.5 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly allantoid, 6-8 x 2.5-3 Fm.

**Substrata.** Reported from dead wood of numerous genera of hardwoods, also rarely on dead conifers, mainly in sunny areas.

**Distribution.** Temperate species in the Northern hemisphere, in East Asia known from China, Japan, Taiwan, Far East Russia, and Vietnam.

**Remarks.** *Pycnoporus cinnabarinus* and *P. sanguineus* are rather well differentiated and are genetically isolated (McKay 1959, Nobles & Frew 1962). The distribution of both species overlap in temperate East Asia.

***Pycnoporus sanguineus* (L.:Fr.) Murrill**

Torrey Bot. Club Bull. 31:421, 1904. - *Boletus sanguineus* L., Sp. Plant. 2nd ed. p.1646, 1763. - *Polyporus sanguineus* L.:Fr., Syst. Mycol. 1:371, 1821.

**Basidiocarps** annual, sessile to effused-reflexed, single or imbricate, dimidiate, thin and applanate, up to 8 x 5.5 cm wide, up to 4 mm thick; pileus orange-red, colour quite persistent but fading to salmon-buff in some old specimens, finely tomentose at the growing margin, becoming scrupose to glabrous on older portions, azonate; pore surface dark red with an orange tint, pores circular, 5-6 per mm, with thick dissepiments, tubes orange-red, up to 2 mm long; 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.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 2.5-4 Fm wide; skeletal hyphae thick-walled, hyaline, with infrequent branching, 2-7 Fm wide; binding hyphae thick-walled, multibranched, 2-4 Fm wide, in the trama more conspicuous, mostly 1.5-2.5 Fm; hyphal contents in the trama strongly dextrinoid in Melzer's reagent.

**Cystidia** absent, hyphal pegs present and usually conspicuous.

**Basidia** clavate, 11-16 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 5-6 x 2-2.5 Fm.

**Substrata.** On dead hardwoods, mainly in exposed areas like forest gaps and trails.

**Distribution.** Pantropical, also common in subtropical and warm-temperate Eastern North America and Asia (China, Taiwan, Far East Russia, Japan, North Thailand, and Vietnam).

**Remarks.** *Pycnoporus sanguineus* differs morphologically from *P. cinnabarinus* by its thin basidiocarps with intense, more persistent orange-red pigmentation, and smaller basidia and basidiospores.

in the context 3-8.5 Fm wide, gelatinizing on drying and difficult to separate; tramal hyphae similar, 3-4 Fm wide.

**Cystidia** absent; fusoid cystidiols scattered in the dissepiments, not always present.

**Basidia** broadly clavate, 17-20 x 10-12 Fm, with four sterigmata.

**Basidiospores** ovoid to subglobose, 3.5-5.5 x 3.5-5 Fm.

**Substrata.** On dead conifers and hardwoods in several genera

**Distribution.** Circumpolar species in temperate areas, in East Asia known from Changbai in Northern China, Kyushu in Japan, Taiwan, and Far East Russia.

**Remarks.** The horny consistency of dried basidiocarps and the pinkish or flesh-coloured pore surface that darkens on drying characterize this species. It reminds of a *Physisporinus* species, since the species lacks encrusted cystidia, but *R. crocatus* is a perennial species with thick-walled generative hyphae, looking almost dimitic.

**Rigidoporus eminens** Y.C. Dai

Ann. Bot. Fennici 35:143-154. 1998.

**Basidiocarps** annual, resupinate, widely effused, soft, more or less watery when fresh, shrinking by drying and becoming soft to fragile, up to 5 mm thick, margin narrow to almost absent, often slightly lifted in dry and old specimens; pore surface white to cream becoming pale brown when bruised, cream to buff when dry and partly cracking, pores angular, in parts irregular 5-8 per mm, tubes concolorous with the pore surface, fragile, up to 4 mm long; context thin, up to 0.3 mm thick, soft and cream coloured.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, usually distinctly thick-walled, 4-6 Fm wide, running parallel to the tubes and agglutinated.

**Cystidia** present as cylindrical, thick-walled hyphal ends and usually with an apical crown of crystals, 5-10 Fm wide and up to 120 Fm from the septum from which they arise, straight and embedded in the trama or bending into and projecting above the hymenium, often abundantly present; fusoid cystidiols present, thin-walled, 13-17 x 4-5.5 Fm.

**Basidia** barrel-shaped to clavate, 11-15 x 6-8 Fm, with four sterigmata.

**Basidiospores** globose, thin-walled, 4,5-6 Fm in diameter.

**Substrata.** On different hardwoods.

**Distribution.** Described from a number of Chinese localities and found also in Japan such as Fukushima Pref., Tadami, Mt. Asakusa, Tochigi Pref., Nikke, Senjogahara.

**Remarks.** This species is closely related to *R. undatus*, but separated by more irregular pores, a softer consistency, being paler when fresh and having prominently projecting cystidia.

**Rigidoporus furcatus** Núñez, Parmasto & Ryvardeen

Fungal Div. 6:112, 2001.

**Basidiocarps** resupinate, annual, hard and fragile when dry, up to 2.5 cm wide and

tus

6. Cystidia clavate to ventricose, coarsely encrusted and not forked.....7

7. Tropical to subtropical species, basidiospores ovoid to subglobose..... **R. vinc-tus**

7. Temperate species, basidiospores globo-se.....8

8. Pores irregular and lacerate, 5-7 per mm, cystidia projecting ..... **R. emi-nens**

8. Pores regular, 7-9 per mm, cystidia enclosed ..... **R. unda-tus**

**Rigidoporus cinereus** Núñez & Ryvardeen

Fungal Div. 3:115, 1999.

**Basidiocarp** annual, pileate, effused reflexed to spatulate, up to 2 cm long, 1.5 cm wide and 4 mm thick at the base, curled and woody hard when dry; pilear surface grey and radially finely fibrillose, azonate; pore surface cream to pale ochraceous, pores round, 5-6 per mm, tubes concolorous with pore surface, up to 2 mm deep, context concolorous up to 1 mm thick.

**Hyphal system** monomitic; generative hyphae with simple septa, hyaline and thin to thick-walled, 3-5  $\mu$ m wide, some of the projecting hyphae in the dissepiments distinctly pointed and resembling contextual cystidia but without any wall thickening.

**Cystidiols** present, hyaline, thin-walled and pointed, up to 22  $\mu$ m long.

**Basidia** clavate, 18-25 x 5-6  $\mu$ m.

**Basidiospores** globose, 5-6  $\mu$ m in diameter.

**Substrata.** *Fagus* sp. and *Cryptomeria japonica*.

**Distribution.** Japan.

**Remarks.** The species is recognized by the greyish, distinctly fibrillose pileus separating it from all other *Rigidoporus* species with similar microscopic characters to those described above.

**Rigidoporus crocatus** (Pat.) Ryvardeen

Occ. Papers. Farlow Herb. 118:13, 1983. - *Poria crocata* Pat., Journ. Bot. 8:220, 1894.

**Basidiocarps** perennial, effused up to 10 cm, tough, brittle when fresh, drying rigid and horny, easily separable, margin buff, fertile or sterile, finely floccose, up to 2 mm wide; pore surface flesh-coloured or very light pinkish, pinkish-brown when bruised, drying smoky grey to black, pores circular to angular, receding, 5-7 per mm, with thin, entire dissepiments, tubes darker, distinct, pinkish tan, hard, horny, up to 3 mm long; context pinkish-buff, azonate, corky to rigid, up to 1 mm thick; taste mild.

**Hyphal system** monomitic; generative hyphae simple-septate, thin- to thick-walled,

**Distribution.** Widespread in the tropics and in subtropical zones and in East Asia seen from China, Japan, Taiwan, North Thailand, and Vietnam.

**Remarks.** The species is very similar to *R. microporus*, which is usually less robust and has smaller basidiospores. Sometimes the cystidia are difficult to observe.

**Rigidoporus microporus** (Sw.:Fr.) Overeem

Icon. Fung. Malayensum 5:1, 1924. - *Boletus microporus* Sw., Fl. Ind. Occ. 3:1925, 1806. - *Polyporus microporus* Sw.:Fr., Syst. Mycol. 1:376, 1821.

**Basidiocarps** annual, more seldom perennial, occasionally resupinate but mostly pileate, often imbricate and gregarious, sessile or broadly attached, dimidiate to flabelliform, up to 10 cm long, 5 cm wide and 1.5 cm thick, consistency hard when dry; pileus first orange-reddish brown and slightly velutinate, later glabrous and fading to wood-colour, concentrically zonate-sulcate, sometimes tuberculate, dull to slightly glossy; margin thin and often deflexed; pore surface first bright orange to reddish brown, fading to pale brown or grey with an orange tint, pores round to angular, 6-9 per mm, dissepiments very thin, tubes single-layered but sometimes stratified and up to 1 cm long, reddish brown; context cream to wood-coloured, radially fibrous, up to 1 cm thick.

**Hyphal system** pseudodimitic; generative hyphae simple-septate, thin- to slightly thick-walled, 3-5 Fm wide; present are also thick-walled hyphae, especially in the context where septa are difficult to observe and which are reminiscent of ordinary skeletal hyphae, up to 8 Fm wide.

**Cystidia** not present; smooth, thin-walled, mucronate cystidiols present among the basidia, 20-25 x 10-12 Fm.

**Basidia** 12-15 x 7-10 Fm, with four sterigmata.

**Basidiospores** subglobose, 3.5-5 x 3.5-4 Fm.

**Substrata.** Numerous genera of hardwoods. A serious problem in the tropics on crop plants of rubber, cacao, coconut, coffee, tea and bamboo.

**Distribution.** Widely distributed in the tropical zone, also in subtropical Eastern North America and Asia, where it is known from Nepal to China, Japan, Taiwan, Korea, North Thailand, and Vietnam.

**Remarks.** In fresh condition the imbricate, reddish basidiocarps with minute pores will be rather diagnostic. A microscopical examination is necessary to separate it from the similar *R. lineatus*, which has larger basidiospores and encrusted cystidia.

**Rigidoporus ulmarius** (Sowerby:Fr.) Imazeki

Bull. Govt. Exp. Sta. Meguro 57:119, 1952. - *Polyporus ulmarius* Sowerby:Fr., Syst. Mycol. 1:365, 1821.

**Basidiocarps** perennial, pileate to effused-reflexed, up to 6 cm thick and 30 cm long, reflexed portion up to 9 cm wide; pileus pale buff to cream (pinkish-buff to light buff), glabrous to finely tomentose, smooth or tuberculate and with incorporated litter where development occurs under roots below the surface, margin pale

long, 2-3 mm thick; pore surface ochraceous, pores angular to irregular, mostly 2-3 per mm, but some also split and elongated, 0.5-2 mm long; tubes concolorous 1-2 mm deep, context concolorous, dense and thin, up to 300 mm thick.

**Hyphal system** monomitic, generative hyphae with simple septa, hyaline, thin- to slightly thick-walled, 3-7 mm wide.

**Cystidia** of two types: a) abundant, clavate to hyphoid, tapering to more commonly apically forked and encrusted, up to 120 µm long from the basal septum to the apex, thin-walled to slightly thick-walled and hyaline, b) rare, mamillate to gloecystidia-like, smooth, thin-walled with a distinct pointed apex, up to 40 µm long.

**Basidia** clavate, 4-sterigmate, 15-20 x 7-8 µm, with a simple basal septum.

**Basidiospores** globose, 4.5-5 (5.5) µm in diameter.

**Substrata.** Known only from *Alnus hirsuta*.

**Distribution.** Known only from the type locality.

**Remarks.** This is a remarkable species by its two types of cystidia, one type with apical encrustation and often forked or divided in or near the apex, the other being smooth and gloecystidia-like.

### **Rigidoporus lineatus** (Pers.) Ryvardeen

Norw. J. Bot. 19:236, 1972. - *Polyporus lineatus* Pers. in Gaud., Voyage aut. du Monde p. 174, 1827.

**Basidiocarps** annual, pileate, more seldom resupinate, solitary to imbricate, sessile or substipitate, dimidiate, flabelliform to spatulate, up to 20 cm long, 7 cm wide and broad and 2 cm thick, consistency very hard when dry; pileus pinkish buff to reddish brown, velutinate, later wood-coloured, darker brown and glabrous, concentrically zonate-sulcate, often radially striate, margin thin, often deflexed; stipe, if present, concolorous with the pileus, up to 7 mm long and 3 mm thick; pore surface bright orange-red when fresh, drying dirty greyish-brown with a pinkish 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-coloured, radially fibrous.

**Hyphal system** pseudodimitic; generative hyphae simple-septate, in the subhymenium thin-walled, moderately branched, 3-6 µm wide, in the trama and 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.

**Cystidia** present, rare to abundant, clavate, thick-walled with slightly widened apex, smooth to strongly encrusted, partly embedded in the trama, partly projecting obliquely into the hymenium, 6-15 µm wide, up to 200 µm long; cystidiols mucronate, smooth, thin-walled, present among the basidia, up to 20 µm long, very difficult to observe unless basidia are developed, they may represent aborted basidia.

**Basidia** short-clavate, 12-15 x 6-8 µm, with four sterigmata.

**Basidiospores** subglobose to globose, often uniguttulate, 5-6 x 4-5 µm.

**Substrata.** Numerous genera of hardwoods.

China (Changbai), Far East Russia, and Japan.

**Remarks.** The tough consistency and beige to isabelline colour and the cystidia clearly point to a relationship with the tropical *R. vinctus* var. *vinctus*. The latter has however, more prominent swollen cystidia, perhaps a minor modification. *Rigidoporus crocatus* is separated by lacking cystidia, having a stratified basidiocarp with an ochraceous distinct context, and its generally cushion-shaped basidiocarps, often slightly discoloured grey to greyish black on the pore surface with drying.

**Rigidoporus vinctus** (Berk.) Ryvarden

Norw. J. Bot. 19:139, 1972. - *Polyporus vinctus* Berk., Ann. Mag. Nat. Hist., II, 9:196, 1852.

**Basidiocarps** annual to perennial, resupinate, first orbicular but becoming widely effused, seldom effused-reflexed with a fragmentary pileus, up to 9 mm thick, tough when fresh, hard when dry, adnate or when old partly loosened along the margin which is whitish to cream, grey to black in old specimens, velutinate to glabrous, narrow; pore surface often beautiful pink when fresh and then darkening by bruising and drying var. *cinerea*, or pale ochraceous buff to light pinkish ochraceous (var. *vincta*), pores round, 6-12 per mm, almost invisible to the naked eye, tubes indistinctly to distinctly stratified, up to 1 mm long in each layer; context ochraceous fibrous, up to 0.5 mm thick, sometimes limited towards the substrate by a thin, black line.

**Hyphal system** apparently dimitic; generative hyphae simple-septate, in the subhymenium hyaline and thin-walled, in the context and trama more thick-walled, but freely branched, 2-5 Fm wide; also present are very thick-walled to almost solid hyphae in which septa are very difficult to observe, hyaline to slightly yellowish, 3-7 Fm wide, these may represent either skeletal hyphae or sclerified generative hyphae; gloeoplerous hyphae often present in the trama, 3-6 Fm wide, with oily contents, apparently absent in some collections.

**Cystidia** abundant to rare, strongly encrusted, clavate and often slightly widened towards the apex where the walls are often thicker, hyaline to slightly yellowish or brownish, either embedded in the trama or obliquely projecting into the hymenium, 20-70 x 8-18 Fm; also present in fertile specimens are mucronate, smooth, thin-walled cystidiols mixed with the basidia, 20-25 x 6-7.5 Fm.

**Basidia** short-clavate, 12-15 x 6-9 Fm, with four sterigmata.

**Basidiospores** ovoid to subglobose, 4-5.5 x 3-4 Fm.

**Substrata.** On dead hardwoods, in Eastern North America and Asia also on conifers.

**Distribution.** Widespread throughout the tropical zone, also in subtropical to warm-temperate Eastern North America and Asia, where it is known from Japan (Okinawa and Kyushu), North Thailand, and Vietnam.

**Remarks.** The resupinate basidiocarp and the large encrusted cystidia are diagnostic. The colour is remarkably variable.

buff, thick, rounded, lobate, usually slightly deflexed and sterile below; pore surface pinkish buff when fresh, drying pale brownish pink (avellaneus to vinous buff) or discoloring darker brownish, pores angular, 5-6 per mm, with thin, entire dissepiments, tubes pinkish brown when dried (avellaneus) indistinctly stratified, up to 1 cm long; context pale buff when dried (cartridge buff), firm, corky-fibrous, azonate, up to 5 cm thick.

**Hyphal system** monomitic; generative hyphae simple-septate, thin- to moderately thick-walled, with rare branching, 2-4(-5) Fm wide, tramal tissue compact and difficult to separate.

**Cystidia** absent; fusoid cystidiols present, 18-28 x 8-9 Fm.

**Basidia** clavate, 15-21 x 10-11 Fm, with four sterigmata.

**Basidiospores** globose to subglobose, becoming thick-walled, 6-8 x 5-6.5 Fm.

**Substrata.** Fruiting at the base of living hardwoods and continuing decay in dead trees and stumps.

**Distribution.** Cosmopolitan species, most common in temperate zones, in East Asia known from temperate China, Taiwan, Japan up to Hokkaido, North Thailand, and Far East Russia.

**Remarks.** The species is recognized by its large, cream, perennial basidiocarps growing at the base of living hardwoods, and its large basidiospores. The largest basidiocarp known, approximately 1.5 m in diameter, is of this species and located on a huge stump of *Ulmus* in Kew Gardens, London.

**Rigidoporus undatus** (Pers.:Fr.) Donk

Persoonia 5:115, 1967. - *Polyporus undatus* Pers.:Fr., Elench. Fung. 1:111, 1828. - *P. undatus* Pers., Mycol. Europ. 2:90, 1825.

**Basidiocarps** annual, resupinate, widely effused, flat to undulating, up to 1 cm thick, tough and partly gelatinous when fresh, hard and very dense when dry, margin narrow to almost absent, often slightly lifted in dry and old specimens; pore surface isabelline to beige, only slightly darker when dry, pores circular and regular when fresh, often partly shrunken and more irregular when dry, hardly visible to the naked eye, 7-9 per mm, tubes concolorous with the pore surface, up to 3 mm long; context very thin to almost absent, dense and cartilaginous.

**Hyphal system** monomitic; generative hyphae simple-septate, hyaline, usually distinctly thick-walled, 3-6 Fm wide, running parallel to the tubes and agglutinated.

**Cystidia** present as cylindrical, thick-walled hyphal ends and usually with an apical crown of crystals, 4-10 Fm wide and up to 120 Fm from the septum from which they arise, straight and embedded in the trama or bending into the hymenium, often abundantly present; fusoid cystidiols present, thin-walled, 12-16 x 4-5.5 Fm.

**Basidia** clavate, 10-15 x 4-5 Fm, with four sterigmata.

**Basidiospores** globose, 5-5.5(6) Fm wide.

**Substrata.** On both on conifers and hardwoods.

**Distribution.** Rare but widespread in Europe and known eastward to cold-temperate

daedaloid, 3-5 per mm, with thin dissepiments that sometimes split forming larger, sinuous pores, tubes concolorous and continuous with the subiculum, up to 3 mm long; subiculum cream to buff, azonate, corky when dry, less than 1 mm thick; taste mild.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled, often branched, 2-6 Fm wide, in the dissepiments several ending in a globose, thin-walled, swollen apex up to 12 Fm wide, others thick-walled, non-septate resembling skeletal hyphae, these with wall often thinning towards the apex.

**Cystidia** absent; lageniform cystidiols present, scarcely projecting, with a long and narrow neck, 3-4 Fm wide at the base, slightly encrusted at the apex.

**Basidia** clavate, with a median constriction, 12-15 x 5-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 3.5-5 x 2.5-3.5 Fm.

**Substrata.** On dead hardwoods in many genera, mainly on thin, hanging or detached, dead branches.

**Distribution.** Cosmopolitan species, widely spread in East Asia and known from China, Japan, Taiwan, Far East Russia, North Thailand, and Vietnam.

**Remarks.** *Schizopora flavipora* is one of the most common polypores on thin branches. Basidiocarps are usually effused-reflexed when growing on standing trees in the tropics.

### **Schizopora paradoxa** (Fr.) Donk

Persoonia 5:76, 1967. - *Hydnum paradoxum* Fr., Syst. Mycol. 1:424, 1821.

**Basidiocarps** resupinate, widely effused, on vertical substrata often with small nodules with fertile underside but no real pilei, tough, white, cream-coloured, or darkening with age (greyish-ochraceous-brownish), 1-5 mm thick, margin normally not differentiated; hymenophore usually with sinuous pores of varying sizes, often irregular or somewhat labyrinthine, on sloping substrata more or less prolonged, or split into irregular teeth; near the margin the pores are shallow or net-like; subiculum cream to pale buff, up to 2 mm thick.

**Hyphal system** dimitic, but skeletal hyphae may be few; generative hyphae with clamps, thin- to somewhat thick-walled, more or less branched, 2-3 Fm wide; skeletal hyphae 3-4(5) Fm wide, straight or sinuous, hyaline or yellow, reaching a length of 100-350 Fm; hyphal ends in the dissepiments encrusted with granular crystals, others capitate.

**Cystidia** absent; cystidiols present in variable numbers, lageniform to usually capitate and apically encrusted.

**Basidia** suburniform, 15-20 x 4-5 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 5-6 (6.5) x 3.5-4 Fm.

**Substrata.** On decayed hardwoods in all kinds of forests.

**Distribution.** A common and cosmopolitan species, in East Asia known from China, Taiwan, Korea, Japan, and Far East Russia.

**Remarks.** The cream-coloured, irpicoid pore surface will normally be diagnostic

**SCHIZOPORA** Velen.

Ceské Houby, p. 638, 1922.

Basidiocarps annual, resupinate or rarely with narrow, imbricate pilei over decurrent tubes; pore surface and subiculum cream to pale buff, pores angular to daedaleoid or hymenophore irregularly hydnceous from splitting of dissepiments; hyphal system monomitic; generative hyphae with clamps, moderately thick-walled, often giving rise to skeletal hyphae or embedded cystidial elements; cystidia absent, lageniform with an encrusted apex present; hyphae at dissepiments encrusted, some with globose ends; basidiospores ellipsoid to subglobose, hyaline, negative in Melzer's reagent. Causing a white rot of dead hardwoods and conifers, or fruiting at the base of living plants. Small cosmopolitan genus.

**Type species:** *Polyporus laciniatus* Velen. = *Schizopora paradoxa* (Schrad.:Fr.) Donk

**Remarks.** The microstructure of *Schizopora* species is similar to 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 the differences among species are not clearly understood.

**Key to species**

1. Pores angular, 1-3 per mm, or hymenophore sinuous to irpicoid,  
basidiocarps always resupinate, basidiospores 4.5-6.5 Fm long..... 2
1. Pores round to angular, 3-5 per mm, basidiocarps resupinate  
to effused-reflexed, basidiospores 3.5-4.5(5) Fm long..... **S. flavipora**
2. Pore surface white to pale cream or yellowish,  
basidiospores 5.5-6.5 Fm long..... **S. paradoxa**
2. Pore surface cream with a distinct shade or orange,  
basidiospores 4-5.5 Fm long..... **S. radula**

**Schizopora flavipora** (Cooke) Ryvarden

Mycotaxon 23:186, 1985. - *Poria flavipora* Cooke, Grevillea 15:25, 1886.

**Basidiocarps** annual, resupinate to effused-reflexed, usually confluent, 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; pilear surface up to 1 cm wide, cream-coloured, velutinate to glabrous, azonate; pore surface whitish to cream when fresh, discolouring to buff on drying, pores angular to

areas, gregarious or confluent in a rosette-like structure, pileus up to 3 cm wide, spatulate to infundibuliform, margin undulate; pilear surface cream becoming pale buff on dried specimens, glabrous to finely tomentose, sulcate; stipe glabrous, cream-coloured, up to 1 cm long and 3 mm wide; hymenophore poroid to hydnceous, white, pores variable, 2-4 per mm, decurrent, tubes concolorous, up to 2 mm long, dissepiment farinose becoming dentate; context white, fragile, up to 2 mm thick.

**Hyphal system** monomitic; generative hyphae with abundant clamps, thin-walled, with occasional branching, 2-5 Fm wide, usually with numerous oil drops.

**Basidia** mostly urniform, 20-25 x 6-8 Fm, some up to 45 Fm long, mostly with six sterigmata.

**Basidiospores** short-cylindrical to oblong, 4-5.5 x 2-2.5 Fm.

**Substrata.** Mostly on the ground among litter, especially in coniferous forests, but also noted on dead hardwoods.

**Distribution.** Circumpolar species, in East Asia only known from coniferous forests in cold temperate Japan (Hokkaido).

**Remarks.** *Sistotrema confluens* usually produces stipitate basidiocarps, an unusual character in the genus. They usually grow forming rosettes on coniferous needles.

### **SKELETOCUTIS** Kotl. & Pouzar

Ceska Mykol. 12:103, 1958.

Basidiocarps annual to perennial, resupinate to pileate, white, cream pink to lilac, often slightly discoloured and resinous when dry; pores usually small, many species with a dense cartilaginous zone above the tubes; hyphal system di-trimitic; generative hyphae with clamps; skeletal hyphae hyaline, straight; both types of hyphae encrusted in the dissepiments; cystidia absent, cystidiols present in most species; basidiospores hyaline, allantoid, cylindrical to ellipsoid, negative in Melzer's reagent. Cosmopolitan genus, causes a white rot.

**Type species:** *Polyporus amorphus* Fr.

**Remarks.** The important generic characters are the dimitic system and the encrustation of the hyphae in the dissepiments. The reader is referred to David (1982) and Niemelä (1985) for further comments.

### **Key to species**

1. Basidiospores allantoid and 0.7-1 Fm wide (but see *S. sensitiva*)..... 2
1. Basidiospores allantoid to subellipsoid, wider than 1 Fm..... 5
2. On hardwoods, pore surface often slightly discoloured in blue to olivaceous tints, binding hyphae present in the context..... **S. nivea**
2. On conifers, binding hyphae absent..... 3
3. Basidiospores 3.5-4.5 mm long .....

for a field determination, and the basidiocarps are often found in exposed positions, such as the underside of still attached branches etc.

**Schizopora radula** (Pers.:Fr.) Hallenb.

Mycotaxon 18:308, 1983. - *Polyporus radula* Pers.:Fr., Syst. Mycol. 1:383, 1821. - *Poria radula* Pers., Obs. Mycol. 2:14, 1799.

**Basidiocarps** annual, resupinate, adnate, effused, up to 5 mm thick, margin narrow and white; pore surface yellowish cream to ochraceous with a distinct pale orange tint; pores usually regular, angular, 1-3 per mm, dissepiments becoming lacerate with age, on sloping substrata the pores are more irregular, tubes concolorous with the pore surface, up to 4 mm long; subiculum fibrous, white, up to 2 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to slightly thick-walled and of regular width, branched, 2-4 Fm wide; hyphal ends in the trama often in part with thickened walls, in the dissepiments thin-walled and usually covered with crystals, some of these hyphae with capitate ends.

**Cystidia** lageniform or capitate, apex up to 6 Fm wide, common in the hymenium.

**Basidia** suburniform with a slight constriction below the sterigmata, 15-20 x 4-5 Fm, with four sterigmata.

**Basidiospores** ellipsoid, hyaline, smooth, thin-walled, negative in Melzer's reagent, 4-5 x 3-4 Fm.

**Substrata.** Numerous hardwoods, more rarely collected on conifers.

**Distribution.** Widespread in temperate zones, in East Asia known from Far East Russia, Northern China (Changbai), and Japan (Okinawa).

**Remarks.** Usually the lack of true skeletal hyphae will distinguish this species from *S. paradoxa* which also has fewer bulbous cystidia and somewhat larger basidiospores. Hallenberg (1983) has proved that both species are intersterile.

**SISTOTREMA** Fr.

Syst. Mycol. 1:246. 1821.

Basidiocarps resupinate or in one species stipitate, arachnoid, pelliculose, or waxy; hyphal system monomitic; generative hyphae with clamps, 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.

**Remarks.** *Sistotrema* is a genus in the family Corticiaceae, and most of the species have basidiocarps with smooth to hydnceous hymenial surface. The species included here has, at least in parts, a poroid hymenophore.

**Sistotrema confluens** Pers.:Fr.

Syst. Mycol. 1:426, 1821. - *Sistotrema confluens* Pers., Neues Mag. Bot. 1:108, 1794.

**Basidiocarps** annual, laterally to eccentrically stipitate, occasionally with resupinate

**amorpha**

11. Pore surface grey to buff, pores 4-6 per mm, often together with  
*Trichaptum abietinum*, basidiospores 1-1.3 Fm wide..... **S. carneogri-**  
**sea**
12. Pores 5-7 per mm, more or less circular..... 13
12. Pores 3-5 per mm, angular and irregular when dry ..... 14
13. Basidiospores 5-6 Fm long, context fibrous..... **S. subincar-**  
**nata**
13. Basidiospores 4-5 Fm long, context almost absent, arachnoid..... **S. al-**  
**bocremea**
14. Basidiocarps with a unpleasant odour of garlic,  
skeletal hyphae unchanged in KOH..... **S.**  
**odora**
14. Basidiocarps without distinct odour,  
skeletal hyphae gelatinized in KOH..... **S. papy-**  
**racea**

**Skeletocutis albocremea** A. David

Nat. Can. 109:237, 1982.

**Basidiocarps** annual, resupinate, adnate and thin, less than 1 mm thick, up to 10 x 3 cm, margin narrow and white; pore surface white, becoming pale alutaceous or cream-coloured with age, pores almost circular, 5-6 per mm, tubes concolorous with the pore surface, up to 0.8 mm long; context very thin, almost absent, white.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, branched, 1.5-3.5 Fm wide, abundantly encrusted; skeletal hyphae sinuous, hyaline, thick-walled, abundant in the trama and dissepiments, 2-4 Fm wide.

**Cystidia** absent; fusoid cystidiols abundantly present, hyaline, thin-walled, not encrusted, 10-17 x 3-5 Fm.

**Basidia** clavate, 10-13 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid, 4-5 x 1.2-1.8 Fm.

**Substrata.** On dead conifers like *Cedrus*, *Picea* and *Pinus*.

**Distribution.** Known from Europe, probably more common, but easily overlooked due to its close resemblance to *S. subincarnata*. There is an uncertain record from Far East Russia.

**Remarks.** This species comes very close to *S. subincarnata*, but has an arachnoid basidiocarp, almost without a context. The basidiospores are slightly smaller than those of *S. subincarnata* but the measurements overlap (5-6 Fm long in the latter species). David (1982) has demonstrated that both species are incompatible.

- ..4
3. Basidiospores 4.5-6 mm long..... **S. stel-**  
**lae**
4. Pores 6-8 per mm, basidiocarps annual or perennial, on *Picea*..... **S. ochro-**  
**alba**
4. Pores 3-5 per mm, basidiocarps annual, on *Pinus*..... **S. kueh-**  
**neri**
5. Basidiospores ellipsoid, 4-4.5 x 3-3.5 Fm,  
basidiocarps with an orange abhymenial surface..... **S. sensi-**  
**tiva**
5. Basidiospores cylindrical, allantoid to lunate, up to 2 Fm wide,  
basidiocarps with a white to light brown abhymenial surface..... 6
6. Basidiospores distinctly lunate, stellate crystals often present on hyphae,  
basidiocarp soft and flexible when dry..... 7
6. Basidiospores allantoid to cylindrical, stellate crystals absent, evenly distributed  
crystals usually present, especially on hyphae in the dissepiments  
Basidiocarps usually hard and dense when dry ..... 8
7. Basidiocarps annual, pores 4-6 per mm, basidiospores 4-5 x 1.5-2 um..... **S. lenis**
7. Basidiocarps perennial, pores 6-8 per mm,  
basidiospores 3-3.5 (4) 1-1.5 um..... **S. vul-**  
**garis**
8. Rhizomorphs present..... **S. aluta-**  
**cea**
8. Rhizomorphs absent..... 9
9. Basidiocarps perennial, on *Acer*..... **S. peren-**  
**nis**
9. Basidiocarps annual ..... 10
10. Basidiocarps effused-reflexed to pileate, rarely resupinate, dense  
cartilaginous layer between upper context and tubes.....
- 11
10. Basidiocarps resupinate, no cartilaginous zone between context and tubes.....
- 12
11. Pore surface pale orange to pinkish, pores 6-8 per mm,  
basidiospores 1.3-1.8 Fm wide ..... **S.**

*S. amorphia* are distinctive characters. *Skeletocutis carneogrisea* is similar but has a beige to greyish pore surface and more strongly curved, lunate basidiospores.

***Skeletocutis carneogrisea* David**

Nat. Can. 109:246, 1982.

**Basidiocarps** annual, resupinate to effused-reflexed, coriaceous when fresh, rigid when dry, pileus up to 2 cm wide and long; pilear surface cream to greyish at the base of the pileus, finely tomentose, with few zones which may become glabrous with age and then pale brown, margin white and floccose; pore surface greyish-violet, becoming buff 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 up to 1 mm thick, white and appressed cottony.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, 2-4 Fm wide, becoming thick-walled; skeletal hyphae thick-walled to solid, 3-5 Fm wide, mostly present in the trama, both types of hyphae finely encrusted in the dissepiments.

**Cystidia** absent; cystidiols numerous, fusoid, smooth, thin-walled and up to 15 Fm long.

**Basidia** clavate, 12-15 x 4-5 Fm, with four sterigmata.

**Basidiospores** cylindrical, 3.5-4 x 1-1.3 Fm.

**Substrata.** Mainly on conifers, often close to or on basidiocarps of *Trichaptum abietinum*, but also on hardwoods in Far East Russia.

**Distribution.** Temperate species in North America, Europe, and East Asia (Changbai in Northern China, Honshu in Japan, and Far East Russia), but not common.

**Remarks.** The species is closely related to *S. amorphia* but separated by having a more greyish pore surface and more lunate basidiospores.

***Skeletocutis kuehneri* A. David**

Nat. Can. 109:248, 1982.

**Basidiocarps** annual, resupinate, adnate, up to 4 mm thick, margin narrow to lacking, white when present; pore surface often present to the margin of the basidiocarp and then with very shallow tubes, pore surface even, white when fresh, becoming pale ochraceous with age or drying, pores angular, rather thin-walled, 3-5 per mm, pore walls partly split after drying and pores becoming larger, tubes concolorous with the pore surface, up to 4 mm long, dissepiments lacerate; context thin, white, up to 3 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-3.5 Fm wide, more or less dominant in the context next to and parallel to the substrate; skeletal hyphae present in the trama, thick-walled, 2.5-4 Fm wide; both types encrusted in the dissepiments.

**Cystidia** absent; fusoid cystidiols present, thin-walled, not encrusted, 8-15 x 3.5-5 Fm.

**Skeletocutis alutacea** (Lowe) Keller

Persoonia 10: 353, 1979. - *Poria alutacea* Lowe, Mycologia 38:202, 1946.

**Basidiocarps** annual, resupinate, effused up to 20 cm, soft, easily separable from the substratum, sterile margin white to cream-coloured, cottony to fimbriate and with conspicuous, white to cream-coloured rhizomorphs up to 1 mm thick; pore surface white to pale ochraceous buff, glancing, pores circular to angular, 4-8 per mm, with thin, entire and farinose dissepiments, tubes cream-coloured, drying brittle, up to 1 mm long; context white to cream-coloured, soft-fibrous, less than 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 2.5-4.5 Fm wide; skeletal hyphae thick-walled, hyaline, rarely branched, 2-3 Fm wide; tramal hyphae encrusted in dissepiments.

**Cystidia** absent, fusoid cystidiols present, 11-15 x 4-4.5 Fm.

**Basidia** clavate, 11-16.5 x 4.5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 3.5-5 x 1-1.5 Fm.

**Substrata.** On dead conifers and hardwoods.

**Distribution.** Temperate North America, Europe, New Zealand, and East Asia (China, Japan, North Thailand, and Far East Russia).

**Remarks.** The rather soft, separable basidiocarps and the conspicuous white rhizomorphs are good field characteristics for *S. alutacea*.

**Skeletocutis amorphia** (Fr.) Kotl. & Pouzar

Ceska Mykol. 12:103, 1958. - *Polyporus amorphus* Fr., Syst. Mycol. 1:364, 1821.

**Basidiocarps** annual, effused-reflexed to resupinate, solitary or imbricate, dimidiate to elongated, often laterally fused, up to 2 x 4 cm wide and 3 mm thick, thin and coriaceous; pilear surface whitish to grey or pale buff, zonate or azonate, tomentose to appressed-hirsute, smooth to deeply sulcate, margin concolorous; pore surface cartilaginous in appearance, pinkish buff to reddish-orange, pores circular to angular, 6-8 per mm, with thin, entire dissepiments, tubes concolorous and continuous with the lower layer of the context, up to 1 mm long; context consisting of a soft, fibrous upper layer and a firm, cartilaginous lower layer, the whole up to 1 mm thick; sections pale yellowish or reddish in KOH; taste slightly bitter.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, becoming thick-walled, 2-6 Fm wide; skeletal hyphae hyaline, thick-walled, with rare branching, 3-6 Fm wide.

**Cystidia** absent; fusoid cystidiols present, not encrusted, thin-walled, 12-18.5 x 3.5-4.5 Fm.

**Basidia** clavate, 14-16 x 4-5 Fm wide, with four sterigmata.

**Basidiospores** allantoid, 3-4.5 x 1.3-1.8 Fm.

**Substrata.** On dead wood of numerous genera of conifers.

**Distribution.** Cosmopolitan species in the cold temperate zone. In East Asia known from China, Japan, and Far East Russia.

**Remarks.** The cartilaginous appearance, pinkish to orange pore surface and tubes of

sional branching, 2-3.5 Fm wide, in the trama compactly arranged and difficult to separate; skeletal hyphae hyaline, thick-walled, with rare branching, 3-5 Fm wide; binding hyphae hyaline, developing from lateral branches on generative hyphae, thick-walled, repeatedly branched, almost dendroid, 1.5-2 Fm wide.

**Cystidia** absent; fusoid cystidiols rare and inconspicuous; hyphal pegs present, usually abundant.

**Basidia** clavate, 11-17 x 3.5-5 Fm, with four sterigmata.

**Basidiospores** allantoid, 3-5 x 0.5-1 Fm

**Substrata.** On dead hardwoods.

**Distribution.** Cosmopolitan species, most abundant in temperate zones, in East Asia known from warm- and cold-temperate China, Japan, and Far East Russia.

**Remarks.** The effused-reflexed basidiocarps with small, glancing pores, and the narrow basidiospores are distinctive characters of *S. nivea*.

### **Skeletocutis ochroalba** Niemelä

Nat. Can. 112:466, 1985.

**Basidiocarps** annual or perennial, pileate to resupinate, coriaceous to hard, up to 1.5 cm wide and 2 to 4 mm thick; pilear surface cream-coloured 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 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 trama, more thick-walled in the context; skeletal hyphae dominating, solid, unbranched, hyaline, 4-6 Fm wide; binding hyphae strongly branched with tapering ends arising as side branches on generative hyphae, 2-3 Fm wide, occurring only in the context; dissepiments strongly encrusted with fine grainy crystals.

**Basidia** clavate, 12-15 x 3-4 Fm, with four sterigmata.

**Basidiospores** allantoid, 3.5-4 x 0.7-0.8 Fm.

**Substrata.** Known only from *Picea*, seemingly restricted to processed timber.

**Distribution.** Known from temperate North America and Europe, but not common. Cited recently for Taiwan.

**Remarks.** The species reminds microscopically of *S. nivea*, also a trimitic species, which however is a southern species restricted to hardwoods.

### **Skeletocutis odora** (Sacc.) Ginns

Mycotaxon 21:332, 1984. - *Poria odora* Sacc., Syll. Fung. 6:294, 1888.

**Basidiocarps** annual, resupinate or almost nodulose on sloping substrata, often widely effused and up to 50 cm in longest dimension although usually of smaller dimension, soft and partly gelatinous or waxy when fresh and then with a distinct odour differently described as garlic or nauseous, drying brittle and shrinking, mar-

**Basidia** clavate, 8-13 x 3.5-5 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 3.5-4.5 x 0.7-1 Fm.

**Substrata.** Known only from dead wood of *Picea*, *Pinus*, and *Larix*.

**Distribution.** Eurasian species, in East Asia known from China, Japan (Hokkaido), and Far East Russia.

**Remarks.** The species is recognized by the resupinate basidiocarps with an ochraceous to orange pore surface and growing on *Pinus*.

**Skeletocutis lenis** (P. Karst.) Niemelä

Karstenia 31:23, 1991. - *Physisporus lenis* P. Karst. in Rabenh., Wint. Fungi Eur. et Exeur., excs. no. 3527, 1886.

**Basidiocarps** perennial, resupinate, often widely effused, and up to 20 cm or more in longest dimension along the trunks, effused, up to 8 mm thick, soft to corky, separable and light in consistency, margin narrow and white; pore surface soft to touch, white to cream, pores round, 4-6 per mm, somewhat sinuous with age, tubes white, up to 10 mm long; context white, cottony to fibrous, soft, 1-3 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled and 2-4 Fm wide; skeletal hyphae thick-walled, unbranched and straight to sinuous, 2-5 Fm wide, stellate crystals abundant and present on all hyphae from the subiculum to the dissepiments, may resemble small cystidia.

**Cystidia** absent; scattered, non-projecting fusoid cystidiols variably present in the hymenium, 15-20 x 3-4 Fm.

**Basidia** clavate, 10-13 x 3-5 Fm, with four sterigmata.

**Basidiospores** lunate, 4-5 x 1.5-2 Fm.

**Substrata.** Almost exclusively on brown rotted conifers, in Europe usually *Pinus* spp. but also recorded on hardwoods.

**Distribution.** Boreal species, seemingly circumpolar in the northern coniferous zone and known from Scandinavia to Canada. Previous notes of distribution should be treated with care because most of them, especially in the tropics, refer to the recently described *S. vulgaris* (Niemelä & Dai 1997).

**Skeletocutis nivea** (Jungh.) Keller

Persoonia 10:353, 1979. - *Polyporus niveus* Jungh., Verh. Batav. Genootsch. 17:48, 1839.

**Basidiocarps** annual, effused-reflexed to resupinate, rarely sessile, solitary or imbricate, dimidiate to elongate, sometimes laterally fused, up to 3 cm wide; pilear surface white to cream-coloured, azonate, finely tomentose to glabrous, becoming bluish-grey or brownish when touched; pore surface white to cream-coloured, glancing, pores circular to angular, 8-10 per mm, with thin, entire dissepiments, tubes white to pale buff, distinct from the context, easily sectioned, up to 2 mm long; context white, azonate, up to 5 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, with occa-

Fm in *S. odora*).

**Skeletocutis perennis** Ryvarden

Acta Mycol. Sin. 5:230, 1986.

**Basidiocarps** perennial, resupinate, adnate, woody, up to 10 cm wide and 2 cm thick, margin white and narrow; pore surface white to wood-coloured, pores round, 6-7 per mm, tubes distinctly stratified, up to 2 cm long; context almost lacking, white and cottony, mostly distinct in cavities in the substrate.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, 2-4 Fm wide; skeletal hyphae dominating, hyaline, thick-walled, 3-5 Fm wide, finely encrusted along the dissepiments.

**Cystidia** absent; pointed cystidiols abundantly present, hyaline, smooth, thin-walled, 10-16 Fm long.

**Basidia** clavate, 12-15 x 3-5 Fm, with four sterigmata.

**Basidiospores** oblong ellipsoid, 3-3.5 x 1.5-2 Fm.

**Substrata.** On *Acer mandschurica*.

**Distribution.** Only known from the type in Changbai in Northern China.

**Remarks.** Macroscopically this species resembles *S. stellae*, which also has perennial basidiocarps. However, the latter species is restricted to conifers, has tiny, allantoid basidiospores, and cystidiols are apparently absent.

**Skeletocutis sensitiva** (Lloyd) Ryvarden

Mycotaxon 44:134, 1992. - *Trametes sensitiva* Lloyd, Mycol. Writ.5:710, 1917.

**Basidiocarps** annual, effused-reflexed to resupinate, adnate and tough when dry, up to 10 cm in diameter in effused specimens, up to 1 cm thick, abhymenial surface orange, tough; pileus usually narrow, 1 cm wide, smooth, glabrous, margin lifted in dry specimens, distinct and rounded; pore surface cream to orange with a slight rosy tint, pores round, 4-5 per mm, tubes concolorous; context white and very thin.

**Hyphal system** di-to trimitic; generative hyphae with clamps, 2-3 wide, hyaline, thin-walled; skeletal hyphae dominating, solid, hyaline, 3-4 Fm wide, in the dissepiments heavily encrusted with fine grainy crystals; binding hyphae scarce, sparingly branched, hyaline, solid, 2-3 Fm wide.

**Basidia** not seen.

**Basidiospores** ellipsoid, difficult to find in most specimens, 4-4.5 x 3-3.5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Temperate Asian species, known from Japan and Far East Russia.

**Remarks.** The species is recognized in the field by its tough, orange basidiocarps with an orange abhymenial surface.

**Skeletocutis stellae** (Pilát) Keller

Persoonia 10:353, 1979. - *Poria stellae* Pilát, Sborn. Nar. Mus. Praha 9:107, 1953.

**Basidiocarps** perennial, resupinate, adnate, up to 8 mm thick, sterile margin cream-

gin narrow and white; pore surface white, drying cream-coloured to pale beige, often with slightly discoloured spots where touched or bruised, pores at first regular, 4-6 per mm, shrinking with drying and age and often splitting in V-shaped figures and becoming dentate, tubes concolorous with the pore surface, resinous when dry and distinctly coloured compared with the light context, up to 8 mm long; context white to pale cream, sometimes with a few dense zones, up to 1 mm thick.

**Hyphal system** dimittic; generative hyphae with clamps, hyaline, thin-walled, branched, 2.5-3.5 Fm wide, dominant; skeletal hyphae or sclerified generative hyphae in the context, thick-walled, 3-5 Fm wide, flexuous, with a few scattered clamps; a few true skeletal hyphae occur in the trama and dissepiments which are composed mainly of generative hyphae, heavily encrusted in their apical part.

**Cystidia** absent; fusoid cystidiols often abundantly present, thin-walled, smooth, 11-14 x 4-5 Fm.

**Basidia** clavate, 11-14 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid, 4-5 x 1-1.5 Fm.

**Substrata.** On conifers and hardwoods.

**Distribution.** Circumboreal species, in East Asia known from Northern China (Changbai), Japan (Honshu), and Far East Russia.

**Remarks.** The species is closely related to *S. stellae*, but *S. odora* has normally larger and more irregular pores, especially in dry condition, annual basidiocarps, and wider basidiospores (0.7-1 Fm in *S. stellae*). *Skeletocutis subincarnata* has more regular pores, a pale orange colour, and larger basidiospores (5-6 Fm long).

### ***Skeletocutis papyracea* A. David**

Nat. Can. 109: 254, 1982.

**Basidiocarps** annual, resupinate, separable, up to 15 cm in longest dimension, margin narrow, white, finely cottony; pore surface at first white, soon ochraceous, pores angular, 3-4 per mm, with fimbriate dissepiments, tubes concolorous with the pore surface, up to 1 mm long; context very thin, white, up to 1 mm thick.

**Hyphal system** dimittic; generative hyphae with clamps, hyaline, thin- to slightly thick-walled, 2-4 Fm wide; skeletal hyphae hyaline, dominating in the trama and dissepiments, thick-walled, 2.5-6 Fm wide, soon gelatinized or dissolved in KOH; both types of hyphae encrusted in the dissepiments.

**Cystidia** absent; fusoid cystidiols numerous in the hymenium, thin-walled, not encrusted, 10-15 x 3.5-5 Fm.

**Basidia** clavate, 10-15 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid to cylindrical, 4.5-5 x 1.5-1.8 Fm.

**Substrata.** On conifers.

**Distribution.** Rare, but probably overlooked species, known from Europe and Far East Russia.

**Remarks.** This species looks macroscopically like *S. odora* and is mainly separated by the skeletal hyphae that swell in KOH, and slightly wider basidiospores (1-1.5

**Basidiocarps** annual, resupinate, usually as ellipsoid patches, rarely more than 8 cm in longest dimension, 1-2 mm thick, rarely up to 5 mm, margin narrow and white or almost absent; pore surface soft to touch, white to cream, pores round, 6-8 per mm, tubes white, up to 2 mm long; context white, cottony to fibrous, soft, 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled and 2-3 Fm wide; skeletal hyphae thick-walled, unbranched and straight to sinuous, 2-4 Fm wide, stellate crystals usually absent or very few, some generative hyphae in the dissepiments with an apical bulbous swelling.

**Cystidia** absent; scattered, non-projecting fusoid cystidiols variably present in the hymenium, 15-20 x 3-4 Fm.

**Basidia** barrel-shaped, 6-9 x 3-5 Fm, with four sterigmata.

**Basidiospores** lunate, 3-4 x 1-5 Fm.

**Substrata.** Equally common on conifers as on hardwoods of many kinds, often in open localities, both on white rot and brown rot wood.

**Distribution.** Probably a southern species and its presence in East Asia has to be proven by an examination of the collections filed under *S. lenis* with which it was previously confused or mixed. The many tropical collections seen, probably belongs here, but there are many names, especially in America, available if these should represent yet another taxon.

**Remarks.** This species is separated from *S. lenis* by being annual and thinner, having smaller basidia and spores and almost lacking the stellate crystals along the hyphae. It also frequently grows on hardwood, a substrate almost unknown for *S. lenis*.

*S. subvulgaris* Dai, recently described from China (Dai 1998) is very similar to the species described here, separated only by a fine encrustation along the hyphae in the dissepiments. We are a little in doubt whether this minor different warrant a specific entity at this stage in the investigation of the genus, and the reader is referred to Dai for comments and arguments.

### **SPONGIPELLIS** Pat.

Hym. Europ. p.140, 1887.

Basidiocarps annual, pileate to effused-reflexed, broadly attached, semicircular; pilear surface white to ochraceous, tomentose to scrupose; hymenophore poroid, pores circular to sinuous, tubes concolorous with the pore surface, dissepiments commonly lacerate; 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 absent; basidiospores ellipsoid to globose, smooth, hyaline, thick-walled, cyanophilous and negative in Melzer's reagent. On living and dead hardwoods, causing a white rot.

**Type species:** *Polyporus spumeus* Sowerby:Fr.

**Remarks.** The genus is close to *Tyromyces* but is distinguished by the distinct du-

coloured, floccose to fimbriate, often rather wide; pore surface cream to tan, glancing, the pores 5-7 per mm, tubes rigid, indistinctly layered, each layer up to 3 mm thick; context firm-fibrous, white, azonate, up to 5 mm thick; taste mild.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, with occasional branching, 2-4 Fm wide; skeletal hyphae thick-walled, hyaline, rarely branched, 2-6 Fm wide; tramal hyphae projecting at dissepiments heavily encrusted.

**Cystidia** absent; inconspicuous fusoid cystidiols present, 12.5-18 x 3-4.5 Fm; hyphal pegs present.

**Basidia** clavate, 10-16 x 4-5 Fm, with four sterigmata.

**Basidiospores** allantoid, 4.6-6 x 0.7-1 Fm.

**Substrata.** On dead wood of several genera of conifers, especially common on *Picea*.

**Distribution.** Boreal species, in East Asia known from Changbai in Northern China, and Far East Russia.

**Remarks.** *Skeletocutis stellae* is close to *S. subincarnata* but differs in having perennial basidiocarps and narrower basidiospores.

#### ***Skeletocutis subincarnata* (Peck) Keller**

Persoonia 10:535, 1979. - *Poria subincarnata* (Peck) Murrill, Mycologia 13:86, 1921.

**Basidiocarps** annual, resupinate or rarely effused-reflexed, separable or somewhat adnate, often rimose upon drying, margin narrow, white, fimbriate or rarely with white rhizomorphs; pore surface cream-coloured or with a pinkish to slight orange tint when fresh, drying cream to buff, pores 5-7 per mm, mostly regular, tubes soft-waxy to coriaceous, up to 4 mm long; context soft, fibrous, thin, whitish; taste mild.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, with occasional branching, 2-3 Fm wide; skeletal hyphae thick-walled, hyaline, rarely branched, 2-4 Fm wide; tramal hyphae heavily encrusted at the dissepiments.

**Cystidia** absent; conspicuous hyphal pegs and small fusoid cystidiols present, the latter 9.5-16 x 3-5.5 Fm.

**Basidia** clavate, 12-15 x 4-5.5 Fm, with four sterigmata.

**Basidiospores** allantoid, 5-6.5 x 1-1.5 Fm.

**Substrata.** On dead wood of conifers, rarely on hardwoods.

**Distribution.** Widely distributed in coniferous forest regions of North America, Europe, and East Asia (Changbai in Northern China, Japan).

**Remarks.** *Skeletocutis subincarnata* may form white rhizomorphs between bark and wood under basidiocarps. It differs from *S. stellae* in having annual basidiocarps and slightly wider basidiospores.

#### ***Skeletocutis vulgaris* (Fr.) Niemelä & Dai**

Ann. Bot. Fennici 34:135, 1997. - *Polyporus vulgaris* Fr. Systema Mycol. 1:381, 1821.

dry, pores round and entire, 1-2(3) per mm, tubes concolorous, up to 1.5 cm long, non-stratified; context white to pale cream, the lower part up to 5 cm thick, upper part 1-3 cm thick, looser with a dominantly vertical fibre direction.

**Hyphal system** monomitic; generative hyphae with clamps, in the trama 2-4.5 Fm wide, in the context slightly thick-walled (rarely more than 0.5 Fm thick), with numerous, large conspicuous clamps, hyaline and intertwined, 4-9 Fm wide, in the pileus 3-7 Fm wide and with a dense and partly grainy protoplasm.

**Basidia** clavate, 25-30 x 7-9 Fm, with four sterigmata.

**Basidiospores** globose to broadly ellipsoid, 6-8.5 x 4.5-6 Fm.

**Substrata.** On living and dead hardwoods.

**Distribution.** East and Central North America, Europe, and Asia. In East Asia known from China, Japan (Honshu, Hokkaido), and Far East Russia.

**Remarks.** *Spongipellis spumeus* may be confused with *S. delectans* which, however, has lacerate and fimbriate dissepiments and often somewhat irregular pores, while those of *S. spumeus* are regular.

### STROMATOSCYPHA Donk

Reinwardtia 1:218, 1951.

Basidiocarps annual, resupinate; hymenium inside isolated papillae which open up to pores; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae present, dendrohyphidia present in the dissepiments; cystidia absent; basidiospores smooth, thin-walled, negative in Melzer's reagent. Monotypic cosmopolitan genus causing a white rot.

**Type species:** *Poria fimbriata* Pers.

**Remarks.** The genus belongs in Cyphellaceae Lotsy as its hymenium develops from hollow papillae that open up to pores. The genus is included here since it is easily mistaken for a polypore and has repeatedly been described as a *Poria* species, especially since it is dimitic with skeletal hyphae. An examination with a lens will however easily reveal the pore development where all stages from small papillae to fully open tubes can be found in the same basidiocarp.

### *Stromatoscypha fimbriata* (Pers.) Donk

Reinwardtia 1:219, 1951. - *Poria fimbriata* Pers., Mag. Bot. (Neues) 1:109, 1794.

**Basidiocarps** annual, resupinate, becoming widely effused, soft, readily separable, margin conspicuously rhizomorphic, often up to 2 or 3 cm wide, white to cream-coloured; pore surface ivory or cinereous, pores forming by the development of an apical pore in isolated papillae which later become crowded or confluent to form atypical tubes, circular to angular, 3-5 per mm in mature specimens, with thick dissepiments, tubes ivory to pale tan, distinct from the context, up to 0.5 mm long; context white to cream-coloured, soft-fibrous, azonate, up to 1 mm thick; taste mild.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, rarely branched, 2.5-3.5 Fm wide; skeletal hyphae only present in the context, hyaline,

plex consistency, and above all by the thick-walled, subglobose to ellipsoid, cyanophilous basidiospores.

### Key to species

1. Pores round to angular, regular ..... **S. spumeus**  
 1. Pores sinuous, becoming lacerate to fimbriate or hydroid ..... **S. delectans**

### **Spongipellis delectans** (Peck) Murrill

North Am. Flora 9:38, 1907. - *Polyporus delectans* Peck, Bull. Torrey Bot. Club 11:26, 1884.

**Basidiocarps** sessile or slightly effused, solitary or imbricate, dimidiate, applanate to unguulate, up to 7 x 15 x 4.5 cm; pilear surface white, discolouring to pale brownish and often streaked with light reddish brown after drying, azonate, tomentose to glabrous, margin concolorous; pore surface white when fresh, becoming pale buff to ochraceous, pores large, circular to angular, sometimes daedaleoid, 1-2 per mm, with thin dissepiments that soon become lacerate, tubes concolorous and continuous with the context, up to 1 cm long; context white to ochraceous, very faintly zonate, corky below, soft, spongy above, up to 2 cm thick.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled, occasionally branched, 4-7 Fm wide.

**Basidia** clavate, 20-30 x 7-9 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to subglobose, 7-9 x 5-7 Fm.

**Substrata.** On dead standing or fallen hardwoods, also causing a heartrot in living trees, particularly *Populus* spp.

**Distribution.** Temperate species known from Europe, North America, and from Nepal to East Asia (Heilongjiang to Guangxi in China, Okinawa in Japan, and Far East Russia).

**Remarks.** Basidiocarps of *S. delectans* resemble those of *Trametes cervina* but this species has cylindrical basidiospores and a trimitic hyphal system.

### **Spongipellis spumeus** (Sowerby:Fr.) Pat.

Ess. Tax. p.84, 1900. - *Boletus spumeus* Sowerby, Col. Fig. Brit. Fungi:211, 1799. - *Polyporus spumeus* Sowerby: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; pilear surface whitish to cream when fresh, pale straw-coloured to ochraceous when dry, finely hirsute to tomentose, in old specimens often scrupose, azonate, margin round and velutinate to almost glabrous; pore surface white when fresh, straw-coloured to ochraceous when

thin-walled, most easy to find in the dissepiments, but also present in the hymenium.

**Basidia** clavate 30-35 Fm long, with four sterigmata.

**Basidiospores** ovoid to amygdaliform, 5-7.5 x 4-5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Paleotropical species, known from subtropical Japan (Okinawa) and Taiwan, besides Sri Lanka, Malaysia, and Tanzania.

**Remarks.** The species is recognized by its very shallow pores and the dendrohyphidia.

### **TINCTOPORELLUS** Ryvar den

Trans. Br. Mycol. Soc. 73:18, 1979.

Basidiocarps perennial, resupinate, woody hard; pore surface brick-red, bluish grey to pale violet, pores angular, 7-9 per mm; hyphal system dimitic, generative hyphae with clamps; skeletal hyphae thick-walled, hyaline to light golden yellow, weakly dextrinoid; basidiospores ellipsoid to subglobose, smooth, hyaline and negative in Melzer's reagent, 4.5-5 x 2.5-3 Fm. Causes a white rot and reddens the substratum in zones. Tropical species on hardwoods.

**Type species:** *Polyporus epimiltinus* Berk. & Broome

**Remarks.** The genus is monotypic with the only species being common all over the tropics.

### **Tinctoporellus epimiltinus** (Berk. & Broome) Ryvar den

Trans. Br. Mycol. Soc. 73:18, 1979. - *Polyporus epimiltinus* Berk. & Broome, J.

Linn. Soc. 14:54, 1873.

**Basidiocarps** resupinate, adnate and widely effused to several meters, woody hard, up to 8 mm thick, distinctly delimited towards the wood which is coloured in red zones, margin lacking or very narrow, brick red or bluish white; pore surface beige, brick-red or bluish grey, with an ashy tint, pores angular to round, 7-9 per mm, almost invisible to the naked eye, in more mature and thicker basidiocarps a few larger and somewhat elongated, on sloping substrata the pores become split and more irregular, tubes up to 3 mm long, whitish inside due to a cover of excreted crystals and old tubes stuffed with white mycelium seen in dry specimens; context almost absent.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, 1.5-2.5 Fm wide, often difficult to find and apparently restricted to the thin subhymenium along the tubes; skeletal hyphae 2-4 Fm wide, hyaline to golden yellow, weakly dextrinoid, solid to semisolid.

**Basidia** clavate, 10-15 x 4-6 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to subglobose, 4.5-5.5 x 2.5-3 Fm.

**Substrata.** On dead standing and fallen hardwoods, mainly on very hard logs, in Kyushu (Japan) also found on *Chamaecyparis*.

**Distribution.** Pantropical, in Asia known from subtropical and warm-temperate China (Jiangxi), Japan (Okinawa and Kyushu), North Thailand, and Vietnam.

thick-walled, straight and flexuous, rarely branched, 1.5-2.5 Fm wide.

**Dendrohyphidia** common in the dissepiments, hyaline and thin-walled.

**Basidia** cylindrical to narrowly clavate, 20-30 x 5-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subellipsoid, 4.5-5 x 2-3 Fm.

**Substrata.** On dead conifers and hardwoods in numerous genera.

**Distribution.** Cosmopolitan species, in East Asia known from temperate Japan (Honshu and Kyushu), and Far East Russia.

**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 poroid fungi. The conspicuous rhizomorphs are also very characteristic.

### THELEPORUS Fr.

Kungl. Vet. Akad. Handl. 11:138, 1848.

Basidiocarps resupinate, adnate, irregularly poroid, light cream to ochraceous; pores 3-6 per mm, angular or often not completely closed, thus the hymenophore may appear semilabyrinthine, some pores with a papilla, hymenium only at the base of the tubes; hyphal system di-trimitic; generative hyphae with clamps; skeletal and binding hyphae hyaline to very pale yellowish, negative in Melzer's reagent; dendrohyphidia present; basidiospores broadly ellipsoid, thin-walled, smooth, negative in Melzer's reagent. On hardwoods. Tropical to subtropical genus.

**Type species:** *Theleporus cretaceus* Fr.

**Remarks.** The genus belongs in Corticiaceae as the hymenium is developed only at the base of the pores. The genus is close to *Grammothele* which however has dextrinoid vegetative hyphae.

### *Theleporus calcicolor* (Sacc. & Syd.) Ryvardeen

Trans. Br. Mycol. Soc. 73:12, 1979. - *Poria calcicolor* Sacc. & Syd., Syll. Fung. 14:192, 1899.

**Basidiocarps** annual, adnate, effused, up to 15 cm long and wide, 5 mm thick, margin white, finely fimbriate; pore surface white to pale cream, or pale buff in old specimens, pores in part irregular, angular, 5-7 per mm, up to 200 Fm deep, finely pruinose along the dissepiments which are uneven and incised in parts, hymenium restricted to the bases of the pores, distinctly whiter than the pore walls; subiculum very thin in the type, white to cream.

**Hyphal system** trimitic; generative hyphae with clamps, 2-3 Fm wide; skeletal hyphae hyaline, narrow, solid, 2-3 Fm wide, more or less parallel in the tube walls; binding hyphae present in the subiculum and the dissepiments, in the subiculum 1-15 Fm wide, sparingly branched and difficult to tease apart, they may represent upper part of branched arboriform hyphae, solid and with fairly short tapering branches, all vegetative hyphae negative in Melzer's reagent.

**Dendrohyphidia** present, difficult to find in older specimens, hyaline, delicately

- 5. Tropical to subtropical species, basidiospores 5-7 Fm long..... **T. menziesii**
- 5. Temperate species, basidiospores 4-5 Fm long..... **T. gibbosa**
  
- 6. Pileus glabrous, basidiospores allantoid, 4-5 x 1-1.5 Fm ..... **T. glabrata**
- 6. Pileus velutinate to tomentose, basidiospores cylindrical, 2-3 Fm wide..... 7
  
- 7. Basidiocarps thin and flexible, rarely above 3 mm thick, with a grey tomentum ..... **T. pocas**
- 7. Basidiocarps hard and rigid, up to 1.5 cm thick, with a cinnamon to brown tomentum..... **T. cervina**
  
- 8. Pileus hirsute to tomentose, context duplex, often with a black line between tomentum and context, at least close to the base..... 9
- 8. Pileus appressed velutinate and dull to semiglossy or soon becoming glabrous except for margin, context homogeneous although a cuticle may develop from the base with age..... 12
  
- 9. Pileus hirsute, white to grey, pore surface becoming grey with age..... **T. hirsuta**
- 9. Pileus tomentose to velutinate or radially strigose, pore surface white, yellowish or pale tan with age..... 10
  
- 10. Pileus azonate or with almost concolorous zones, finely tomentose or strigose with fine radial lines, pore surface becoming yellowish with age..... **T. pubescens**
- 10. Pileus usually strongly multizonate, often in different colours as tomentose and glabrous zones are alternating; pore surface white becoming pale tan with age..... 11
  
- 11. Basidiocarps smooth, thin and flexible, often with strongly contrasting colours, basidiospores 5-6 x 1.5-2 Fm ..... **T. versicolor**
- 11. Basidiocarps rigid to hard, pileus usually in brown shades, warted or ridged, basidiospores 6-8.5 x 2-2.5 Fm..... **T. ochracea**

**Remarks.** The species is usually easy to identify because it reddens the substrate. *Porogramme albocincta* also reddens the substrate, but this species has a bluish black pore surface. Although they have similar cultural characters, the two species are grossly different macroscopically and should be kept apart as pointed out by David & Rajchenberg (1985).

**TRAMETES** Fr.

Fl. Scand. p.339, 1835.

Basidiocarps annual to biennial, pileate, sessile, dimidiate to flabelliform, single or imbricate, flexible to hard; pilear surface hispid to glabrous, often zonate; pore surface white, cream to pale grey; context white to isabelline, homogeneous or duplex, in some species with a dark line; hyphal system trimitic; generative hyphae with clamps and hyaline; skeletal hyphae thick-walled to solid, hyaline, in some species swelling in KOH; binding hyphae tortuous, solid, hyaline; in many species arboriform hyphae are present instead of skeletal and binding hyphae; cystidia lacking; basidiospores ellipsoid to allantoid, hyaline, thin-walled and negative in Melzer's reagent. Causes a white rot in hardwoods, rarely on conifers. Cosmopolitan genus with many common and widespread species.

**Type species:** *Polyporus suaveolens* L.:Fr.

**Remarks.** The generic concept used here is mainly based on the pileate basidiocarps, the trimitic hyphal system, complete lack of cystidia or cystidiols, the thin-walled, negative in Melzer's reagent basidiospores, and their ability of producing white rot.

**Key to species**

1. Pores regular, 1-3 per mm, or lamellate, daedaloid, semilabyrinthine or lacerate to almost hydroid..... 2
1. Pores regular, 3-8 per mm, round to angular, more or less entire..... 8
2. Pores entire, circular to angular ..... 3
2. Pores radially elongated, lamellate, daedaloid, semilabyrinthine or lacerate to almost hydroid..... 4
3. Cold-temperate species, basidiocarps with anise odour, basidiospores 9-12 Fm long..... **T. suaveolens**
3. Tropical to warm-temperate species, basidiocarps without anise odour, basidiospores 4-7.5 Fm long..... **T. lactinea**
4. Hymenophore lamellate or with radially arranged pores..... 5
4. Hymenophore poroid to irpicoid..... 6

**Basidiocarps** annual, pileate, dimidiate to flabelliform, coriaceous when fresh, more rigid when dry, up to 3 cm wide, 5 cm long and 3 mm thick at the base, often preceded by cupulate, sterile structures up to 1.5 cm in diameter, partly separately on the substrate, partly at or around the base of the basidiocarp, both parts white or buff to pale yellowish tan, the cupulate structures becoming dark brown to black in zones; pilear surface zonate, glabrous or very finely velutinate, when dry often radially wrinkled or furrowed, margin thin and wavy; pore surface white to yellowish tan, pores angular, usually concentrically elongated, thin-walled, 2-4 per mm, tubes concolorous, up to 2 mm long; context white, up to 1 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, 2-4 Fm wide; skeletal hyphae hyaline, thick-walled, up to 8 Fm wide; binding hyphae tortuous, solid, up to 4 Fm wide in the main stems.

**Basidia** clavate, 10-15 x 4-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, 5-7 x 1.5-2.5 Fm.

**Substrata.** On dead branches of hardwoods, especially *Ulmus* and *Acer*.

**Distribution.** Temperate hardwood forest regions of China, Japan, Far East Russia, and East and Central North America to East Montana. A good example of the East Asia-Eastern North America disjunction.

**Remarks.** The species is easy to recognize in the field when the sterile cup-shaped structures are present as no other polypores have similar structures. Brodie (1951) showed these to be splash cups which disseminate oidia during rainy periods.

***Trametes gibbosa* (Pers.) Fr.**

Epicr. Mycol. p.492, 1838. - *Daedalea gibbosa* Pers., Syn. Fung. p.501, 1801.

**Basidiocarps** annual, pileate, applanate, sessile to dimidiate, usually semicircular in outline, up to 15 cm wide and long, 1-4 cm thick at the base, tough and coriaceous; pilear surface at first white, then cream to ochraceous or discoloured pale brown to olivaceous in spots and isolated areas, often greenish at the base due to algae, tomentose to glabrous zonewise, with age becoming glabrous, margin sharp; pore surface white to pale cream or straw-coloured in old specimens, pores distinctly radially elongated, angular with entire dissepiments, in parts splitting up with age and becoming partly sinuous, labyrinthine to lamellate, 1-2 per mm measured tangentially, 1-5 mm long measured radially, tubes concolorous with the pore surface, up to 2 cm long; context white, dense, tough-fibrous, azonate, up to 3 cm thick at the base.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, branched, 2-4 Fm wide; arboriform hyphae thick-walled to almost solid, hyaline, 4-9 Fm wide in the main axis, branches tortuous, thick-walled to solid, hyaline, 2-4 Fm wide.

**Cystidia** absent; fusoid cystidiols present, 13-19 x 4-5 Fm.

**Basidia** clavate, 14-18 x 3-5 Fm, with four sterigmata.

**Basidiospores** cylindrical to oblong ellipsoid, 4-5 x 2-2.5 Fm.

**Substrata.** Most common on dead *Fagus* spp., but also recorded from other hard-

12. Basidiocarps white, usually with sterile cup- to disc-shaped structures at the base ..... **T. conchifer**
12. Basidiocarps ochraceous to grey, never with sterile structures at the base..... 13
13. Temperate species, basidiospores 3-4 Fm wide ..... **T. ljubarskyii**
13. Tropical to subtropical species, basidiospores 1-2(2.5) Fm wide..... 14
14. Pileus pale pink or isabelline to cocoa-coloured, often with outgrowths from the base, context isabelline, reddish in KOH, but fading, pores 6-10 per mm, almost invisible to the naked eye ..... **T. modesta**
14. Pileus in different shades of grey, without outgrowths from the base, context white, becoming yellow with KOH, pores 2-6 per mm, radially arranged ..... **T. menziesii**

**Trametes cervina** (Schwein.) Bres.

Ann. Mycol. 1:81, 1903. - *Boletus cervinus* Schwein., Syn. Fung. Carol. p.70, 1822.

**Basidiocarps** annual, pileate to effused-reflexed or occasionally resupinate, up to 21 x 5 x 1.5 cm, often imbricate and laterally fused; pilear surface pinkish buff to cinnamon-buff, hirsute to strigose, faintly zonate to azonate; pore surface cinnamon-buff or becoming darker brown with age, pores irregular, up to 1 mm wide, dissepiments becoming thin and lacerate and hymenophore becoming daedaleoid or almost hydneous, tubes concolorous, continuous with the context, up to 1 cm long; context pale buff, azonate, up to 1 cm thick.

**Hyphal system** di-trimitic; generative hyphae with clamps, thin-walled, rarely branched, 2-4 Fm wide; skeletal hyphae thick-walled, with rare branching, 3-5.5 Fm wide.

**Basidia** clavate, 20-30 x 6-7 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 7-9(10) x 2.5-3 Fm.

**Substrata.** On dead wood of numerous hardwoods, rarely on conifers.

**Distribution.** Throughout the temperate forest regions of East America, Europe, and Asia (Hubei, Jiangxi, and Jilin in China, Japan, and Far East Russia).

**Remarks.** Basidiocarps of *T. cervina* are distinguished in the field by their pale tan colour and the large irregular pores that tend to split and form a hydneous hymenophore.

**Trametes conchifer** (Schwein.:Fr.) Pilát

Atlas Champ. Eur. 3:264, 1939. - *Polyporus conchifer* Schwein.:Fr., Elench. Fung. 1:96, 1828. - *Boletus conchifer* Schwein., Schr. Nat. Ges. Leipzig 1:98, 1822.

**Basidia** clavate, 15-22 x 5-7 Fm, with four sterigmata.

**Basidiospores** cylindrical, 6-9 x 2-2.5 Fm.

**Substrata.** On hardwoods, more rarely on conifers.

**Distribution.** Circumpolar in the boreal-temperate zone, in East Asia known from China, Japan, Taiwan, Far East Russia, North Thailand, and Vietnam.

**Remarks.** The grey, hirsute pilear surface and the greyish pore surface are characteristic of *T. hirsuta*. Basidiocarps of *T. versicolor* differ in being markedly more appressed velutinate and zonate, those of *T. ochracea* and *T. pubescens* have a brownish pileus.

**Trametes lactinea** (Berk.) Pat.

Essai Tax. p.92, 1900. - *Polyporus lactineus* Berk., Ann. Nat. Hist. 10:373, 1942. -

*Polystictus orientalis* Yasuda, Bot. Mag. Tokyo 32:135, 1918.

**Basidiocarps** annual to biannual, pileate, solitary to more rarely imbricate, dimidiate to semicircular, applanate, 1-15(28) cm broad and wide, 0.2-1.2 cm thick, consistency corky to woody hard when dry; pilear surface dull, first white to cream, becoming ochraceous to grey or tan, soft and velvety to touch, with age becoming warted or with irregular outgrowths especially near the base, mostly azonate, sometimes very slightly concentrically sulcate, somewhat radially striate, margin entire to weakly lobed, obtuse and relatively thick, concolorous or paler than the rest of the pilear surface, especially in old specimens; pore surface cream, ochraceous to pale fulvous, slightly darker and more grey than the pilear surface, sometimes discoloured when old, pores round to angular, mostly 1.5-2 per mm, but in some collections 3-4(5) per mm, dissepiments rather thick, entire, tubes concolorous with the context, usually not stratified, 1 cm long; context 1-2 cm thick, cream, ochraceous to pale fulvous, darker with KOH, soft, corky to woody hard, homogeneous with vague growth zones especially near the margin.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline and delicately thin-walled, 1-4 Fm wide, often collapsed and not easy to find in dried specimens; skeletal hyphae abundant, hyaline to pale yellow, thin-walled to almost solid, 3-8 Fm wide in the tubes, more golden and up to 10 Fm wide in the context; binding hyphae abundant, hyaline to pale yellow, thick-walled, 1-7 Fm wide, often with short, tapering branches.

**Basidia** subcylindrical to clavate, 12-15 x 3-4 Fm, with four sterigmata.

**Basidiospores** cylindrical, 5-7 x 2-2.5 mm.

**Substrata.** On several hardwood genera.

**Distribution.** Pantropical species, rare in Africa, more widespread in Asia from Pakistan to the Philippines and South to Australia, in East Asia known from temperate and subtropical China (Fujian, Guangxi, Guangdong), Japan (Okinawa), Taiwan, and North Thailand.

**Remarks.** The species is recognized by the velvety, azonate pileus, the thick basidiocarps and the relatively large pores. In Japan, a greyish form is known as *T.*

woods.

**Distribution.** Widespread from Europe through Asia to China, Japan, Taiwan, Far East Russia, and Vietnam. Not known from North America.

**Remarks.** The species is easy to recognize by the flat, white basidiocarps with radially elongated pores.

**Trametes glabrata** (Lloyd) Ryvarden

Mycotaxon 44: 130, 1992. - *Polystictus glabratus* Lloyd, Mycol. Writ. 5:626, 1917.

**Basidiocarps** annual, single to imbricate, usually gregarious, flabelliform to spatulate, up to 3 cm wide and long tapering to a narrow base, 1-4 mm thick, coriaceous when fresh, fragile when dry; pilear surface white when fresh, in the type ochraceous to wood-coloured, glabrous, faintly zonate and somewhat radially furrowed; pore surface concolorous, uneven and larger pores subdivided into smaller, thin-walled and angular, approximately 2-3 per mm, tubes becoming papery thin, up to 3 mm long, with fimbriate dissepiments; context thin, whitish, up to 3 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, 2-4 Fm wide; skeletal hyphae thick-walled to solid, hyaline, 3-5 Fm wide; binding hyphae solid, tortuous, 1-3 Fm wide.

**Basidia** inconspicuous, not seen.

**Basidiospores** allantoid, 4-5 x 1-1.5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Temperate species, only known from Japan.

**Remarks.** The whitish, flabelliform basidiocarps with angular pores should make this species easy to recognize in the field. It resembles old glabrous specimens of *Trichaptum bififormis*, which is easily separated microscopically by its abundant encrusted cystidia.

**Trametes hirsuta** (Fr.) Pilát

Atl. Champ. Europe 3:265, 1939. - *Polyporus hirsutus* Fr., Syst. Mycol. 1:367, 1821.

**Basidiocarps** annual, pileate, effused-reflexed or rarely resupinate, coriaceous when fresh, dimidiate, applanate; pilear surface whitish to grey, often covered with algae when old, hirsute, concentrically zonate; pore surface white to tan, becoming greyish when old, pores circular, (2)3-4 per mm, with thick, entire dissepiments that become thin with age, tubes concolorous with the lower context, up to 6 mm long; context duplex, the upper layer grey, 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 1.5 cm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 2.5-9 Fm wide; skeletal hyphae thick-walled, often sinuous, hyaline, with few branches, 3-7 Fm wide; binding hyphae thick-walled, much branched, 2-4 Fm wide.

**Cystidia** absent; fusoid cystidiols present, 12-18 x 3-5 Fm; hyphal pegs occasionally present.

mm, tubes concolorous with the pore surface, up to 4 mm long, dissepiments lacerate; context pure white and fairly dense when fresh, becoming ochraceous to very pale cinnamon-fulvous in old specimens, yellow to pale brown in contact with KOH, but the colour disappears after a few seconds.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled and 2-3 Fm wide; skeletal hyphae very common, hyaline, thick-walled to almost solid, 3-7 Fm wide, in old specimens often swelling strongly in 5% KOH and many then become up to 15 Fm wide; binding hyphae prominent and abundant both in context and trama, often with a fairly wide trunk up to 6 Fm wide, and numerous thin, tapering and solid branches which break easily in sections.

**Basidia** clavate, 15-18 x 4-5 Fm, with four sterigmata.

**Basidiospores** ellipsoid to cylindrical, 5-7 x 1-2 Fm, usually very difficult to find in dry specimens.

**Substrata.** On dead hardwoods of many kinds, often in open and dry localities.

**Distribution.** Paleotropical species extending southward to South Australia, also known from subtropical China (Guangxi, Guangdong), Japan (Okinawa), Taiwan, North Thailand, and Vietnam.

**Remarks.** The species is variable especially as to pore size. When typically developed, the substipitate basidiocarps with greyish, narrowly zonate pileus and radially arranged pores are distinct.

**Trametes modesta** (Fr.) Ryvardeen

Norw. J. Bot. 19:236, 1972. - *Polyporus modestus* Fr., Linnaea 5:519, 1830.

**Basidiocarps** annual, pileate, applanate to slightly concave, single or frequently imbricate or fused laterally, 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 when fresh or dry; pilear surface variable with age and development, pale pinkish brown to buff with pink shades or café au lait, becoming paler tan to pale brown, first finely velutinate and soft to glabrous and then dull, very finely concentrically zonate, usually more radially wrinkled with spots or streaks, sometimes becoming whitish, azonate, frequently covered with irregular, pale ochraceous outgrowths spreading from the base, lacking in many specimens; pore surface pale pinkish-beige, to buff, 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 long; context whitish to pink, 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 with clamps, thin-walled, hyaline, 2-4 Fm wide; skeletal hyphae unbranched, pale pink to yellow, thick-walled, but usually with a distinct lumen, 2-5 Fm wide; binding hyphae scarce in the context, sparingly branched, more common and more densely branched in the dissepiments, thick-

*orientalis* (Hattori & Ryvarden 1994).

**Trametes ljubarskyii** Pilát

Bull. Soc. Mycol. Fr. 52:309, 1936.

**Basidiocarps** annual to biennial, effused-reflexed to pileate, single or imbricate, dimidiate, up to 15 cm long, 8 cm wide and 3 cm thick at the base; pilear surface at first whitish, soon ochraceous to pale greyish brown in spots or smaller areas, at first velutinate, soon becoming glabrous and dull, azonate; margin obtuse and pale grey; pore surface white to pale ochraceous, pores circular to angular, 3-4 per mm, dissepiments thin, becoming slightly lacerate, tubes concolorous with the pore surface, indistinctly stratified, up to 2 cm long; context white to pale cream, tough-fibrous, usually concentrically zonate.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, 1.5-3 Fm wide; skeletal hyphae hyaline, thick-walled, 3-7 Fm wide; binding hyphae present in the context, tortuous, hyaline, thick-walled to solid, 1.5-3 Fm wide.

**Cystidia** absent; fusoid cystidiols present, 15-20 x 6-8 Fm.

**Basidia** clavate, 17-22 x 8-10 Fm, with four sterigmata.

**Basidiospores** cylindrical to oblong-ellipsoid, 5-6 x 3-4 Fm.

**Substrata.** Usually on hardwoods, once also found on *Pinus* (Pieri & Rivoire 1993).

**Distribution.** Warm-temperate Europe and Asia (Far East Russia, China, and North Thailand).

**Remarks.** This species may be overlooked or confused with the white *Fomitopsis*, spp. although the relatively short and wide basidiospores of *T. ljubarskyii* are unknown in *Fomitopsis*. Besides, *T. ljubarskii* produces a white rot.

**Trametes menziezii** (Berk.) Ryvarden

Norw. J. Bot. 19:236, 1972. - *Polyporus menziezii* Berk., Ann. Nat. Hist. 10:378, 1843.

**Basidiocarps** annual, very variable in size, pileate, single or imbricate to gregarious, applanate, substipitate, dimidiate to flabelliform or spatulate, almost circular when the lobes behind partly meet over the point of attachment, up to 15 cm wide and long, 3-8 mm thick, flexible and tough when fresh, hard when old in thicker specimens, margin thin and acute, strongly lobed, usually deflexed in dry specimens; pilear surface first white to ochraceous, in most cases becoming greyish in different shades, darker towards the base, first appressed velvety, usually soon becoming glabrous, normally with numerous, narrow, 1-3 mm wide concentric zones, smooth or slightly sulcate, wrinkled radially when dry, in some specimens with an outgrowth from the base, normally paler than the pileus; stipe or contracted base often distinct with a 2-1 cm long sterile area between the pore layer and the substrate, white to deep grey; pore surface first white becoming cream coloured to pale tan when dry, in old and weathered specimens more deep ochraceous, pores variable, partly entire, round and small, 6-7 per mm, but usually larger, round to angular and from 2-6 per

tubes shallow, up to 1 mm long; context white and thin, with a black line towards the tomentum.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, thin-walled, 1-3 Fm wide; skeletal hyphae hyaline, thick-walled to solid, 2-7 Fm wide, up to 10 Fm wide in the context; binding hyphae tortuous, solid, hyaline, common, 1-4 Fm wide.

**Cystidia** absent; hyphal pegs normally present.

**Basidia** clavate, 10-15 x 4-6 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid, 4-5.5 x 2.5-3 Fm.

**Substrata.** On hardwoods.

**Distribution.** Paleotropical species, in East Asia extending to subtropical to warm-temperate China, Japan, Taiwan, and Far East Russia.

**Remarks.** Usually easy to recognize because of the thin, pliable basidiocarps with a hirsute pileus and the broadly ellipsoid basidiospores.

**Trametes pubescens** (Schumach.:Fr.) Pilát

Atl. Champ. Europ. 3:268, 1939. - *Polyporus pubescens* Schumach.:Fr., Syst. Mycol. 1:367, 1821. - *Boletus pubescens* Schumach., Enumer. Plant Saell. 2:384, 1803.

**Basidiocarps** annual, pileate or effused-reflexed, up to 6 cm wide, dimidiate, often imbricate, flat to triquetrous, coriaceous; pilear surface cream-coloured to warm buff, tomentose to finely pubescent or almost glabrous, azonate or faintly zonate; pore surface cream to pale straw-coloured, pores angular, 3-5 per mm, dissepiments becoming thin, tubes cream-coloured to pale buff, up to 4 mm long; context white to cream, tough-fibrous, azonate, up to 5 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 2-4 Fm wide; skeletal hyphae thick-walled, hyaline, with occasional branching, 5-10 Fm wide; binding hyphae thick-walled, much branched, 1.5-4 Fm wide.

**Cystidia** absent; fusoid cystidiols present, 15-19 x 4-5 Fm; hyphal pegs usually present.

**Basidia** clavate, 14-22 x 4.5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly allantoid, 5-7 x 2-2.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Circumpolar in the boreal-temperate zone, in East Asia known from China, Japan, Far East Russia, and Taiwan.

**Remarks.** The uniformly cream to buff, azonate and tomentose pileus, and straw-coloured pore surface distinguish basidiocarps of *T. pubescens* from those of other species in the so-called *Coriolus* group. The microscopic characters of all these are virtually identical. Basidiocarps of *T. pubescens* are very rapidly eaten by insects and collections should be put in a deep freezer or fumigated immediately after collecting.

**Trametes suaveolens** L.:Fr.

Epicr. Syst. Mycol. p.491, 1838. - *Polyporus suaveolens* L.:Fr., Syst. Mycol. 1:366, 1821. - *Boletus suaveolens* L., Sp. Plant. p.1177, 1753.

walled to solid, 2-3 Fm wide.

**Basidia** clavate, 10-15 x 3-5 Fm, with four sterigmata.

**Basidiospores** cylindrical, 4.5-6 x 1.5-2(2.5) Fm.

**Substrata.** Dead hardwoods of many genera.

**Distribution.** Pantropical, in Asia known from China (Guangxi), Japan (Okinawa), Taiwan, Vietnam, and North Thailand.

**Remarks.** Specimens of *T. modesta* may be confused with those of *Fomitopsis feeii* which however have a more distinct pink colour and cause a brown rot. Besides, the pileus of the latter species is almost azonate.

**Trametes ochracea** (Pers.) Gilb. & Ryvardeen

North Am. Polypores 2:752, 1987. - *Boletus ochraceus* Pers., Ann. Bot. (Usteri) 11:29, 1794.

**Basidiocarps** annual or biennial, pileate or effused-reflexed, dimidiate to elongated, tough-fibrous; pilear surface vinous-buff to avellaneous with zones of reddish brown (ferruginous) or pale buff with faint darker zones, finely tomentose to almost glabrous, smooth, warted or ridged; pore surface cream-coloured to cinereous, pores circular, 3-4 per mm, with thick dissepiments, tubes concolorous and continuous with the context, up to 4 mm long; context cream-coloured, tough-fibrous, azonate, up to 5 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, 2-3.5 Fm wide; skeletal hyphae thick-walled, hyaline, 4-8 Fm wide; binding hyphae thick-walled, much branched, 2.5-5 Fm wide.

**Basidia** clavate, 12-15 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 6-7 x 2-2.5 Fm.

**Substrata.** On dead hardwoods, rarely on conifers like *Picea* and *Pinus*.

**Distribution.** Circumpolar species, in East Asia known from temperate China, Japan, and Far East Russia.

**Remarks.** Basidiocarps of *T. ochracea* are usually much paler in colour 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 a yellowish pore surface and an azonate or very faintly zonate pilear surface.

**Trametes pocas** (Berk.) Ryvardeen

Mycotaxon 20: 351, 1984. - *Polyporus pocas* Berk., J. Linn. Soc., Bot. 16:51, 1878.

**Basidiocarps** annual to biennial, pileate, dimidiate to flabelliform, more rarely effused-reflexed, often fused laterally to form compound basidiocarps, flexible, up to 5 cm wide and long, up to 1 mm thick at the base, margin thin, undulated to lobed, often curled in dry specimens; pilear surface white, grey to unevenly pale to dirty brown, frequently greenish because of algae, strigose to hirsute, coarsely towards the base, distinctly zonate with persistent tomentum; pore surface white to cream, pores angular, thin-walled, 1-3 per mm, the larger ones with incomplete tube walls,

Basidiocarps annual, stipitate to mostly resupinate, soft and fragile, loosely attached; hymenial surface smooth to hydneous or poroid; hyphal system monomitic in most species; generative hyphae with clamps, commonly with ampullate septa; cystidia present or absent; basidiospores globose to ellipsoid, smooth or ornamented with spines or warts, negative in Melzer's reagent. Associated with white rots.

**Type species:** *Trechispora onusta* P. Karst. = *T. hymenocystis* (Berk. & Br.) K.H. Larsson

**Remarks.** *Trechispora* is a large genus in the family Corticiaceae and most species have a smooth to hydneous hymenial surface. Four poroid species, all resupinate, are known from East Asia.

### Key to species

1. Encrusted cystidia present in the hymenium..... **T. regularis**
1. Cystidia absent from hymenium..... 2
2. Subicular hyphae slightly thick-walled, 2-3 Fm wide, with numerous bipyramidic crystals, some hyphae rough..... **T. mollusca**
2. Subicular hyphae thin-walled, 2-6 Fm wide, crystals different, no rough hyphae..... 3
3. Subiculum with large, globose vesicles and rhomboidal crystal plates, dry specimens yellow to dull pinkish ..... **T. hymenocystis**
3. Subiculum without vesicles but hyphae often inflated, crystals as numerous rodlets, single or grouped, dry specimens remaining whitish or becoming only slightly yellowish ..... **T. candidissima**

***Trechispora candidissima*** (Schwein.) Bondartsev & Singer

Ann. Mycol. 39:48, 1941. - *Polyporus candidissimus* Schwein., Amer. Phil. Soc. Trans. 2(4):159, 1832.

**Basidiocarps** annual, resupinate, effused, soft and fragile, easily separable from the substratum, margin white, thinning out or byssoid with short rhizomorphs; pore surface white to cream-coloured, pores angular, 2-3 per mm, with age becoming irregular, dissepiments often lacerate, tubes up to 2 mm long; subiculum white contrasting with the pore surface, up to 2 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, up to 3 Fm wide, with ampullate septa up to 10 Fm wide in the rhizomorphs, in the subiculum frequently branched, broad and inflated to 10 Fm wide, encrusted with aggregates of

**Basidiocarps** annual, pileate, with a pleasant anise odour when fresh, usually solitary, dimidiate or elongate, up to 14 cm wide; pilear surface cream-coloured to buff, finely tomentose to glabrous, azonate, smooth, margin rounded; pore surface cream-coloured to pale buff, pores circular to angular, 2-3 per mm, dissepiments thick and entire, tubes concolorous with or slightly darker than the context, up to 1 cm long; context white to cream-coloured, soft-corky, zonate, up to 3.5 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 3-5 Fm wide; arboriform hyphae thick-walled, hyaline, main axis 4-8 Fm wide, with abundant branching at the apex, branches 2.5-5 Fm wide.

**Basidia** clavate, 22-30 x 6-7 Fm, with four sterigmata.

**Basidiospores** cylindrical, 8-12 x 4-4.5 Fm.

**Substrata.** On hardwoods, especially on *Salix* spp..

**Distribution.** Circumpolar in the temperate zone, in East Asia known from cold-temperate China, Japan, Taiwan, and Far East Russia.

**Remarks.** The pleasant anise odour of fresh basidiocarps is very characteristic of this fungus. The relatively large basidiospores also provide a reliable character for identification.

**Trametes versicolor** (L.:Fr.) Pilát

Atl. Champ. Eur. 3:261, 1936. - *Boletus versicolor* L., Sp. Plant.: 1176, 1753 - *Polyporus versicolor* L.:Fr., Syst. Mycol. 1:368, 1821.

**Basidiocarps** annual, pileate or effused-reflexed, dimidiate, often imbricate; pilear surface highly variable in colour, with sharply contrasted concentric zones of various shades of brown, buff, reddish brown, bluish or rarely almost white, velutinate to tomentose; pore surface cream-coloured to cinereous, pores angular to circular, 4-5 per mm, dissepiments thick, tubes concolorous and continuous with the context, up to 3 mm long; context cream-coloured, tough-fibrous, with a thin black layer below the surface tomentum, up to 5 mm thick.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, 2.5-3 Fm wide; skeletal hyphae hyaline, thick-walled, 4-6 Fm wide; binding hyphae hyaline, thick-walled, much branched, 2-4 Fm wide.

**Basidia** clavate, 15-20 x 4-5 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 5-6 x 1.5-2 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Cosmopolitan species, most common in temperate areas.

**Remarks.** Basidiocarps of *T. versicolor* are extremely variable in the colour and surface characters, other characters of the pilear surface, but all have thin, zonate basidiocarps with the same pore size. Completely white specimens growing in deep shades have often been called *Polyporus velutinus* Pers.:Fr.

**TRECHISPORA** P. Karst.

Taxon 15:318, 1966.

context, soft and fragile, up to 2 mm long; context white, azonate, soft, less than 0.5 mm thick; taste mild.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, hyaline, often ampullate and encrusted with bipyramidic crystals, frequently branched, 2.5-5 Fm wide.

**Basidia** short-cylindrical, 14 x 4.5-5.5 Fm, with four sterigmata.

**Basidiospores** ovoid to subglobose, echinulate, 3.5-4.5 x 2.5-3.5 Fm.

**Substrata.** On dead hardwoods and conifers.

**Distribution.** Cosmopolitan species, in East Asia known from areas of China with maritime influence (Hebei, Fujian, Jiangxi), Japan (Hokkaido), and Far East Russia (Kamschatka, Primorsk).

**Remarks.** *Trechispora mollusca* is separated from *T. regularis* by its lack of cystidia.

### **Trechispora regularis** (Murrill) Liberta

Can. J. Bot. 51:1878, 1973. - *Poria regularis* Murrill, Mycologia 12:87. 1920.

**Basidiocarps** annual, resupinate, effused up to several cm, soft and fragile, easily separated from the substratum; pore surface white to cream-coloured, 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, slender rhizomorphs; tubes white to cream-coloured, soft and fragile, up to 2 mm long; subiculum soft, arachnoid, very thin.

**Hyphal system** monomitic; subicular hyphae with abundant clamps and some simple septa, thin-walled, hyaline, with frequent branching, often ampullate at the septa, 2-6 Fm wide.

**Cystidia** abundant, cylindrical, thin-walled, heavily encrusted with elongated crystals, 40-60 x 4-6 Fm.

**Basidia** broadly clavate, 12-14 x 5-6 Fm, with four sterigmata.

**Basidiospores** subglobose to ovoid, echinulate, 4-4.5 x 3-3.5 Fm.

**Substrata.** On dead hardwoods, quite common on *Quercus* spp.

**Distribution.** Tropical and subtropical America, in East Asia known from Japan.

**Remarks.** *Trechispora regularis* is quite similar to *T. mollusca* but is readily recognized by the conspicuous encrusted cystidia.

### **TRICHAPTUM** Murrill

Bull. Torrey Bot. Club 31:608, 1904.

Basidiocarps annual, resupinate, effused-reflexed or pileate; pilear surface blackish, grey or dirty white, hispid to appressed tomentose; hymenophore irpicoid, 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 di- to trimitic; generative hyphae with clamps; skeletal hyphae hyaline to pale brown, dominant; binding hyphae rarely present, apparently absent or at

rod-like crystals, subhymenium usually as a layer of short hyphae up to 4 Fm wide branching at straight angles.

**Basidia** cylindrical, often with a median constriction, 10-12 x 5-6 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid, ornamented, 4.5-5.5 x 3.5-4.5 Fm.

**Substrata.** On much decayed conifers and hardwoods.

**Distribution.** Circumpolar, but rare. In East Asia known from Northern China (Changbai).

**Remarks.** The aggregates of crystals on the subicular hyphae is a good character to separate this species from *T. hymenocystis*, which besides has a yellow to dull pinkish pore surface.

**Trechispora hymenocystis** (Berk. & Broome) K.H. Larss.

Mycol. Res. 98:1167, 1994. - *Polyporus hymenocystis* Berk. & Broome, Ann. Mag. Nat. Hist. 5:210, 1879.

**Basidiocarps** annual, resupinate, effused, soft and fragile, readily separable, margin white, abrupt, thin, or with thin rhizomorphs; pore surface at first white, on drying or with age cream to pale pink, pores circular to angular, 2-3 per mm, with thin dissepiments that become lacerate with age, tubes continuous and concolorous with the context, soft and fragile, up to 1 mm long; subiculum white, azonate, soft, less than 0.5 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, hyaline, often ampullate and irregularly encrusted, frequently branched, 1.5-5 Fm wide, in the subiculum forming large, thin-walled sphaerocysts from side branches, these up to 40 Fm wide; hyphae of the rhizomorphs up to 6 Fm wide, with frequent ampullaceous septa, up to 9 Fm wide, and small rhomboid crystals.

**Basidia** short-cylindrical, often with a slight median constriction, 12-15 x 5 Fm, with four sterigmata.

**Basidiospores** ovoid to subglobose, densely echinulate, 4.5-5.5 x 3.5-4.5 Fm.

**Substrata.** On dead conifers and hardwoods.

**Distribution.** Continental species in Europe and North America. Recently cited for Northern China (Changbai) by Dai (1996).

**Remarks.** The species has a continental distribution, while *T. mollusca* occurs mainly in coastal areas (Larsson 1996).

**Trechispora mollusca** (Pers.:Fr.) Liberta

Can. J. Bot. 51:1878, 1973. - *Polyporus molluscus* Pers.:Fr., Syst. Mycol. 1:384, 1821. - *Boletus molluscus* Pers., Syn. Fung. p.547, 1801.

**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-coloured, pores angular, 2-4 per mm, with thin, floccose dissepiments that become lacerate with age, tubes continuous and concolorous with the

6. Pores angular, 1-3 per mm..... **T. byssogenum**
6. Pores angular to round, 3-6 per mm..... 7
7. Pore surface grey, pores 8-10 per mm, tropical species..... **T. durum**
7. Pore surface ochraceous to violet, pores 3-6 per mm, temperate species..... **T. abietinum**

**Trichaptum abietinum** (Dicks.: Fr.) Ryvarden

Norw. J. Bot. 19:237, 1972. - *Boletus abietinus* Dicks., Plant Crypt. Brit. 3:21, 1793. - *Polyporus abietinus* Dicks.:Fr., Syst. Mycol. 1:370, 1821.

**Basidiocarps** annual, usually effused-reflexed, sometimes pileate or resupinate, solitary or more commonly imbricate, often laterally fused, up to 8 cm long, 1.5 cm broad and up to 2 mm thick; pilear surface grey, hirsute, azonate, smooth, margin concolorous; pore surface bright purplish, fading to ochraceous, rough, pores angular, 4-6 per mm, with thick, entire dissepiments that become thin and deeply lacerate with age, tubes concolorous and continuous with the lower layer of the context, up to 1.5 mm long; context usually less than 1 cm thick, duplex, upper layer whitish, floccose, soft, lower layer white, firm, tough-fibrous.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 2-4 Fm wide; skeletal hyphae thick-walled, hyaline, with rare branching, 2.5-5 Fm wide.

**Cystidia** abundant, broadly clavate, usually apically encrusted, embedded or projecting, 15 x 4-7 Fm, arising from embedded tramal skeletal hyphae that bend into the hymenium; hyphal pegs also present.

**Basidia** clavate, 12.5-14 x 5-6 Fm, with four sterigmata.

**Basidiospores** cylindrical, slightly allantoid, 6-7.5 x 2.5-3 Fm.

**Substrata.** On dead sapwood of conifers, occasionally on hardwoods.

**Distribution.** Circumpolar throughout the coniferous forest regions. In East Asia known from China, Japan, Far East Russia, Taiwan, and Vietnam.

**Remarks.** The species is a pioneer in newly fallen logs. Raestad (1940) and Macrae (1967) proved that this species and the similar but hydroid *T. fuscoviolaceum* are intersterile.

**Trichaptum biforme** (Fr.) Ryvarden

Nor. J. Bot. 19:237, 1972. - *Polyporus biformis* Fr. in Klotzsch, Linnaea 8:486, 1833.

**Basidiocarps** annual, pileate, solitary or imbricate, dimidiate to flabelliform or petaloid, up to 6 cm wide and 3 mm thick; pilear surface grey to buff, in tropical specimens usually cream-coloured, hirsute to glabrous with age, zonate, margin acute;

least very difficult to demonstrate; cystidia present in the hymenium, thin-to thick-walled, subulate to clavate, smooth or apically encrusted; basidiospores cylindrical, often slightly allantoid, smooth, hyaline, negative in Melzer's reagent. Cosmopolitan genus on conifers and hardwoods, causing a white rot.

**Type species:** *Polyporus trichomallus* Berk. & Mont. = *Trichaptum perrottetii* (Lév.) Ryvarden, 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 basidiospores and the cystidia are diagnostic. The parentheses in the dolipore apparatus is imperforate (Traquair & McKeen 1978, Moore 1985, Rajchenberg & Bianchotti 1992), an uncommon character in Polyporaceae s. str. Apparently all *Trichaptum* species cause a similar fragile, lacy white pocket rot.

### Key to species

1. Hymenophore lamellate to distinctly hydroid..... 2
1. Hymenophore poroid, sometimes with lacerate dissepiments..... 6
  
2. Hymenophore lamellate..... **T. laricinum**
2. Hymenophore hydroid to irpicoid..... 3
  
3. Gelatinous layer present between tubes and context, basidiocarps pileate to resupinate..... 4
3. Gelatinous layer absent between tubes and context, basidiocarps petaloid, flabelliform to dimidiate ..... **T. biformis**
  
4. Basidiocarps resupinate, hymenophore ochraceous to pale brown with a pinkish tint, Japanese species ..... **T. parvulus**
4. Basidiocarps resupinate, effused-reflexed or flabelliform, hymenophore purplish becoming brown to almost black ..... 5
  
5. Basidiocarps flabelliform to dimidiate, hymenophore deep grey to almost black with age, on *Quercus* ..... **T. quercinum**
5. Basidiocarps resupinate to effused reflexed, hymenophore brown with age, on conifers..... **T. fuscoviolaecum**

Genootsch. 17:62, 1838.

**Basidiocarps** annual to perennial, usually rather small, solitary or imbricate, applanate to triquetrous, mostly dimidiate with a contracted base, more rarely broadly attached on a decurrent pore surface, up to 8 cm long and 6 cm wide, 2 cm thick at the base, woody hard; pilear surface first finely tomentose and then pale brownish to dirty greyish, soon more glabrous and then dingy greyish to almost blackish, tuberculate or warted, mostly azonate, margin rather acute; pore surface umbrinus to dark bluish-grey, pores round and entire, almost invisible to the naked eye, 8-10 per mm, tubes up to 5 mm long, dark umbrinus or almost blackish, indistinctly stratified, tubes often with a white lining of a hymenium, more or less collapsed in dry specimens; context bony hard, umber to greyish, up to 1 cm thick.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline and thin-walled, often difficult to find, 2-4 Fm wide; skeletal hyphae pale yellowish to fuscous or fuliginous, thick-walled to almost solid, 4-10 Fm wide.

**Cystidia** present in the hymenium, fusoid, with an apical encrustation, thick-walled, up to 15-17 x 4-6 Fm.

**Basidia** clavate, 12-14 x 5-6 Fm.

**Basidiospores** broadly ellipsoid, 3.5-4.5 x 2-2.5 Fm.

**Substrata.** On dead, often very hard wood.

**Distribution.** Paleotropical species, widespread from Western Africa to The Philippines and Australia, in East Asia known from subtropical China, Japan (Okinawa), Taiwan, North Thailand, and Vietnam.

**Remarks.** The species is in most cases easy to recognize in the field because of the often warted or tuberculate pileus in greyish-blue to umber or blackish colours, a very hard consistency and almost invisible pores.

**Trichaptum fuscoviolaceum** (Fr.) Ryvarden

Norw. J. Bot. 19:237, 1972. - *Hydnum fuscoviolaceus* Fr., Syst. Mycol. 1:421, 1821.

**Basidiocarps** annual, usually effused-reflexed, rarely pileate or resupinate, single or imbricate, often laterally fused, up to 1.5 x 8 x 0.3 cm; pilear surface white to grey, tomentose to slightly hirsute, azonate, margin white to pale brown; hymenophore with radially elongated, short lamellae, with irregular pores along the margin before 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 colour and consistency as the tubes, and a white, dense, cottony upper layer integrating with the tomentum above.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, hyaline, rarely branched, 2-4 Fm wide; skeletal hyphae thick-walled, hyaline, with rare branching, 2.5-5 Fm wide.

**Cystidia** abundant, thick-walled, usually apically encrusted, embedded or projecting to 15 x 7 Fm, arising from tramal skeletal hyphae that bend into the hymenium;

pore surface purple to violaceous or fading to pale buff, often becoming ipiricoid, pores angular, 3-5 per mm, dissepiments thin and lacerate or splitting to form spines, tubes violaceous or concolorous with the context, up to 2 mm long; context pale buff, azonate, tough-fibrous, up to 1.5 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, occasionally branched, 2.5-6 Fm wide; skeletal hyphae hyaline, thick-walled, rarely branched, 3-6 Fm wide.

**Cystidia** abundant, slightly thick-walled, fusoid, apically encrusted, 20-35 x 3-5 Fm and projecting to 20 Fm.

**Basidia** clavate, 12-22 x 4-5.5 Fm.

**Basidiospores** cylindrical, slightly allantoid, 6-8 x 2-2.5 Fm.

**Substrata.** On dead hardwoods in many genera.

**Distribution.** Cosmopolitan species, in East Asia known from China, Japan, Taiwan, Far East Russia, North Thailand, and Vietnam.

**Remarks.** Tropical specimens seem to be more white than temperate ones, usually without a violet tint in the pore surface.

**Trichaptum byssogenum** (Jungh.) Ryvardeen

Norw. J. Bot. 19:237, 1972. - *Polyporus byssogenus* Jungh., Verh. Botav. Genootsch. 17:43, 1838.

**Basidiocarps** annual, resupinate to effused-reflexed or pileate; pilear surface grey-brownish, finally greyish-tan, hispid, strigose or matted-tomentose with a chestnut brown tomentum which wears away in parts; pore surface purplish when fresh, dull purplish brown on age and drying, pores circular to angular, 1-2 per mm, with thick, entire dissepiments that become thin and lacerate, tubes sharply distinct from the context, pale wood brown, rarely two-layered, up to 1 cm long; context pale wood-brown, soft, spongy and fibrous, up to 3 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin- to thick-walled in the context, 2-3.5 Fm wide; skeletal hyphae hyaline, thick-walled, with rare branching, 2-4 Fm wide.

**Cystidia** abundant, fusoid, thin- to moderately thick-walled, apically encrusted, 15-35 x 3-6 Fm.

**Basidia** clavate, 14-17 x 5-6 Fm.

**Basidiospores** cylindrical, slightly allantoid, 5.5-8 x 2-2.5 Fm.

**Substrata.** On conifers and hardwoods.

**Distribution.** Pantropical species, in East Asia extending to subtropical to warm-temperate areas in China, Japan, Taiwan, North Thailand, and Vietnam.

**Remarks.** The brown basidiocarps with large pores, and the abundant encrusted cystidia characterize *T. byssogenum*.

**Trichaptum durum** (Jungh.) Corner

Beih. Nova Hedwigia 86:219, 1987. - *Polyporus durus* Jungh., Verh. Batav.

encrusted, 10-15 x 4-6 Fm, mostly hymenial, others as skeletal hyphae with apical encrustation that bend into the hymenium.

**Basidia** clavate, 10-14 x 4 Fm, with four sterigmata.

**Basidiospores** ellipsoid, 6-7 x 3 Fm.

**Substrata.** On hardwoods, the type was collected on *Lespedeza burgeri*.

**Distribution.** Only known from Japan.

**Remarks.** Maas Geesteranus (1974) has commented upon the status of this species and pointed out the resemblance of *Steccherinum*. As in Corticiaceae s.l., the hymenium covers the whole spines in this species. However, the irregular hymenophore with pinkish-violet tints together with the numerous ventricose, apically encrusted cystidia point towards *Trichaptum*.

**Trichaptum quercinum** (Parmasto) Dai

Fung. Sci. 11:100, 1996. - *Hirschioporus quercinus* Parmasto, Bibl. Mycol. 115: 137, 1987.

**Basidiocarps** annual, pileate, solitary or imbricate, dimidiate to flabelliform or petaloid, up to 4 cm wide and 3 mm thick; flexible to tough, pileus grey to buff, becoming almost whitish in older specimens, hirsute to glabrous with age, zonate, margin acute; hymenophore first poroid and then about 3 per mm, soon irpicoid to almost hydroid, purple to pale violaceous in fresh specimens, fading to grey or almost black with age, tubes or spines concolorous with the context, up to 2 mm long; context pale buff, azonate, tough-fibrous, up to 1 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, thin-walled, occasionally branched, 2.5-6 Fm wide; skeletal hyphae hyaline, thick-walled, rarely branched, 3-6 Fm wide.

**Cystidia** abundant, thick-walled, capitate, smooth or apically encrusted, 20-30 x 3-5 Fm and projecting to 10 Fm.

**Basidia** clavate, 12-20 x 4-5.5 Fm.

**Basidiospores** cylindrical, slightly allantoid, 4.5-6 x 1.4 - 2.2 Fm.

**Substrata.** On dead *Quercus*.

**Distribution.** Known only from Northern China (Dai op cit.) and adjacent areas of Russia.

**Remarks.** This species is undoubtedly related to *T. biforme*, but has in general smaller basidiocarp and its hymenophore are darker and distinctly more split to spines with irregular teeth than in the latter species. *T. quercinus* also has a resinous cuticle between context and tubes lacking in *T. biformis*.

Parmasto in his original description indicate the basidiospores to be shorter than those of *T. biforme*, while Dai (op cit) states them to be equal. Spore prints are necessary to settle this point.

**TYROMYCES** P. Karst.

Rev. Mycol. 3(9):17, 1881.

hyphal pegs also present.

**Basidia** clavate, 12.5-14 x 5-6 Fm.

**Basidiospores** cylindrical, slightly allantoid, 6-7.5 x 2.5-3 Fm.

**Substrata.** On dead conifers like *Pinus* and *Abies*.

**Distribution.** Circumpolar in the temperate zone, in East Asia known from China, Japan (Okinawa to Honshu), and Far East Russia.

**Remarks.** This species is separated from *T. abietinum* only by the hydroid hymenophore. See remarks under the latter species.

**Trichaptum laricinum** (P. Karst.) Ryvar den

Norw. J. Bot. 19:237, 1972. - *Lenzites lacrinus* P. Karst., Acta Soc. Fl. F. Fenn. 27:4, 1905.

**Basidiocarps** annual, pileate, effused-reflexed or resupinate, mostly imbricate, thin but rigid; pilear surface tan to grey, hirsute, faintly zonate; hymenophore purplish, brown in dried specimens, with distinct radial lamellae, sometimes poroid near the margin, lamellae up to 3 mm long in vertical sections; context pale purplish-brown, coriaceous, less than 1 mm thick, continuous with the trama.

**Hyphal system** dimitic; generative hyphae with clamps, thin- to thick-walled, rather inconspicuous in mature specimens, 2-4 Fm wide; skeletal hyphae hyaline to light brown, thick-walled, with rare branching, 3-5 Fm wide.

**Cystidia** abundant, thick-walled, apically encrusted, broadly fusoid, 4-6 Fm wide and embedded or projecting to 10 Fm.

**Basidia** clavate, 18-20 x 4-5 Fm.

**Basidiospores** allantoid, 6-7 x 2-2.5 Fm.

**Substrata.** On dead conifers, mostly on *Pinus*.

**Distribution.** Widely distributed in boreal conifer forests, in East Asia known from China (Jilin, Xizang), Japan, Korea, and Far East Russia.

**Remarks.** Macrae & Aoshima (1966) give a complete list of synonyms of *T. laricinum*. Macrae (1967) carried out infertility tests with homocaryons from poroid, irpiciform, and lamellate specimens of the *T. abietinum* complex and concluded they are three distinct species.

**Trichaptum parvulus** (Yasuda) Hattori & Ryvar den

Mycotaxon 50:41, 1994. - *Irpex parvulus* Yasuda, Bot. Mag. Tokyo 35:254, 1922.

**Basidiocarps** annual, resupinate, adnate and separable when dry; pore surface ochraceous to pale brown with a distinct pale pinkish-violet tint, irpicoid to hydroid with flattened teeth 2-3 per mm, up to 1 mm long; context 0.3 mm thick, pale brown, dense and cartilaginous as the spines in dry condition.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, 2-4 Fm wide, skeletal hyphae dominating in the basidiocarp, hyaline, thick-walled to solid, 3-6 Fm wide.

**Cystidia** very abundant, ventricose to cylindrical, thick-walled and mostly apically

tus

7. Basidiocarps creamish, pores 2-3 per mm ..... **T. fissilis****Tyromyces chioneus** (Fr.) P. Karst.Rev. Mycol. 3, no. 9:17, 1881. - *Polyporus chioneus* Fr., Syst. Mycol. 1:359, 1821.

**Basidiocarps** annual, pileate, single or imbricate, applanate to slightly convex, broadly attached to semicircular and dimidiate, more rarely spatulate, up to 8 cm broad and 10 cm wide, 0.5-2 cm thick, soft and fleshy when fresh, drying rather hard and brittle; pilear surface first whitish and finely tomentose, azonate, soon becoming glabrous as the hyphae agglutinate, then cream, light yellowish, or pale greyish to straw-coloured, finely scrupose and warted, as the agglutination proceeds a smooth pellicle is developed which on drying becomes radially to irregularly wrinkled, in old specimens rather distinct in section, in age somewhat discoloured and then dirty yellowish to pale sordid grey; pore surface white to pale cream, slightly glossy, drying somewhat darker, pores angular to round and mostly thin-walled, 3-4(5) per mm, tubes concolorous with the pore surface, up to 8 mm long; context white and dense in dry condition, usually distinctly thicker than the tubes, up to 1.5-2 cm thick at the base; taste mild and with a slight aromatic scent when fresh.

**Hyphal system** dimitic; generative hyphae with clamps, in the context intricately branched and twisted and difficult to separate in long sections, side-branches with repeated branching, 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 Fm wide, in parts collapsed, in the trama more or less parallel, mostly 2-4 Fm wide; skeletal hyphae unbranched, thick-walled, 2-4.5 Fm, present only in the trama.

**Basidia** clavate, 10-15 x 4-5 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly allantoid, 4-5 x 1.5-2 Fm.

**Substrata.** On dead wood of numerous hardwood genera, especially common on *Betula*.

**Distribution.** Circumpolar, in East Asia known from China, Japan, and Far East Russia.

**Remarks.** The slightly applanate, short-lived basidiocarps, frequently with a thin yellowish pellicle are useful macroscopic characters for a field determination. Microscopically the branched generative hyphae of the context and the slightly wider basidiospores will separate it from the often confusingly similar *Oligoporus tephroleucus*.

**Tyromyces fissilis** (Berk. & M.A. Curtis) DonkMed. Bot. Mus. Univ. Utrecht 9:135, 1933. - *Polyporus fissilis* Berk. & M.A. Curtis, Hooker's J. Bot. 1:234, 1849.

**Basidiocarps** annual, pileate, broadly attached, single, imbricate or caespitose, applanate to semitriangular, up to 10 cm wide and 20 cm long (in compound basidio-

Basidiocarps annual, pileate, sappy when fresh, usually rigid and fragile when dry, often shrinking, taste mild to bitter; pilear and pore surface mostly white, drying darker; hyphal system mono-dimitic; generative hyphae with clamps; gloeoplerous hyphae present in some species; cystidia absent, but cystidiols sometimes present; basidiospores hyaline, thin-walled, allantoid to ovoid, negative in Melzer's reagent. On hardwoods and conifers, causing a white rot. Cosmopolitan genus.

**Type species:** *Polyporus chioneus* Fr.

**Remarks.** The genus is restricted to species with generally white, pileate, and short-lived 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.

### Key to species

1. Basidiospores cylindrical to allantoid ..... 2
1. Basidiospores ovoid-ellipsoid..... 4
2. Basidiocarps vivid reddish-orange, on conifers..... **T. incarnatus**
2. Basidiocarps cream to pale greyish, on hardwoods..... 3
3. Basidiospores 1.5-2 mm wide, pores 3-5 per mm..... **T. chioneus**
3. Basidiospores 1-1.5 mm wide, pores 6-9 per mm..... **T. leucomallus**
4. Basidiocarps orange to apricot..... **T. kmetii**
4. Basidiocarps differently coloured..... 5
5. Pilear surface with numerous small brown squamules,  
basidiospores subcylindrical to navicular..... **T. squamosellus**
5. Pilear surface without brown squamules,  
basidiospores broadly ellipsoid to subglobose..... 6
6. Context homogeneous, basidiospores up to 3 mm long..... **T. galactinus**
6. Context marmorate, basidiospores longer than 4 mm ..... 7
7. Basidiocarps light pink when fresh, pores 6-7 per mm..... **T. transformans**

**Basidiospores** ellipsoid to ovoid, 2.5-3 x 2-2.5 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Temperate North America and Asia, in East Asia known from China (Hebei) and Japan.

**Remarks.** In the field the species may be recognized by the white, sappy basidiocarps with a fragrant odour and a strigose to hispid pileus. The context is zonate or dries very dense.

**Tyromyces incarnatus** Imazeki

Bull. Gov. Forest Exp. Sta. Tokyo 67:31, 1954.

**Basidiocarps** annual, pileate, spatulate, flabelliform to dimidiate, applanate, up to 10 cm long and 1 cm thick, margin thin and acute; pilear surface pink, rose to reddish orange, drying darker, glabrous, smooth to somewhat nodulose; pore surface pinkish, pores circular, 3-4 per mm, dissepiments thin, tubes up to 5 mm long, pinkish white; context sappy when fresh, drying rigid, up to 7 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled to almost solid, 2-6 Fm wide.

**Basidia** clavate, 12-16 x 4.5-5.5 Fm, with four sterigmata.

**Basidiospores** cylindrical, 4-5 x 1.5-2.5 Fm.

**Substrata.** On conifers.

**Distribution.** Asian species, only known from temperate Japan and Taiwan.

**Remarks.** A characteristic species with its reddish basidiocarps always growing on conifers. When dry, it can be mistaken as *Leptoporus mollis*, also occurring on conifers, but the latter has simple-septate generative hyphae.

**Tyromyces kmetii** (Bres.) Bondartsev & Singer

Ann. Mycol. 39:51, 1941. - *Polyporus kmetii* Bres., Atti Accad. Sci. Ag. Rov. Ser. 3, Vol. 3:70, 1897.

**Basidiocarps** annual, pileate, broadly attached, applanate, semicircular to elongated, 0.5-2 cm wide, 0.5-5 cm long, 1-4 mm thick at the base, margin very thin and sharp, slightly wavy, fleshy and sappy when fresh, shrinks with drying, becoming light and brittle; pilear surface apricot orange when fresh, fading on drying to yellowish orange along the margin, straw-coloured to pale ochraceous or cream in the more basal parts, when fresh finely velutinate to slightly warted or scrupose, on drying and age becoming more glabrous or with tufted agglutinated hairs or radial striae making the surface rough and uneven; pore surface light orange when fresh, cream to light straw-coloured 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 the pore surface, up to 3 mm long; 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; taste mild.

carps 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; pilear surface first white, then cream to ochraceous, sometimes with a pinkish tint, tomentose to pubescent, often scrupose, uneven and undulating, margin thick to thin, rounded or sharp; pore surface white, often with pinkish tints, drying cream coloured, pores round to angular, 2-3 per mm, tubes up to 2.5 cm long, brown, dense, much darker than the context, greasy and glossy when dry, stains paper in contact with sectioned tubes; context whitish, pinkish, or cream, marmorate, drying slightly darker to pale amber or pallid straw-coloured, often with resinous concentric zones, up to 5 cm thick, very hard; smell sweet.

**Hyphal system** monomitic; generative hyphae with clamps, thin- to thick-walled, 3.5-6 Fm wide, often with many small, hyaline to pale yellowish crystals, in the context agglutinated in fibers connected with looser or randomly arranged hyphae.

**Basidia** clavate, 15-20 x 4-6 Fm, with four sterigmata.

**Basidiospores** ellipsoid to subglobose, 4-6 x 3-4 Fm.

**Chlamydospores** present in the context, globose, slightly thick-walled and negative in Melzer's reagent, 4-10 Fm in diameter.

**Substrata.** On living hardwoods or rarely on dead trees, particularly common on *Quercus*.

**Distribution.** Circumpolar in the temperate zone, in East Asia known from China, Japan, and Far East Russia.

**Remarks.** The large sappy and partly waxy basidiocarps that dry with considerable shrinking, staining the paper in which they are wrapped, make this species rather easy to recognize.

### **Tyromyces galactinus** (Berk.) Lowe

Mycotaxon 2:17, 1975. - *Polyporus galactinus* Berk., Lond. J. Bot. 6:321, 1847.

**Basidiocarps** annual, pileate, 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; pilear surface white to pale grey when fresh, becoming more yellow to pale ochraceous when dry, first strigose to tomentose, by age and drying more tufted to scrupose, 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, 4-6 per mm, with entire to lacerate dissepiments, tubes up to 1 cm long, concolorous with the 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; taste mild, with a slight fragrant odour when fresh.

**Hyphal system** monomitic; generative hyphae with clamps, in the trama narrow, 2-5 Fm wide, in the context thin-walled, 4-7 Fm wide and branched, in the tomentum partly in strands and more sparingly branched.

**Basidia** clavate, 12-16 x 4-6 Fm, with four sterigmata.

surface pale ochraceous brown and covered with numerous tiny brown squamules giving the surface a dotted appearance when viewed with the naked eye, azonate; pore surface yellowish-orange when fresh, becoming dark resinous brown when old, pores round, 3-4 per mm, tubes concolorous with the pore surface, up to 2 mm deep, context light ochraceous, with some fine radial dark resinous bands when dry, up to 8 mm thick.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline and thin- to thick-walled, 3-5  $\mu\text{m}$  wide, densely agglutinated and running conspicuously parallel in the trama, those of the dissepiments with distinctly thickened apex, gloeoplerous hyphae present in the trama and context, up to 6  $\mu\text{m}$  wide, contorted and filled with a brownish matter.

**Cystidia** or other sterile organs not seen in the hymenium.

**Basidia** clavate, 15-20 x 4-5  $\mu\text{m}$ .

**Basidiospores** oblong ellipsoid with a pointed apex (navicular), 5-6 x 2  $\mu\text{m}$ .

**Substrata.** Dead hardwood.

**Distribution.** Known only from the type locality at Ogawa forest, Ibaraki Pref., Japan.

**Remarks.** The species is remarkable in resembling a small *Polyporus squamosus* Fr. with tiny pores and squamules. The change of the tubes from orange to dense resinous dark brown and a fragile consistency is also conspicuous. The basidiospores are typically navicular and the distinctly thickened apex of the projecting hyphae in the dissepiments is a feature not observed by us in any other polypore. This is a very distinct species.

***Tyromyces transformatus*** Núñez & Ryvarden

Fungal Divers. 3:117, 1999.

**Basidiocarp** annual, pileate, sessile, fused laterally, up to 7 cm long, 3 wide and 5 mm thick at the base, soft and fleshy when fresh, shrunken, dense, resinous hard and curled when dry; pilear surface light pink when fresh, dull, covered with a dense hyphal layer with projecting hairs (lens), to the naked eye looking glabrous, azonate, smooth, becoming glabrous from the base, wrinkled and deeper ochraceous to pale brown from the base when dry, pore surface pinkish when fresh, becoming pale brown when dry, pores round to angular, thin-walled, invisible to the naked eye, 6-7 per mm, tubes concolorous with the pore surface, up to 2 mm deep, context duplex, just above the tubes with a very thin pale zone, above marmorate, drying dense and pale resinous brown, looser and lighter towards the pilear surface, lower part 2-4 mm thick, upper part up to 1 mm thick.

**Hyphal system** monomitic, generative hyphae with clamps, hyaline and thin- to thick-walled, 3-5  $\mu\text{m}$  wide, densely agglutinated.

**Cystidia** or other sterile organs not seen in the hymenium.

**Basidia** clavate, 20-24 x 4-5  $\mu\text{m}$ .

**Basidiospores** broadly ellipsoid to amygdaliform, 5-6 x 3.5-4.5  $\mu\text{m}$ , many with an

**Hyphal system** monomitic; generative hyphae with clamps, hyaline and thin-walled, in the trama parallel, 2-4 Fm wide, in the pilear surface pinkish in KOH and with an oily refractive content, 2-4 Fm wide, in the context up to 8 Fm wide, randomly oriented and with short, stout side-branches without septa often branching off at right angles.

**Cystidia** absent; cystidiols fusiform, thin-walled, 10-15 x 4-6 Fm, often difficult to observe.

**Basidia** clavate, 14-20 x 4-6 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid, 4-4.5 x 2.5-3 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Circumpolar in temperate areas, in East Asia known from China, Far East Russia, Japan, and North Thailand.

**Remarks.** The small, apricot-orange basidiocarps are diagnostic in the field. The ellipsoid basidiospores and the contextual generative hyphae with short side-branches make the species rather distinctive microscopically.

**Tyromyces leucomallus** (Berk. & M.A. Curtis) Murrill

N. Am. Flora 9:36, 1907. - *Polyporus leucomallus* Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10:308, 1868.

**Basidiocarps** annual, pileate, 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; pilear surface white to cream, often slightly darker when dry, azonate, velvety to tomentose, drying more scrupose to slightly tufted, often radially fibrillose, margin thin and sharp; pore surface white to cream, pores thin-walled, angular, 6-9 per mm, tubes up to 5 mm long, brittle when dry; context white, soft and brittle, slightly duplex and looser towards the pilear surface, up to 1.5 cm thick at the base; taste mild.

**Hyphal system** monomitic; generative hyphae with clamps, in the context slightly branched, 3-8 Fm wide, in the trama more narrow and mixed with gloeoplerous hyphae, yellow and with an oily to grainy content, up to 9 Fm wide.

**Basidia** clavate, 10-14 x 4-6 Fm.

**Basidiospores** allantoid, 3.5-4.5 x 1 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Warm-temperate and subtropical species. In East Asia known from Japan.

**Remarks.** The species is similar to *Oligoporus tephroleucus* which produces a brown rot and has slightly larger basidiospores. The gloeoplerous hyphae are a good diagnostic character together with the short, allantoid basidiospores.

**Tyromyces squamosellus** Núñez & Ryvardeen

Fungal Divers. 3:117, 1999.

**Basidiocarp** annual, pileate, sessile to dimidiate, up to 10 cm wide and 1 cm thick at the base, soft and fleshy when fresh, shrunken and woody hard when dry; pilear

**Hyphal system** trimitic; generative hyphae with clamps, hyaline, up to 3.5 Fm wide, thin-walled; skeletal hyphae light brown, with a linear lumen, unbranched, up to 6 Fm wide; binding hyphae abundant in the dissepiments, up to 3.5 Fm wide, yellowish brown.

**Basidia** clavate, 12-18 x 5-6.5 Fm, with four sterigmata.

**Basidiospores** subellipsoid, 6-8 x 2.5-3 Fm, usually very difficult to find.

**Substrata.** On dead hardwoods, often in mangroves.

**Distribution.** Tropical to subtropical Asian species. In East Asia known from subtropical Japan, China, and Vietnam.

**Remarks.** The flat, brownish basidiocarps with a black cuticle at the stipe and base of the pileus make this species very characteristic. *Daedalea aurora* (Cesati) Aoshima, a tropical Asian species, is similar but has smaller basidiospores (3-4.5 x 1.5-2 Fm), a tuberculate and more concentrically zonate pileus, and cottony, pinkish and not glossy context (Corner 1987).

### **WOLFIPORIA** Ryvarden & Gilb.

Mycotaxon 19:141, 1984.

Basidiocarps annual, resupinate; pore surface white to ochraceous, pores circular to angular, 1-5 per mm, tubes concolorous, up to 2 mm long; context white to pale buff, firm-fibrous; hyphal system dimitic; generative hyphae simple septate, thin- to thick-walled, some inflated up to 20 Fm; skeletal hyphae hyaline to yellowish, thick-walled, mostly branched; fusoid cystidiols present or absent; basidiospores ellipsoid to cylindrical, hyaline, negative in Melzer's reagent. Causes a brown cubical rot of hardwoods and conifers.

**Type species:** *Poria cocos* Wolf., teleomorph of *Sclerotium cocos* Schwein.

**Remarks.** *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. Basidiospores 8-11 Fm long..... **W. cocos**
1. Basidiospores 3-5 Fm long.....  
...2
2. Basidiospores ellipsoid ..... **W. dilatohypha**
2. Basidiospores cylindrical to slightly allantoid ..... **W. curvispora**

### **Wolfiporia cocos** (Schwein.) Ryvarden & Gilb.

Mycotaxon 19:141, 1984. - *Sclerotium cocos* Schwein., Naturf. Ges. Leipzig Schrift. 1:56. 1822. - *Poria cocos* (Schwein.) Wolf, J. Elisha Mitchell Sci. Soc. 38:134.

oil drop.

**Substrata.** Dead conifers and hardwoods.

**Distribution.** Known only from Hokkaido in Japan.

**Remarks.** The species is distinctive in the colour change from pink to deep brown when drying. *Tyromyces fissilis* (Berk. & M.A. Curtis) Donk has also a marmorate context, but its basidiocarps are white to cream, with larger pores (2-3 per mm, Ryvarden & Gilbertson 1994).

### WHITFORDIA Murrill

Bull. Torrey Bot. Club 35:407, 1908.

Basidiocarps laterally stipitate with a short stipe, applanate; pilear surface cinnamon brown with a dark purplish to black cuticle spreading from the base; pores minute, 8-10 per mm; context light brown, glossy; hyphal system trimitic; generative hyphae with clamps; skeletal and binding hyphae light brown; basidiospores hyaline, cylindrical. Monotypic Asian genus.

**Type species:** *Fomes warburiganus* Hennings = *Polyporus scopulosus* Berk.

**Remarks.** The genus is macroscopically similar to *Amauroderma* or *Pyrrhoderma*. After a microscopical examination, the smooth, hyaline basidiospores, and the clamps in the generative hyphae rule out both genera. Since we do not know what kind of rot *Whitfordia* produces, we can only attempt to relate this genus to *Fomitopsis* by its trimitic system with coloured vegetative hyphae. Corner (1989) places this species in *Trametes* because of its trimitic hyphal system. We feel that the perennial, laterally stipitate basidiocarps with coloured vegetative hyphae deviate sufficiently from *T. suaveolens* (type species of *Trametes*) that it for the time being better is placed in a genus of its own.

### *Whitfordia scopulosa* (Berk.) Nunez & Ryvarden comb. nov.

Basionym: *Polyporus scopulosus* Berk., Hooker's J. Bot. Kew Gdn. Misc. 6:143, 1854.

**Basidiocarps** annual to biennial, sessile to stipitate, rarely effused-reflexed with a resupinate part up to 4 cm wide, solitary to sometimes imbricate, semicircular, flat, up to 10 cm wide; pilear surface pallid tan becoming ochraceous to fawn brown, glabrous, sometimes radially rugulose, neither tuberculate nor padded at the base, faintly sulcate, glabrous and semiglossy, with a dark purplish to black cuticle extending from the stipe up to 1 cm to the base of the pileus; stipe cylindrical, up to 3.5 cm long and 2 cm thick, with a black cuticle; pore surface white becoming dingy greyish, even vinous, with a velvety touch, pores regular, entire, 8-10 per mm, tubes up to 7 mm long, fuscous fawn; context glossy, floccose-felted, ochraceous to cinnamon, up to 1 cm thick, thinning towards the margin, hard and woody, sometimes with white mycelial strands.

ments, tubes elongated, up to 8 mm long; context white to cream, tough-fibrous, up to 2 mm thick, azonate or with a thin black line.

**Hyphal system** dimitic; generative hyphae simple-septate, hyaline, thin-walled and up to 12 Fm wide in the trama, thick-walled in the context up to 15 Fm wide; skeletal hyphae thick-walled, with frequent branching, the walls typically uneven in thickness resulting in conspicuous variation in the diameter of the lumen, 4-8 Fm wide.

**Basidia** clavate, 12-19 x 5.5-6.5 Fm, with four sterigmata.

**Basidiospores** ellipsoid to ovoid, hyaline, smooth, 4-5 x 2-3 Fm, negative in Melzer's reagent.

**Substrata.** On living and dead hardwoods, mainly on Fagaceae.

**Distribution.** Temperate species known from Eastern North America and temperate areas in China (Changbai) and Japan (Hokkaido, Kyushu).

**Remarks.** *W. dilatohypha* is easily distinguished from *W. cocos* by its smaller basidiospores.

**WRIGHTOPORIA** Pouzar

Ceska Mykol. 20:173, 1966.

Basidiocarps annual to perennial, resupinate to pileate; pores small to medium, white to cream or grey; hyphal system dimitic; generative hyphae with clamps, one species with simple septa; skeletal hyphae thick-walled to solid, dextrinoid to negative in Melzer's reagent; basidiospores less than 7 Fm long, globose to cylindrical, smooth to ornamented, weakly to strongly amyloid. On dead wood, both of conifers and hardwoods. Tropical to warm-temperate genus, causing a white rot.

**Type species:** *Poria lenta* Overh. & Lowe

**Remarks.** The genus belongs to the same clade or group as *Heterobasidion*, *Bondarzewia*, *Gloeocystidiellum*, *Dentipellis*, *Echinodontium* and *Laurilia* because of the small, ornamented, amyloid basidiospores. The family concepts within this group are not yet settled (see Hibbett et al. 1997).

**Key to species**

- 1. Basidiocarp pileate..... **W. japonica**
- 1. Basidiocarp resupinate..... 2
- 2. Basidiocarps perennial, brown, with thick-walled, encrusted cystidia... **W. tropicalis**
- 2. Basidiocarps annual, cream to violet, without encrusted cystidia..... 3

1922.

**Basidiocarps** annual, initially orbicular, becoming confluent and widely effused, margin abrupt, fertile or sterile, often wide, tomentose, cartridge buff; pore surface light ochraceous buff to pinkish buff, with 1-2 pores per mm, pores angular, tubes pale buff, continuous with the context, up to 2 mm long; context cream to pale pinkish buff, fibrous to corky, 1-2 mm thick.

**Hyphal system** dimitic; generative hyphae simple-septate, thin- to thick-walled, occasionally branched, 3-14 Fm wide, some in lower context greatly inflated, thick-walled, up to 20 Fm wide; skeletal hyphae thick-walled to almost solid, rarely branched, 3-8 Fm wide.

**Cystidia** lacking; fusoid, thin-walled cystidiols scarcely projecting, 22-38 x 5-7 Fm.

**Basidia** clavate, 17-45 x 8-10 Fm, with four sterigmata.

**Basidiospores** cylindrical, 8-11 x 3-4 Fm.

**Substrata.** On living and dead conifers and hardwoods, especially *Quercus* spp., causing a brown cubical root.

**Distribution.** Known from North America and Asia (China, Japan, Taiwan, Korea).

**Remarks.** *Wolfiporia cocos* forms large, hypogeous sclerotia, in North America known as tuckahoes, apparently from mycelium in roots.

*Wolfiporia curvispora* Dai

Ann. Bot. Fenn. 35:151, 1998.

**Basidiocarps** biannual, resupinate, becoming widely effused, in the type up to 3 meter long and 70 cm wide, soft when fresh, corky when dry, margin thin, pore creamy white, drying wood-coloured to isabelline, pores angular, 6-8 per mm, with thin, entire dissepiments, tubes up to 5 mm long and distinctly stratified with thin layers of context; subiculum thin and whitish to pale yellow.

**Hyphal system** dimitic; generative hyphae simple-septate, hyaline, thin-walled, 2.5-5 Fm wide; skeletal hyphae thick-walled, unbranched and with a distinct lumen, 4-6 Fm wide.

**Basidia** barrel-shaped, 7-9 x 5-7 Fm, with four sterigmata.

**Basidiospores** cylindrical to slightly allantoid, 3.3-4 x 1.2-1.8 Fm.

**Substrata.** On dead *Pinus*.

**Distribution.** Known only from the type locality in Jilin prov, Huinan county in China.

**Remarks.** *W. curvispora* is easily distinguished from the other species in the genus by its curved basidiospores.

*Wolfiporia dilatohypha* Ryvarden & Gilb.

Mycotaxon 19:141, 1984. - *W. cartilaginea* Ryvarden, Acta Mycol. Sin. 5:231, 1986.

**Basidiocarps** annual, resupinate, becoming widely effused, margin fertile or sterile, up to 3 mm, abrupt to finely fimbriate; pore surface nodulose, white to yellowish, drying cream to cinnamon, pores angular, 4-5 per mm, with thin, entire dissepiments.

**Distribution.** Tropical species, in East Asia also known from warm-temperate Japan (Kyushu).

**Remarks.** The species is related to *W. avellanea*, but has much smaller pores, often almost invisible to the naked eye, and a glossy pore surface. Further, the basidiospores are on average smaller than those of *W. avellanea*.

**Wrightoporia avellanea** (Bres.) Pouzar

Ceska Mykol. 20:173, 1966. - *Poria avellanea* Bres., K. Akad. Wiss. Math. Naturw. Klas. Denk. Schr. 83:14, 1907.

**Basidiocarps** annual, resupinate becoming widely effused, up to 12 cm in diameter and 8 mm thick, easily separable from the substrate, margin white to pale fulvous, membranous to arachnoid, often with several lobes and conspicuous rhizomorphs, consistency corky to soft fibrous-tough when dry; pore surface cream to pale fulvous, often with darker brown patches, dull, pores round to more irregular on sloping substrata, 1.5-3 per mm, dissepiments thin to rather thick, tubes up to 8 mm long, concolorous or slightly paler than the pore surface; context fibrous, up to 1 mm thick, concolorous and continuous with the trama.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline and thin-walled, 1.5-2.5 Fm wide; skeletal hyphae dominating in the basidiocarp, thick-walled to solid, hyaline to pale yellow, sometimes weakly branched, 2-4 Fm wide but of varying thickness, strongly dextrinoid.

**Basidia** clavate, 14-18 x 5-6 Fm, with four sterigmata.

**Basidiospores** subglobose to broadly ellipsoid, smooth to weakly warted, thin- to slightly thick-walled, 3.5-4.5 x 2.5-3.5(4) Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Known from warm-temperate and tropical China (Guangdong) and Taiwan, otherwise in subtropical and tropical America, only few records from Africa.

**Remarks.** The species can easily be separated from *W. africana* by the thicker basidiocarps and the larger pores.

**Wrightoporia cinnamomea** Ryvarden

Norw. J. Bot. 2:146, 1982.

**Basidiocarps** annual, resupinate, easily detached and light in weight when dry, margin cream and narrow; pore surface cream to pale cinnamon, pores 6-8 per mm, in sloping substrates 3-5 pores per mm, tubes pale cinnamon, up to 3 mm deep; context cottony, soft and cinnamon, 1-2 mm thick.

**Hyphal system** dimitic; generative hyphae with clamps, 2-3 Fm wide; skeletal hyphae thick-walled, with a distinct lumen, negative in Melzer's reagent, 1.5-3.5 Fm wide, straight to sinuous, usually encrusted in the context.

**Basidia** clavate, 15-18 x 4-5 Fm, with four sterigmata.

**Basidiospores** subglobose, finely asperulate, 3-4(5) x 2.5-3 Fm.

3. Pore surface pinkish when fresh, if cream violet when touched or dry  
.....4
3. Pore surface cream to light brown, not darkening when dry..... 5
4. Pore surface light pinkish, generative hyphae simple-septate,  
basidiospores 4-6(7) x 3-4 mm..... **W. ru-**  
**bella**
4. Pore surface cream, darkening to violet when dry, generative hyphae  
with clamps, basidiospores 3-4.5 x 3-4 mm..... **W. io-**  
**bapha**
5. Tubes and context cinnamon, skeletal hyphae not dextrinoid..... **W. cinnamo-**  
**mea**
5. Tubes and context white to cream-pinkish, skeletal hyphae dextrinoid ..... 6
6. Basidiospores 5-6 x 4.5-5.5 mm, on conifers and hardwoods..... **W.**  
**lenta**
6. Basidiospores smaller, up to 4.5 x 4 mm, on hardwoods..... 7
7. Pores 5-6 per mm..... **W. afri-**  
**cana**
7. Pores 1.5-3 per mm ..... **W. avel-**  
**lanea**

**Wrightoporia africana** Ryvarden & I. Johans.

Trans. Br. Mycol. Soc. 72:196, 1979.

**Basidiocarps** annual, resupinate, becoming widely effused, up to 15 cm wide and 2 mm thick, easily separable from the substratum, consistency soft, fibrous to tough when dry, margin cream to white, cottony, fimbriate to slightly rhizomorphic, narrow to wide; pore surface whitish cream to ochraceous, dull to slightly glossy when turned in incident light, pores first circular and regular, 5-6 per mm, elongated on sloping substrata, tubes non-stratified, continuous with the context, dissepiments thin and fimbriate; context cream to white, thin, fibrous, with a few rhizomorphs penetrating into the substratum.

**Hyphal system** trimitic; generative hyphae with clamps, hyaline and thin-walled, 1.5-2.5(4) Fm wide; skeletal hyphae hyaline, dominant, dextrinoid, thick-walled, flexuous, unbranched, narrow and 1.5-2 Fm in Melzer's reagent, swelling to 1.5-4 Fm wide in KOH, wall thickness often irregular.

**Basidia** clavate, 15-19 x 4-6 Fm, with four sterigmata.

**Basidiospores** subglobose to broadly ellipsoid, thin- to rather thick-walled, with small ridges and warts, 3-3.5(4) x 2.5-3 Fm.

**Substrata.** On dead hardwoods of many kinds.

**Remarks.** The species is recognized by the pileate basidiocarp with a zoned pileus and the tiny pores.

**Wrightoporia lenta** (Overh. & Lowe) Pouzar

Ceska Mycol. 20:173, 1966. - *Poria lenta* Overh. & Lowe, Mycologia 38:210, 1946.

**Basidiocarps** resupinate, effused, up to 3 mm thick, separable to slightly adnate, tough when dry, margin white; pore surface white to cream, pores round to angular, often slightly sinuous on sloping substrata, on average 2-3 per mm, thin-walled, tubes concolorous with the pore surface, up to 2 mm long; context thin and white.

**Hyphal system** dimitic; generative hyphae with clamps, 1-3 Fm wide; skeletal hyphae thick-walled to solid, 1.5-3 Fm wide, strongly dextrinoid; gloeoplerous hyphae rare and scattered, irregular and often with blunt side-branches, slightly yellowish when mounted in KOH, diameter variable, mostly 3-6 Fm, but parts up to 15 Fm wide.

**Basidia** clavate, 15-20 x 4-8 Fm.

**Basidiospores** globose, finely asperulate, 5-6 x 4.5-5.5 Fm.

**Substrata.** On conifers in United States and East Asia, on hardwoods and palms in subtropical and tropical areas.

**Distribution.** Widespread in America and Africa, but rare. Recently found on *Abies* in Northern China (Changbai) by Dai (1996a).

**Remarks.** The species is recognized by its cream basidiocarps with large, ornamented and amyloid basidiospores.

**Wrightoporia rubella** Dai

Karstenia 35:86, 1995.

**Basidiocarps** annual, resupinate to effused-reflexed, cottony soft and easily separable from the substrate when fresh, margin sterile, pale ochraceous with strong, vinous rhizomorphs which form a cottony pseudopileus; pore surface pinkish when fresh, discolouring to ochraceous when dry, pores round to angular, 2-4 per mm, tubes tough, shallow, about 1 mm long; context tough, pinkish brown, becoming reddish black with KOH.

**Hyphal system** dimitic; generative hyphae simple-septate, thin-walled, 2-4 Fm wide, in the context thick-walled, negative in Melzer's reagent; skeletal hyphae thick-walled, straight to flexuous, up to 5 Fm wide, some of them branched, dextrinoid; gloeoplerous hyphae present in the context.

**Gloeocystidia** variable in shape and dimension, 25-45 x 5-14 Fm, with an oily content, not common.

**Basidia** clavate, 20-38 x 5-7.5 Fm, with four sterigmata.

**Basidiospores** broadly ellipsoid to subglobose, finely echinulate, 4-6(7) x 3-4 Fm.

**Substrata.** On hardwoods, the only two known specimens were found in parks on very rotten wood.

**Distribution.** Only known from the type locality in Beijing (China).

**Substrata.** On dead hardwoods.

**Distribution.** Warm-temperate to subtropical Asian species described from North Thailand, also found in Japan (Chiba).

**Remarks.** Basidiocarps of *W. cinnamomea* are recognized by their cinnamon colour. The non-dextrinoid skeletal hyphae are atypical in the genus.

**Wrightoporia iobapha** (Pat.) Ryvarden

Occ. Pap. Farlow Herb. 18:21, 1983. - *Phaeolus iobaphus* Pat., Bull. Soc. Mycol. Fr. 22:85, 1917.

**Basidiocarps** annual, resupinate, easily detached, soft when fresh, shrinking and hard when dry, margin floccose and soft, cream when fresh, darkening to pale brown; pore surface cream when fresh darkening to violet-pinkish when touched, drying dark violet to vinous, pores irregular, angular, up to 0.5 mm wide when fresh, 3-4 per mm when dry, tubes up to 8 mm long; context up to 2 mm thick, cream when fresh, drying vinous brown.

**Hyphal system** dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-3 Fm wide; skeletal hyphae thick-walled, unbranched, hyaline, dextrinoid, 3-5 Fm wide.

**Basidia** not seen.

**Basidiospores** subglobose, finely asperulate, 3-4.5 x 3-4 Fm.

**Substrata.** On dead hardwoods.

**Distribution.** Rare tropical and subtropical Asian species described from Singapore, recently found in subtropical Japan (Okinawa) (Nunez & Ryvarden 1999).

**Remarks.** The violet-pinkish tints when dry and large pores make this species distinct in *Wrightoporia*.

**Wrightoporia japonica** Núñez & Ryvarden

Fungal Divers. 3:119, 1999.

**Basidiocarp** annual, pileate, broadly attached, up to 2 cm long, 1 cm wide and 0.8 cm thick at the base, tough; pilear surface ochraceous to greyish from the base, sulcate, adpressed velutinate; pore surface cream to wood-coloured, pores round, 6-8 per mm, tubes concolorous with pore surface, up to 3 mm deep, context pinkish when fresh, drying pale brown and dense but always with a pinkish tone, up to 5 mm thick.

**Hyphal system** dimitic, generative hyphae with scattered clamps, hyaline and thin-walled, 2-4 mm wide, skeletal hyphae thick-walled, 3-5 mm wide, strongly dextrinoid in the trama, less so in the context.

**Basidia** clavate, 10-14 x 5-6 mm.

**Basidiospores** ellipsoid 4 x 2.5 mm, asperulate and strongly amyloid.

**Substrata.** Unknown hardwood tree in subtropical forest.

**Distribution.** Known only from the type locality at Okinawa Pref., Irimote Island, Shiira River, Japan.

**Cystidia** thick-walled, heavily encrusted, blunt at the apex, arising from skeletal hyphae.

**Basidia** clavate, 18-23 x 5-7 Fm, with four sterigmata.

**Basidiospores** hyaline, ellipsoid, thin-walled, echinulate, 3-4 x 2-2.5 Fm.

**Substrata.** On hardwoods.

**Distribution.** Pantropical, in Asia known north to subtropical China and Japan (Okinawa).

**Remarks.** The species is easy to recognize by its resupinate, brown, stratified basidiocarps with dextrinoid vegetative hyphae and ornamented, amyloid basidiospores.

**Remarks.** The species is very characteristic by its light pink basidiocarps. *Wrightoporia iobapha* is similar to *W. rubella*, but has generative hyphae with clamps.

**Wrightoporia tropicalis** (Cooke) Ryvardeen

Prelim. Polyp. Fl. East Africa p. 619, 1980. - *Fomes tropicalis* Cooke, Grevillea 15:22, 1886.

**Basidiocarps** perennial, resupinate, applanate to pulvinate, widely effused, up to 3 cm thick, woody hard when dry, margin up to 2 cm wide, glabrous and smooth, grey to black and then in section with a thin, black cuticle; pore surface grey to pale brown, pores small, 6-8 per mm, slightly elongated when growing on sloping substrata, tubes pale brown, weakly stratified, up to 2 cm long, dissepiments thin, usually farinose; context pale umber brown, very thin to lacking.

**Hyphal system** trimitic; generative hyphae with clamps, thin-walled, hyaline, difficult to find in dry basidiocarps; skeletal hyphae dominating, solid to thick-walled, 3-4 Fm wide, brown, dextrinoid in Melzer's reagent, binding hyphae scattered, brownish, tortuous, up to 3 Fm wide.



































































































































































































