

Synopsis Fungorum 50

# **HYDNOID GENERA - A WORLD SYNOPSIS**

Leif Ryvarden

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Fungiflora

## ABSTRACT

All known genera which includes one or several species with a hydroid hymenophore are described in full with all known and accepted species, except for a few general like *Hydnellum Sarcodon* and *Steccherinum*, where only European species are included. A key to all accepted genera including hydroid species is provided.

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## INTRODUCTION

This book is a companion to "Genera of polypores" (Ryvarden 1991) as it tries to give a survey of all genera described for fungi with a hydroid hymenophore. Thus, it includes not only those where all species are hydroid, but also those where only one or several species are hydroid. Examples are *Trichaptum* and *Spongipellis*. These are fully treated in the manuals covering poroid fungi of Europe, Africa and North America (Ryvarden 2022a, 2022b and 2024).

Banker (1902) was the first one to give a list of hydroid genera with their respective type species. Donk (1956) gave the most comprehensive treatment of such genera, and the following list is heavily indebted to the detailed and accurate information given there.

Firstly, one may ask why a new list, is there something wrong with Donk's list? No there is nothing wrong as such, but many new hydroid genera has been described since his list was published and it included no key to such genera, and thus, was felt that an update with keys could be useful.

Secondly ICBN was changed in 1981 (the so called Sydney code after the place where the changes were made) as the starting point for nomenclature was moved from 1821 to 1753 even if all Fries names in *Systema Mycologium* 1-3 (1821-1832) and *Elenchus fungorum* (1828-24) by definition was given protected status. That means that they have priority above all previous names based on the same type and besides this also for taxonomic synonyms. This means that some of the historical discussions given by Donk are totally irrelevant for the current nomenclatorial status for a number of important genera.

Thirdly, the Sydney code also decided that the so called strict type method was the only allowed, thus ending years of debate on how to interpret misapplied names used for generic types. A typical example is *Amaurodon* P. Karsten based on *Hydnum viride* Albert & Schwein., a species originally described from Pennsylvania in United States. Karstens determination was wrong as he actually had a specimen of *Hypochnus mustaliensis* in his hand when he thought he had found *H. viride* new to Finland. The strict type method states that *Amaurodon*, has to be based on the type of *H. viride* independent of any misapplication of the name. Previously the two possibilities have been a source for much heated debate.

## KEY TO HYDROID GENERA

- 1. Basidiospores ornamented ..... 2
- 1. Basidiospores smooth ..... 3
  
- 2. Basidiospores amyloid ..... **Key A**
- 2. Basidiospores non-amyloid ..... **Key B**
  
- 3. Spores amyloid ..... **Key C**
- 3. Spores non-amyloid ..... 4
  
- 4. Basidiocarps pendant ..... **Key D**
- 4. Basidiocarps differently shaped ..... 5
  
- 5. Basidiocarps with brown setae ..... **Key E**
- 5. Basidiocarps with hyaline cystidia or without cystidia ..... 6
  
- 6. Basidiocarps stipitate to reflexed to sessile with distinct pileus ..... **Key F**
- 6. Basidiocarps resupinate ..... **Key G**

## KEY A. BASIDIOSPORES AMYLOID, SMOOTH TO ORNAMENTED

- 1. Basidiocarps laterally to centrally stipitate ..... 2
- 1. Basidiocarps resupinate, reflexed to sessile ..... 3
  
- 2. Basidiocarps white and laterally stipitate and branched ..... **Hericium**
- 2. Basidiocarps unbranched, usually centrally stipitate, cream to deep brown ..... **Auriscalpium**
  
- 3. Basidiocarps sessile to effused reflexed ..... 4
- 3. Basidiocarps strictly resupinate ..... 5
  
- 4. Basidiocarps white ..... **Creolophus**
- 4. Basidiocarps deep brown to black ..... **Gloiodon**

5. Basidiocarps greenish.....	<b>Amaurodon</b>
5. Basidiocarp white to cream .....	<b>6</b>
6. Encrusted cystidia absent .....	<b>Dentipellis</b>
6. Encrusted cystidia present .....	<b>7</b>
7. Basidiocarps as single white hydroid spines, very rare genus.....	<b>Dentipratulum</b>
7. Spines on coherent basidiocarp.....	<b>8</b>
8. Encrusted cystidia present .....	<b>Gloeodontia</b>
8. Encrusted cystidia absent .....	<b>Stecchericium</b>

#### **KEY B. BASIDIOSPORES ORNAMENTED AND NON AMYLOID**

1. Basidiocarps stipitate .....	<b>2</b>
1. Basidiocarps pileate, effused reflexed to resupinate.....	<b>5</b>
2. Basidia with 6-8 sterigmata, small white basidiocarps .....	<b>Sistotrema confluens</b>
2. Basidia tetrasterigmatic, basidiocarps larger and often coloured .....	<b>3</b>
3. Basidiocarps rather small, spores smaller than 5 µm .....	<b>Phellodon</b>
3. Basidiocarps often robust and up to 10 cm wide, spores dominantly larger than 5 µm in longest dimension .....	<b>4</b>
4. Basidiocarps rather soft, basidiospores usually larger than 6 µm in longest dimension .....	<b>Sarcodon</b>
4. Basidiocarps tough, basidiocarps 4-6 µm in longest dimension.....	<b>Hydnellum</b>
5. Spores coloured, often irregularly hydroid .....	<b>Tomentella</b>
5. Spores hyaline, regularly tuberculate to hydroid.....	<b>6</b>
6. Spores up to 6 µm long .....	<b>Trechispora s. lato</b>
6. Spores 8-12 µm long .....	<b>Kavinia</b>

#### **KEY C. SPORES AMYLOID OR DEXTRINOID AND SMOOTH**

1. Basidiocarps stipitate .....	<b>Hydnum</b>
1. Basidiocarps pileate to resupinate .....	<b>2</b>
2. Spores dextrinoid.....	<b>Gyrodontium</b>
2. Spores amyloid .....	<b>3</b>
3. Basidiocarps pendant, simple or with few branches .....	<b>Mucronella</b>
3. Basidiocarps resupinate to pileate .....	<b>Irpicondon</b>

#### **KEY D. BASIDIOCARPS PENDANT**

1. Basidiocarps sulphurous yellow, gloeocystidia present, rare tropical genus .....	<b>Hormomitaria</b>
1. Basidiocarps white to ochraceous, cystidia absent, widespread genera .....	<b>2</b>
2. Hyphal system dimitic with skeletal hyphae, tropical genus.....	<b>Deflexula</b>
2. Hyphal system monomitic, cosmopolitan genus.....	<b>Mucronella</b>

#### **KEY E. ASTEROSetae OR HYMENIAL SETAE PRESENT**

1. Asterosetae present .....	<b>Asterodon</b>
1. Asterosetae absent, simple setae present .....	<b>Hydnochaete</b>

## KEY F. BASIDIOCARPS PILEATE

1. Basidiocarps stipitate .....	<b>Mycorrhaphium</b>
1. Basidiocarps sessile to effused reflexed.....	2
2. Basidia with 4-8 sterigmata, basidia urniform.....	<b>Sistotrema</b>
2. Basidia tetrasterigmatic and clavate .....	3
3. Cystidia absent .....	4
3. Cystidia present .....	6
4. Basidiospores 15-22 µm long, neotropical species.....	<b>Mycobonia</b>
4. Basidiospores smaller, wide spread genus .....	5
5. Spores thin-walled .....	<b>Climacodon</b>
5. Spores thick-walled .....	<b>Spongipellis</b>
6. Generative hyphae with simple septa.....	7
6. Generative hyphae with clamps.....	8
7. Basidiospores oblong elliptic to cylindrical, 5-7 x 2-3 µm, basidiocarps white .....	<b>Irpex lacteus</b>
7. Basidiocarps elliptic, 4.5-5.5. x 2.5-3.2 µm, basidiocarps distinctly coloured.....	<b>Australohydnum</b>
8. Encrusted cystidia present, hyphal system dimitic .....	9
8. Encrusted cystidia absent, gloecystidia present, hyphal system monomitic.....	<b>Donkia</b>
9. Hymenophore white to ochraceous .....	<b>Steccherinum</b>
9. Hymenophore violet to pale brown .....	<b>Trichaptum</b>

## KEY G. BASIDIOCARPS RESUPINATE

1. Cystidia present.....	2
1. Cystidia absent .....	12
2. Basidiospores pale brown, very rare West Indian genus.....	<b>Phaeoradulum</b>
2. Basidiospores hyaline.....	3
3. Generative hyphae with simple septa, both smooth and encrusted cystidia present.....	4
3. Generative hyphae with clamps .....	5
4. Two types of cystidia present, spores allantoid, basidiocarps whitish to grey.....	<b>Scopuloides</b>
4. Only thin walled cystidia present, spores elliptic, basidiocarps reddish orange .....	<b>Hydnophlebia</b>
5. Hyphal system dimitic.....	6
5. Hyphal system monomitic.....	7
6. Basidiospores longer than 6 µm.....	7
6. Basidiospores shorter than 6 µm.....	8
7. skeletal hyphae present and dextrinoid .....	<b>Cystidiodontia</b>
7. Basidiospores 6-8 x 5-6 µm, usually on <i>Populus tremula</i> , rare species .....	<b>Radulodon</b>
7. Basidiospores 9-11 x 3-3.5 µm, cylindrical, on all types of substrate, common .....	<b>Basidioradulum</b>
8. Lagenocystidia and leptocystidia present.....	<b>Hyphodontia</b>
8. Only one type of cystidia present.....	9
9. Basidiospores up to 4 µm long, on coniferous wood.....	<b>Physodontia</b>
9. Basidiospores longer than 4 µm.....	10
10. Old basidiospores dextrinoid, rare Central European species on <i>Quercus</i> .....	<b>Hyphoradulum</b>
10. Basidiospores non dextrinoid, widespread species .....	11

11. Hymenophore densely hydroid, hyphae densely agglutinated .....	<b>Mycoacia</b>
11. Hymenophore variably odontoid to hydroid, hyphae easily separated.....	<b>Xylodon</b>
12. Hyphal system dimitic with skeletal hyphae .....	<b>13</b>
12. Hyphal system monomitic.....	<b>14</b>
13. Skeletal hyphae dextrinoid, very rare African genus .....	<b>Dextrinodontia</b>
13. Skeletal hyphae non dextrinoid, cosmopolitan genus.....	<b>Fibrodontia</b>
14. Spores up to 5 µm long .....	<b>15</b>
14. Spores longer than 5 µm in longest dimension .....	<b>16</b>
15. Basidiospores 3.8-4.2 x 2.4-2.6 µm, elliptic, very rare Australian genus .....	<b>Amaurohydnum</b>
15. Basidiospores 4-5 x 4.5 µm, subglobose, very rare African genus .....	<b>Odontopsis</b>
16. Generative hyphae with simple septa .....	<b>Odonticum</b>
16. Generative hyphae with clamps.....	<b>17</b>
17. Spores in average longer than 8 µm .....	<b>18</b>
17. Spores in average shorter than 8 µm .....	<b>20</b>
18. Dendrohyphae present, basic hyphae brown, very rare South African genus.....	<b>Dendrodontia</b>
18. Dendrohyphae absent, all hyphae hyaline, wide spread genera.....	<b>19</b>
19. Spores sub-cylindrical to ovoid, 4-5 µm wide, basic hyphae with warts.....	<b>Kavinia</b>
19. Spores elliptic, 6.5-8 µm wide, basic hyphae smooth .....	<b>Radulomyces</b>
20. Spores thick-walled, very rare African genus .....	<b>Cyanodontia</b>
20. Spores thin-walled, widespread genera.....	<b>21</b>
21. Spores pyriform, very rare South American genus.....	<b>Radulodontia</b>
21. Spores different, very wide spread genus .....	<b>Xylodon</b>

### **AMAURODON J. Schroet.,**

in Cohn. Krypt. Fl. Schlesien 3: 461, 1889.

**Type species:** *Hydnum viride* Alb. & Schw. — Syn. *Hypochnopsis* P. Karst., *Lazulinospora* Burdsal. & M.J. Larsen, *Tomentelago* Hjortstam & Ryvarden.

Basidiocarps resupinate, fragile, greenish yellow, olivaceous green or bluish green, smooth to hydroid, generative hyphae nodose-septate or simple-septate, cystidia absent, basidia clavate with four sterigmata, basidiospores globose, ovoid or with irregular outline, smooth to ornamented, pale yellow to hyaline in water, purplish blue in KOH, on dead wood and debris on the ground, probably saprophytic or weakly mycorrhizal.

**Remarks.** This is a highly characteristic genus with its greenish to bluish colours and basidiospores that react strongly in KOH. The genus clearly belongs in Thelephoraceae, but is included here because its species are reminiscent of a general corticoid species and not a typical thelephoroid one.

One hydroid species is included in the treatment of hydroid species.

For a description of the European corticoid species in the genus, see Larsson & Ryvarden p. 60, 2021.

### **Amaurodon viridis (Alb. & Schwein.: Fr.) J. Schroet.,**

in Cohn, Krypt. Fl. Schlesien 3: 461, 1889. — *Sistotrema viride* Alb. & Schwein., Consp. Fung. Lusat., p. 262, 1805. — *Hydnum viride* Alb. & Schwein.: Fr., Syst. Mycol. 1: 421, 1821.

**Basidiocarps** resupinate, effused, separable, arachnoid to pelliculose, bluish green when fresh, fading to yellowish green when dry, when young smooth, gradually becoming warted to hydroid.

**Hyphal system** monomitic, hyphae thin-walled and 2.5–4.5 µm wide, in the subhymenium slightly thick-walled, hyaline to somewhat yellowish, in the teeth the hyphae can be wider, up to 7 µm, slightly yellowish hyphal cords present in the subiculum.

**Basidia** 20–40 × 5–8 µm, clavate, usually with a median constriction, tetrasterigmatic, some basidia with blue amorphous granules or small drops.

**Basidiospores** 4.5–6 µm in diam., more or less globose, evenly verruculose, pale yellow to hyaline in water, moderately blue in Melzer's reagent and violet in KOH.

**Substrate.** On dead and rotten hardwoods of all kinds, rarely on conifers like *Abies*, *Picea* and *Pinus*.

**Distribution.** Widespread and almost cosmopolitan, but rarely collected in Europe. Seems to be favoured by warm summers and several times observed in climatically favoured localities in the Norwegian fiord landscape.

**Remarks.** When well-developed this species is recognized by its bluish-green colour and the hydroid hymenophore. When less developed and with a smooth hymenium, the spore morphology and the violet reaction in KOH are diagnostic.

### **AMAUROHYDNUM Jülich,**

Persoonia 9: 455, 1978.

Basidiocarps annual, resupinate, effused, adnate, membranaceous, hymenial surface minutely hydroid, pale coloured. Hyphal system monomitic, hyphae with clamps. Cystidia absent. Basidia distinctly clavate, small, tetrasterigmatic. Basidiospores hyaline, thin-walled, smooth, non-amyloid. Monotypic genus.

**Type species** – *Amaurohydnium flavidum* Jülich.

**Remarks.** The genus is characterized by the inconspicuous hydroid basidiocarps, absence of cystidial elements, and elliptic, smooth and non-amyloid basidiospores. The phylogenetic relationships of the genus are unclear because there are no available sequences (Larsson 2007b).

### **ASTERODON Pat.,**

Bull. Soc. Mycol. France 10: 129, 1894.

Basidiocarps annual, resupinate, widely effused, soft but tough, margin floccose to cottony, often very wide; hymenial surface hydroid, rusty brown; hyphal system dimitic, generative hyphae simple septate, hyaline to rusty brown; asterosetae abundant, brown; basidia tetrasterigmatic; basidiospores elliptic, hyaline and non-amyloid. Causing intense white rot in conifers. Monotypic, boreal genus.

**Type species:** *Asterodon ferruginosus* Pat.

**Remarks.** The genus belongs in Hymenochaetaceae and is undoubtedly related to *Hymenochaete* and only separated in principle by its branched asterosetae. *Asterostroma* has similar asterosetae but molecular phylogenetic studies have shown that it is related to *Scytinostroma* and *Vararia* (Lachnocladiaceae).

### **Asterodon ferruginosus Pat.,**

Bull. Soc. Mycol. France 10: 129, 1894. — *Hydnochaete setigera* Peck, Rep. New York State Mus. Nat. Hist. 50: 113, 1897.

**Basidiocarps** annual, resupinate, widely effused, easily detached, often of large dimensions, soft and cottony, easily compressed, margin often wide, cottony, rusty brown, filling crevices of the wood, hymenial surface deep rusty brown, densely hydroid, spines up to 3 mm long, pointed, subiculum rusty brown, cottony, up to 1 cm thick, often filling voids and cracks in the substrata.

**Hyphal system** dimitic, generative hyphae with simple septa, thin- to thick-walled, hyaline to rusty brown, 1–4 µm wide, skeletal hyphae thick-walled, rusty brown, 2–4 µm wide, mycelial cords present in and on the surrounding substrate, whitish to brownish, up to 5 mm wide.

**Asterosetae** 120–150 × 3–8 µm, present throughout the basidiocarp, light to dark brown, thick-walled, in the margin and subiculum with 3–6 rays, each of them penetrating into the hymenium, simple or with a few basal branches.

**Basidiospores** 5–6 × 3.5–4.5 µm, elliptic.

**Habitat.** On decaying wood of conifers, especially *Picea*, but also collected on *Abies* and *Pinus*, more rarely on hard woods such as *Populus tremula*.

**Distribution.** A boreal species with a taiga distribution in Europe. It is common in Central and Northern Fennoscandia and its distribution extends through Siberia to North America. Known only from one locality in Central Europe.

**Remarks.** The brown hydroid basidiocarp and the asterochaete make this a very distinct genus and species.

### **AURISCALPIUM S. F. Gray,**

Nat. Arrang. Br. plants 1:650, 1821.

Basidiocarps laterally to centrally stipitate, hydroid, pileus hirsute to glabrous, pale to dark brown, spines dark brown, hyphal system mono- or dimitic, generative hyphae with clamps, skeletal hyphae present either as such or as intercalary segments between clamps, gloeocystidia present, basidiospores ornamented, hyaline to pale brown and amyloid, cosmopolitan genus.

**Type species:** *Auriscalpium vulgare* S. F. Gray.

**Remarks.** The genus is undoubtedly related to *Gloiodon*, separated mainly by its stipitate basidiocarps. Still, there are few reports of some of the *Auriscalpium* species, and the descriptions given below must be used with a care since they probably do not cover the whole morphological variation for some of these rarer species.

## Key to species

1. Upper surface hispid to hirsute..... 2
1. Upper surface more or less glabrous..... 6
2. Growing on cones of *Pinus* spp..... 3
2. Growing on dead hardwood, tropical species..... 5
3. Spores 3.5- 4.5 x 3- 3.8  $\mu\text{m}$ , on cones of *Pinus armandii*..... **A. microsporum**
3. Spores larger, growing on different cones..... 4
4. Widespread in the temperate species ..... **A. vulgare**
4. Occurring in Tibet and subtropical China ..... **A. orientale**
5. Pileus deeply split in narrow lobes, context pale brown, African species..... **A. dissectum**
5. Pileus entire, context white to cream coloured, Neotropical species ..... **A. villipes**
6. Spores longer than 5  $\mu\text{m}$  in longest dimension ..... 7
6. Spores shorter than 5  $\mu\text{m}$  in longest dimension ..... 9
7. Stipe lateral, upper surface cream coloured, spores globose ..... **A. andinum**
7. Stipe central, upper surface brown, spores elliptic ..... **A. barbatum**
8. Stipe hollow, skeletal hyphae present, hyphal strands present at the base of stipe, Australian species ..... **A. barbatum**
8. Stipe solid, skeletal hyphae absent, hyphal strands absent at base of stipe, New Zealand species ..... **A. umbellatum**
9. Stipe tomentose to hispid, pileus margin split, pilei up to 2 cm in diam, Chinese species ..... **A. fimbriato-incisum**
9. Stipe glabrous, pileus entire, pilei up to 8 mm in diam, Neotropical species ..... **A. gilbertsonii**

### **Auriscalpium andinum (Pat.) Ryvarden,**

Harvard Pap. Bot. 6: 194, 2001. - *Hydnum andinum* Pat., Bull. Herb. Bois. 3:55, 1895.

**Basidiocarp** laterally stipitate, pileus more or less circular up to 10 mm wide, upper surface glabrous except for a fine pruina of raised hairs at the base, pale ochraceous to straw-coloured, smooth or slightly veined radially, stipe tapering, about 5 mm long, pale brown to ochraceous, glabrous, spines up to 300  $\mu\text{m}$  long and about 100  $\mu\text{m}$  in diameter, white, context dense, 150  $\mu\text{m}$  thick, ochraceous.

**Hyphal system** monomitic, generative hyphae with clamps, 2-3  $\mu\text{m}$  wide, hyaline, oleiferous hyphae present, 3-6  $\mu\text{m}$  wide, some ending as embedded to slightly projecting gloecystidia.

**Gloecystidia** present, mostly projecting beyond the basidia, usually ventricose, some also clavate, 14-20 x 5-7  $\mu\text{m}$ , thin-walled and with a pale yellow granular content.

**Basidiospores** globose, 5-6.5  $\mu\text{m}$  in diam, finely ornamented, hyaline, amyloid.

**Substrata.** On dead hardwood with a white rot.

**Distribution.** Known only from the type locality.

**Remarks.** The species is easy to recognize because of the small size, its glabrous ochraceous pileus and globose basidiospores.

### **Auriscalpium barbatum, Maas Geesteranus,**

Persoonia 9: 491, 1978.

**Basidiocarp** centrally stipitate, pileus more or less circular up to 20 mm wide, upper surface glabrous, smooth to slightly veined radially, dark brown with a tint of reddish, margin wavy, but entire, stipe 15 x 3-5 mm, central, hispid especially towards the base, dark brown, arising from a sand filled subiculum, spines up to 7 mm long, subulate, ashy grey, crowded, decurrent, paler in the apex, context up to 0.5 mm, brown with a very thin black line towards the pileus and slightly so also towards the spines.

**Hyphal system** dimitic, generative hyphae with clamps, 2-3.5  $\mu\text{m}$  wide, skeletal hyphae 3-8  $\mu\text{m}$  wide, hyaline, thick-walled, oleiferous hyphae present, 3-6  $\mu\text{m}$  wide.

**Gloecystidia** present, numerous, projecting beyond the basidia, distal part often swollen, up to 11  $\mu\text{m}$  wide and 20  $\mu\text{m}$  long, arising from oleiferous hyphae running parallel to the hymenium, thin-walled and hyaline to pale yellow.

**Basidiospores** 6-6.5 x 4-5  $\mu\text{m}$ , elliptic to pip-shaped, finely ornamented.

**Substrata.** On soil.

**Distribution.** Known only from the type locality in Fitzgerald River National Park, Western Australia.

**Remarks.** The species is recognized by the combination of a glabrous pileus, and a hispid stipe both brown with reddish, shades and the fairly large elliptic basidiospores.

### **Auriscalpium dissectum Maas Geesteranus & Rammeloo,**

Proc. Kon. Nederl. Akad. Wetensch. Series C, vol 82, part 2:211, 1979.

**Basidiocarp** laterally stipitate, pileus more or less circular up to 12 mm wide, strongly split in narrow lobes with fimbriate apices, single lobes up to 8 mm long and 0.3-1 mm wide, upper surface first tomentose, becoming glabrous with age, pale to dark brown, stipe 8-15 x 0.5-1.5 mm, slightly swollen towards the base, hispid, and covered with shiny bundles of hyphae or bristle-like hairs, dark brown to almost black, spines up to 2 mm long, subulate, brown in young state, later ashy grey with a



violet tinge, context up to 0.3 mm thick, pale brown, with a thin dark zone towards the upper tomentum and with a similar zone towards the spines.

**Hyphal system** dimitic, generative hyphae with clamps, 2.5–4 µm wide, hyaline in the context, skeletal hyphae 2–4 µm wide, hyaline in the context, oleiferous hyphae present, yellowish, 2–5 µm wide and with clamps.

**Gloeocystidia** numerous, projecting beyond the basidia, distal part often swollen, but mostly clavate and slightly irregular of out-line, up to 5 µm wide, 6–12 µm wide in the swollen part, thin-walled and hyaline to pale yellow.

**Basidiospores** 4.5–5.6 x 3.5–4 µm, pip- to drop-shaped.

**Substrata.** On dead wood of *Musanga* sp. (Moraceae).

**Distribution.** Known only from the type locality in Zaire.

**Remarks.** The species is recognized by a strikingly split pileus, a tomentose dark brown stipe and its distribution.

#### ***Auriscalpium fimbriato-incisum* (Teng) Maas Geesteranus,**

Proc. Kon. Nederl. Akad. Wetensch. Series C, 69, part 1:28 1966. - *Hydnum fimbriato-incisum* Teng, Contrib. Biol. Lab. Sci. Soc. China, Bot. Ser. 1:25, 1932.

**Basidiocarp** laterally to rarely centrally stipitate, pileus flabelliform to round or irregular due to several pilei becoming fused with age, partly infundibuliform, individual pilei up to 2 cm wide, margin wavy and split, upper surface pale to dark brown, becoming paler towards the margin, almost smooth and glabrous, except for a velutinate tomentum close to the stipe attachment, stipe cylindrical, up to 2 mm in diam and 2 cm long, tomentose to hispid especially towards the base and yellowish brown, becoming darker and glabrous with age, spines up to 1 mm long, subulate, pale brown, context pale brown with an upper dark zone towards the upper surface of the pileus.

**Hyphal system** dimitic, generative hyphae with clamps, 2–4 µm wide, hyaline, skeletal hyphae dominating in the stipe tomentum and towards the upper surface of the pileus, 2–5 µm wide, gloeopleurous hyphae present, yellowish, 2–5 µm wide.

**Gloeocystidia**, numerous, projecting beyond the basidia, ventricose to clavate, up to 5 µm wide and 20 µm long, hymenial or arising as swollen ends of gloeopleurous hyphae bending into the hymenium, thin-walled and hyaline to pale yellow.

**Basidiospores** 4.5–5 x 3–3.7 µm, elliptic.

**Substrata.** From the base of unknown grasses.

**Distribution.** Known only from the type locality in China.

**Remarks.** The species is recognized by the almost smooth and glabrous pileus and its association with grasses.

#### ***Auriscalpium gilbertsonii* Ryvarden,**

Harvard Pap. Bot. 6:196, 2001.

**Basidiocarp** laterally stipitate, pileus round, semicircular, applanate, glabrous, smooth, ochraceous to pale brown, 3–8 mm in diam, faintly zoned in semicircular thin lines, stipe 20–25 x 1–2 mm, smooth, glabrous, spines dense, up to 1 mm long, greyish white when dry, context whitish, 300 µm thick.

**Hyphal system** dimitic, generative hyphae with clamps, 3–10 µm wide, hyaline, skeletal hyphae hyaline, thick-walled, 3–7 µm wide, gloeopleurous hyphae present, pale yellow, 2–5 µm wide.

**Gloeocystidia** numerous, projecting beyond the basidia, ventricose to clavate, up to 10–15 µm long, hymenial or arising as swollen ends of gloeopleurous hyphae bending into the hymenium, thin-walled and hyaline to pale yellow.

**Basidia** subclavate, 12–16 x 4–5 µm, with 4-sterigmata and basal clamp.

**Basidiospores** 4.5–5 x 3–3.3 µm, elliptic.

**Substrata.** On the ground in sandy soil.

**Distribution.** Known only from the type locality in Costa Rica.

**Remarks.** The species is recognized by the smooth and glabrous pileus and the small size. Its basidiospores are narrower than those of *A. fimbriato-incisum* from China, which however has a distinctly hispid to tomentose stipe.

#### ***Auriscalpium microsporium* Wang & Yang,**

Mycol. Progress 18:646, 2019.

**Basidiocarp** laterally stipitate, pileus more or less circular up to 10–40 mm in diameter, upper surface dark brown, hispid to hirsute, tomentose to strigose, becoming glabrous by age, stipe lateral, 2–4 cm long, 2–6 mm wide, hispid, concolorous with pileus, spines up to 3 mm long, dark brown, context white to cream.

**Hyphal system** dimitic, generative hyphae with clamps, 3–5 µm wide, hyaline, skeletal hyphae 3–6 µm wide, present in the pileus hairs.

**Gloeocystidia** 25–35 x 5–7 µm, common, conical to fusiform, mostly projecting beyond the basidia, thin-walled, hyaline or with a pale yellow granular content.

**Basidiospores** globose, 3.5–4.5 x 3–3.8 µm.

**Substrata.** On cones of *Pinus armandii*.

**Distribution.** Known from the subtropical areas of China.

**Remarks.** The species is distinguished by its small basidiospores and host.

#### ***Auriscalpium orientale* Wang & Yang,**

Mycol. Progress 18:647, 2019.

**Basidiocarp** laterally stipitate, pileus more or less circular up to 8–15 mm in diameter, pileus dark brown, hispid to hirsute,

tomentose to strigose, becoming glabrous by age, stipe lateral, 2-8 cm long, 1-3 mm wide, hispid, concolorous with pileus, spines up to 3 mm long, dark brown, context white to cream.

**Hyphal system** dimitic, generative hyphae with clamps, 3-5  $\mu\text{m}$  wide, hyaline, skeletal hyphae 3-5  $\mu\text{m}$  wide hyaline to pale brown, wide on the pileus

**Gloeocystidia** 25-40 x 5-7  $\mu\text{m}$ , common, conical to fusiform, mostly projecting beyond the basidia, thin-walled, hyaline or with a pale yellow granular content.

**Basidiospores** 4.5- 5.5 x 4-4.5  $\mu\text{m}$ , subglobose.

**Substrata.** On cones of *Pinus* spp.

**Distribution.** China and Tibet.

**Remarks.** This species is almost identical with *A. vulgare* and may be looked upon as a subspecies of the former having a more southerly distribution.

#### **Auriscalpium umbellum Maas Geesteranus,**

Verhand. Kon. Nederl. Akad. Wetensch. 2 Series, part 3, no 3:17, 1971.

**Basidiocarp** centrally stipitate, pileus round and more or less flat, up to 3.5 cm in diam, margin slightly dentate to lacerate, upper surface smooth to slightly radially veined and with a few tuberculate warts, glabrous, yellowish brown to dark brown, becoming paler towards the margin, stipe cylindrical, up 4.5 cm long and 2-3 mm in diam, finely tomentose or fibrillose, pale brown, becoming darker and glabrous with age, first solid, then hollow, pale brown, spines up to 5 mm long, white when fresh, context pale brown and homogenous and with an upper dark zone towards the surface of the pileus.

**Hyphal system** monomitic, generative hyphae with clamps, 6-12  $\mu\text{m}$  wide, hyaline, gloeopleurous hyphae present, yellowish, 2-6  $\mu\text{m}$  wide.

**Gloeocystidia** numerous, projecting beyond the basidia, clavate, up to 5  $\mu\text{m}$  wide and arising as swollen ends of gloeopleurous hyphae bending into the hymenium, thin-walled and hyaline to pale yellow.

**Basidiospores** 5.5-7 x 5-5.5  $\mu\text{m}$ , subglobose to broadly elliptic.

**Substrata.** On the ground, growing among mosses.

**Distribution.** Known only from the type locality in New Zealand.

**Remarks.** The species is recognized by the almost smooth and glabrous pileus, the large spores and monomitic hyphal system.

#### **Auriscalpium villipes (Lloyd) Snell & Dick,**

Lloydia 21: 35, 1958. - *Hydnum villipes* Lloyd, Lloyd Mycol. Writ. 5:801, 1918.

**Basidiocarp** laterally (occasionally dorsally) to centrally stipitate, pileus flabelliform to round, up to 7 cm wide, upper surface pale to dark brown, hispid to hirsute, becoming glabrous towards the margin with age, azonate, stipe cylindrical, up to 4 mm in diam and 4 cm long, tomentose to hispid and more so than on the pileus, dark brown, spines up to 2 mm long, subulate, pale brown, context white to cream with an upper dark zone towards the much darker upper tomentum.

**Hyphal system** dimitic, generative hyphae with clamps, 3-7  $\mu\text{m}$  wide, hyaline in the context, slightly tinted in the other parts of the basidiocarps, skeletal hyphae few, 2-5  $\mu\text{m}$  wide, gloeopleurous hyphae present, yellowish, 2-5  $\mu\text{m}$  wide.

**Gloeocystidia** present, numerous, projecting beyond the basidia, ventricose to clavate, up to 8  $\mu\text{m}$  wide and 2  $\mu\text{m}$  long, hymenial or arising as swollen ends of gloeopleurous hyphae bending into the hymenium, thin-walled and hyaline to pale yellow.

**Basidia** subclavate, 18-24 x 5-7  $\mu\text{m}$ , with 4-sterigmata and basal clamp.

**Basidiospores** 4.5-5.5 x 3.5-4.5  $\mu\text{m}$ , elliptic.

**Substrata.** On dead hardwood.

**Distribution.** Neotropical species and known from Argentina, Brazil, Bolivia, Colombia, Costa Rica and Puerto Rico.

**Remarks.** The species comes close to *A. vulgare*, but is distinctly paler in all parts besides growing on hardwoods in the Neotropical zone. Microscopically the two species are virtually identical.

#### **Auriscalpium vulgare S. F. Gray,**

Nat. Arrang. Br. plants 1:650, 1821.

**Basidiocarp** laterally stipitate, pileus more or less circular up to 20 mm wide, upper surface hispid to hirsute, becoming glabrous with age, pale to dark brown, finally almost black, stipe slightly swollen towards the base, hispid, dark brown, spines up to 3 mm long, subulate, dark brown, context white to cream coloured with a dark zone towards the much darker upper tomentum.

**Hyphal system** dimitic, generative hyphae with clamps, 1.5- 2.5  $\mu\text{m}$  wide, hyaline in the context, slightly tinted in the other parts of the basidiocarps, skeletal hyphae 2-4  $\mu\text{m}$  wide, hyaline in the context, otherwise pale brown.

**Gloeocystidia** numerous, projecting beyond the basidia, distal part often swollen, up to 6  $\mu\text{m}$  wide, thin-walled and hyaline to pale yellow.

**Basidiospores** 4.5-5.6 x 3.5-5  $\mu\text{m}$ , elliptic.

**Substrata.** On cones of *Pinus* spp.

**Distribution.** Seemingly following the genus *Pinus* in the boreal-coniferous zone, but not common although easily overlooked due to its small size and brown colours.

**Remarks.** The species is distinct by its characteristic basidiocarps growing on old *Pinus* cones.

### Excluded species.

*Auriscalpium cupulare* (Wahlenb.) Kuntze = *Hohenbuelia unguicularis* (Fr.) O. K. Miller.

*Auriscalpium cupuliformis* (Henn.) Kuntze = *Arrhenia cupuliformis* Henn.

*Auriscalpium fechtneri* (Vel.) Nikol. = *Auriscalpium vulgare* Gray.

*Auriscalpium luteolum* (Fr.) P. Karsten = *Hydnum luteolum* Fr.,

unknown identity, said to be minute and reddish. Found on dry branches.

*Auriscalpium mesopus* (Saut.) Kuntze = *Arrhenia mesopoda* Saut.

*Auriscalpium occidentale* (Paulet) P. Karsten = *Hydnum occidentale* Paulet, *Traite champ.* 2: tab. 32, 1808. - unknown taxonomic position.

*Auriscalpium tenellum* (Lam. & DC) Kuntze = *Merulius tenellus* Lam. & DC. – *Cantharellus* sp. See Ginns, J. *Can. J. Bot.* 54:164, 1976.

### **ASTRALOHYDNUM Jülich,**

*Persoonia* 10: 138, 1978.

Basidiocarps annual, resupinate to effuse-reflexed, membranaceous, adnate, context homogeneous, margin determinate, rhizomorphs or hyphal strands lacking. Hymenophore hydroid. Hyphal system monomitic or indistinctly dimitic, hyphae simple-septate, hyaline, cylindrical, compactly arranged, thin-walled in the subhymenium, thick-walled in the trama, smooth. Cystidia (skeletocystidia) present, projecting part loosely encrusted. Basidia clavate, tetrasterigmatic. Basidiospores hyaline, more or less elliptic, thin-walled, smooth and non-amyloid. Monotypic genus.

**Type species.** *Hydnum griseofuscens* Reichardt, *Verh. Zool.-bot. Ges. Wien* 16: 374, 1866. (= *Corticium dregeanum* Berk., *J. Bot., Lond.* 5: 3, 1846).

**Remarks.** *Australohydnum* is phylogenetically related to genera like *Phanerochaete* and *Phlebiopsis*. It shares with these genera the simple-septate hyphae, but it differs in the pseudodimitic hyphal system and in the presence of skeletocystidia.

### **Australohydnum dregeanum (Berk.) Hjortstam & Ryvar den,**

*Syn. Fung.* 4: 61. 1990. - *Corticium dregeanum* Berk., *London J. Bot.* 5: 3. 1846. - *Lopharia dregeana* (Berk.) P.H.B. Talbot,

*Bothalia* 6: 57. 1951. - *Hydnum griseofuscens* Reichardt, *Verh. Zool.-Bot. Ges. Wien* 16: 374. 1866. - *Austrohydnum*

*griseofuscens* (Reichardt) Jülich, *Persoonia* 10: 138. 1978. - *Irpex vellereus* Berk. & Broome, *J. Linn. Soc., Bot.* 14: 61. 1873.

- *Irpex purpureus* Yasuda ex Lloyd, *Mycological Notes* 50: 715. 1917.

**Basidiocarps** annual, resupinate to effuse-reflexed, forming patches up to 5 cm wide, and laterally confluent and effused, up to 15 cm wide, cracked when dried, bluish in the centre when fresh, gradually lilac to the margin; brownish when dried, more or less warted, warts up to 2.5 mm long, differently anastomosed, margin distinct, white, slightly tomentose, up to 4 mm wide, basidiocarps easily separated from the substrate when dry.

**Hyphal system** pseudodimitic, generative hyphae simple septate, 4–5 µm wide, hyaline, more or less thick-walled.

**Basidiospores** 4.5–5.5 x 2.5–3.2 µm, elliptic.

**Skeletocystidia** very abundant, cylindrical, up to 125 µm long and 4.5–6.5(–7) wide, more or less encrusted, rarely projecting beyond the hymenium.

**Substrate.** Hardwoods, such as *Eucalyptus*, In Europe known from Portugal and Italy, otherwise widespread in the paleotropical zone.

**Remarks.** The species can be recognized by the coarsely hydroid, reddish to gray basidiocarps, the simple septate hyphae and the numerous encrusted cystidia.

### **BANKERA Pouzar,**

*Ceská Mycol.* 9: 95, 1955.

Basidiocarps stipitate, pileus smooth to slightly felty or fine scrupose, white to pale brown, hymenophore hydroid, white to grey, context white to slightly ochraceous, soft, azonate, hyphal system monomitic, hyphae with simple septa, spores elliptic to globose, warted, basidia tetrasterigmatic, weak scent of spices when dry, stronger when dry. Ectomycorrhizal with gymnosperms. Widespread in the Northern hemisphere.

**Type species:** *Hydnum fuligineo-album* Schmidt: Fr.

**Remarks.** The genus is related to *Phellodon* and separated mainly by fleshier basidiocarps, a character of doubtful generic importance. Thus, the two following species are often treated as *Phellodon* species.

### **Key to species**

1. Pileus often with incorporated debris, spores elliptic, 4.5–6.5 x 2.7–3.5 µm ..... **B. fuligineo-alb**
1. Pileus usually smooth and clean, spores subglobose, 4.5–5.5 x 4–4.5 µm ..... **B. violascens**

### **Bankera fuligineo-alba (Fr.) Pouzar,**

*Ceská Mycol.* 9:96, 1955. – *Hydnum fuligineo-album* Fr., *Syst. Mycol* 1:400, 1821.

**Basidiocarps** usually solitary rare connected, more or less centrally stipitate, up to 15 cm in diameter, centrally depressed, slightly tomentose to matted, pitted, often slightly lobed, brownish, often with dry needles and debris from the soil, hy-

menophore hydroid, spines up to 5 mm long, white to ochraceous becoming reddish brown by age and drying, context homogenous, azonate, yellowish white to pale ochraceous.

**Stipe** up to 3 cm long and 1 cm wide, central to eccentric, tomentose to matted, becoming glabrous, concolorous with pileus.

**Hyphal system** monomitic, hyphae up to 20 µm wide in context, narrower in spines and stipe.

**Spores** 4.5-6.5 x 2.7-3.5 µm, subglobose, hyaline and spiny.

**Habitat.** On the ground in pine forests,

**Distribution.** Seemingly follows *Pinus* in natural stands of the tree.

**Remarks.** The species is recognized by its brownish colour, the soiled pileus and elliptic spores.

### **Bankera violascens (Alb. & Schw.: Fr.) Pouzar,**

Ceská Mycol 9: 96, 1955. — *Hydnum violascens* Alb. & Schwein. Consp. Fung. p. 265, 1905, Fr., Syst. Mycol. 1: 401, 1821.

**Basidiocarps** stipitate, pileus 6-12 cm wide, more or less round, undulating, becoming centrally depressed, finely tomentose to adpressed scaly or finely fibrillose, first whitish becoming reddish brown sometimes with purplish tones spreading from the centre, margin light coloured when fresh, darker by age undulating and sharp, hymenophore densely hydroid, spines up to 6 mm long, first white becoming greyish, context white to pinkish, usually more brown to purplish brown toward the base of the stipe.

**Stipe** central to eccentric, 4-10 cm tall and 0.5-2-2 cm in diameter, often split in the upper part and then irregular in outline, finely tomentose, first white becoming rust coloured to purplish brown by age.

**Hyphal system** monomitic, hyphae thin walled, up to 20 µm wide in parts of the pileus.

**Spores** 4.5-5.5 x 4-4.5 µm, subglobose, hyaline and spiny.

**Habitat.** Follows *Picea* and *Pinus*, and with the latter to 70° N in Finnmark northern Norway and the Northern hemisphere,

**Remarks.** *B. violascens* is distinguished by a smooth pileus and its subglobose spores.

### **BASIDIORADULUM Nobles,**

Mycologia 59: 192, 1967.

Basidiocarps effused, resupinate; hymenophore coarsely hydroid to irpicoid; hyphal system monomitic, hyphae with clamps; cystidia enclosed, cylindrical but with several constrictions and with homogenous contents; basidia utriform and with a more or less distinct stipe, tetrasterigmatic; basidiospores allantoid, smooth, thin-walled, negative in Melzer's reagent. Causing white-rot in dead wood. One species in Europe.

**Type species:** *Hydnum radula* Fr.:Fr.

**Remarks.** The genus is characterized by its irregular hydroid hymenophore and the often moniliform cystidia.

### **Basidoradulum radula (Fr.:Fr.) Nobles,**

Mycologia 59: 192, 1967. — *Hydnum radula* Fr., Observ. Mycol. 2: 271, 1818. - Fr., Syst. Mycol. 1: 422, 1821. — *Hyphoderma radula* (Fr.) Donk, Fungus 27: 15, 1957. — *Radulum hydnans* Schwein., Trans. Amer. Philos. Soc., new Series 4: 164, 1834. — *Radulum orbiculare* Fr., Syst. Orb. Veg. 1: 81, 1825- - Fr. Elench. Fung. 1: 150, 1828. — *Radulum bennettii* Berk. & M.A. Curtis, Grevillea 1: 146, 1873. — *Corticium colliculosum* Berk. & M.A. Curtis, Grevillea 2: 3, 1873. — *Radulum corallinum* Berk. & Broome, Ann. Mag. Nat. Hist. ser. 4 15(no 85): 32, 1875— *Radulum epileucum* Berk. & Broome, Ann. Mag. Nat. Hist. ser. 4 15: 32, 1875. — *Odontia cerasi* Pers., Observ. Mycol. 2: 16, 1799. - *Polyporus cerasi* Pers: Fr., Syst. Mycol. 1: 382, 1821. — *Odontia macroverruca* H. Furuk., Bull. Gov. Forest Exp. Sta. Meguro 261: 41, 1974. — *Sistotrema digitatum* Pers., Syn. Meth. Fung. 1: 553, 1801. — *Sistotrema laevigatum* Pers., Mycol. Eur. 2: 195, 1825. — *Sistotrema leucoplaca* Pers., Mycol. Eur. 2: 196, 1825.

**Basidiocarps** resupinate, orbicular and confluent when growing on bark, more effused on decorticate wood, at first almost smooth, soon becoming raduloid with blunt, up to 5 mm long and 2 mm wide teeth, in the young state white, then cream to ochre yellow or light brownish; hymenial surface more or less ceraceous in the living fungus, almost corneous when dried, trama soft, almost chalky, remaining pure white, margin generally white, finely fimbriate at least under the lens.

**Hyphal system** monomitic, hyphae nodose-septate, distinct, thin-walled or in the centre of the teeth with somewhat thickened walls, uniformly 3-4 µm wide, strongly ramified and densely interwoven in the subhymenium, otherwise rather straight with sparse branching.

**Cystidia** 50-70 x 5-8 µm, generally few, especially in mature specimens, more frequent in young states as well as in the smooth hymenium between the teeth, thin-walled, cylindrical, with few constrictions to distinctly moniliform.

**Basidiospores** 9-11 x 3-3.5 µm, suballantoid with a characteristic bend at the apicular end.

**Substrate.** Usually on bark of deciduous wood, but can be found also on decorticate wood and in rare cases on conifers as well.: *Abies*, *Larix*, *Picea*, *Pinus*, *Acer*, *Alnus*, *Betula*, *Castanea*, *Carpinus*, *Corylus*, *Fagus*, *Populus*, *Prunus*, *Quercus*, *Salix*, *Sorbus* and *Sambucus*.

**Distribution.** Common in most parts of Europe, widespread on the Northern Hemisphere and apparently absent in tropical regions.

**Remarks.** The strongly raduloid basidiocarp with its conspicuous, often crowded, blunt and irregular teeth and the white, chalky context, make this fungus characteristic and recognizable already in the field. The spore morphology is also highly characteristic while the cystidia often can be difficult to observe. Sometimes the teeth can be missing entirely, but in such cases the spores and cystidia should be sufficient for an identification.

## **BEENAKIA D. Reid,**

Kew Bull. 1955:635, 1956. - *Psathyrodon* Maas Geest., Kew Bull. 31:417, 1977.

Basidiocarps pileate, dimidiate to laterally or centrally stipitate, upper surface tomentose to matted and scrupose, white, beige to ochraceous, becoming darker with age and often with olivaceous tints, hymenophore hydroid with round spines, concolorous with upper surface, stipe, if present, concolorous with pileus and with the same surface structure, context homogeneous, soft and spongy, white to ochraceous with olivaceous tints.

Hyphal system monomitic, generative hyphae with clamps, hyaline and often inflated, smooth to distinctly warted, cystidia absent, basidia slender and clavate, tetrasterigmatic, basidiospores broadly elliptic to pipshaped or almost navicular, finely ornamented, hyaline to yellowish, negative in Melzer's reagent.

On dead hardwoods apparently with a white rot.

**Type species:** *Beenakia dacostae* Reid op. cit.

**Remarks.** The genus is characterized by the dimidiate to stipitate basidiocarps and ornamented spores.

### **Key to species**

1. Spores cylindrical 7-11 x 3-4  $\mu\text{m}$  .....2
1. Spores elliptic to ovate 4-8 x 3-5  $\mu\text{m}$  .....3
2. Basidiocarp up to 2 cm wide, 1-3 mm thick, New Zealand and Australia..... **B. dacostae**
2. Basidiocarp up to 5 cm wide, 5-10 mm thick, Central Africa..... **B. fricta**
3. Basidiocarps soft and fleshy when fresh, drying lightweight, pileus 2-4 cm thick and 4-10 cm wide, spores 5-7 x 4-5  $\mu\text{m}$ ..4
3. Basidiocarps pliable and soft when fresh, drying dense and cartilaginous, pileus up to 3 cm wide and 1-3 mm thick, spores 4-5 x 3-3.5  $\mu\text{m}$  ..... **B. subglobospora**
4. Basidiocarps semi-stipitate, pinkish white to fuscous, pileus scrupose to coarsely warted when dry, known from Zambia and India ..... **B. fuliginosa**
4. Basidiocarps sessile and applanate, white to yellow or pale olivaceous, pileus papery smooth to finely warted when dry, spores distinctly yellow, tropical America..... **B. informis**

## **Beenakia dacostae D. Reid,**

op.cit.

**Basidiocarps** pileate, semi-stipitate to dimidiate, applanate and reniform to fan shaped, up to 2.5 cm wide and long and 2-3 mm thick at the base, upper surface white when fresh becoming dingy yellowish brown to olivaceous or ochraceous when dry, adpressed tomentose or cottony at first, becoming matted and smooth in places or wrinkled to slightly warted, azonate, stipe central to lateral and expanding towards the pileus, glabrous, short and often poorly developed, up to 10 mm long and 1 mm in diameter, spines white becoming concolorous with upper surface, spines up to 3 mm long, subulate and crowded, context 1-3 mm thick, spongy and soft, homogeneous, white to yellowish brown when dry, no taste or odour.

**Hyphal system** monomitic, generative hyphae with clamps at all septa, inflated in parts and up to 11  $\mu\text{m}$  wide, with ampullaceous septa in a few places, hyaline or with oily drops near the tips.

**Cystidia** absent.

**Basidiospores** 7-11 x 3-5  $\mu\text{m}$ , elliptic to pipshaped, warted, yellowish brown.

**Substrata.** On dead hardwoods, noted from *Eucalyptus*, *Dicksonia*, and other hosts.

**Distribution.** Known only from Eastern Australia and New Zealand.

**Remarks.** The species is characterized by the small stipitate basidiocarps, the pipshaped spores, darker than in any other species in the genus, and the distribution.

## **Beenakia fricta Maas Geest.,**

Bull. Jard. Bot. Nat. Belg. 37:80, 1967.

**Basidiocarps** stipitate, pileus flat to undulating and centrally depressed at the attachment of the stipe, up to 5 cm wide and long, up to 8 mm thick at the centre, upper surface whitish when fresh (?), ochraceous to pale brown when dry, velutinate to tomentose, matted and smooth to finely scrupose when dry, azonate, stipe 4-6 cm high, 6-10 mm in diameter, central or lateral, concolorous with the pileus but paler towards the base, finely tomentose and matted, central core white to pale cream and homogeneous, spines crowded, up to 5 mm long, olivaceous and pointed, context up to 8 mm, spongy and cottony and lightweight when dry, faintly duplex, lower part denser than upper part, whitish to olivaceous.

**Hyphal system** monomitic, generative hyphae with clamps, inflated in parts and up to 12  $\mu\text{m}$  wide, moderately branched.

**Basidiospores** 8,5-11 x 3.5-4  $\mu\text{m}$ , fusiform to navicular, finely warted, yellowish.

**Substrata.** On very rotten hardwood.

**Distribution.** Known from the type locality in Zaire and Ndola in Zambia.

**Remarks.** The long pipshaped to cylindrical spores and the slender stipitate basidiocarps immediately separate this species from the only other *Beenakia* species known from Africa, i. e. *B. fuliginosa*.

### **Beenakia fuliginosa (Maas Geest.) Parm. & Ryvarden,**

Windahlia 18:39, 1990. - *Psathyrodon fuliginosus* Maas Geest., Kew Bull.31:417, 1977.

**Basidiocarps** stipitate to dimidiate, individual basidiocarps 5-8 cm wide and long, often fused into larger, more compound structures, individual pilei up to 2 cm wide, upper surface white to pinkish translucent when fresh, drying greyish brown to dark ochraceous, tomentose to velutinate and soft when fresh, hispid to scrobiculate or even finely crested in parts when dry, azonate, stipe, if present, strongly expanding towards the pileus and covered with spines almost to the base, up to 2 cm long and 5 to 12 mm in diameter in the sterile part, white when fresh, cream to ochraceous when dry, hymenophore hydroid, spines crowded, white when fresh, ochraceous when dry, simple, occasionally forked, 1-3 mm long, round to slightly flattened in parts, context white to faintly olivaceous with some darker, fuscous zones, soft and fibrous, homogeneous, up to 1 cm thick at the base.

**Hyphal system** monomitic, generative hyphae with clamps, hyaline, 3-9  $\mu\text{m}$  wide, not conspicuously inflated, partly covered with rounded warts in the spines, not dissolving in KOH.

**Basidiospores** 6-7 (8) x 4-5  $\mu\text{m}$ , oblong elliptic to slightly pipshaped, thin-walled, finely warted, hyaline to faintly coloured in mass.

**Substrata.** Dead hardwoods.

**Distribution.** Known from Zambia and India.

**Remarks.** The species is characterized by its semi-stipitate basidiocarps with a pinkish to whitish colour when fresh, rather wide spores, and distribution.

### **Beenakia informis (Rick) Maas Geest.,**

Persoonia 7:555, 1974. - *Hydnum informe* Rick, Egatea 17:2, 1932.

**Basidiocarps** pileate, sessile, applanate, dimidiate to semicircular, up to 10 cm in diameter and 3 cm thick at the base, sappy when fresh, very lightweight and fragile when dry, upper surface adpressed tomentose at first, becoming papery smooth with age, azonate, whitish with olivaceous tints when fresh, drying dingy brown to olivaceous grey, hymenophore with spines, first white then cream to yellowish and finally pale olivaceous when dry and old, spines crowded, up to 8 mm long, cylindrical and pointed, context spongy to cottony, white when fresh, drying wood-coloured or pale ochraceous with a few darker zones, up to 3 cm thick at the base.

**Hyphal system** monomitic, generative hyphae with clamps, somewhat inflated, 4- 10  $\mu\text{m}$  wide, sparingly branched, some with small drops of oily content.

**Basidiospores** 5-6 x 4-5  $\mu\text{m}$ , elliptic to pipshaped, verruculose to warted, yellowish.

**Substrata.** Dead hardwoods.

**Distribution.** Known from Brazil, Bolivia and Costa Rica.

**Remarks.** The species is recognized by the applanate basidiocarp, the pale dingy yellow to olivaceous colour, the very soft and lightweight context, and the long spines.

### **Beenakia subglobospora Nunez & Ryvarden,**

Sydowia. 46:326, 1994.

**Basidiocarp** annual, centrally stipitate, up to 5 cm high and 3 cm wide in fresh condition, soft and pliable at first, drying dense and cartilaginous, pileus infundibuliform with undulating and lobed margin 1-3 mm thick, upper surface glabrous, azonate, pale brown, stipe concolorous, smooth when fresh, wrinkled and partly contracted when dry, becoming pale ochraceous in the upper part, hymenophore finely rugose soon becoming hydroid, cream to ochraceous, individual spines up to 3 mm long, context dense and pale brown, about 1 mm thick in dry condition.

**Hyphal system** monomitic, generative hyphae with clamps, hyaline, 3-6  $\mu\text{m}$  wide.

**Basidiospores** 4-5 x 3-3.5  $\mu\text{m}$ , oblong to subglobose, asperulate, pale yellow in KOH.

**Substrata.** On very rotten wood.

**Distribution.** Known only from the type locality (Brazil, Sao Paulo, Reg. Santos, Cananea, Ihla de Cardoso).

**Remarks.** The type of basidiocarp and consistency remind one of *B. dacostae* from New Zealand. However, this species is much darker and has longer spores.

### **CLIMACODON P. Karsten,**

Rev. Mycol. (Toulouse) 3: 20 1881.

Basidiocarps annual, pileate, often imbricate in dense clusters, white to cream, pileus smooth to scrupeuse; hymenial surface densely covered with slender spines; hyphal system monomitic, generative hyphae with clamps or simple septa; cystidia absent or present; basidia clavate, tetrasterigmatic; basidiospores globose to elliptic, smooth, thin-walled, negative in Melzer's reagent. Causing a white rot in hardwoods.

**Type species:** *Hydnum septentrionale* Fr.

**Remarks.** The genus is usually easily recognized by the often large, imbricate clusters of pileate and densely hydroid basidiocarps with a smooth pileus surface. Superficially it may remind one of species of *Heridium*, which have the same type of basidiocarps, but where the spores are ornamented and amyloid.

## Key to species

1. Basidiocarps reddish ..... 2
1. Basidiocarps whitish ..... 3
  
2. West African species ..... **C. sanguineus**
2. South Asian species ..... **C. javanicum**
  
3. Spores globose, no cystidia present ..... **C. africanus**
3. Spores elliptic to subcylindrical, cystidia present ..... 4
  
4. Only gloeocystidia present, see ..... **Donkia pulcherrimus**
4. Gloeocystidia and apically encrusted cystidia present ..... 5
  
5. Predominantly boreal to temperate species ..... **C. septentrionalis**
5. Predominantly tropical Asian species ..... 6
  
6. Cystidia smooth or finely encrusted, contextual hyphae with clamps, spores elliptic, 4.5-6 µm long ..... **C. dubitativus**
6. Cystidia covered with an oily sheath, all hyphae simple septate, spores cylindrical, 3.6-4.3 µm long ..... **C. chlamydocystis**

### **Donkia africana** Decock & Ryvardeen

Synopsis fung. 44:24,2021

**Basidiocarps** pileate, sessile, broadly attached, 8 cm long and 2 cm wide and 2 cm thick at the base, dense, pileus white, glabrous, azonate, dull and smooth, hymenial surface white, densely hydroid, individual spines up to 1 cm long, round to slightly flattened, about 1-2 mm wide, white to pale, context white, dense, azonate up to 1 cm thick at the base.

**Hyphal system** monomitic, generative hyphae with clamps, thin walled, 3-7 µm wide.

**Cystidia** not observed.

**Basidia** 15-24 x 4-6 µm tetrasterigmatic.

**Basidiospores** globose and 4-5 µm in diameter.

**Habitat.** Dead hardwood.

**Distribution.** Known only from the type locality in Gabon.

**Remarks.** The lack of cystidial organs and the globose spores characterize this species.

### **Climacodon dubitativus** (Lloyd) Ryvardeen,

Mycotaxon 44:129, 1992. – *Polystictus dubitativus* Lloyd, Lloyd Mycol Writ. 7:1111, 1922. - *Climacodon efflorescens* Maas-Geest., Verhand. Naturk. Kon. Nederl. Akade, Wetens. ser 2.part 60, no 3:136, 1971.

**Basidiocarps** pileate, sessile, forming large clusters, up to 30 cm tall and wide, becoming coralloid with numerous pile form a common base, pileus up to 12 cm wide and long, spatulate, first tomentose to velutinate, becoming strigose and centrally furrowed, finally glabrous, white, becoming ochraceous when dry, in older parts darker and pale orange brown with some darker lines, spines up to 1.5 mm long, white when fresh, brittle and paler brown when dry, context white, up to 7 mm thick.

**Hyphal system** monomitic, generative hyphae simple-septate, 3-5 µm wide.

**Cystidia** of two types:

**Gloeocystidia** 5-7 µm wide, projecting up to 40 µm and about 4 µm wide.

**Encrusted cystidia** as terminal ends of generative hyphae, 4 µm wide and covered with fine crystals.

**Basidiospores** 4.5-6 x 3.7-4.5 µm, elliptic.

**Habitat.** On dead wood, but also seen at the base of a living tree.

**Distribution.** Singapore, Malaysia and Solomon Islands.

**Remarks.** The large basidiocarps and fairly large spores characterize this conspicuous species.

### **Climacodon chlamydocystis** Maas-Geest.,

Verhand. Naturk. Kon. Nederl. Akade, Wetensk. ser 2. part 60, no 3:133, 1971.

**Basidiocarps** pileate, sessile, effused reflexed, imbricate, pilei up to 2.5 cm wide and long, pilear surface finely pubescent to glabrous, slightly zoned, white to pale ochraceous with scattered reddish brown lines or streak, hymenial surface densely hydroid, individual spines up to 2.5 mm long, white when fresh, pinkish to pale brown when dry, context 1-2 mm thick, white when fresh with some horizontal darker lines.

**Hyphal system** monomitic, hyphae predominantly simple-septate in the trama, in the context with scattered clamps, 3-7 µm wide.

**Cystidia** of two types:

**Gloeocystidia** as terminal ends of generative hyphae, projecting, about 4 µm wide.

**Encrusted cystidia** 4 µm wide, up to 300 µm long and covered with crystals over which there is a cover of oily matter.

**Basidia** not seen,

**Basidiospores** 3.5-4.5 x 1.8-2 µm, narrowly elliptic to subcylindrical.

**Habitat.** At the base of a living tree.

**Distribution.** Known only from the type locality in Singapore.

**Remarks.** The small spores characterize this rare species.

### **Climacodon javanicum (Pat.) Decock & Ryvardeen,**

Synopsis Fung. 44:20, 2021. - *Hydnum javanicum* Pat., Ann. Jard. Bot. Buitenzorg suppl. 1:114, 1897. - *Mycoleptodon annamensis* Hariot & Pat., Bull. Mus. Natn. Hist. nat. 20:154, 1914. - *Hydnum roseo-maculatum* Henn. & E. Nyman, Monsonia 1:10, 1899.

**Basidiocarps** pileate, effused reflexed to flabelliform with narrow base, up to 4.5 wide and 6 cm long, radiately fibrillose, with partly raised veins, villose to hirsute especially towards the base, rosy pink when fresh, drying with age more ochraceous to pale brown, margin entire to slightly split, stipe when occurring up to 2 cm long, villose and concolorous with the pileus, spines moderately crowded, up to 1 cm long and 5 mm wide, reddish when fresh, fading to pale pink ochraceous when dry, context up to 8 mm thick, firm, fibrillose, whitish to ochraceous when fresh, yellowish brown when dry.

**Hyphal system** monomitic, generative hyphae on the pileus with scattered clamps, those of the spines simple septate, 3-6  $\mu\text{m}$  wide.

**Gloeocystidia** up to 80  $\mu\text{m}$  long and 20  $\mu\text{m}$  wide, projecting in parts above the hymenium, smooth or finely encrusted.

**Basidiospores** 4.3-6 x 2-3  $\mu\text{m}$ , elliptic to subcylindrical.

**Habitat.** On the ground.

**Distribution.** South Asian species from Viet Nam, Indonesia and Borneo.

**Remarks.** The reddish colours and the sessile, occasionally dimidiate basidiocarps, beside the distribution, make it a distinct species. It is undoubtedly related to *C. sanguineus* of Western Africa, which however, is a centrally stipitate species with a deep red and even colour both as dry and fresh.

### **Climacodon sanguineus (Beeli) Maas-Geest,**

Verhand. Naturk. Kon. Nederl. Akad. Wetensk. ser 2. part 60, no 3:131, 1971. - *Hydnum sanguineum* Beeli, Bull. Soc. Bot. Belg. 58:210, 1928.

**Basidiocarps** centrally stipitate, dark red, pileate, often in clusters, pileus individual branched, often densely imbricate, up to 4 cm in diameter, 5 mm thick, soft when fresh, denser and tough when dry, adpressed fibrillose to tomentose, stipe centrally to slightly lateral, up to 5 cm tall, deep reddish and finely pubescent, hymenophore densely hydroid, individual spines up to 3 mm long, concolorous with the pileus.

**Hyphal system** monomitic, those on the pileus with clamps, in context and spines also some with simple septa, 3-6  $\mu\text{m}$  wide.

**Cystidia** 25-60 x 8-18  $\mu\text{m}$ , abundantly present in the hymenium, broadly fusiform to conical with a pointed apex, thick-walled, smooth or with a small apical crystal crown.

**Basidiospores** 4.5-5 x 2-2.5  $\mu\text{m}$ , narrowly elliptic to subcylindrical.

**Habitat.** On the ground.

**Distribution.** Known only from Western tropical Africa.

**Identification.** The deep reddish, stipitate basidiocarps characterise this beautiful species.

### **Climacodon septentrionalis (Fr.) P. Karsten,**

Rev. Mycol. (Toulouse) 3: 20 1881. — *Hydnum septentrionale* Fr., Syst. Mycol. 1: 41, 1821.

**Basidiocarps** pileate, often densely imbricate, individual pilei up to 20 cm wide, 1-2 cm thick, fleshy and soft when fresh, hard and brittle when dry, pileus scrupose to slightly strigose, the whole basidiocarps at first white, later cream to chamois yellow, discoloured in patches and brownish when dried, hymenophore densely hydroid, individual spines up to 2 cm long, context white and dense, up to 1.5 cm thick, tough and fibrous.

**Hyphal system** monomitic, hyphae predominantly simple-septate in the trama, in the context with scattered clamps, also with some multi-clamped septa, hyphae hyaline, thin- to slightly thick-walled, in the trama 3-5  $\mu\text{m}$  wide, in the context up to 10  $\mu\text{m}$  wide.

**Cystidia** abundantly present in the hymenium, broadly fusiform to conical with a pointed apex, thick-walled, smooth or with a small apical crown of crystals, 25-60 x 8-18  $\mu\text{m}$ .

**Basidiospores** 4.5-5 x 2-2.5  $\mu\text{m}$ , narrowly elliptic to subcylindrical.

**Habitat.** On living hardwoods such as *Acer*, often high above the ground along vertical cracks in the trunks.

**Distribution.** A typical eastern continental species in Europe, known throughout southern Fennoscandia and central parts of Europe to eastern France. Widespread through Siberia and in North America.

**Identification.** Superficially this species reminds one about the hydroid representatives of Hericiaceae with its white, soft, hydroid basidiocarps. However, the smooth, non-amyloid basidiospores and the thick-walled conical cystidia immediately rule out this family, where the basidiospores are ornamented and amyloid and the cystidia are of the gloeocystidia type.

### **CYANODONTIA Hjortstam,**

Mycotaxon 28: 23, 1987.

Basidiocarps resupinate, soft, odontoid to hydroid, with dense aculei conical or more commonly flattened, or sometimes subporoid especially near the margin, hyphal system monomitic, subiculum composed by thick-walled hyphae, subhymenial hyphae thin-walled and, cystidia absent, basidia short clavate, tetrasterigmatic and with a basal clamp, basidiospores subglobose to ellipsoid, slightly to distinctly thick-walled, non-amyloid. On dead wood in Africa.



**Type species** *Cyanodontia spathulata* Hjortstam.

**Remarks.** *Cyanodontia* reminds one of *Hypochnicium* by the thick-walled basidiospores, but differing in the light cyanophilous reaction in the basidiospores and distinctly cyanophilous hyphae.

### **Cyanodontia spathulata** Hjortstam,

Mycotaxon 28:23, 1987.

**Basidiocarps** resupinate, moderately soft, pale yellow, distinctly odontoid to hydroid, in parts semiporoid, aculei 1-3 mm long

**Hyphal system** monomitric generative hyphae with clamps, thick walled in subiculum, thin-walled in the subhymenium, 6-7 µm wide,

**Cystidia** absent.

**Basidiospores** 6-7 x 4.5-5 µm, subglobose to elliptic, thin- to slightly thick-walled.

**Distribution.** Known only from Tanzania.

**Remarks.** The thick walled spores make the genus distinct, but difficult to separate from *Hypochnicium*.

### **CYSTIDIODONTIA** Hjortstam,

Mycotaxon 17: 571, 1983, emend. Hjortstam & Ryvarden, Mycotaxon 25: 546, 1986.

Basidiocarps resupinate, closely adnate, crustaceous, hymenophore grandinoid, odontoid or hydroid. Hyphal system dimitic, skeletal hyphae non-dextrinoid or strongly dextrinoid, subhymenial hyphae thin-walled or with slight wall thickening, with clamps. Gloecystidia as a rule numerous, with yellowish contents, Dendrohyphidia absent or present. Basidia subclavate, small to medium-sized, tetrasterigmatic, basidiospores moderately thick-walled, subglobose, IKI negative.

**Type species.** *Hydnum artocreas* Berk. & M.A. Curtis, Grevillea 20: 1, 1891 (= *Hydnum laminiferum* Berk. & M. A. Curtis, J. Linn. Soc., Bot. 10: 325, 1868).

**Remarks.** *Cystidiodontia* seems closely related to *Crustomyces*, sharing the dimitic hyphal system and the presence of dendrohyphidia and gloecystidia, but the basidiospores are thickwalled and skeletal hyphae stain reddish-brown in Melzer's reagent in some species of *Cystidiodontia*. The genus was described with *Hydnum artocreas* Berk. & M.A. Curtis as the generic type species, but the description was based on East African specimens which later on appeared to be distinctly separated from the type of *H. artocreas* belonging to *Kneiffia isabellina* Berk. & Br., which primarily differs by its dextrinoid skeletal hyphae.

### **Cystidiodontia isabellina** (Berk. & Broome) Hjortstam,

Mycotaxon 25: 549, 1986. - *Kneiffia isabellina* Berk. & Broome, J. Linn. Soc. Bot. 14: 62, 1875. - *Hypochnicium grandinoides* Ryvarden, Bull. Jard. Bot. nat. Belg. 48:91, 1978.

**Basidiocarp** resupinate, effused, closely adnate. Hymenophore variable, odontoid to strongly hydroid, greyish to light brown, aculei 3-6 per mm and 0.2-1 (-1.5) mm long, smooth or apically fimbriate, margin thinning out or slightly byssoid.

**Hyphal system** dimitic (and sometimes also with a few binding hyphae). Generative hyphae thin-walled, hyaline, intermingled with skeletal hyphae, with clamp connections. Skeletal hyphae strongly dextrinoid, thick-walled, without clamp connections, occurring both in the subiculum and in the middle part of the aculei.

**Cystidia** few to rather common, mainly hyaline or sometimes with yellowish colour in KOH, sulpho-negative, tubular, about 25-35 x 6-7µm. Projecting hyphal ends abundant in some specimens, rarely branched. **Basidiospores** almost globose, smooth, thick-walled, 3-3.5 µm diam.

**Distribution.** Ethiopia and Sri Lanka.

**Remarks.** The small globose spores and the dimitic hyphal system are characteristic for this rare species.

### **Cystidiodontia laminifera** (Berk. & M. A. Curtis) Hjortstam,

Mycotaxon 39, 416, 1990. - *Hydnum laminiferum* Berk. & M. A. Curtis, Lin. Soc. Bot. 10: 325, 1869.

*Cystostereum artocreas* (Berk. & M. A. Curtis) Hjortstam, Mycotaxon 17: 571, 1983. - *Hydnum laminiferum* Berk. & M. A. Curtis J. Linn. Soc. Bot. 10: 325, 1869. - *Hydnum indicum* Sacc. & Stow, Syll. Fung. 14:205, 1899.

**Basidiocarps** whitish to pale yellowish, surface densely odontoid, spines or protuberances up to 05 mm long, conical to more or less cylindrical, margin abrupt and distinct, especially in mature specimens yellowish with KOH.

**Hyphal system** dimitic, generative hyphae 2-3 µm wide with clamps, skeletal hyphae are 2-3 µm wide, mostly present in the subiculum.

**Basidiospores.** 3.5-4.5 x 2-2.5 µm, elliptic.

**Substrata.** On dead wood of deciduous trees.

**Distribution.** Widespread in the tropical zone.

**Remarks.** The odontoid surface and the dimitic hyphal system characterize this species.

### **DEFLEXULA** Corner,

Ann. Bot. Mem 1:394, 1950.

Basidiocarps annual, pendant, spiny, unbranched or sparingly branched, usually as small clusters, arising directly from the wood without subiculum, white to coloured, rather tough even if fresh condition, stipe sterile, usually distinct, thinner than adjacent part of the basidiocarp, hyphal system dimitic, generative hyphae with clamps, now and then with intercalary skeletal hyphae, skeletal hyphae solid to thick walled, cystidia absent, basidia tetrasterigmatic, basidiospores smooth, slightly thick-walled with or without oil drops, globose to elliptic and without reaction in Melzer's' reagent.

On hardwoods with a white rot.

**Type species:** *Pterula fascicularis* Bres.

**Remarks.** The genus is macroscopically like *Mucronella*, but is easily separated by having a dimitic hyphal system making the basidiocarps tough. The latter genus is monomitic with fragile basidiocarps and smaller basidiospores.

### Key to species

1. American species ..... 2
1. Asian species..... 3 (not described here)
  
2. Basidiocarps shorter than 3 mm long, lilaceous to violet when dry, United States..... **D. ulmi**
2. Basidiocarps longer than 3 mm long, white, tropical species..... **D. subsimplex**
  
3. Basidiospores subcylindrical to elliptic..... **D. pacifica**
3. Basidiospores globose 9-14 µm in diameter ..... 4
  
4. Basidiocarps shorter than 3 mm, white then yellow to brown or violet ..... **D. liaceo-brunnea**
4. Basidiocarps longer than 3 mm, white to pale ochraceous ..... **D. fascicularis**

### **Deflexula subsimplex (Henn.) Corner,**

Ann. Bot. n. s. 16:279, 1952. – *Pterula subsimplex* Henn., Hedwigia 36:197, 1897. – *Pterula nivea* Pat. Bull. Soc. Mycol. Fr. 18: xx, 1902.

**Basidiocarps** spiny, acute, hanging, growing directly from the wood without basal subiculum, single or in clusters, simple or branched, cylindrical, up to 2 cm long, 0.2-0.4 mm in diameter, tough, stipe smooth, narrower than fertile part, up to 3 mm long, whole basidiocarp white when fresh, drying pale dirty brown.

**Hyphal system** dimitic; generative hyphae with clamps, which can be very difficult to observe, in dry specimens, 2-8 µm wide, thin-walled and hyaline, and in parts inflated, skeletal hyphae dominate the basidiocarp, parallel, hyaline, thick-walled to solid, up to 5 µm thick.

**Cystidia** none.

**Basidiospores** 10-14 x 6-8 µm, elliptic to slightly navicular, thin-walled, but often appearing slightly thick-walled because of large oil drops that may fill almost the whole spore.

**Substrata.** On dead wood of deciduous trees.

**Distribution.** Known from Guadeloupe (type locality), Costa Rica, Mexico, Brazil, Panama, Bolivia and Belize.

**Remarks.** The white, hanging, branched and tough basidiocarps make this to a distinct species. The large basidiospores are grossly different from all other species with similar pendant basidiocarps.

### **Deflexula ulmi (Peck) Corner,**

Ann. Bot. Mem 1:394, 1950. – *Mucronella ulmi* Peck, N. Y. State Mus. Rep. 54:154, 1901.

**Basidiocarps** annual, single, hydroid, acute, hanging, growing directly from the wood with a faint whitish radiating mycelium at the base, up to 1 mm long, white when fresh, ashy grey with a slight violet tinge when dry.

**Hyphal system** dimitic; generative hyphae with clamps, which can be difficult to observe in dry specimens, 2-4 µm wide, thin-walled and hyaline, skeletal hyphae dominate the basidiocarp, hyaline, thick-walled to solid, up to 1.5–2.5 µm wide.

**Cystidia** none.

**Basidiospores** 12-16 x 8-10 µm, thin-walled, lemon shaped to pyriform or slightly navicular.

**Substrata.** On dead wood of deciduous trees.

**Distribution.** Known from United States.

**Remarks.** The small size of the single hanging basidiocarp and the large spores should be sufficient to recognize this species, which probably is easily overlooked in the field.

### **DENDRODONTIA Hjortstam & Ryvarden,**

Mycotaxon 10: 273, 1980.

Basidiocarps resupinate, effuse, loosely adnate, hymenial surface tuberculate or odontoid, yellowish to greyish, subiculum well differentiated, brownish. Hyphal system dimitic (or pseudodimitic), generative hyphae with clamps, thin- to thick-walled, skeletal or pseudoskeletal hyphae thick-walled, yellowish to brown, slightly ramified, with sparse clamps. Dendrohyphidia present, hyaline. Cystidia absent. Basidia tetrasterigmatic Basidiospores elliptic to suballantoid, smooth, thin-walled, IKI negative.

**Type species.** *Grandinia bicolor* Talbot.

**Remarks.** *Dendrodontia* is characterized by dendrohyphae, presence of brown skeletal hyphae in the subiculum (can be considered as pseudoskeletal hyphae because they have sparse clamps), and small basidiospores (Hjortstam & Ryvarden 1980a). The genus seems morphologically related to *Dentocorticium*, but it differs above all in the presence of skeletoid hyphae.

### **Dendrodontia bicolor (Talbot) Hjortstam & Ryvarde**

Mycotaxon 10:273, 1980. – *Grandinia bicolor* Talbot, Bothalia 4: 947, 1948.

**Basidiocarp** resupinate, effused, smooth, cracking on drying, separable, densely hydroid, spines rounded to pointed, pale greenish yellow with a bluish tint, subiculum brown, margin slightly lifted when dry.

**Hyphal system** monomitic, generative hyphae with clamps, dark brown, 3-4 µm wide.

**Cystidia** not observed.

**Basidiospores** 7-10 x 2.8-3.5 µm, cylindrical to elliptic.

**Habitat.** Dead hardwood.

**Distribution.** Known only from the type locality in South Africa.

**Remarks.** This is a conspicuous species by the hydroid, pale coloured hymenophore and a dark brown context.

### **DENTIPRATULUM Domanski,**

Acta Mycol. 1:6, 1965.

Basidiocarp as single white teeth in a dense layer, individual teeth up to 1.5 mm long, pointed and unbranched, hyphae system monomitic with clamped generative hyphae, gloeocystidial yellow hyphae present in the central core bending outward and ending as gloeocystidia in the hymenial surface, basidiospores subglobose to globose, smooth to faintly asperulate, strongly amyloid. A rare monotypic European genus.

**Type species:** *Dentipratulum bialoviense* Domanski

**Remarks.** The genus is undoubtedly close to *Mucronella* Fr., which has the same type of basidiocarp, hyphal system and almost identical basidiospores with a faint amyloid reaction. The only character separating the two genera is the presence of gloeocystidial elements in *Dentipratulum*. Both genera belong to Hericiaceae sharing with this family all its basic characters. *Mucronella* and *Dentipratulum* are seemingly related to *Dentipellis* which is separated only by having a subiculum from which the teeth arise.

#### **Dentipratulum bialoviense Domanski, op. cit.**

**Basidiocarp** annual, as individual, pendant, unbranched white spines or teeth, each up to 1.5 mm long, occurring in dense clusters as a small “lawn” up to 15 cm in longest dimension.

**Hyphal system** monomitic, generative hyphae with clamps, hyaline, thin-walled, flexuous often of irregular outline, 2-6 µm wide, in the central core more or less parallel.

**Cystidia** richly present in the hymenial surface, clavate to fusiform, smooth, thin-walled and filled with an oily yellowish content arising from deeply embedded gloeocystidial hyphae, 5-10 µm in diameter and of undetermined length.

**Basidiospores** 3.5-5 x 3-4.5 µm, globose to subglobose, smooth to finely asperulate, strongly amyloid.

**Substrata.** Known only from dead *Picea abies*.

**Distribution.** Known only from the type locality in Bialowiesza national park in Eastern Poland.

**Remarks.** The species will in the field be taken for the common *Mucronella calva*, but a microscopical examination will reveal the gloeocystidial elements and thus, the identity.

### **DENTIPPELLIS Donk,**

Persoonia 2:232, 1962. - *Amylodontia* Nikol., Nov. sist. Niz. Rast. 4: 238, 1967.

Basidiocarps resupinate, hydroid, generative hyphae with clamps, gloeocystidial elements present in most species, spores subglobose to globose, finely asperulate and amyloid, on dead hardwoods with a white rot.

**Type species:** *Hydnum fragile* Pers.:Fr.

**Remarks:** The genus belongs in Hericiaceae with its white hydroid basidiocarps, presence of gloeocystidial elements and finely ornamented amyloid spores, all characteristics typical for this family.

#### **Key to species**

1. Spores 3.0-3.5 x 2.5 µm, rare species, Western Norway and China, ..... **D. coniferarum**
1. Spores larger ..... **2**
2. Spores 3.2-4.0 x 2.4-3.0 µm ..... **D. leptodon**
2. Spores larger ..... **3**
3. Growing on gymnosperms, Siberian species, spores 4.5-6 x 3-4 µm ..... **D. paramstoi**
3. Growing on deciduous wood, widespread species, spores different ..... **4**
4. Spores 4.4- 4.8 x 3.4- 4 µm ..... **D. dissita**
4. Spores larger 5.0 -5.6 x 4.0-4.8 µm ..... **D. fragilis**

#### **Dentipellis coniferarum Dai & Zhou,**

Mycologia 105: 641, 2013.

**Basidiocarps** annual, resupinate, separable, soft when fresh. brittle when dry, margin white, fimbriate, narrow, separable, hymenial surface densely hydroid, individual teeth up to 10 mm white becoming plae ochraceous by age.

**Hyphal system** monomitic; generative hyphae with clamps, 2-4 µm wide, hyaline, thin-walled, richly branched in the subiculum, gloeocystidial hyphae common.

**Gloeocystidia** 30-50 x 8-10 µm, smooth, cylindrical to clavate, thin-walled, slightly projecting above the hymenium

**Basidiospores** subglobose to elliptic, 3.0-3.5 x 2.5 µm, finely asperulate, strongly amyloid.

**Habitat.** On dead hardwoods and coniferous wood.

**Distribution.** Rare, in Norway on hardwood, in China found on coniferous wood.

**Remarks.** The very small spores characterize this species.

#### **Dentipellis dissita (Berk. & M. A. Curtis) Maas Geest.,**

Persoonia 7:551, 1974. - *Hydnum dissitum* Berk. & M. A. Curtis, J. Linn. Soc. Bot. 15:387, 1876. - *Hydnum macrodon* Miller, Mycologia 25:365, 1933.

**Basidiocarps** annual, resupinate, pale pink to ochraceous, widely effused, separable, soft when fresh. brittle when dry, margin narrow, separable, pale yellow white, hymenial surface densely hydroid, individual teeth up to 6 mm long, subiculum thin and white.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled.

**Gloeocystidia** 30-50 x 8-15 µm, smooth, thin-walled in upper part, thick walled in the basal part, projecting up to 10 µm, in the subhymenium up to 300 µm long.

**Basidiospores** 4-4.7 x 3.4-4 µm, subglobose to broadly elliptic.

**Habitat.** On dead hardwoods.

**Distribution.** Brazil, Canada, United States and Nepal.

**Remarks.** The medium sized spores are the discriminating character.

#### **Dentipellis fragilis (Pers.:Fr.) Donk,**

op cit. - *Hydnum fragile* Pers., Syn. Fung. p. 561, 1801. - *Hydnum fragile* Pers.:Fr., Syst. Mycol. 1:417, 1821. - *Dentipellis echinospora* Furukawa, Bull. Govt. Forest Exp. Sta. 261: 54, 1974.

**Basidiocarps** annual, resupinate, separable, soft when fresh. brittle when dry, margin narrow, separable, white, hymenial surface densely hydroid, individual teeth up to 6 mm long, subiculum thin and white.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled, richly branched in the subiculum.

**Gloeocystidia** 30-50 x 8-15 µm, smooth, thin-walled, projecting up to 30 µm above the hymenium.

**Basidiospores** subglobose to ovoid, 4-5.5 µm in diameter.

**Habitat.** On dead hardwoods.

**Distribution.** Widespread in Europe north to southern part of Fennoscandia.

**Remarks.** The species is easy to recognize by its white, densely hydroid and resupinate basidiocarps and strongly amyloid and asperulate spores.

**Dentipellis leptodon** (Mont.) Maas Geesteranus,

Persoonia 7: 558, 1974. - *Hydnum leptodon* Mont., Ann. Sci. Nat., Bot., sér. 2, 20: 366, 1843. - *Hydnum isidioides* Berk., London J. Bot. 4:58, 1845. - *Hydnum separans* Peck, Ann. Rep. N.Y. St. Mus. 50: 112, 1896. - *Dentipellis subseparans* Khara & S.S. Rattan, Bibliothca Mycol. 60: 100, 1977.

**Basidiocarps** annual, resupinate, separable, soft when fresh. brittle when dry, margin white, fimbriate, narrow, separable, hymenial surface densely hydroid, individual teeth up to 5 mm long, pale yellow to pale tan, subiculum thin and white, up to 0.2 mm thick,

**Hyphal system** monomitic; generative hyphae with clamps, 2-4 µm wide, hyaline, thin-walled, richly branched in the subiculum.

**Gloeocystidia** 40-80 x 8-10 µm, smooth, cylindrical to clavate, thin-walled, projecting up to 30 µm above the hymenium

**Basidiospores** 3.2- 4.0 x 2.4-3.0 µm, elliptic.

**Habitat.** On dead hardwoods.

**Distribution.** Rare, but widespread in Asia and North America.

**Remarks.** The small spores characterize this species.

#### **Dentipellis parmastoi (Nikol.) Stalpers,**

Studies in Mycol. 40: 37, 1996. - *Amylodontia parmastoi*, Nikol. Nov. Sist. Niz. Rast. 1967: 238.

**Basidiocarps** annual, resupinate, separable, soft when fresh. brittle when dry, margin white, fimbriate, narrow, separable, hymenial surface densely hydroid, individual teeth up to 5 mm long, white.

**Hyphal system** monomitic; generative hyphae with clamps, 2-5 µm wide, hyaline, thin-walled.

**Gloeocystidia** 30-60 x 8-10 µm, present, but rare, smooth, cylindrical to clavate.

**Basidiospores** 4.5-6 x 3-4 µm, elliptic.

**Habitat.** On gymnosperms.

**Distribution.** Known only from Siberia.

**Remarks.** The oblong to subcylindrical spores characterize this rare species.

#### **DEXTRINODONTIA Hjortstam & Ryvardeen,**

Mycotaxon 12: 172, 1980.

Basidiocarps resupinate, effused, distinctly hydroid, fairly soft, hyphal system dimitic, skeletal hyphae thick-walled and strongly dextrinoid, generative hyphae with clamps, cystidia absent, spores smooth and thin walled.

**Types species:** *Dextrinodontia molliuscula* Hjortstam & Ryvardeen.

**Remarks.** The genus is characterized by its hydroid hymenophore and the dextrinoid skeletal hyphae.

### **Dextrinodontia molliuscula** Hjortstam, & Ryvarden,

Op.cit.

**Basidiocarps** resupinate, soft, effused, hydroid, occasionally with flattened teeth, ochraceous, spines up to 2 mm long, cylindrical to conical, margin fibrillose to rhizomorphic.

**Hyphal system** dimitic, skeletal hyphae, up to 2 µm wide, strongly dextrinoid, generative hyphae with with clamps and long cells, 2-3 µm wide.

**Basidiospores** 3.5-4 x 2.5-3 µm, subglobose to slightly dacryoid.

**Substrate.** Dead hardwood.

**Distribution.** Known only from Mt. Kenya in Kenya.

**Remarks.** The hydroid hymenophore and the strongly dextrinoid skeletal hyphae make this to a distinct species.

### **DONKIA** Pilat,

Bull. Soc. Mycol. Fr. 52:328, 1936.

Basidiocarp annual, pileate, white to reddish orange, pilear surface smooth to scurpouse, hymenial surface densely covered with slender spines, hyphal system monomitic, generative hyphae with clamps or simple septa, cystidia present, smooth to apically encrusted, basidiospores ellipsoid, smooth, thin-walled and negative in Melzer's reagent, causing a white rot in hardwoods.

**Type species:** *Hydnum pulcherrimum* Berk. & W. A. Curtis.

**Remarks.** The genus is recognized by the pileate and densely hydroid basidiocarps with a smooth pileus. Superficially it may remind one of species of Hericiaceae which have the same type of basidiocarps, but where all hydroid species have ornamented and amyloid basidiospores.

#### **Key to species**

1. Spores globose, gloecystidia absent, African species..... **D. africana**
1. Spores elliptic, gloecystidia present, widespread species..... **D. pulcherrima**

### **Donkia africana** Decock & Ryvarden,

Synopsis Fung. 44: 24, 2021.

**Basidiocarps** pileate, sessile, broadly attached, 8 cm long and 2 cm wide and 2 cm thick at the base, dense; pileus white, glabrous, azonate, dull and smooth; hymenial surface white, densely hydroid, individual spines up to 1 cm long, round to slightly flattened, about 1-2 mm wide, white to pale, context white, dense, azonate up to 1 cm thick at the base.

**Hyphal system** monomitic, all generative hyphae with camps, thin walled, 3-7 µm wide.

**Cystidia** absent.

**Basidiospores** globose, 4-5 µm in diameter.

**Substrata.** Dead hardwoods.

**Distribution.** Known only from the type locality in Gabon.

**Remarks.** The lack of cystidial organs and the globose spores characterize this species.

### **Donkia pulcherrima** (Berk. & W. A. Curtis) Pilat,

Op. cit. - *Hydnum pulcherrimum* Berk. & W. A. Curtis, Hook., J. Bot. 1:235, 1849. - *Hydnum gilvum* Berk., Hook., J. Bot. 3:168, 1851. - *Hydnum uleanum* Henn., Hedwigia 36:198, 1897. - *Hydnum kauffmannii* Peck, Bull. Torrey Bot. Cl. 34:348, 1907. - *Hydnum australe* Lloyd, Mycol. Writ. 5 (Letter 69):11, 1919. - *Hydnum duriusculum* Lloyd, Mycol. Writ. 7:1107, 1922.

**Basidiocarp** pileate, often imbricate, individual pilei up to 7.5 cm wide and long, 1-2 cm thick, fleshy and soft when fresh, dense and brittle when dry, pilear surface first white, fibrillose, scurpouse to slightly strigose, later discoloured in brown colours and becoming warted, tuberculate, radially veined to almost smooth, hymenial surface densely hydroid, white becoming cartilaginous brown when dry, individual spines up to 4 mm long, subiculum white fleshy, becoming brown, shrunken and dense, up to 10 mm thick when fresh.

**Hyphal system** monomitic, generative predominantly simple-septate with some scattered clamps, thin- to slightly thick-walled, 3-5 µm wide in the spines, up to 8 µm wide in the subiculum, in the core of the spines oleiferous hyphae present, yellowish and up to 8 µm wide.

**Gloeocystidia** present in the hymenium, embedded and often difficult to observe properly, up to 50 µm long, 2-5 µm wide, negative in Melzer's reagent.

**Basidiospores** 3.5-4.5 x 1.5-2 µm, elliptic, adaxially flattened.

**Substrata.** On dead hardwoods.

**Distribution.** A rare species in Europe, widespread in Asia, Africa and America.

**Remarks.** The similar *Climacodon septentrionale* is usually a larger, fleshier species besides having thick-walled smooth to slightly encrusted cystidia, thus easily separated from *D. pulcherrima*. The gloecystidia may sometimes be difficult to observe properly, making determination more difficult. DNA sequencing has showed it not to be related to *C. septentrionalis*, even if their basidiocarps are strikingly similar.

## **FIBRODONTIA** Parmasto,

Consp. Syst. Cort. p. 174, 1968.

Basidiocarps resupinate, adnate but soft and fibrous; hymenophore odontoid, with dense, more or less cylindrical aculei; hyphal system subdimitic or dimitic; all hyphae with clamp connections; cystidia absent, but especially in the aculei with subcapitate hyphal ends; basidia clavate to subcylindrical, tetrasterigmatic, basidiospores elliptic, thin-walled, hyaline. On hardwoods.

**Type species:** *Fibrodontia gossypina* Parmasto.

**Remarks.** The genus has been regarded as related to or even a taxonomic synonym of *Hyphodontia* s.l. However, DNA data shows that the similarities to *Hyphodontia* are superficial and that *Fibrodontia* belongs in Trechisporales.

### **Fibrodontia gossypina** Parmasto

Consp. Syst. Cort. p. 207, 1968.

**Basidiomata** resupinate, closely adnate, effused, detachable in small pieces, in the living state hypochnoid, when dried bysoid or fibrous, hymenium odontoid, with dense and short (usually less than 1 mm), as a rule cylindrical aculei, apically hairy from projecting hyphae, white to pale ochraceous, margin sometimes fimbriate, rarely continuing into a mat of sterile hyphae, downy at first but becoming more villose with an increasing amount of skeletal hyphae.

**Hyphal system** dimitic (or pseudodimitic), generative hyphae with clamps, 2–3 µm wide, richly branched, skeletal hyphae, 2.5–3.5 µm wide, without septa and not branching, skeletal hyphae in the centre of the hymenial aculei emanate from generative hyphae in the subiculum, which is thin and consists of loosely intertwined generative and skeletal hyphae.

**Cystidia** none.

**Basidia** 10–20 × 3.5–5.5 µm, subcylindrical, tetrasterigmatic.

**Basidiospores** 3.5–4.5(–6) × 2.5–3.5(–4) µm, elliptic.

**Habitat.** Usually on much decayed hardwood and recorded from e.g. *Alnus*, *Carpinus*, *Fagus*, *Populus*, *Quercus*, and *Ulmus*. Also found on *Juniperus* and *Pinus* in South Europe.

**Distribution.** A southern species in Europe extending its distribution northwards to Estonia. Cosmopolitan and widespread in warmer parts of temperate and subtropical zones.

**Identification.** This species looks like a typical member of *Xylodon* or *Kneiffiella*. It differs by the presence of skeletal hyphae and the total lack of cystidia or modified hyphal ends in the hymenium.

## **GLOEODONTIA** Boidin,

Cah. Maboké 4: 22, 1966. - *Amylosporomyces* S.S. Rattan.

Basidiomata resupinate, effused, adnate; hymenium smooth to hydroid; hyphal system mono- or dimitic, generative hyphae with clamps; gloeocystidia present, tubular, rare in the trama, more common in the hymenium, blue to black in sulpho-vanilline, apically encrusted cystidia present in some species; basidia clavate to subcylindrical, tetrasporic; basidiospores elliptical to reniform, hyaline, ornamented, strongly amyloid. On wood with a white rot.

**Type species:** *Irpex discolor* Berk. & M. A. Curtis.

**Remarks.** The two species present in Europe are morphologically rather different but molecular investigations show that they are rather closely related and must be placed in the same genus, at least for the time being.

### **Key to species**

1. Hymenophore odontoid..... **G. columbiensis**
1. Hymenophore smooth ..... **G. subasperispora** - not included here.

### **Gloeodontia columbiensis** Burds. & Lombard,

Mem. New York Bot. Gard. 28: 17, 1976.

**Basidiomata** resupinate, effused, adnate, subceraceous to crustose, continuous when fresh, often rimose when dry, hymenial surface initially porulose, finally continuous, odontoid, white, pale yellow to cream or pale orange, individual aculei fimbriate in the apex and somewhat irregular, occasionally branched, hymenium thinning out with no noticeable margin.

**Hyphal system** monomitic, all septa with clamps, subiculum thin, indistinct, with hyaline to pale yellow thick-walled, 3–4 µm wide hyphae, spine trama with hyaline, agglutinated and indistinct, 2–4 µm wide hyphae, subhymenium thin-walled, 1.5–3 µm wide, irregular, short-celled, richly branched.

**Cystidia** tubular, of variable length and 7–15 µm wide in the apical, strongly encrusted part, thick-walled, arising deep in the trama and partly bending into the hymenium, especially near the apex but also penetrating into the apical part of the aculei, and here usually in fascicles.

**Gloeocystidia** present in the hymenium, ovate, fusiform or cylindrical, obtuse or subulate, 20–40(–60) × 5–8 µm, sometimes with a schizopapilla, smooth, thin-walled, empty or with granular, stringy contents, positive in sulpho-vanilline.

**Basidia** 25–45 × 5–6 µm, clavate to cylindrical, often with a median constriction and with a short stipe, tetrasporic with a basal clamp.

**Basidiospores** 5.5–7 × 3.7–4.5 µm, elliptic to subcylindrical, hyaline, moderately thick-walled, finely asperulate, but appearing smooth or almost so in KOH, amyloid.

**Habitat.** On dead trunks and branches of hardwoods such as *Acer*, *Fagus*, *Populus*, and *Tilia*. In North America also appearing on conifers.

**Distribution.** In Europe only known from France, Italy, and Switzerland. Seems to be more widespread in North America.

**Identification.** The macromorphology indicates a species of *Xylodon* or a *Steccherinum*, but in micromorphology the species is unmistakable with the combination of encrusted, fasciculate cystidia, gloeocystidia and amyloid, asperulate spores.

### **GLOIODON P. Karsten,**

Meddeland. Soc. Fauna Fl. Fenn. 5:42, 1879. – *Sclerodon* P. Karsten, Finl. Basidsv. 360. 1889. -

*Leaia* Banker, Mem. Torrey Bot. Club 12: 175. 1906.

Basidiocarp annual, pileate to effused-reflexed; upper surface strigose to smooth, dark brown to almost black when mature; lower side covered by dark, conical spines; context an entangled mass of hyphal strands, dark brown; hyphal system monomitic with clamped generative hyphae some of which are sclerified, sparingly branched, pigmented and with occasional clamps, simulating true skeletal hyphae; gloeocystidia present; basidiospores subglobose, hyaline, finely ornamented and strongly amyloid; on dead wood with a white rot.

**Type species:** *Hydnum strigosus* Sw.:Fr.

**Remarks:** *Gloiodon* is undoubtedly closely related to *Auriscalpium*. Both genera include species with a hydroid hymenophore, gloeoplerous hyphae, and amyloid, ornamented basidiospores. However, while species of *Gloiodon* have pileate or effused-reflexed basidiocarps, those of *Auriscalpium* are characterized by stipitate basidiocarps.

### **Key to species**

2. Basidiocarps deeply incised, context up to 3 mm thick, spines up to 1 mm long, tropical species ..... **G. nigrescens**  
2. Basidiocarps entire, margin occasionally with a few lobes, context up to 10 mm thick, spines to 6 mm long, boreal species  
..... **G. strigosus**

### **Gloiodon nigrescens (Petch) Maas Geesteranus,**

Persoonia 3(2): 166. 1964. - *Hydnum nigrescens* Petch, Ann. Roy. Bot. Gard. (Peradeniya) 7: 288, 1922.

**Basidiocarps** annual, pileate, sessile, attached laterally to the substrate without obvious subiculum or effused portion, irregularly flabelliform to spatulate, 10-28 mm long x 15-20 mm wide x 2-3 mm thick, consisting of ramified strands of tissue that give rise to a deeply lobed and dissected pileus which is densely woolly-tomentose to woolly-scaly, matted-tomentose and dark brown near attachment to substrate, orange-buff to the white margin; lower side strongly hydroid, individual spines up to 1 mm long, narrowly conical, brown near region of basidiocarp attachment to the substrate, grading into dingy orange-buff at the margin.

**Hyphal system** monomitic; generative hyphae 2-3.2 µm diam, hyaline to yellow and with clamps, thin-walled, becoming thick-walled in age, terminating in skeletal-like hyphae, these 2-4 µm diam, gloeopleurous hyphae present, 2.5-5 µm diam, with oily, refractive, hyaline contents, terminating in gloeocystidia.

**Gloeocystidia** 20-28 x 5-7.5 µm, clavate to fusoid, projecting up to 8 µm.

**Basidiospores** 3.8-5.1 x 3.5-4.5 µm, globose to subglobose, asperulate, amyloid.

**Substrata.** On dead hardwoods.

**Distribution.** Known at present from Sri Lanka, Sumatra and Bali.

**Remarks.** *G. nigrescens* is characterized by a dark brown to nearly black basidiocarp with deeply incised margin, a thin context (only up to 3 mm thick), and short spines.

### **Gloiodon occidentale Ginns,**

Mycologia 80: 66. 1988.

**Basidiocarps** annual, pileate, dimidiate to laterally substipitate, 45-80 x 40-70 x 10-15 mm, fleshy when fresh, hard and woody when dry; upper surface brownish purple to brown, becoming paler when dry, densely strigose, undulating, margin paler and in parts glabrous, in parts split into tongue-like extensions 1-2 mm wide; lower side strongly hydroid, individual spines white when fresh, greyish black when dry, up to 12 mm long and 0.3 mm in diameter; context pale brown, in older parts with black lines and alternating zones of loose and denser consistency, up to 10 mm thick at the base.

**Hyphal system** monomitic; generative hyphae with clamps, 3-4 µm wide, sklerified dark coloured generative hyphae abundant simulating skeletal hyphae.

**Gloeocystidia** abundant, smooth, tubular and often irregular with slight constrictions, in parts parallel with the hymenium and then bending into this, the hymenial part up to 45 µm long 8-12 µm in diameter.

**Basidiospores** 6-7 (7.5) x 4-5.5 µm, broadly elliptic, hyaline, finely ornamented, strongly amyloid.

**Substrata.** Hitherto known only from dead wood of *Tsuga heterophylla*.

**Distribution.** Known only from British Columbia in Canada.

**Commentary.** This species is distinguished from the far more common *G. strigosus* by larger, more compact basidiocarps, larger basidiospores and growth on gymnosperms.

### **Gloiodon strigosus (Sw.:Fr.) P. Karsten,**

Meddeland. Soc. Fauna Fl. Fenn. 5: 28. 1879. - *Hydnum strigosus* Sw.: Fr. Syst. Mycol. 1: 414. 1821.

**Basidiocarps** annual, pileate, effused-reflexed, up to 20 mm wide and 50 mm long and to 10 mm thick; upper surface dark brown to almost black, strigose to hispid; lower side strongly hydroid, concolorous with upper surface or light brown when sporulating; individual spines conical, up to 6 mm long; context a strongly intertwined mass of strands or cordons, dark brown to black.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline and thin-walled, highly branched and dominating in the subhymenium, 2.5-3.5 µm wide, sklerified dark coloured generative hyphae abundant simulating skeletal hyphae, up to 6 µm wide.

**Gloeocystidia** abundant, tubular and often with irregular constrictions, up to 120 µm long.

**Basidiospores** 5.5 x 3.5-4 µm, subglobose, finely ornamented, strongly amyloid.

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

**Distribution.** Widespread but rare in Europe.

**Remarks.** The dark, strigose to hispid, pileate basidiocarp with up to 6 mm long dark spines, and growth on hardwood, is usually sufficient to recognize this species.

### **GRAMMOTHELE Berk. & M. A. Curtis,**

J. Linn. Soc. Bot. 10:327, 1868.

Basidiocarps annual, resupinate, adnate, effused, up to 2 mm thick, hymenial surface irregularly irpicoid to poroid and then partly labyrinthine to sinuous, pore surface, cream, bluishgrey to almost black with age or time pale brownish pinkish to pale umber brown as the skeletal hyphae becomes coloured, in some specimens the skeletal hyphae are collected in bundles and then the pore surface becomes dotted with darker coloured spots consisting of bundles of skeletal hyphae may become almost blackish and thus very conspicuous when viewed in a lens, hymenium restricted to the horizontal basal parts of the pores or between teeth and slightly down the vertical walls, context light and thin. Hyphal system dimitic, generative hyphae with clamps, skeletal hyphae thickwalled to solid, dextrinoid at least in the outer parts, first hyaline and then darker with age and in some species coloured from the very beginning. Dendrohyphidia absent or present, spores elliptic to cylindrical, thin to thickwalled, smooth and nonamyloid to dextrinoid. On hard wood wood and on monocotyledons. Tropical genus with 5 species.

**Type species:** *Grammothele lineata* Berk. & M. A. Curtis.

**Remarks.** The genus is related to *Theleporus* (usually poroid and not treated here) which is separated by being ditrimitic with branched, non dextrinoid, dendroid skeletal hyphae.

### **Grammothele lineata Berk. & M. A. Curtis,**

Jour. Linn. Soc. 10:327, 1868. *Grammothele grisea* Berk. & M. A. Curtis, Jour. Linn. Soc. 10:327, 1868. *Grammothele polygramma* Berk. & M. A. Curtis, Journ. Linn. Soc. 10:327, 1868. - *Grammothele mappa* Berk. & M. A. Curtis, Journ. Linn. Soc. 10:327, 1868. *Polyporus hydrioporus* Berk., Videnskab. Medd. For. Köbenh. 187980, p. 751. *Porogramme duporti* Pat., Soc. Mycol. Fr. Bull. 29:208, 1913. *Grammothele cineracea* Bres. Hedwigia 56:299, 1915.

**Basidiocarps** resupinate, adnate, effused, up to 1 mm thick, but frequently only 200-400 µm thick, margin white to pale pinkish, pore surface first white to greyish, later pinkish, pale cocoa or sordid grey, the colour change occurs as the skeletal hyphae become tinted or coloured by age, in some specimens they are collected in bundles and then the pore surface becomes dotted with dark spots with age, especially along the dissepiments, more scattered on the vertical, sterile tube walls where these bundles often project as hyphal pegs, in other specimens the skeletal hyphae are more evenly distributed and the pore surface becomes more evenly coloured with age, tubes shallow, angular (1)2-4 per mm, often irregular as irregular plates or teeth which later merge to a more or less poroid pattern where, hymenophore whitish and restricted to the base of the pores, subiculum, thin, whitish to pinkish, with age becoming dark and resinous.

**Hyphal system** trimitic, generative hyphae thinwalled and with clamps, 1.5-2.5 µm wide, skeletal hyphae thickwalled to solid, 1.0-2.5 µm wide, first hyaline, with age becoming tinted in shades of brown, darkening in KOH and dextrinoid.

**Dendrohyphidia** richly present, hyaline and irregularly branched at the top, difficult to find in old specimens, in the hymenium up to 35 µm long, in the dissepiments and on the vertical walls apparently arising at the end of branched generative hyphae.

**Basidiospores** 4.56 x 1.5-2.5 µm, oblongelliptic.

**Substrate.** On hard wood of many kinds.

**Distribution.** Pantropical.

**Remarks.** The species has often an irregular poroid to semi hydroid surface and the projecting bundles of skeletal hyphae, often darker than the rest of the surface, make this to a distinct species.

### **GYRODONTIUM Pat.,**

Essai Tax. Hyménomyc. p. 117, 1900. - *Boninohydnum* Ito & Imai, Trans., Sapporo nat. hist. Soc. 16:127, 1950.

Basidiocarps resupinate to subpileate, hymenophore tuberculate to hydroid, hyphal system monomitic, hyphae with simple-septa, thin- to thick-walled, cystidia absent, basidia subclavate, tetrasterigmatic. basidiospores elliptic, smooth, thick-walled and dextrinoid.

**Type species:** *Hydnum henningsii* Bres.

**Remarks.** *Gyrodontium* is characterized by tuberculate to hydroid, resupinate basidiocarps and thick-walled and dextrinoid basidiospores and is morphologically and phylogenetically related to *Coniophora* in the Coniophoraceae.

### **Gyrodontium sacchari (Spreng.) Hjortstam,**

Mycotaxon 54: 186, 1995. — *Hydnum sacchari* Spreng., Kongl. Svenska Vetensk. Acad. Handl. 41: 51, 1820. — *Hydnum boveanum* Mont., Anns Sci. Nat., Bot., sér. 2 4: 194, 1835. — *Hydnum clavarioides* Berk. & M.A. Curtis, J. Linn. Soc., Bot. 10(no. 46): 325, 1868. — *Hydnum polymorphum* Berk. & Broome, J. Linn. Soc., Bot. 14: 59, 1875. — *Hydnum versi-*



color Berk. & Broome J. Linn. Soc., Bot. 14: 59, 1875. — *Hydnum merulioides* Berk. & Broome, Trans. Linn. Soc. London, Bot., Ser. 2 2: 63, 1883. — *Hydnum henningsii* Bres., Bull. Soc. Mycol. France 6: 48, 1890. — *Hydnum serpuloides* Henn., Verh. bot. Ver. Prov. Brandenb. 40: 122, 1898. — *Hydnum flavidum* Lloyd, Mycol. Writings 6: 957, 1920. — *Hydnum pulchrum* Lloyd, Mycol. Writ. 6: 918, 1920. — *Boninohydnum pini* S. Ito & S. Imai, Trans. Sapporo Nat. Hist. Soc. 16: 127, 1940. — *Gyrodontium capense* D.A. Reid, Kew Bull. 17: 269, 1963.

**Basidiomata** resupinate to pileate, often with several imbricate pilei from a common effused basidioma, pilei up to 6 × 6 cm, broadly attached, up to 1 cm thick, soft and spongy, brittle when dried, pileus surface smooth to slightly rugose, ochraceous to light brownish, hymenium initially tuberculate to subporoid, finally hydroid, with mostly flattened, blunt spines, up to 10 mm long, sulphur yellow to olivaceous brown.

**Hyphal system** monomitic, all septa simple-septate, hyaline, in the context mainly moderately thick-walled and of two types (1) rather straight, parallel, 4–7 µm wide, and (2) curved, branching, 2–3 µm wide giving the impression of binding hyphae, trama composed of agglutinated, thin-walled, mainly 4–7 µm wide.

**Basidiospores** 4–5(–6) × 2.3–2.7(–3.5) µm, elliptic, thick-walled and dextrinoid.

**Habitat.** On dead wood of different kinds, also on man-made substrates.

**Distribution.** The species has a pan-tropical distribution extending into the temperate regions.

**Remarks.** The genus is characterised by its hydroid basidiocarps, simple-septate hyphae, and small, golden brown spores.

## **HERICIUM Persoon,**

Neues Mag. Bot. 1:109, 1794.

Basidiocarps pileate, annual, stipitate to dimidiate with a contracted base, compact or finely divided in numerous branches, white when fresh, lower side(s) covered with long spines, context fleshy to tough, homogenous and amyloid; hyphal system monomitic with clamps, gloecystidia present in the subhymenium and hymenium, spores elliptic to subglobose, finely asperulate and amyloid in Melzer's reagent. Wood-inhabiting with a white rot. Cosmopolitan genus.

**Type species:** *Hericium coralloides* Scop.

**Remarks.** *Hericium* is easy to recognize by its white, fleshy and spiny basidiocarp and basidiospores with a strong amyloid reaction with Melzer's reagent. *Dentipellis* is in principle only separated by having a resupinate basidiocarps. *Climacodon* is rather similar as to type of basidiocarp, but its spores are grossly different being smooth and non-amyloid.

### **Key to species:**

1. Basidiocarp strongly branched, spines to 1 cm long.....2
1. Basidiocarp compact and massive, spines up to 4 cm long..... **H. erinaceus**
2. Spines evenly distributed from the lower side of the branches like teeth on a comb, widespread, on hardwood, spores 3.5-4.5 × 2.5-3.5 µm ..... **H. coralloides**
2. Spines unevenly distributed mostly in terminal tufts of clusters, on *Abies* in the Central European mountains, spores .5-6.5 × 4.5-5.5 µm ..... **H. alpestre**

## **Hericium alpestre Persoon,**

Mycol. Europ. 2:151, 1825.

**Basidiocarps** annual, pileate, up to 15 cm in diameter, strongly branched, flesh to tough, white when fresh, dries slowly and becoming pale resinous brown and fragile, lower side covered with unevenly distributed spines, mostly in tufts or clusters on short and tough side branches, sometimes more regular on only slightly branched basidiocarps, individual spines or teeth up to 2 cm long; context first white and homogenous and amyloid, drying brown and resinous dense with a sweet scent that are persistent for a long time.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled (in places with a wall thickness of 4 µm), 3.5-12(18) µm wide, inflated and slightly to strongly amyloid in Melzer's reagent.

**Gloeopleurous hyphae** present in the context, sparingly branched, simple septate, yellow, up to 8 µm wide.

**Gloeocystidia** present, smooth, tubular and often irregular with slight constrictions and bent tips, embedded or projecting beyond the hymenium, 3-9 µm wide, up to 120 µm long.

**Basidiospores** 5.5-6.5 × 4.5-5.5 µm, elliptic.

**Habitat.** Known only from dead trunks of *Abies*.

**Distribution.** Known only from the central European mountains and seemingly following *Abies* within its natural area. Also known from Siberia, Japan and North America.

**Remarks.** The species is easy to recognize by its basidiocarps and the specific host.

## **Hericium coralloides (Scop.:Fr.) S.F. Gray,**

Nat. Arrang. Br. Plants 1:652, 1821. — *Hydnum coralloides* Scop.: Fr. Syst. Mycol. 1:408, 1821.

**Basidiocarps** annual, pileate, up to 15 cm in diameter, strongly branched, flesh to tough, white when fresh, dries slowly and becoming pale resinous brown and fragile, lower side covered with evenly distributed spines almost like the teeth on a comb, individual spines or teeth up to 1 cm long; context first white and homogenous and amyloid, drying brown and resinous dense with a sweet scent that are persistent for a long time.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled (in places with a wall thickness of 4 µm), 3.5-18 µm wide, inflated and slightly to strongly amyloid in Melzer's reagent.

**Gloeopleurous hyphae** present in the context, sparingly branched, simple septate, yellow, up to 8 µm wide.

**Gloeocystidia** present, smooth, tubular and often irregular with slight constrictions and bent tips, embedded or projecting beyond the hymenium, 5-9 µm wide, up to 120 µm long.

**Basidiospores** 3.5-4 (4.5) x 2.5-3.5 µm, elliptic.

**Habitat.** Known from numerous hardwoods, in Central Europe *Fagus* seems to be the preferable host, in North Europe *Populus* is seemingly the most common host.

**Distribution.** Known north to 70 N in Norway, but rather rare everywhere. Circumpolar species also known from Australia and New Zealand.

**Remarks.** The species is recognized immediately by its striking basidiocarp. In most of Europe it is the only fungus with this type of basidiocarp. At least in North Europe it occurs distinctly more often in certain years for so to disappear for many years.

### **Hericium erinaceum (Bull.:Fr.) Pers.,**

Mycol. Europ. 2:153, 1825. - *Hydnum erinaeus* Bull.:Fr. Syst. mycol. 1.407, 1821.

**Basidiocarps** annual, pileate, up to 10 cm in diameter, sessile to dimidiate, subglobose to ovoid and partly hanging covered by a mass of crowded spines, flesh to tough, white when fresh, dries slowly and becoming pale resinous brown and fragile, individual spines or teeth up to 2 cm long, those on the upper side more irregular and flexuous, the lower longer and sharper; context first white and with characteristic elliptic to circular patches later developing to irregular cavities, amyloid, drying brown and resinous dense with a sweet scent that are persistent for a long time.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin- to thick-walled (in places with a wall thickness of 4 µm), 3.5-20 µm wide, inflated and slightly to strongly amyloid in Melzer's reagent.

**Gloeopleurous hyphae** present in the context, sparingly branched, simple septate, yellow, up to 8 µm wide.

**Gloeocystidia** 6-12 µm wide, up to 130 µm long, tubular and often irregular with slight constrictions and bent tips, embedded or projecting beyond the hymenium.

**Basidiospores** 5-6 x 4-5 µm, elliptic, hyaline, finely asperulate, amyloid in Melzer's reagent.

**Habitat.** On dead hardwoods of many kinds.

**Distribution.** Known throughout Europe north to the oak border through South Fennoscandia. Also known from Siberia, Japan and North America.

**Remarks.** The species is easy to recognize by the globose massive basidiocarp with spines even on the top.

### **HORMOMITARIA Corner,**

Ann. Bot. Memor. 1: 410, 1950.

Basidiocarps hydroid, pendant with a short sterile stalk and a conical fertile part, basidiospores, pip shaped, smooth, non-amyloid, basidia tetrasterigmatic, cystidia present as oleiocyctidia, smooth and with an apical oily excretion, hyphal system monomitic with clamped generative hyphae, often with globose secondary septation. On dead hardwoods with a white rot. Paleotropical genus.

**Type species:** *Hormomitaria sulphurea* Corner.

**Remarks:** The genus may possibly be related to *Mucronella* having the same type of basidiocarps, but easily separated by the characteristic cystidia and the pendant growth form.

#### **Key to species**

1. Spores 4-5 x 2.5-3.5 µm, basidiocarps whitish to pale yellow, African species ..... **H. tenuipes**
1. Spores 5-6 x 3-3.5 µm, basidiocarps sulphureus yellow, East Asian species..... **H. sulphurea**

### **Hormomitaria tenuipes (Lloyd) Berthier,**

Rev. Mycol. 33: 208, 1968. - *Mucronella tenuipes*, Lloyd, Mycol. Writ. 5:789, 1918. - *Hormomitria eburnea* Berthier & Berthier, Rev. Mycol. 31: 160, 1966.

**Basidiocarps** annual, pendant, hydroid as individual spines, up to 35 mm long, usually in dense clusters, soft and waxy when fresh. brittle when dry, white yellowish when dry, stipe white, up to 10-15 mm and 0.3 mm in diameter, cylindrical and tapering towards the apex, slender, fertile part wider than the stipe, white, fertile part of the basidiocarp up to 1 mm wide at the base tapering towards the apex, smooth, solid, white to pale yellow.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled, often inflated, especially in the fertile part, individual cells 55-60 x 6-11 µm.

**Cystidia** 40-45 x 12-25 µm, clavate, smooth, thin-walled, immersed or projecting.

**Basidiospores** 4-5 x 2.5-3.5 µm, ovoid to elliptic.

**Substrate.** On dead hardwoods.

**Distribution.** Known only from the type locality in Cameroon.

**Remarks.** The species is above all recognized by the pendant basidiocarps with a distinct stipe, the pale yellowish colour and the small spores.

### **Hormomitaria sulphurea Corner,**

Ann. Bot. Memor. 1: 696, 1950.

**Basidiocarps** annual, pendant, hydroid as individual spines, up to 12 mm long, usually in dense clusters, soft and waxy

when fresh. brittle when dry, stipe white, up to 0.8 mm long and 0.3 mm in diameter, cylindric, slender, fertile part wider than the stipe, white, fertile part of the basidiocarp up to 1 mm wide at the base tapering towards the apex, smooth, solid, pale yellow to sulphurous yellow by maturity.

**Hyphal system** monomitic; generative hyphae with clamps, hyaline, thin-walled, often inflated, especially in the fertile part, individual cells 15-140 x 8-30 µm, many secondary septate forming curved rows of globose to broadly elliptic cells, 15-30 µm, 4 to 10 cells in a row.

**Oleocystidia** 30-65 x 9-12 µm, present, smooth, thin-walled, clavate, immersed in the subhymenium or projecting, apically covered with an oily to resinous yellowish exudate being smooth or with irregular protuberances (up to 12 µm long) looking almost like a small crown.

**Caulocystidia** 30-50 x 9-12 µm, present on the stipe as smooth, widened hyphae, hyaline, slightly thick-walled, straight or curved, sometimes lobed or branched, covering the whole stipe as a palisade.

**Basidiospores** 5-6 x 3-3.5 µm, smooth, pip shaped to ovoid.

**Substrate.** On dead hardwoods.

**Distribution.** Known only from the type locality in Malaysia (Kedah, Langkawi Island).

**Remarks.** The species is above all recognized by the pendant basidiocarps with a distinct stipe, yellowish colour and the distinct and conspicuous cystidia.

## **HYDNELLUM P. Karsten, - European species**

Meddel. Soc. Fauna Flora Fenn. 5:41, 1879.

Basidiocarps stipitate, pileus glabrous to irregularly scrupeuse, brown, bluish to greenish, hymenophore hydroid, hyphal system monomitic, generative hyphae with clamps or simple septate, cystidia absent, basidia tetrasterigmatic, basidiospores ornamented, pale brown, growing on the ground, and all species ectomycorrhizal with either gymnosperms or hard wood trees. Widespread genus although with most representatives in the temperate and boreal zones.

**Type species.** *Hydnum suaveolens* Scop.

**Remarks.** The genus is related to *Sarcodon* sharing the same type of stipitate basidiocarps and coloured ornamented basidiospores, and the two genera are separated by spore size, those of latter genus are generally larger than 6 µm in longest dimension.

**NB.** The following keys and descriptions are based entirely on the original text and, thus, should be treated with care since they probably do not cover the entire variation in the microscopical characters and basidiocarps.

### **Key to species**

- |  |               |
|--|---------------|
| 1. Hyphae with clamps.....                             | <b>Key A</b>  |
| 1. Hyphae simple septate.....                          | <b>2</b>      |
| 2. Species ectomycorrhizal with hardwoods .....        | <b>Key B.</b> |
| 2. Species ectomycorrhizal with coniferous trees ..... | <b>Key C</b>  |

#### **Key A. Hyphae with clamps.**

- |   |                      |
|---|----------------------|
| 1. Pileus white to yellowish becoming pale greyish .....  | <b>2</b>             |
| 1. Pileus yellowish brown to purplish brown .....   | <b>4</b>             |
| 2. Basidiocarps with strong and fragrant odour and smell.....   | <b>H. suaveolens</b> |
| 2. Basidiocarps with mild odour, stem differently coloured.....   | <b>3</b>             |
| 3. Pileus with bluish colours, spores 5-6 x 4- 5 µm .....   | <b>H. caeruleum</b>  |
| 3. Pileus citric to yellowish, spores shorter than 5 µm in longest dimension.....   | <b>H. geogenium</b>  |
| 4. Spores 5-5.5 µm in longest dimension, pileus smooth, ectomycorrhizal with <i>Pinus</i> , taste very bitter .....                               | <b>H. peckii</b>     |
| 4. Spores 4.5-5.5 µm in longest dimension, pileus radially scaly, ectomycorrhizal with <i>Picea</i> , taste mildly bitter... <b>H. versipelle</b> |                      |

#### **Key B. Species ectomycorrhizal with hard wood trees**

- |   |                     |
|---|---------------------|
| 1. Spores smaller than 5 µm in longest dimension .....  | <b>2</b>            |
| 1. Spores longer than 5 µm in longest dimension .....   | <b>8</b>            |
| 2. Spores 3.4-5 µm long .....   | <b>3</b>            |
| 2. Spores longer than 5 µm in longest dimension .....   | <b>4</b>            |
| 3. Pileus whitish to orange becoming reddish by age, strongly decurrent pores on stipe, no specific smell when fresh..... | <b>H. cumulatum</b> |
| 3. Pileus pinkish brown becoming dark brown by age, pores not decurrent on stipe, farinaceous smell when fresh .....      | <b>H. nemorosum</b> |

4. Spores 6.3-7 µm in longest dimension.....	<b>H. illudens</b>
4. Spores shorter than 6.3 µm in longest dimension .....	5
5. Pileus velutinate to slightly hirsute .....	<b>H. compactum</b>
5. Pileus glabrous, smooth to scaly .....	6
6. Pileus orange, yellow to orange brown.....	7
6. Pileus darker.....	8
7. Pileus reddish orange to orange brown, radially furcate to fibrillose.....	<b>H. auratile</b>
7. Pileus yellowish brown, smooth to velutinate, slightly scaly by age, stipe whitish becoming pinkish .....	<b>H. joeides</b>
8. Context pinkish brown, pileus distinctly pink to pinkish brown.....	<b>H. concrescens</b>
8. Context whitish, to pale brown, pileus pale pink becoming pale brown.....	9
9. Widespread species with different hard woods .....	<b>H. lepidum</b>
9. Known only from Great Britain with <i>Fagus sylvatica</i> .....	<b>H. fagiscabrum</b>

### Key C, Species ectomycorrhizal with coniferous hosts

1. Spores 6.3- 7. 6 µm long .....	2
1. Spores smaller.....	3
2. Pileus fibrillose to fine scaly, yellowish becoming darker by age, context whitish.....	<b>H. fennicum</b>
2. Pileus squamous to coarsely fibrous, reddish to purplish brown, context pale with dark lines .....	<b>H. scabrosus</b>
3. Spores up to 5 µm in longest dimension, pileus finely tomentose to glabrous .....	4
3. Spores longer than 5 µm in longest dimension, pileus glabrous to scaly.....	5
4. Spores globose to subglobose, stipe up to 6 cm long and 1.5 cm wide, known only from Cent. Sweden....	<b>H. roseoviolaceus</b>
4. Spores elliptic, stipe up to 1.5 cm long and 4 mm thick, wide spread with <i>Pinus</i> .....	<b>H. gracilipes</b>
5. Pileus more or less smooth to velutinate .....	6
5. Pileus fibrillose, scaly to hirsute with age .....	8
6. Context whitish, pileus yellowish to purplish brown.....	<b>H. martioflavum</b>
6. Context coloured, pileus yellowish brown .....	7
7. Stipe purplish violet .....	<b>H. fuligineoviolaceum</b>
7. Stipe whitish becoming pale pinkish brown.....	<b>H. glauopus</b>
8. Pileus irregularly orange to rusty reddish brown .....	<b>H. aurantiacum</b>
8. Pileus ochraceous to dark brown .....	9
9. Context distinctly duplex .....	10
9. Context more or less homogenous .....	11
10. Pileus sulphureus becoming ochraceous to brown, stipe tomentose, short to almost absent .....	<b>H. mirabile</b>
10. Pileus pale to dark brown, stipe up to 6 cm long and 3 cm wide, velutinate to smooth.....	<b>H. ferrugineum</b>
11. Pileus yellowish to purplish brown becoming fibrillose, context whitish to pale brown ectomycorrhizal with <i>Picea</i> following the host .....	<b>H. lundellii</b>
11. Pileus reddish to dark brown with scattered fibrillose coarse scales, context yellowish to pale brown, ectomycorrhizal with <i>Pinus</i> , seemingly known only from Eastern Sweden.....	<b>H. scabrosellum</b>

### **Hydnellum aurantiacum (Batsch) P. Karsten,**

Medd. Soc. Fauna Flora Fenn. 5: 41, 1879. – *Hydnum suberosum* var *aurantiacum* Batsch, Elench fung. p. 103, 1789.

**Pileus** usually single but occasionally fused with other caps; 3-10 cm wide; flat, becoming shallowly depressed; pitted, ridged, or elaborately irregular orange to rusty red overall, with a whitish to dingy pinkish margin that often bruises brownish to blackish, spines 2-5 mm long; whitish at first, becoming dingy, context, duplex, upper layer soft, whitish to dull orange, lower layer orange-brownish. Odor fragrant; taste somewhat unpleasant.

**Stipe** 2-5 cm long; 1-2 cm thick at apex; cylindrical, club-shaped, or somewhat irregular; sometimes spongy near the base; orange to rusty red.

**Hyphae** simple septate, 2-5 µm wide.

**Spores** 5.5-6.5 x 4.5-5 µm; subglobose, irregular and ornamented.

**Habitat.** Ectomycorrhizal with coniferous trees.

**Distribution.** Widespread follows *Picea* to its northernmost localities, rare and scattered north to Troms in Norway.

**Remarks.** The orange colours especially in the stipe and context characterize this species and is reflected in the specific epithet.

### **Hydnellum auratile (Britz.) Maas. –Geest.,**

Persoonia 1:111, 1959. – *Hydnum auratile* Britz., Hymen. Südbayern 8:14, 1891.

**Basidiocarps** stipitate, pileus single or crowded, up to 5 cm wide, depressed to infundibuliform, smooth to scrupose radially ridged, in then concentrically corrugate to radially fibrillose, first velutinate becoming scrupose, first vivid orange to orange brown, later brownish, context up to 2 mm thick, vivid orange to pale brown.

**Stipe** up to 4 cm high and 1 cm wide, velutinate, felted, concolours with pileus.

**Hyphae** 2.5-7 µm wide with simple septa.

**Spores** subglobose 5-6 x 3.5.4,5, tuberculate.

**Habitat.** Both with coniferous and deciduous trees

**Distribution.** Scattered to the northern border for *Picea* in Scandinavia, scattered throughout Europe.

**Remarks.** The yellowish to brownish colours make a rather distinct species and similar to the more vivid citric yellow coloured and gregarious *H. aurantiacum*.

### **Hydnellum caeruleum (Hornem.) P. Karsten,**

Medd. Soc. Fauna Flora Fenn. 5:41, 1879. - *Hydnum caeruleum* Hornem. Fl. Danica 8:7, 1808.

**Pileus** usually single but occasionally several fused to compound basidiocarps; 3-15 cm wide; convex, becoming flat or shallowly depressed; somewhat velvety; sometimes ridged or pitted; when fresh and young white to whitish or pale yellowish, usually with a bluish cast, becoming dingy tan to brownish over the centre or overall; the pale margin often bruising blue, spines that are 3-6 mm long; whitish to pale greyish at first, becoming brownish to brown, context whitish to pale orange or brownish, with zones of blue or brown. Odour and taste, mealy.

**Stipe** 2-5 cm long; 1-3 cm thick at apex; more or less cylindrical, or with a slightly swollen base; orange to orange with

**Hyphae** with clamps, 2-6 µm wide.

**Spores** 5-6 x 4-5.5 µ; subglobose to irregular and with low warts

**Habitat.** Ectomycorrhizal with *Pinus* and *Picea*, rarely with other gymnosperms.

**Distribution.** Follows *Pinus sylvestris* to its outmost localities at 70° N in Porsanger, Norway, but seemingly rarer north of the Polar circle.

**Remarks.** A cap that is bluish when young and the bluish to orange stipe characterize the species.

### **Hydnellum compactum (Pers.) P. Karsten,**

Meddn. Soc. Fauna Flora Fenn. 5: 41, 1879. – *Hydnum compactum* Pers., Comm. Schaeff. Icon. Pict. 57, 1800. – *Hydnum striatum* Schaeff. Fung. Bavar. 4: 98, 1774. – *Hydnum tuberculatum* Britzelm., Ber. Naturw. Verhand. Schwaben, 31: 176, 1894.

**Basidiocarps** stipitate, simple or several fused to compound structures, up to 7.5 cm wide, pileus flat to slightly depressed centrally, first velutinate to slightly hirsute, later more hispid, first white, becoming yellowish to pale brown by age, spines up to 4 mm long, first white then purplish brown by maturity, context, up to 2 cm thick, usually homogenous, pale yellowish to sepia brown by age. Taste sharp then bitter.

**Stipe** up to 4 mm long, first whitish becoming purplish brown by maturity, core first whitish then olivaceous.

**Hyphae** 3-14 µm wide and simple septate.

**Spores** 5.6-5.8 x 3.6 x 4.5 µm.

**Habitat.** Ectomycorrhizal with deciduous trees such as *Castanea*, *Fagus* and *Quercus*.

**Distribution.** Follow the host trees throughout Europe to the northern limit for *Quercus* in Central western Norway.

**Remarks.** This species is macroscopically rather similar to *H. mirabile*, which however is ectomycorrhizal with conifers and have a very distinct duplex context.

### **Hydnellum concregens (Pers.) Banker,**

Medm. Torrey Bot. Club 12: 157, 1906. – *Hydnum concregens* Pers., Observ. Mycol. 1:74, 1796. -

*Hydnellum zonatum* (Batsch) P. Karsten, Medd. Soc. Fauna Flora Fenn. 5:41, 1879. - *Hydnellum fasciatum* Baird, The stipitate hydnums of Eastern US, p. 77, 1951. - *Hydnellum queletii* (Fr.) P. Karsten, Medd. Soc. Fauna Flora Fenn. 5:41, 1879. - *Hydnellum vespertilio* (Berk.) Banker, Mycologia 5: 198, 1913.

**Basidiocrp** brownish pink to pinkish brown, sometimes fading to nearly whitish, single or often fused with other caps; 2-10 cm wide; first often convex, becoming flat or shallowly depressed; finely velvety to almost glabrous, often with pits and radially arranged ridges, or irregular outgrowths; with concentric zones of texture and/or color; the fresh margin bruising dark brown to black, lower side with 1-3 mm long spines, context pinkish to brownish, often with zones of these shades whitish at first, becoming brownish to brown. Odor not distinctive, or mealy; taste mild or mealy.

**Stipe.** 2-4 cm long, 5-2 cm thick at apex; often swollen, velvety or spongy, especially towards the base.

**Hyphae** simple septate, 2-6 µm wide.

**Spores** 4.5-6 x 4-5 µm, subglobose to irregular; prominently nodulose.

**Habitat.** Ectomycorrhizal with both deciduous trees and gymnosperms.

**Distribution.** Rather common throughout in Europe and north to the Polar circle, rarer northwards.

**Remarks.** This species is closely related to the similar *Hydnellum scrobiculatum* but is separated by its velvety distinctly zoned pileus.

### **Hydnellum cumulatum Harris.,**

Can. J. Bot. 42: 1225, 1964.

**Basidiocarps** stipitate, up to 7 cm wide, plane to depressed centrally, single or in fused groups, velutinate tomentose, occasionally corrugate with tufts and warted, whitish orange becoming darker and more brownish to reddish by age, spines up to 3 mm long, strongly decurrent on stipe, greyish to brownish orange, context duplex, pale orange to reddish, nonspecific odour or taste.

**Stipe** up to 3 cm long and 1 in diameter, tomentose to dull and matted, more or less concolorous with pileus.

**Hyphae** up to 6 µm wide, simple septate, occasionally mixed with gloeopleurous hyphae in the context.

**Basidiospores** 4-5 x 3.5-4.5 subglobose and tuberculate.

**Habitat.** Ectomycorrhizal with deciduous trees.

**Distribution.** Southern species and known north to southern tip of Norway in the oceanic zone. Probably widespread with *Quercus* species in Europe. Described from Central United States.

**Remarks.** The white to orange colours when fresh and the strongly decurrent spines, are good field characters.

### **Hydnellum fagiscabrosum Ainsw. & Nitare,**

Fung. Syst. Evol. 7: 238, 2021.

**Basidiocarp** stipitate, pieus up to 14 cm wide, convex, then flattened or depressed, irregular, fibrillose, coarsely scaly, pinkish brown becoming chestnut brown to blackish brown, margin paler and almost white, spines up to 1 cm long, grayish brown, darkening with age, context whitish or pale pink, smell mealy.

**Stipe** up to 10 cm long and 1-3 cm wide, whitish, pinkish or reddish brown, sometimes blue green, dark green or black at the base, often with whitish at the base, mealy smell and bitter taste

**Hyphae** up to 8 µm wide and simple septate.

**Basidiospores.** 4.5-6.3 x 3.8-5.3 µm and irregularly warted.

**Habitat.** Ectomycorrhizal with *Fagus* and *Castanea*, seemingly most common on sandy soil.

**Distribution.** Known only from Great Britain.

**Remarks.** The subglobose spores and the pale context is distinct for this species.

### **Hydnellum ferrugineum (Fr.) P. Karsten,**

Medd. Soc. Fauna Flora Fenn. 5:41, 1879. – *Hydnum ferrugineum* Fr., Syst. Mycol. 1 403, 1821. – *Hydnum carbunculus* Serchr., Mycogr. Suisse p. 515, 1833. – *Hydnellum anguinarium* Banker, Mem. Torrey Bot. club 12: 152, 1906. – *Hydnelleum pineticola* Harrison, Can. J. Bot. 42: 1226, 1964. – *Hydnellum spongiosipes* Peck, Ann Rep. New York State Mus. 50: 111, 1897.

**Basidiocarps** centrally stipitate, single or in clusters, pileus up to 10 cm wide, flat to slightly depressed, even or with scattered tufts or swellings, first velutinate, but soon hairy to hispid, often radially fibrillose, first pale brown and the often with secreted drops, but soon dark brown, spines up to 6 mm long, context up to 15 mm thick, duplex, first pinkish then purplish brown.

**Stipe** up to 6 cm high and 3 cm in dimer, first velutinate, soon matted and dull, concolorous with the pileus.

**Hyphae** simple septate, 2.5-5 µm wide.

**Basidiospores** 5.5-6.5 x 3.5 -4.5, subglobose and warted.

**Habitat.** Usually in coniferous forests.

**Distribution.** Follows *Pinus sylvestris* to about 70° in Norway.

**Remarks.** The rather thick basidiocarps, the even brown colours and secreting reddish drops when young, characterize this species.

### **Hydnellum fennicum (P. Karst) Larsson, Larsson & Koljalg,**

Myckeys 54: 40, 2019. - *Sarcodon fennicus* (P. Karst.) P. Karst., Rev. Mycol. 9:10, 1887.

**Basidiocarps** simple or in groups, pileus up to 10 cm wide, flat to centrally depressed, densely fibrillose to scaly, those the centre often erect, more fibrillose to adpressed towards the margin, first ochraceous yellow, darkens to yellowish brown, sometime with reddish brown patches, spines up to 5 mm long, whitish becoming purplish brown, context whitish, green to grey at the base of the stipe, smell of bitter almonds when fresh.

**Stipe** 3-7 x 1-3 cm, cylindrical, tomentose, glabrous by age, concolorous with pileus except at the base which becomes bluish green to greyish green and often covered with pale mycelium.

**Hyphae** simple septate, up to 20 µm wide in pileus.

**Basidiospores** 6.3-7.6 x 4.5-5.2 µm, pale brown, strongly angular.

**Habitat.** Ectomycorrhizal and connected to *Pinus* spp.

**Distribution.** Continental parts of Norway and eastwards.

**Remarks.** The yellowish pileus, the bluish green base and the simple septate hyphae characterize this species.

**Hydnellum fuligineoviolaceum (Kalchbr. in Fr.) Larsson, Larsson & Koljalg,**

Myckeys 54: 41, 2019. - *Hydnum fuligineo-volaceum* Kalchbr. in Fr., Hymen. Europe. p. 602, 1974.

**Basidiocarps** simple, pileus up to 13 cm wide, pale to slightly centrally depressed, first tomentose, becoming slightly scaly or glabrous, smooth and shiny, ultimately cracking, yellowish brown to reddish brown, sometimes with greyish to bluish shades, spines to 4 mm, purplish brown, context reddish pink to pale purplish to violaceous.

**Stipe** up to 4 mm long, 0.6-4 cm in diameter, cylindrical, first tomentose, soon glabrous, purplish violet.

**Hyphae** simple septate, up to 20 µm wide in the context.

**Spores** 5.4-6.5 x 4-4.5 µm, brownish and angular.

**Habitat.** Ectomycorrhizal with *Abies*, *Picea* and *Pinus*.

**Distribution.** North to Troms in northern Norway, but apparently rare, seemingly more widespread in Central Europe.

**Remarks.** The glabrous brownish pileus, dark coloured context, small spores and simple septate hyphae characterize this rare species.

**Hydnellum geogenium (Fr.) Banker,**

Mycologia 5:204, 1915. - *Hydnum geogenium* Fr., Övers. Vet. Akad. Förh. p. 131, 1852.

**Basidiocarps** single, more often confluent, pileus up to 10 cm wide, often consisting of individual lobes of different length and size, tuberculate to radially furrowed, citric to sulphurous yellow to whitish yellow, in wet weather often with reddish guttation drops, spines up to 3 mm long, context first yellow, later brown, aromatic odour and taste mild.

**Stipe** up to 3 cm long and 2 cm wide in individual specimens, tapering, citric yellow.

**Hyphae** with clamps, 2-6 µm wide.

**Spores** 4-5 x 3-3.5 µm, subglobose, tuberculate.

**Habitat.** Ectomycorrhizal with *Picea*.

**Distribution.** North to the Polar circle, wide spread in the Northern temperate zone.

**Remarks.** The vivid yellowish colours in fresh condition and the often gregarious crowded basidiocarps, are characteristic for this distinct species.

**Hydnellum glaucopus (Maas-Geest. & Nannf.) Larsson, Larsson & Koljalg,**

Myckeys 54: 41, 2019. - *Sarcodon glaucopus* Maas Geest. & Nannf. Svensk Bot. Tidskr. 63:407, 1969.

**Basidiocarps** single or in small groups, pileus up to 10 cm wide, flat to slightly centrally depressed, first tomentose, then dull and smooth, sometimes with scales at the margin, yellowish brown to vinaceous or purplish brown, spines up to 5 mm long crowded, first white becoming pale purplish brown, context whitish to slightly yellowish, greyish green at base of stipe. Taste bitter.

**Stipe** up to 7 cm long and 4 cm wide, tomentose to fibrillose, matted, first whitish soon pinkish brown, pale to greenish whitish at the base.

**Hyphae** up to 20 µm wide in pileus, simple septate.

**Basidiospores** 5.4-6 x 4-4.5 µm pale brown and spiny or crested.

**Habitat.** Ectomycorrhizal with gymnosperms, preferably with *Picea* in slightly base rich soil

**Distribution.** Scattered to Troms in Northern Norway, wide spread in Europe.

**Remarks.** The species is recognized by its small spores, smooth pileus in variable colours, the greyish to green base and the host connections.

**Hydnellum gracilipes (P. Karst.) P. Karsten.,**

Meddel. Soc. Fauna Flora. Fenn. 5: 362, 1868. - *Hydnum gracilipes* P. Karst., Not. Sällsk. Fauna Fenn. Förhand. 9: 362, 1862.

**Basidiocarps** centrally stipitate, up to 3 mm wide, flat to slightly depressed, tomentose then dull and glabrous, pale purplish brown more yellowish in the centre, spines up to 2 mm long, pale purplish brown by maturity, context up to 1.5 mm thick, faintly duplex, faintly purplish brown by maturity.

**Stipe** up to 1.5 cm long and 4 mm thick, tomentose becoming glabrous, concolorous with pileus.

**Hyphae** 2-6 µm wide, simple septate.

**Spores** 4.3-4.6 x 2.7-3.6 µm and ornamented.

**Substrate.** Ectomycorrhizal with coniferous trees.

**Distribution.** Scattered north to Finnmark in Northern Norway and widespread in Europe.

**Remarks.** The small basidiocarps and the rather small elliptic spores characterize this rare species.

**Hydnellum illudens (Maas-Geest.) Nitare,**

Fung. Syst. Evol. 7: 245, 2021. - *Sarcodon illudens* Maas-Geest., Proc. K. Ned. Wet. Ser. C, Biol. Med. Sci. 79: 285, 1976.

**Basidiocarps** stipitate, pileus up to 7 cm wide, plant to convex by maturity slightly centrally depressed, first evenly velutinate, surface then becoming scaly, especially towards the centre, scales adnate with raised tips, first pinkish violet then darkening to blackish to deep brown, spines up to 5 mm long, first white then purplish brown, context white.

**Stipe** up to 5 cm long and 1.5 cm wide, minutely tomentose, becoming glabrous with scattered fibrils, first brownish white then concolorous with pileus.

**Hyphae** simple septate, 2-6 µm wide, up to 22 µm wide in the pileus.

**Spores** 6.3- 7 x 3.6- 4.5. elliptic and coarsely tuberculate.

**Substrate.** Ectomycorrhizal with hard wood trees.

**Distribution.** Known North to central Norway and throughout central Europe.

**Remarks.** The fairly large elliptic spores, the glabrous stipe and the raised scales on the pileus by maturity, are characteristic for this rare species.

#### **Hydnellum joeides (Pass) Larsson, Larsson & Koljalg,**

Myckeys 54: 42, 2019. - *Hydnum joides* Pass., Nuovo G. Bot. Ital. 4:157, 1872. - *Sarcodon commutatus* Bourdot & Galzin, Bull. Soc. Mycol. fr. 4:109, 1924.

**Basidiocarps** simple or in clusters, pileus up to 12 cm wide, distinctly centrally depressed, velutinate to felty becoming slightly scaly when old, yellowish brown, often with lilac tints or pale zones, becoming darker by age, by age often covered with excreted yellowish dots, spines up to 3 mm long, purplish brown by age, context whitish towards the base, otherwise pinkish to pale violet.

**Stipe** 3.5-6 x 0.7-20 cm, cylindrical, first tomentose becoming glabrous, whitish becoming pinkish and finally concolorous with pileus.

**Hypha** simple septate, up to 22 µm wide in pileus.

**Basidiospores** 5.4- 5.8 x 3.6-4.2, pale brown and angular.

**Substrate.** On the ground, ectomycorrhizal with *Quercus*, *Fagus* and *Castanea*.

**Distribution.** Widespread in Europe and north to the coastal areas in Southern Norway.

**Remarks.** The small spores, the smooth pileus in brownish to pinkish colours, the host range and simple septate hyphae, are characteristic for this rare species.

#### **Hydnellum lepidum (Maas-Geest.) Larsson, Larsson & Koljalg,**

Myckeys 54: 41, 2019. - *Sarcodon lepidus* Maas-Geest., Verhand. Kon. Nederl. Akad. Wetensch. 2. Series, 65:105, 1976. - *Sarcodon regalis* Maas Geest., Verhand. Kong. Nederl. Akad. Wetensch. Natur. 2. Seer, part 65: 106, 1976.

**Basidiocarps** stipitate, pileus up to 10 cm in diameter, flat to slightly convex, scaly

**Basidiocarps** simple to concolorous, up to 7 cm wide, flat to slightly centrally depressed, first tomentose then fibrillose to scaly towards the centre, first pinkish brown becoming purplish brown, spines up to 3 mm long, decurrent on stipe, purplish brown in the end, context up to 6 mm thick in centre, whitish in pileus.

**Stipe** up to 4 cm long and 0.5-1.2 cm in diameter, tapering towards the base, first finely tomentose becoming glabrous by age, yellowish brown to pinkish brown and greyish green at the base.

**Hyphae** simple septate, up to 24 µm wide in pileus.

**Spores** 5.8- 6.3 x 3.5-4.3 µm, elliptic and irregularly angular to tuberculate.

**Substrate.** Ectomycorrhizal with deciduous trees, especially with *Quercus*.

**Distribution.** Known north to southern tip of Norway, probably widespread with the host genus in Europe.

**Remarks.** This species comes close to *H. glaucopus* which however is connected to coniferous hosts.

#### **Hydnellum lundellii (Maas-Geest- & Nannf.) Larsson, Larsson & Koljalg,**

Myckeys 54: 42, 2019. - *Sarcodon lundellii*, Maas. Geest. & Nannf., Svensk Bot. Tidskr. 63:421, 1960

**Basidiocarps** simple or fused in group, pileus up to 9 cm wide, yellowish brown to reddish or purplish brown with scattered brown scales, spines up to 4 mm long, purplish brown when mature, flat to slightly centrally depressed, scaly from the centre, more glabrous to velutinate at the margin, the latter often fibrillose, odour slightly farinaceous. context whitish to pale brown, darker at the base of the stipe.

**Stipe** up to 8 cm high and 2 cm wide, finely tomentose, soon glabrous, first whitish brown, soon dark coloured as the pileus.

**Hyphae** simple septate, in pileus up to 20 µm wide.

**Basidiospores** 5-5.8 x 3.6-4-2 µm, irregular, pale brown.

**Substrate.** On the ground ectomycorrhizal with *Picea*.

**Distribution.** Known apparently only from Fennoscandia.

**Remarks.** The reddish brown pileus and stipe, the pale context and the irregular, fairly small spores characterize this rare species.

#### **Hydnellum martioflavum (Snell, Harris. & Jacks.) Larsson, Larsson & Koljalg,**

Myckeys 54: 42, 2019. - *Hydnum martioflavum* Snell, Harris. & Jacks., Lloydia 25: 161, 1962. - *Sarcodon armeniacus* Maas-Geest., Nyt. Mag. Bot. 10: 169, 1963.

**Basidiocarps** simple or in groups, pileus up to 10 cm wide, flat to slightly centrally depressed, finely velutinate, finally glabrous to slightly wrinkled, ochraceous yellowish brown becoming purplish brown by age, spines up to 5 mm first whitish soon purplish brown, context whitish in pileus, brownish in stipe.

**Stipe** up to 5 cm high and 2 cm wide, cylindrical velutinate, concolorous with pileus, context brownish.

**Hyphae** up to 20 µm wide in context and simple septate.

**Basidiospores** 5-6.3 x 3.6 -4.5 µm, pale brown and angular.

**Habitat.** On the ground in coniferous forests.

**Distribution.** North to Troms in Northern Norway, following pine throughout Europe.

**Remarks.** The smooth pileus becoming purplish by age, simple septate hyphae and the pale context, characterize this rare species.



**Hydnellum mirabile (Fr.) Karsten,**

Meddn. Soc. Fauna Flora Fenn. 5:41, 1863 - *Hydnum mirabile* Fr., Monograph. Hymen. Suec. 2:349, 1863. – *Hydnum acre* Quel. Bull. Soc. Mycol. Fr. 23: 352, 1876.

**Basidiocarps** stipitate, single or in groups, pileus up to 9 cm wide, flat to centrally depressed, first velutinate, later hairier becoming hispid to pitted with finally a mat surface with raised hairs, first sulphurous yellow, becoming ochraceous and finally dark brown, spine up to 5 mm long, first yellowish then purplish brown by maturity, context up to 15 mm thick centrally, distinctly duplex, the loosed upper part thicker than the denser lower part, pale brown.

**Stipe** up to 3 cm long and 2 cm wide, often almost absent, cylindrical tomentose, first whitish then olive brown.

**Hyphae** up to 11 µm wide and simple septate.

**Spores** 5-5.8 x 4.5 µm, angular.

**Habitat.** Ecotmycorrhizal with *Picea* and *Pinus*.

**Distribution.** Known to 69° N in Troms, Northern Norway, widespread in Europe with the host trees.

**Remarks.** The almost sessile basidiocarp with yellowish pileus when young and the loose, distinctly duplex context, are characteristic for this species.

**Hydnellum nemorosum A.M. Ainsw. & E. Larss.,**

Fungal Syst. Evol. 7: 245, 2021.

**Basidiocarps** terrestrial, stipitate, medium-sized and fleshy, solitary or in small groups, pileus 4–10 cm wide, irregularly rounded to lobate, initially convex or umbonate, becoming more plane with age and sometimes developing a depressed centre; margin thin, undulating, first almost smooth, matt, becoming pellicular and sometimes shiny in places, occasionally with a few marginal areolae and zones of poorly-developed appressed scales, becoming deeply lacerated to produce radial fissures in the underlying paler context and a central zone of coarse block-like scales; initially pinkish or vinaceous brown, becoming darker reddish or vinaceous brown towards the centre and blackening with age, spines slightly decurrent, up to 5 mm long, first pinkish brown vinaceous and browner from the base, context azonate, whitish with pink tinges becoming more vinaceous when exposed to the air by tearing of pileal surface, with distinctive, smell farinaceous but with a penetrating fruity element

**Stipe** 20–60 × 10–30 mm, cylindrical or basally tapered with a smooth or fibrillose texture and sometimes covered by rudimentary or entire spines; concolourous with the young pileus at the apex, darker below and distinctly bluish–green to black at the base with whitish mycelium binding the soil, in section greyish- or bluish green patch within the base of the stipe, taste farinaceous and bitter.

**Hyphae** up to 7 µm wide and simple septate.

**Basidiospores** 3.2–5.1 × 3.0–4.2 µm, subglobose to short elliptic, irregularly tuberculate.

**Habitat.** Probably ectomycorrhizal with various broadleaved tree species such as *Castanea sativa*, *Fagus sylvatica* and *Quercus* spp.

**Distribution.** Scattered in South and Central Europe.

**Remarks.** The rather small spores and the bluish black base of the stipe characterize this species.

**Hydnellum peckii Banker,**

Bull. N. Y. State Mus. 157: 28, 1912.

**Basidiocarps** up to 8 cm wide, first domed then flat and finally slightly funnel shaped, first pale pink becoming deeper pink and then brown, when young often with excluded reddish drops, spines up to 5 mm long, slightly decurrent on the stipe, context tough. Taste very sharp

**Stipe** variable, 0.5 to 8 cm high, up to 2 cm in diameter, smooth, pinkish brown.

**Hyphae** with clamps, up to 12 µm wide.

**Spores** 5-5.5 x 4- 4.5 µm, tuberculate.

**Habitat.** Ectomycorrhizal with *Pinus*.

**Distribution.** Follows *Pinus sylvestris* to 70° N in Norway, widespread with the host tree.

**Remarks.** Macroscopically similar to *H. ferrugineum* which however has clamped hyphae and besides has a mild taste.

**Hydnellum roseoviolaceum Nitare,**

Fungal Syst. Evol. 7: 248, 2021.

**Basidiocarps** terrestrial, stipitate, simple, often rather small and slender, pileus 5- 8 cm wide, convex to flat, somewhat depressed in the centre, ochraceous brown, tobacco brown to reddish brown, with blackish spots in old or damaged parts, first finely tomentose, soon glabrous, spines strongly decurrent, up to 5 mm long, but rarely reaching the middle of the stipe, with age dark brown, but for a long time pallid at the tip, context azonate, first pinkish to rosy, becoming violaceous to lilac. No particular smell, taste mild

**Stipe** 4–6 × 1–1.5 cm, concolorous with the pileus, tapering downwards.

**Hyphae** simple septate, up to 10 µm wide.

**Basidiospores** 4.3–5.1 × 3.2–4.2 µm, pale brownish, globose or subglobose, tuberculate.

**Habitat.** Presumably ectomycorrhizal with *Pinus sylvestris*. on dry, acidic sandy soil with *Cladonia* lichens.

**Distribution.** Only known from two localities in eastern central Sweden, within the middle and northern boreal vegetation zones in areas with a rather continental climate.

**Remarks.**

**Hydnellum scabrosellum Nitare,**

Evolution 7:250, 2021.

**Basidiocarps**, stipitate, thin and slender, single or conrescent, pileus up to cm wide, flat to convex to depressed, upper surface fibrillose and scaly, cracking up from the centre, at first rosy to pinkish, with whitish growing edge, with age becoming coppery or vinaceous reddish-brown to purplish-brown, with darkening blackish-brown scales in the centre, spines strongly decurrent, often reaching the middle of the stipe, up to 5 mm long, at first pallid and whitish, by age becoming yellowish brown, when dry yellowish to ochraceous, context homogenous, yellowish-ochraceous brown,

**Stipe** 30–60 × 5–10 mm, ochraceous pinkish-brown or concolorous with the pileus, tapering downwards, at the base bluish-grey or blackish-green under a white mycelial cover.

**Hyphae** up to 10 µm wide, simple septate.

**Basidiospores** 5.1–6.6 × 3.4–4.7 µm, pale brownish, globose or irregularly subglobose, tuberculate.

**Ecology.** Presumably ectomycorrhizal with conifers (mixed forest with *Pinus* and *Picea*, associated tree-species not exactly known, strongly calciphilous.

**Distribution.** Mostly known from coniferous forests on calcareous ground.

**Remarks.** The bluish green to black green stipe base, is a distinct character for this rare species.

**Hydnellum scabrosum (Fr.) Larsson, Larsson & Koljalg,**

Myckeys 54: 42, 2019. – *Hydnum scabrosus* Fr., Anteck. Sveriges ätl. Svampar, p. 62, 1836.

**Basidiocarps** pale brown, more or less centrally stipitate, up to 14 cm in diameter, fleshy when fresh, tougher when old, pileus first flat soon centrally depressed in variable degree, first velvety to felted, becoming finely squamose with age becoming fibrillose, reddish brown to purplish brown occasionally paler and more pure brown, darker by age, spines decurrent, up to 6 mm long, first pale brown, later deep brown, context up to 2 cm thick, whitish with brown zones or lines, often with reddish or vinaceous tints and bluish to greenish at the base. taste bitter.

**Stipe** up to 7 cm high and 2 to 3 cm in diameter, finely felted, becoming slightly fibrillose to glabrous, greyish pink to brown with vinaceous shades or tints, at base dark bluish grey or blackish greenish, often with a fine mycelial cover.

**Hyphae** simple septate, up to 30 µm wide.

**Basidiospores** 6.3–7.3 × 4–5 µm, pale brown, coarsely angular and of irregular outline.

**Substrate.** On the ground and ectomycorrhizal with *Pinus*.

**Distribution.** Dry pine forest, but rather rare north of the Polar circle. Circumpolar in the coniferous forest.

**Remarks.** The species is recognized by its finely scaly pileus with pink shades and the bluish green at base of the stipe. From similar brown species it is separated by having simple septate hyphae and smaller spores than the macroscopically similar *S. imbriactus* and *S. squamosus*.

**Hydnellum suaveolens (Scop.) P. Karsten,**

Medd. Soc. Fauna Flora Fenn. 5:41, 1879. - *Hydnum suaveolens* Scop., Fl. Carniol. 2:472, 1772.

**Basidiocarps** usually single but occasionally fused with other caps; 5–15 cm wide; convex, becoming flat; dry; velvety; becoming wrinkled, ridged, or pitted; white to whitish or very pale yellowish when fresh and young, becoming dingy grayish to brownish by age, spines 3–7 mm long; whitish at first, becoming brownish to brown as the spores mature, context whitish to brownish, with zones of blue or brown (especially in the stem). Odour strong and fragrant or minty

**Stipe.** 2–5 cm long; 1–3 cm thick at apex; more or less stubby and cylindrical; purplish blue; bruising blackish blue where handled; dry; velvety.

**Hyphae** with clamps, 3–6 µm wide.

**Basidiospores** 4–6 × 2–4 µm; irregular; nodulose; hyaline to brown.

**Habitat.** Ectomycorrhizal with conifers

**Distribution.** Rather common north to the northern limit for *Picea* in Scandinavia, widespread in Europe.

**Remarks.** *Hydnellum suaveolens* is fairly easily recognized with its combination of a whitish cap, a purplish blue stem, and a strong fragrant odour.

**Hydnellum versipelle (Fr.) Quel., E. Larss, K.-H. Larsson & Koljalg,**

Myckeys 54: 42, 2019. - *Hydnum versipelle* Fr. Vet. Akad. Förhand. 18: 31, 1861

**Basidiocarps** often in clusters, pileus up to 15 cm wide, flat to slightly centrally depressed, azonate, first felted, then radially scaly, scales fairly loosely attached, towards the margin with long radial fibrils, vivid orange to brown when young and fresh and then with coloured fibres, becoming yellowish grey to umber brown when old, spines up to 6 mm long, whitish becoming purplish brown by maturity, context white in pileus later chrome yellow, greyish at base becoming more greenish to pale violet by age and maturity. Mild odour, taste flavour like to bitter.

**Stipe** up to 9 cm long and 3 cm wide, tomentose to matted, concolorous with pileus or purplish brown.

**Hyphae** up to 15 µm wide and with clamps.

**Basidiospores** 4.5–5.5 × 3.5–4.5 µm, pale brown and irregularly angular.

**Substrate.** On the ground in coniferous forests.

**Distribution.** Widespread in Europe, in Scandinavia it follows the spruce in its natural stands to Mo in Northern Norway.

**Remarks.** The orange brown smooth to finely scaly pileus, white context, small spores and clamped hyphae characterize this species.

## **HYDNOCHAETE Bres.,**

Hedwigia 35:287, 1896.

**Basidiocarp** resupinate to effused-reflexed with a narrow pileus, adnate to easily detached, hymenophore hydroid to odontoid, rusty to dark reddish-brown. Hyphal system dimitic, generative hyphae simple septate, skeletal hyphae yellow to rusty brown, setae always present, in one species with transitions to setal hyphae, simple, acute and dark brown, mostly abundantly present, spores hyaline, allantoid to cylindrical, smooth and non amyloid. On deciduous wood, in some species with a distinct pocket rot. American-Australasian genus.

**Type species:** *Hydnochaete badia* Bres. = *H. peroxydata* (Berk. & M. A. Curtis) Dennis.

**Remarks.** The genus is undoubtedly related to *Hymenochaete* as only the hydroid hymenophore separate it in principle from this genus. DNA sequencing has shown that the species of *Hydnochaete* have different relationships to a number of *Hymenochaete* clades or groups. Of practical reason the genus is never the less kept as one unit here.

### **Key to species**

1. Australasian species..... 2
  1. American species ..... 5
  
  2. Basidiocarp mostly pileate, often in dense imbricate clusters, pileus tomentose to hirsute in zones, context duplex ..... 3
  2. Basidiocarp resupinate, more rarely effused-reflexed with an adpressed velutinate to glabrous pileus, context or subiculum homogeneous, but a black zone may be present next to the substratum ..... 4
  
  3. Teeth round to slightly flattened, context without a black zone, Australian species ..... **H. saepiaria**
  3. Teeth flattened to semi-lamellate, context with one or two black zones, Japanese species ..... **H. tabacinoides**
  
  4. Basidiocarp resupinate, teeth up to 0.7 mm long, 2-3 per mm, black zone present next to the substrate, subiculum thin, rarely over 0.3 mm thick setae up to 160 µm long ..... **H. duportii**
  4. Basidiocarp resupinate-pileate, teeth up to 0.4 mm long, often not more than irregular warts, 1-2 per mm, no black zone next to the substratum, subiculum up to 2 mm thick, setae up to 70 µm long ..... **H. japonica**
  
  5. Pileus (if present) or subiculum fibrillose, teeth blunt and round, rather soft, setae (or short setal hyphae) up to 250 µm long and present in trama, subiculum and pileus, West Indian species ..... **H. resupinata**
  5. Pileus (if present) and subiculum dense to cottony, teeth acute to fimbriate and forked at the top, hard to coriaceous, setae if present, up to 140 µm, absent or a few present in context or subiculum..... 6
  
  6. Basidiocarp reddish-brown, resupinate, papillate to hydroid, hard and dense, setae of even width up to the apex and usually abruptly terminated, spores 3-4 µm long,..... **H. peroxydata**
  6. Basidiocarp pileate-resupinate, cinnamon to rusty brown, distinctly hydroid, often with flattened and forked teeth, coriaceous, setae subulate, spores 4-6 µm long ..... 7
  
  7. Context or subiculum duplex with a black zone between upper and lower part, teeth monomitic, setae scanty, occurring only in lower part of the teeth, 20-50 µm long, known only from oak in Southern part of United States ..... **H. tabacina**
  7. Context or subiculum homogeneous with a black zone next to the substratum, whole basidiocarp dimitic, setae very abundant over the entire teeth, 50-200 µm long, on various kinds of deciduous wood, widespread in America .... **H. olivacea**
- NB** Since all species have smooth, thin walled and non-amyloid spores and tetrasterigmatic basidia, this information is not repeated for each species.

### **Hydnochaete duportii Pat.,**

Bull. Soc. mycol. Fr. 31:76, 1915.

**Basidiocarp** resupinate, hydroid, slightly cracked when dry, effused, up to 15 cm long, 8 cm wide and 2 mm thick, strongly adnate and hard, margin narrow, unber brown and finely felted, teeth dense, 2-3 per mm, up to 0.7 mm high, round to slightly flattened, reddish-brown with a purplish tinge and with numerous projecting setae (lens), in section the hymenium appears as a very thin white layer above the dark rusty-brown trama. context homogenous, up to 300 µm thick, rusty-brown and with a black zone next to the substratum.

**Hyphal system** dimitic, generative hyphae thin-walled and with simple septa, 2-3 µm wide, skeletal hyphae abundant, agglutinated and difficult to tease apart, 2-5 µm wide, rusty-brown, solid to thick-walled.

**Setae** 40-160 x 6-15 µm, abundant throughout the basidiocarp, both projecting and embedded in context and trama, often in clusters, acute to blunt, thick-walled, dark brown, mostly of even thickness in the upper part, mostly straight, but in the hymenium frequently with a bent base.

**Basidiospores** 4-5 x 1.5-2 µm, cylindrical.

**Substrate and distribution.** On deciduous wood with a distinct pocket rot. Known only from Viet Nam and Thailand.

**Remarks.** Its closest relative seems to be *H. peroxydata* from South America which shares the same dark, umber to purplish brown colour. However, this species has longer teeth, a distinct duplex context with the upper and lower part separated by a black zone. Such a zone may also be seen in *H. duportii*, but it is developed next to the substrate. Further, the spores of *H.*

*duportii* are longer than those of *H. peroxydata*.

*Hydnochaete japonica* may represent a young and immature specimen of *H. duportii*. See *H. japonica* for comments.

### **Hydnochaete japonica Lloyd,**

Mycol. Writ. 4, Letter 61:7, 1916.

**Basidiocarp** pileate to effused reflexed, very hard and brittle, up to 2 µm thick in resupinate parts, pileus, if present, up to 4 mm wide and 1 cm long, dull, adpressed velutinate, dark brown to black, margin rusty brown, hymenophore deep brown, tuberculate with blunt aculei densely covered with projecting setae, 200–400 µm high, about 1–2 per mm. context up to 2 mm thick, woody hard, dark brown with diffuse melanoid black areas or elongated zones, but no distinct bands.

**Hyphal system** dimitic, generative hyphae not seen, skeletal hyphae only observed as small fragments, 3–5 µm wide, solid yellow, context consists of a densely agglutinated mass of inseparable hyphae, excreted crystals and dark substances.

**Setae** 25–70 x 4–10 µm, abundantly present throughout the basidiocarp, dark brown, sharply pointed, thick-walled.

**Basidia** and basidiospores not seen.

**Substrate.** Unknown.

**Distribution.** Only known from the type locality on Bonin Islands, Japan.

**Remarks.** The type is the only specimen examined and gives the impression of an old, dead specimen as no hyphal elements could be observed properly. From *H. duportii* it is separated by absence of a distinct black zone next to the substratum and shorter, more scattered aculei (2–3 per mm in *H. duportii*.)

However, as the setae are rather similar in the two species, the separation is based on morphological features which could be atypical in the type of *H. japonica*. The pileus may prove to be a distinct character when more collections have been made.

### **Hydnochaete olivacea (Schw. ex Fr.) Banker,**

Mycologia 6:234, 1914. - *Hydnum olivaceum* Schw. ex Fr., Elench. Fung. 1:234. 1828. - *Sistotrema olivaceum* Schw. Schr.

Nat. Ges. Leipzig 1:101, 1822. - *Sistotrema fuscescens* Schw. ibid. p. 102. - *Irpex cinnamomeus* Fr., Epicr. p. 524, 1838. - *Irpex quisquilaris* Pat. Bull. Herb. Boiss. 3:55, 1895.

**Basidiocarp** resupinate, effused, adnate and coriaceous, annual, margin wide to narrow, pale cinnamon to rusty brown, hymenophore hydroid with irregular, round to flattened teeth with numerous projecting setae, obtuse to incised in the top, often antler like with a fused base, shorter at the margin than in more mature parts of the basidiocarp, 0.5–2.5 mm long, cinnamon in fertile specimens, rusty brown in sterile and old specimens. context up to 0.3 mm thick, rusty brown, in old specimens with a black zone next to the substrate.

**Hyphal system** dimitic, generative hyphae with simple septa, in the hymenial parts thin-walled, hyaline, 1.5–3 µm wide, frequently branched, in the trama and context more thick-walled, yellow and with scattered septa and moderately branched, 2–5 µm wide, skeletal hyphae dominating, thick-walled to solid, yellow to pale rusty brown, 3–5(5) µm wide.

**Setae** 60–200 x 8–15 µm, abundant in the hymenium and subhymenium, projecting up to 50 µm, more scattered in the context and trama, thick-walled, dark brown, straight to slightly bent at the base, of even thickness in the upper part, those of the hymenium usually shorter than those of the context and trama.

**Basidiospores** 4–5 x 1–1.5 µm, cylindrical to allantoid.

**Substrate.** On deciduous wood of many kinds, often on dead branches still attached to the trees.

**Distribution.** Known from South-East Canada, United States south to Florida and west to Wisconsin, Jamaica and Ecuador.

**Remarks.** The species is usually easy to recognize because of the cinnamon and coriaceous basidiocarp, often with a narrow pileus. The teeth are usually forked and flattened in more mature specimens while younger ones are more hydroid. The setae are slender and abundantly present, while they are rather scarce in *H. tabacina*. In *H. olivacea* skeletal hyphae are present throughout the basidiocarp. *H. resupinata* has a distinct fimbriate basidiocarp, a granular to odontoid hymenophore and dendroid skeletal hyphae throughout the basidiocarp.

### **Hydnochaete peroxydata (Berk. & Curt.) Dennis,**

Kew Bull. Add. Ser.3:105, 1970. - *Hydnum peroxydatum* Berk & M. A. Curtis, Grevillea 20:1,1881. - *Hydnochaete*

*badia* Bres., Hedwigia 35:287, 1896. - *Hydnochaete ferruginea* Rick, Ann. Mycol. 3:235, 1905.

**Basidiocarp** annual-perennial (?) resupinate, adnate, effused, largest specimen seen about 8 cm in diameter, coriaceous to brittle when dry, margin narrow to very wide, i.e. 1–2 cm, cinnamon, finely floccose, hymenial surface hydroid, first papillate to odontoid or raduloid with simple papillae or a shallow pattern of partly connected ridges or flattened teeth, with age and in centre of more developed specimens distinctly hydroid and most teeth cylindrical, a few more flattened, single teeth up to 1.5 mm long in mature specimens, 2–400 µm in diameter at the base, surface ashy-pinkish when fertile due to a layer of generative hyphae and then only the tip of the projecting setae can be seen with a lens, with age and in sterile specimens rusty to deep brown and with numerous projecting setae, especially in the upper part of the teeth, more embedded in the lower part and between the teeth, subiculum rusty-brown, dense and separated from the teeth by a black resinous zone, 100–500 µm thick, above which there is a very thin and light cinnamon layer on which the teeth are dispersed. The teeth are fragile when dry and are easily broken when a section is made.

**Hyphal system** dimitic, skeletal hyphae dominating, thick-walled to solid, yellow to rusty brown, 2–3(4.5) µm wide, generative hyphae hyaline, 1–3 µm wide, simple septate.

**Setae** 35–70(90) x 7–15(23) µm, very abundant throughout the basidiocarp, projecting on the teeth, especially on the upper part, dark brown, thick-walled, acute, but most of them of even width before they terminate abruptly, in old specimens often covered with a granular to semi-crystalline layer in the upper part. Most setae straight, and often occurring in clusters, a few are bent with a horizontal part parallel with the surface of the teeth.

**Basidiospores** 3-4 x 1.5-2 µm, cylindrical.

**Substrate.** On deciduous wood with a distinct pocket rot.

**Distribution.** Specimens have been examined from Brazil and Venezuela, but the species has probably a wide distribution in South America.

**Remarks.** *H. peroxydata* is separated from the other American species by its dark umber brown colour, hard and dense basidiocarp and its blunt and wide setae.

#### **Hydnochaete resupinata (Swartz) Ryvarden,**

Mycotaxon 15:437, 1982. - *Hydnum resupinatum* Swartz, Nova. gen. spec. Prodr. descr. veget. p. 149, 1788. - *Thelephora setosa* Swartz. Fl. Occident. 3:1929, 1806 (name change for *H. resupinatum*). - *Hymenochaete aspera* Berk. & M. A. Curtis, J. Linn. Soc. Bot. 10:334, 1868.

**Basidiocarp** annual, effused reflexed to pileate, soft to coriaceous, pileus when present, up to 3 cm wide and 10 cm long, 1-3 mm thick, cinnamon to rusty brown, densely covered with entangled forked hairs, mostly pointed towards the margin and distinctly flattened, hymenophore rusty brown, tuberculate or irregular hydroid, aculei pointed to rounded, scattered or in groups, up to 2 mm long, densely covered with projecting setae, subiculum and context cinnamon to rusty brown, loose, less than 1 mm thick.

**Hyphal system** monomitic, generative hyphae thin- to thick-walled, in the latter case yellow to pale rusty brown and strongly reminding of skeletal hyphae, but scattered simple septa can be found along all the hyphae which are dominating in the context and on the pileus, 2-5 µm wide, in the subhymenium hyaline and thin-walled.

**Dichohyphae** abundantly present in the teeth, less common in the context, strongly branched with mostly short side branches, yellow to hyaline and arising from a simple septum, those of the context with a wider branching.

**Setae** (and setal hyphae?) abundantly present, those of the hymenium 30-80 x 4-10 µm, those deeper in the trama, context and in pileus-cover up to 250 µm long and similar to setal hyphae.

**Basidiospores** not seen.

**Substrate.** On deciduous wood.

**Distribution.** Specimens have been examined from Jamaica, Cuba, Mexico, Venezuela and Dominica.

**Remarks.** The species is characterized by its blunt and irregular aculei, its fimbriate and loose pileus and subiculum. Microscopically the dendroid hyphae are characteristic, in addition the abundant long and narrow setae in the trama and context. Swartz published *Hydnum resupinatus* in 1788, but changed the name for unknown reasons to *Thelephora setosa* in 1806.

Fries did not include either names in *Systema mycologicum*, and it was Berkley (1843) who reintroduced Swartz' last name.

#### **Hydnochaete saepiaria (Lloyd) Ryvarden,**

Mycotaxon 15:439, 1982. - *Irpex saepiarius* Lloyd, Lloyd Mycol. Writ. 5:682, 1917.

**Basidiocarp** effused reflexed to pileate, pileus narrow 2 mm wide and 3 cm long, finely tufted in zones, dark umber brown, spines up to 2 mm long, crowded 2-3 per mm, cylindrical to flattened at the base. context distinctly duplex, lower part cinnamon to rusty, 0.5 mm thick, upper part looser and more umber, no black zone between the two parts or between the context or subiculum and the substratum, the basidiocarp is apparently easy to loosen and the upper part of the context or subiculum is smooth to pitted when separated from the substratum.

**Hyphal system** dimitic, generative hyphae thin-walled hyaline, simple septate, 2-3 µm wide, skeletal hyphae yellow to rusty brown, 3-4 µm thick-walled to solid.

**Setae** very numerous in the hymenium, dark brown, sharply pointed and thick-walled, 35-60(80) projecting up to 30 µm, scattered and few in the trama, 6 x 9 µm wide, up to 150 µm long, no setae in the context.

**Basidiospores** 4-5 x 1.5-2 µm, cylindrical.

**Substrate.** On deciduous wood

**Distribution.** Known only from Australia.

**Remarks.** The species is characterized by its dark umber colour, the long and crowded spines and the spongy, duplex consistency of the context. *H. olivacea* is yellowish brown to cinnamon, the teeth are soft and often antler like, and the context is homogeneous and develops a black zone next to the substratum in old specimens.

#### **Hydnochaete tabacina (Berk. & M. A. Curtis) Ryvarden,**

Mycotaxon 15: 441, 1982. - *Irpex tabacinus* Berk. & M. A. Curtis in Fries, Nova Acta Reg. Soc. Sci. Upsal. Ser. 3, Vol. 1:106, 1851.

**Basidiocarp** resupinate, effused reflexed, adnate, coriaceous, up to 3 mm thick, pileus when present, up to 6 mm wide, concentrically zoned, smooth to sulcate, tomentose, dark cinnamon brown, hymenophore hydroid, teeth up to 2 mm long, 2-3 per mm, round and acute to flattened, often fused in basal parts and when immature sinuous and deeply incised, cinnamon to dark brown in old specimens. Subiculum up to 0.5 mm, floccose, cottony and dark rusty brown, separated from the teeth by a distinct thin black zone.

**Hyphal system** dimitic, generative hyphae with simple septa, thin to slightly thick-walled 2-4(5) µm wide, hyaline to pale rusty brown, very rare in the subiculum, while they are the only type of hyphae present in the trama and subhymenium, skeletal hyphae straight, thick-walled and dark rusty brown, 3-5 µm wide, only observed in the subiculum where they dominate totally.

**Setae** 20-50 x 5-9 µm, scattered and not common, only present in the hymenium in the lower part of the teeth, dark brown, straight, thick-walled, obtuse and often with slightly undulating walls.

**Basidiospores** 5-6 x 1-1.5 µm, allantoid to cylindrical.

**Substrate.** On *Quercus* spp. in the South-Eastern part of United States.

**Remarks.** The species is characterized by its cinnamon colour and the duplex consistency with a dark brown subiculum separated by a black zone from the lighter and more cinnamon coloured teeth. The setae are few, more obtuse and shorter than in the other species in the genus besides that skeletal hyphae are only present in the subiculum. Further, all collections examined so far, have been from *Quercus* spp.

### **Hydnochaete tabacinoidea (Yas.) Imaz.,**

Bull. Tokyo Sci. Mus. 6:103, 1943. - *Irpex tabacinoidea* Yas., Bot. Mag. Tokyo 33:189, 1919.

**Basidiocarp** annual, pileate to effused reflexed, often in dense imbricate rows, coriaceous, pileus yellowish brown to dark brown, tomentose to hirsute in concentric zones, up to 1.5 cm wide and 3 cm long, often laterally connected in imbricate clusters, hymenophore hydroid to semi lamellate with deeply incised lamellae, 1-2 per mm measured tangentially, 1-2 mm deep and densely covered with projecting setae, the lamellae are distinctly radially orientated, especially along the margin, context rusty brown and fibrous, duplex, the lower part less than 0.5 mm thick and dense, separated from the upper part by one or two black bands, the upper part loose and fibrous towards the pileus.

**Hyphal system** dimittic, generative hyphae with simple septa, 3-4 µm wide in the subhymenium, in the trama and the context pale yellow and more thick-walled, up to 5 µm wide, skeletal hyphae yellow to pale rusty brown, thick-walled and 4-6 µm wide.

**Setae** 40-90 (120) x 8-16 (20) µm, numerous in the hymenium, partly embedded, but mostly projecting, rather obtuse and often covered with scattered crystals at the apex, no setae in the context.

**Basidiospores** 4-5 x 1-1.5 µm, allantoid to cylindrical.

**Substrate.** On deciduous wood, probably on many different kinds, from the labels of examined specimens recorded on *Pasania cuspidata* and *Prunus spinosa*.

**Distribution.** Known only from Japan.

**Remarks.** The closest relative is *H. olivacea*, but *H. tabacinoidea* is separated by its distinct pileate shape, where only a part of the hymenophore may become effused resupinate and its hirsute zoned pileus. Further, its hymenophore is distinctly semi-lamellate with incised radiating lamellae, a configuration not seen in the other species where the teeth may become partly flattened. The obtuse, rather short setae with scattered apical crystals are also a striking character.

### **HYDNOPHLEBIA Parmasto,**

Eesti N.S.V. Tead. Akad. Toimet., Biol. 16: 384, 1967.

Basidiocarps resupinate, effused, adnate or pliable, soft to firm ceraceous, hymenium odontoid to hydroid, hyphal cords mostly present, margin fimbriate or not differentiated; hyphal system monomittic, hyphae in hymenium and subhymenium without clamps, hyphae in subiculum with scattered clamps; cystidia mostly present but often few, hymenial, cylindrical or tapering towards apex, thin-walled; basidia clavate, tetrasterigmatic, basidial bases simple septate, basidiospores subglobose to elliptic to sub cylindrical, thin-walled, smooth, neither amyloid, dextrinoid nor cyanophilous. On decaying angiosperm wood, mainly tropical-subtropical genus.

**Type species:** *Hydnum chrysorhizon* Eaton.

**Remarks.** The hydroid surface and the phlebioid consistency characterize this genus.

#### **Key to species**

1. Basidiospores 2.7-3.5 x 1.8- 2.2 µm ..... **H. flavicans**
1. Basidiospores larger ..... **2**
  
2. Hyphae with clamps..... **H. chrysorhizon**
2. Hyphae simple septate..... **H. meloi**

### **Hydnophlebia flavicans (Bres.) K.H. Larss. & Ryvardeen,**

Synopsis Fung. 2: xx, 2024. — *Hydnum flavicans* Bres., Atti Acad. Giagato Rovereto 3: 95, 1897. — *Odontium monfraguense* M.N. Blanco et al., Cryptog. Mycol. 10: 137, 1989.

**Basidiocarps** resupinate, closely adnate, effused, ceraceous when fresh, compact and rather hard when dried, hymenium densely hydroid, pale yellow to pale orange, becoming brownish orange or pale cinnamon, spines cylindrical or slightly flattened, to 10 mm long, 3-4 per mm, single or fused, margin narrow and pale yellow.

**Hyphal system** monomittic, septa without clamps, hyphae in the thin subiculum 3-5 µm wide, irregular, much branched, thick-walled, partly pale brownish, hyphae in spine trama 3.5-5 µm, straight, parallel, thick-walled, apically thin-walled and with obtuse apices, subhymenium very thin composed of thin-walled, 2-3 µm wide, richly branched, densely united hyphae.

**Cystidia** 25-30 x 4-5 (-7) µm, scattered to rare, fusiform, apically obtuse, thin-walled, projecting for about half their length.

**Basidiospores** 2.7-3.5 x 1.8-2.2 µm, elliptic.

**Habitat.** On bark and wood of *Quercus*, especially *Q. suber*.

**Distribution.** A rare species. The type was collected in Slovakia, but recently recorded also from Portugal, Spain, France and Italy.

**Identification.** The yellowish, hydroid basidiocarps, the simple septate hyphae, the small, fusiform cystidia, and the host make this a distinct species. It is more robust and harder and with longer aculei than *H. meloi*.

**Remarks.** This species has usually been placed in *Odonticium* because of its simple-septate hyphae. However, the type of *Odonticium*, *O. romellii*, belongs in Hymenochaetales while *Hydnum flavicans* belongs in Polyporales. Molecular data confirm that its proper place is in *Hydnophlebia*.

### **Hydnophlebia meloi** Telleria, M. Dueñas & M.P. Martín,

MycKeys 27: 54, 2017.

**Basidiomata** resupinate, effused, soft and fragile, membranous, hymenium hydroid, aculei up to 1 mm high, 2–3 per mm, at first white, then gradually becoming pale orange to reddish orange, margin white, fibrillose and with hyphal cords.

**Hyphal system** monomitic, hyphae without clamps, subiculum composed of 3–7 µm wide, thin-walled to slightly thick-walled, parallel hyphae, partly covered by a grainy incrustation, hyphae in spine trama thin-walled, 3–4 µm wide, mostly without crystals, subhymenium thin, with 2.5–3.5 µm wide, thin-walled, richly branched hyphae, hyphal cords with 3–8(–10) µm wide, mostly thick-walled hyphae, with inflations to 13 µm, no clamps observed.

**Cystidia** hymenial, rather few, fusoid, 20–35 × 3.5–5 µm, thin-walled, blunt, contents hyaline, smooth, projecting to 15 µm.

**Basidiospores** 4–5 × 2.7–3.2 µm, elliptic.

**Habitat.** On a variety of hardwoods.

**Distribution.** In Europe only collected twice in Italy.

**Identification.** The hydroid basidiocarps with small smooth cystidia and small elliptic basidiospores characterize this species. *Byssomerulius pirottae* is similar but seems to lack cystidia.

**Remarks.** The Italian specimens were first identified as *Phanerochaete omnivora* (= *Hydnophlebia omnivora*) a species described from Arizona, USA. This species is morphologically quite similar to *H. meloi* and also to two other species, *H. gorgonea* and *H. canariensis* described at the same time as *H. meloi*. The latter three species were all found in Canary Islands and Cap Verde Islands. We prefer to use a name defined by material from the European side of the Atlantic, but the exact identity of the Italian specimens cannot be settled without DNA information.

### **Hydnophlebia chrysorhizon** (Eaton) Parmasto,

Eesti NSV Tead Akad. Toim. Biol. Ser. 16:384, 1967 - *Hydnum chrysorhizon* Eaton, Man. Bot, Edn. 3: 309, 1822.

**Basidiocarps** resupinate, 2–6 cm wide often larger r much larger; bright orange hydroid, individual teeth up to 1.5 mm long, soft and phlebioid, dense when dry, margin cordlike with rhizomorphs, these may be 10–20 cm long margin rhizomorphic, white to orange.

**Hyphal system** monomitic, hyphae with clamps 2–6 µm wide.in the subiculum thick-walled, hyaline to slightly yellowish, and encrusted. wall thickness ranging from thin to moderately thick.

**Cystidia** are sparse and tubular, hyaline, thin-walled or have a slight wall thickening.

**Basidiospores** 4–5 × 3–4 µm, elliptic.

**Habitat.** On hard woods.

**Distribution:** Cosmopolitan, but rare in the temperate zone.

**Remarks.** The bright often deep orange colour, the hydroid surface and the often conspicuous rhizomorphs are characteristic for this species.

### **HYDNUM L.:Fr.,**

Spec. Pl. 2: 1178, 1753. – Syst. Mycol. 1:397, 1821.

Basidiocarps stipitate, pileus glabrous to irregularly scrupose, more or less round, irregularly wavy usually 5–15 cm wide, white to ochraceous or yellowish white, hymenophore hydroid, individual teeth up to 1 cm long, context up to 1.5 cm thick at base, homogenous, more or less concolorous with pileus, hyphal system monomitic, generative hyphae with clamps, cystidia absent, basidia tetrasterigmatic, basidiospores smooth, hyaline, growing on the ground, and ectomycorrhizal with different hosts. Widespread and throughout the temperate and boreal zones.

**Type species.** *Hydnum repandum* Fr.

**Remarks.** The genus is related to *Albatrellus* and in principle separated only by its hydroid hymenophore, this being poroid in all *Albatrellus* species.

For a survey of all names published in the genus, see Ryvar den

### **Hydnum repandum L.:Fr. Op. cit.**

**Basidiocarps** single or in smaller groups, stipitate, pileus wavy to flat, up to 15 cm wide, occasionally larger, whitish to ochraceous, more or less smooth, hymenophore densely hydroid, individual spines to 1 cm long, context white to pale ochraceous, homogenous, dense, up to 1 cm thick in the central part of the basidiocarp.

**Hyphal system** monomitic, hyphae with clamps, in the hymenium 4–8 µm wide, in the cap up to 20 µm wide.

**Basidia** 30–45 by 6–10 µm, tetrasterigmatic

**Basidiospores** 5.5–7.5 × 4.5–5.5 µm, smooth, thin walled, round to oval.

**Substrate.** On the ground in both coniferous and hardwood forests and ectomycorrhizal with both gymnosperm and deciduous trees.

**Distribution.** Widespread in the temperate and boreal zones north to 70° in Northern Norway, replaced by similar species in the subtropical and tropical zones.

**Remarks.** In its wide senses easily recognized by its light colours and densely hydroid basidiocarps. However, there are now deserved several similar species, many of them separated by external characters. Its basidiocarps are collected and edible.

In addition to the type species there are several rather similar species which all are edible and often are collected in great numbers, both for sale and private consumption. For the time being there is no comprehensive treatment of the taxonomy of the genus.

## **HYPHODERMELLA John Eriksson & Ryvarden,**

Cort. North Europe 4:579, 1976.

Basidiocarps resupinate, effuse, thickening with age, crustose; hymenium ceraceous, at first whitish or cream-coloured, with age darkening to ochraceous; hymenophore irregularly odontoid, with small aculei, scattered in the young hymenium, but numerous, irregularly crowded in the older ones; apically the aculei with more or less encrusted, projecting cystidia like hyphae, readily visible under the lens and giving the fungus a characteristic appearance; hyphal system monomitic, hyphae thin-walled, simple septate, about 2-3 µm wide; cystidia absent, basidia clavate, tetrasterigmatic; basidiospores elliptic, smooth, thin-walled, non-amyloid, about 10 x 5 µm.

**Type species:** *Grandinia corrugata* Fr.

**Remarks.** The genus is related to *Hyphoderma*, but differs in the shape of the basidia, which are clavate, basally narrowed into a stalk-like part, and in the absence of clamps. The genus is so far monotypic.

### **Hyphodermella corrugata (Fr.) John Eriksson & Ryvarden,**

op. cit. - *Grandinia corrugata* Fr., Hym. Eur. p. 625, 1874.

**Basidiocarp** resupinate, effuse, adnate, at first orbicular, then confluent, crustose, thickening with age and sometimes stratified; hymenium ceraceous, at first whitish or cream-coloured, with age turning darker, ochraceous or isabelline, rarely reddish, irregularly odontoid, at first scattered, then crowded with short, conical aculei, apically provided with projecting, cystidia-like encrusted hyphae which become glued into crystalline pillars; margin variable but mostly determinate, in young basidiocarps often fibrillose.

**Hyphal system** monomitic; hyphae distinct, thin-walled, about 3 µm in diameter, simple septate; hyphal direction mostly vertical. In old basidiocarps hyphae are partly collapsed, thus the texture gets a net-like appearance in a section.

**Cystidia** none, but in the apical part of the aculei cystidioid hyphae, which become heavily encrusted.

**Basidia** clavate, basally often tapering into a stalk-like part, mostly 35-50 x 6-7 µm, sometimes longer, especially in young basidiocarps, with normally 4 sterigmata.

**Basidiospores** 7-10 x 4-6 µm, elliptic.

**Substrata.** On hardwood, occasionally also on coniferous wood.

**Distribution.** Centrally Europe and north to southern Norway.

**Remarks.** The species is as a rule easily recognized even with the naked eye because of the crystallized hyphae in the apex of the aculei. These are distinctly visible through a lens.

## **HYPHODONTIA J. Eriksson,**

Symb. Bot. Upsal. 16: 101, 1958.

Basidiocarps resupinate, effused, adnate, fibrous but soft and easily squeezed when fresh and wet, more friable and tough when dried, pale ochraceous, hymenium smooth to grandinioid to hydroid; hyphal system monomitic, hyphae clamped and mostly about 3 µm wide, somewhat thick-walled; lagenocystidia and leptocystidia present, the latter in some species with clamped septa; basidia subclavate to subcylindrical, more or less constricted and then utriform; basidiospores elliptic, thin-walled, smooth, non-amyloid. Causing white rot in conifer and angiosperm wood.

**Type species:** *Gonatobotrys pallidula* Bres.

**Remarks.** Recent investigations have shown that *Hyphodontia* as defined here, is a small genus, and that most species that previously have been referred to *Hyphodontia* based on morphology, are better placed in other genera, e. g. *Kneiffiella* and *Xylodon*.

### **Key to *Hyphodontia* sensu stricto**

1. Basidiocarps odontoid to hydroid ..... 2
1. Basidiocarps smooth to grandinioid ..... 3
2. Basidiospores ellipsoid, 4.5-6 x 3.5-4 µm ..... **H. arguta**
2. Basidiospores subglobose, 4.5-5.5 x 4.5-5 µm ..... **H. pachyspora**
3. Lagenocystidia numerous, basidiospores 3.5-4 µm wide ..... **H. alutaria**
3. Lagenocystidia mostly few or absent, basidiospores 2.5-3 µm wide ..... **H. pallidula**

### **Hyphodontia alutaria (Burt) J. Eriksson,**

Symb. Bot. Upsal. 16(1): 104, 1958. — *Peniophora alutaria* Burt, Ann. Missouri Bot. Gard. 12: 332, 1926. — *Peniophora laminata* Burt, Ann. Missouri Bot. Gard. 12: 246, 1926.

**Basidioma** resupinate, effused, adnate, at first pale yellowish, then pale ochraceous, when young and fresh soft, subceraceous, easily squeezed, when mature firmer, subcrustaceous, hymenium first almost smooth, under the lens porose, then finely tuberculate to grandinioid with semi-globose papillae, continuous, after drying often cracked, margin indeterminate, gradually thinning out, in the periphery pruinose.



**Hyphal system** monomitic, hyphae clamped, mostly 2.5–4 µm wide throughout the basidioma, hyphae in the poorly developed subiculum distinct and somewhat thick-walled, weakly yellowish, in the subhymenium hyaline, thin-walled, richly branched.

**Cystidia** of two kinds, 1) septocystidia numerous, extending from subicular hyphae and projecting beyond the hymenium, with 1–2 clamped septa, sometimes lacking septa, somewhat thick-walled, usually with an apical rounded head which is usually covered by a resinous encrustation, moreover with rounded intercalary enlargements and constrictions, mostly 50–80 × 5–7 µm, sometimes longer, cyanophilous,

2) lagenocystidia numerous, embedded or projecting, hyphoid, total length 20–30 µm with the incrustated, needle-like part 6–10 µm, basal part slightly thick-walled, the encrustation may disappear in old specimens, cyanophilous, especially the apical part.

**Basidiospores** 4.5–5 × (3–)3.5–4 µm, broadly elliptic to subglobose.

**Habitat.** On decayed wood, preferably on conifers, less frequent on deciduous wood.

**Distribution.** Widespread and locally common, but seemingly rarer than *H. pallidula*.

**Remarks.** Similar to *H. pallidula* and previously often treated as a synonym. Microscopically *H. alutaria* is characterized by numerous lagenocystidia while they are usually few in *H. pallidula*. *H. alutaria* has slightly larger basidiospores, about 3.5–4 µm wide, in *H. pallidula* 2.5–3 µm wide.

### **Hyphodontia arguta (Fr.) J. Eriksson,**

Symb. Bot. Upsal. 16: 104, 1958. - *Hydnum argutum* Fr., Syst. Mycol. 1: 424, 1821.

**Basidioma** resupinate, effused, adnate, whitish, cream-coloured or argillaceous when young, when mature pale ochraceous, postmature dull ochraceous, hymenium odontoid to hydroid with usually conical to cylindrical aculei, 0.5–2 mm long, tapering to the apex which is tomentose or even penicillate (under the lens) by projecting hyphae and cystidia, aculei in well-developed specimens regular, in older ones irregular and branched, with several tips, on a sloping substrate sometimes flattened, hymenium between the aculei porose-reticulate in young basidiomata, later obscured by developing aculei, margin in young basidiomata thinning out into a pruinose periphery, in mature ones more abrupt.

**Hyphal system** monomitic, hyphae with clamps, in subiculum and aculei trama sparsely branched and rather straight, distinct, somewhat thick-walled, mainly 2–3 µm wide, in subhymenium richly branched, thin-walled, 2–4 µm wide, densely intertwined, all hyphae cyanophilous.

**Cystidia** of two kinds, 1) capitate, somewhat projecting, often with intercalary enlargements, the head in the living basidioma surrounded by a resinous drop, drying up to a brittle, cap-like encrustation, length to the first septum 40–75 µm, head 5–7 µm wide, with encrustation 7–10 µm, 2) lagenocystidia with apical encrustation 8–10 µm long, the whole length to the first septum 30–50 µm. Both types of cystidial organs agree with those of *H. alutaria*.

**Basidiospores** 4.5–6 × 3.5–4 µm broadly elliptic.

**Habitat.** On much decayed wood, preferably of deciduous trees.

**Distribution.** Widespread and rather common in deciduous forest, following the distribution of oak to its limit in North Europe.

**Remarks.** Very similar to *H. pachyspora* from which it differs by longer hymenial aculei and elliptic instead of subglobose basidiospores. The habitat also seems to differ since *H. pachyspora* is found in open dry heathland while *H. arguta* belongs to the closed deciduous forest. *H. alutaria* differs by a more or less smooth hymenium.

### **Hyphodontia pachyspora Xue W. Wang & L.W. Zhou,**

Journ. Fungi 7: 26, 2021.

**Basidioma** resupinate, effused, adnate, soft, hymenium at first smooth, then becoming irregularly grandinoid to odontoid, hymenial aculei to 0.4 mm long, when fresh whitish, ochraceous when dry.

**Hyphal system** monomitic, hyphae with clamps, subiculum not well differentiated, byssoid with slightly thick-walled, mainly 2–3 µm wide hyphae, subhymenial hyphae somewhat irregular and 2–4(–5) µm wide, thin-walled.

**Cystidia** of two kinds, 1) (septo)cystidia numerous, cylindrical, often somewhat capitate, 30–50 × 5–7 µm, sometimes branched, with 0–2 clamped septa, 2) lagenocystidia numerous, 20–40 × 4–5 µm, tapering more or less abruptly to the subulate apex, apically mostly with a 7–15 µm long incrustation, thick-walled.

**Basidiospores** 4.5–5.5 × 4–5 µm, subglobose to globose.

**Habitat.** Collected on *Juniperus communis* and *Potentilla fruticosa* in open, sunny heathland on limestone.

**Distribution.** Known only from China and Sweden.

**Identification.** Can be readily identified by the irregularly grandinoid to odontoid basidioma in combination with globose basidiospores. It is most similar to *H. arguta*, which has broadly elliptic basidiospores and a densely hydroid hymenium. The two species also differ markedly in ecology since *H. arguta* is found in closed deciduous forest.

**Remarks.** The species is recently described based on Chinese specimens. Swedish and Chinese ITS sequences are identical. *H. pachyspora* is described as having thick-walled basidiospores, a character we could not confirm in Swedish material.

### **Hyphodontia pallidula (Bres.) J. Eriksson,**

Symb. Bot. Upsal. 16: 104, 1958. - *Gonatobotrys pallidula* Bres., Ann. Mycol. 1: 127, 1903. — *Gloeocystidium oleosum* Höhn. & Litsch., Sitzungsber. Kaiserl. Akad. Wiss. Wien, Math. Naturwiss. Cl., Abt 1 116: 827, 1907.

**Basidiocarps** resupinate, effused, adnate, thin (about 0.1–0.2 mm), soft crustaceous, hymenium at first porulose, then continuous, generally smooth to the naked eye but under the lens mostly finely grandinoid and pilose by projecting cystidia, white to pale ochraceous, margin in young basidiomata indeterminate and pruinose, when mature mostly abrupt and fertile to the edge.

**Hyphal system** monomitic, hyphae thin-walled, 2–3 µm wide, clamped, cyanophilous, richly branched, subiculum not clearly distinguished, subhymenial hyphae forming a somewhat dense texture.

**Cystidia** of two kinds, 1) septocystidia, numerous, hyphoid, projecting, with slightly thickened walls, cyanophilous, with mostly 4–9 clamped septa, often with constrictions and globose expansions, apically obtuse or somewhat capitate, 80–120 × 4–6 µm, apical head usually with resinous encrustation, 2) lagenocystidia, usually rare and probably absent in some specimens, apically provided with an encrustation that may disappear by age.

**Basidiospores** 3.5–4.5(–5.5) × 2.5–3 µm, elliptic, ovoid to subglobose.

**Habitat.** On decayed wood, preferably on conifers, less often on deciduous wood (e. g. *Alnus*, *Betula*, *Populus*).

**Distribution.** Frequent in conifer forests in all parts of Europe.

**Remarks.** It can be separated from *H. alutaria* above all by the number of lagenocystidia, which always are frequent in *H. alutaria*, while none or only a few can be found in *H. pallidula*. Furthermore, *H. pallidula* has slightly smaller basidiospores.

## **IRPEX Fr.,**

Elench. Fung. 1:142, 1828, - Syst. Orb. Veg. p. 81, 1825.

Basidiocarps annual, sessile, effusedreflexed, or resupinate, hymenophore becoming strongly hydaceous; pileus surface tomentose to hirsute, white to pale buff; hyphal system dimitic; generative hyphae simpleseptate; cystidia thickwalled, 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.** The genus is closely related to the poroid genus *Junghuhnia* and *Steccherinum* and is in principle separated only by the simple septa on the generative hyphae. 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. For numerous other synonyms, see Maas Geesteranus op. cit.

**Basidiocarps** annual, usually effusedreflexed or resupinate at first, occasionally sessile, pilei usually imbricate, dimidiate or laterally fused, up to 1 × 7 × 0.5 cm; upper surface white to cream colored or pale buff, densely tomentose to hirsute, azonate to faintly zonate, smooth or shallowly sulcate, margin concolorous; pore surface white to cream, the pores angular, 2–3 per mm near the margin with thin deeply split dissepiments so soon there is a split to hydroid hymenophore; context white to pale tan, softfibrous, azonate, up to 2 mm thick; tube layer concolorous and continuous with the context, up to 3 mm thick.

**Hyphal system** dimitic; generative hyphae thin to firmwalled, simpleseptate, 2–4 µm in diam; skeletal hyphae hyaline, thick-walled, occasionally simpleseptate, with rare branching, 2.5–6 µm in diam; tramal hyphae similar.

**Cystidia** 50–110 × 5–10 µm, conspicuous, abundant, thickwalled, heavily encrusted apically, projecting up to 40 µm, originating in the subhymenium from tramal skeletal hyphae.

**Basidiospores** 5–7 × 2–3 µm, oblong to cylindrical.

**Substrata.** Dead wood of numerous hardwood genera.

**Distribution.** Cosmopolitan species and ranging throughout Europe except for the northernmost part of Scandinavia. Widespread also in the tropics.

**Remarks.** The strongly hydaceous hymenophore, conspicuous encrusted cystidia, and simpleseptate 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. *S. cremealbum* Hjortst. and *S. crinale* (Peck) Ryv. have both simple septate hyphae and make the borderline between *Irpex* and *Steccherinum* disturbingly vague. However, both the latter species are strictly resupinate and have elliptic spores.

## **IRPICODON Pouzar,**

Folia geobot. phytotax. Praha 1:371, 1966.

Basidiocarps pileate, dimidiate or substipitate, flabelliform or lobed, sometimes imbricate, or rarely sub-resupinate, thin and small, cream white at least as young, soft; hymenial side more or less hydroid with cylindrical or flattened aculei, sometimes more or less sub-lamellate; hyphal system monomitic; hyphae with clamps, with thin, or in the trama, somewhat thickened walls; subhymenium thickening, composed of densely intertwined, thin-walled, tortuous hyphae; cystidia none; basidiospores allantoid to reniform, smooth, thin-walled, amyloid. Monotypic genus.

**Type species:** *Sistotrema pendulum* Alb. & Schw.

**Remarks.** The genus can be looked upon as a satellite genus to *Amylocorticium* where all species have resupinate basidiocarps.

## **Irpicodon pendulus (Alb. & Schw.:Fr.) Pouzar,**

op. cit. - *Hydnum pendulum* Alb. & Schw.:Fr., Syst. Mycol. 1: 413, 1821. - *Sistotrema pendulum* Alb. & Schw. Consp. Fung. p. 261, 1805.

**Basidiocarp** mostly pileate, varying in shape but mostly flabelliform, dimidiate or basally substipitate, entire or lobed, sometimes imbricate; small (0.5–2 mm) and thin (about 1 mm), when young cream white but in time darkening, the upper side turning greyish; surface variable, almost smooth to radially wrinkled; no pellicle; hymenial side in young specimens rarely smooth but usually with blunt, cylindrical or more commonly flattened, irregular aculei, in some cases radially widened to small lamellae.

**Hyphal system** monomitic; hyphae with clamps, mostly 3–4 µm wide, thin-walled, hyphae of the inner trama of the pileus

more or less widened, bladder like, in parts reaching 10 or even 15 µm, and irregularly constricted, some of the widened hyphae with an oily protoplasm. Pileus with adpressed hyphae, not forming a pellicle.

**Basidiospores** 4-5 x 2-2,5 µm, allantoid to reniform, adaxial side more or less concave.

**Substrata.** On dead or dying, often standing trunks of *Pinus silvestris*, sometimes in scars left from broken branches, in most cases on still fresh bark and at varying height above the ground. Practically all collections from the Nordic countries are made during the cold part of the year from October to April.

**Distribution.** Little known species and the collections from N. Europe are relatively few. In C. Europe it is reported from France and Germany.

**Remarks.** The white pileate basidiocarp with irregular teeth or lamellae, the host and the smooth amyloid basidiospores make *Irpicodon pendulus* a well characterized species.

## **KAVINIA Pilát,**

Stud. bot. Chech. 1:3, 1938.

Basidiocarps resupinate, effused, hydroid, consisting of a loose, sterile subiculum, bearing spines, mostly 1-5 mm long; rhizomorphs present in the periphery of the basidiocarp and in the subiculum; margin irregular or at least partly fibrillose; hyphae with clamps, smooth or with warts, those of the subiculum somewhat thick-walled; hyphal ampullae present, especially in the subiculum and in the rhizomorphs; basidia clavate, more or less stalked, pleurobasidia present in the marginal hymenia; spores oblong, subcylindrical or somewhat fusiform, smooth or provided with warts and non amyloid.

**Type species:** *Kavinia sajanensis* Pilát = *K. alboviridis* (Morgan) Gilb. & Burdsall.

**Remarks.** The lack of fertile hymenium between the hymenial aculei makes *Kavinia* an easily recognized genus.

### **Key to species**

1. Spores smooth, hyphae with warts..... **K. himantia**  
1. Spores warted, hyphae smooth ..... **K. alboviridis**

## **Kavinia alboviridis (Morgan) Gilb. & Budington,**

Journ. Ariz. Acad. Sc. 6:95, 1970. - *Hydnum alboviride* Morgan, J. Cinc. Nat. Hist. 10:12, 1887.

**Basidiocarps** resupinate, effused, attached by a loose subiculum and numerous rhizomorphs, hymenial aculei dense, mostly 1-3 mm long, narrow (about 0,3 mm), cylindrical, apically conical and tapering to the subulate, sterile apex; at first white, then greenish, olive green at last brownish; subiculum white, cottony; margin variable, cottony or fibrillose; thin rhizomorphs present in the periphery and in the subiculum.

**Hyphal system** monomitic; hyphae 2-4 µm wide and with clamps, in young texture thin-walled and smooth, older hyphae in subiculum and rhizomorphs with somewhat thickened walls, often encrusted, in some cases widened at septa.

**Basidiospores** 8-10(-12) x 3-4(-5) µm, warted, pale yellow in microscopical preparations, subfusiform, obliquely tapering to apiculus, with thickened walls, usually with a single oil drop.

**Substrata.** On much decayed coniferous and deciduous wood.

**Distribution.** A rare species, scattered in the Nordic countries.

**Remarks.** In most cases the species is easily recognized because of the green olivaceous colour, the small, subulate spines and the rough spores, which are yellow in microscopical preparations and ochraceous in mass.

## **Kavinia himantia (Schw.) John Erikss.,**

Symb. bot. Ups. 16:160, 1958. - *Hydnum himantia* Schw., Schr. Nat. Ges. Leipzig 1:104, 1822.

**Basidiocarps** resupinate, effused, loosely adnate, consisting of a loose, white sterile subiculum, bearing dense aculei, at first white, then ochraceous and at last brownish; hymenial aculei about 5 x 0,5 mm, cylindrical, slightly tapering towards the apex which is rather obtuse in the mature fungus; margin white, variable, often fibrillose; rhizomorphs present in the periphery and in the subiculum.

**Hyphal system** monomitic; hyphae 3-4 µm, with clamps, distinct, thin-walled in young parts, somewhat thick-walled in mature hyphae, as a rule with dense warts.

**Basidiospores** 8-10(-12) x 4-5 µm, smooth, white or cream-coloured, subcylindrical to narrowly ovoid, thin-walled, with oil drops in the protoplasm.

**Substrata.** On much decayed coniferous or deciduous wood, and often the basidiocarps spread over loose debris and soil.

**Distribution.** Widespread in the oak zone north to Trøndelag in Norway, Central Sweden and southern Finland, widespread in the temperate zone.

**Remarks.** Distinguished from *K. alboviridis* by the smooth spores and asperulate hyphae.

## **LEUCOGYROPHANA Pouzar,**

Ceská Mykol. 12: 32, 1958.

Basidiocarps resupinate, effuse, more or less athelioid, i.e. hymenial part forming a thin, continuous, easily detached layer, smooth or meruloid, white - yellow - orange red; all hyphae with clamps, subicular ones distinct, straight, sparsely branched, subhymenial hyphae dense, richly branched; cystidia lacking, or sometimes thin-walled, cylindrical cystidia present; basidia clavate, tetrasterigmatic, basidiospores broadly or narrowly elliptic, smooth, thick-walled, negative in Melzer, grey or yellow brown.

**Type species:** *Merulius molluscus* Fr.

**Remarks.** The genus is usually easy to recognize by the irregular folded surface in yellowish to brown colours and the yellow thick walled spores.

### **Leucogyrophana pulverulenta (Sowerby: Fr.) Ginns,**

Can. J. Bot. 56:1966, 1978. - *Merulius pulverulenta* Sowerby:Fr., Elenchus Fug. 1:60, 1828.

**Basidiocarp** resupinate, effuse, loosely attached to the substrate, soft and fleshy when alive, fragile when dried, up to 30 cm wide, but usually of smaller dimension, margin white to cream, hymenophore smooth close to the margin, then folded to raduloid to semihydroid, more rarely with low ridges anastomosing to form small pits, brown to yellowish brown, often covered with a deposit of spores and then granulose and rigid subiculum white to pale yellow, up to 5 mm thick, spongy or felted, sometimes with a few strands deeper into the substrate.

**Hyphal system** monomitic; hyphae thin-walled, with clamps and some occasional simple septa., 2-7 µm wide, in cases up to 15 µm wide, hyphal strand composed of a central hyphae surrounded more narrow ones, the core ones mostly simple septate,

**Cystidia** none, but cystidioles may be present, barely projecting above the basidia, smooth and thin walled.

**Basidiospores** 5.5-7 (8) x 3.5-4.5 (5) µm, broadly elliptic, thick-walled, yellow and non-dextrinoid.

**Habitat.** On decayed wood, of conifers, very rarely on hard woods.

**Distribution.** Apparently wide spread in Europe and north to southern Norway.

**Remarks.** The brown folded surface with the whitish contrasting margin makes this a distinct species in the genus. The brown colour makes it reminiscent of a *Serpula* species.

### **LINDTNERIA Pilát,**

Stud. Bot. Czech. 1:72, 1938.

Basidiocarps resupinate, loosely attached, meruloid to poroid with large irregular pores and low, thin and brittle dissepiments, consistency of the whole fungus soft, cottony; hyphal system monomitic, hyphae thin-walled, branching at right angles, with or without clamps on the hyphae, with clamps at the basidial bases; no cystidia; basidia rather broad, often constricted, with granular plasmatic contents, granulate - in some basidia floating together to larger bodies or drops; tetrasterigmatic; basidiospores globose, ovoid or lemon shaped, spinulose or with wing-like crests.

**Type species:** *Poria trachyspora* Bourd. & Galz.

**Remarks.** Easily recognized genus because of the ornamented basidiospores and hyphae with scattered clamps and simple septa. Only one distinctly hydroid species is included here.

### **Lindtneria hydnoidea Bernicchia & Ryvarden,**

Mycol. Res. 102:503, 1998.

**Basidiocarp** effused resupinate, occurring in small patches, fragile when dry and pelliculose, tuberculate, pappilate to odontoid, sometimes slightly labyrinthiform which may disappear in dry condition, deep yellow to orange becoming isabelline to rusty brown when dry, subiculum almost concolorous with the hymenophore and shrinking to a thin membranaceous layer, margin soft and arachnoid, concolorous with the hymenophore.

**Hyphal system** monomitic, generative hyphae 2.5-5 µm diam, all septa simple, richly branched, subhymenial hyphae 2.5-4 µm wide and covered with yellow crystals, subicular cells hyaline, 5 - 12 µm wide and frequently with several branches from a single septum.

**Cystidioles** present, smooth and with an apical swelling, often mixed with simple hyphal ends of variable width and up to 50 µm long from the septum from which they arise.

**Basidiospores** more or less globose, 7.5-9.5 in diameter excluding the ornamentation, hyaline to yellow when mature, odontoid to slightly crested, each protuberance up to 1 µm long, non-amyloid.

**Substrata.** The type was found below mosses.

**Distribution.** Known only from the type locality in Northern Italy.

**Remarks.** The species comes close to *L. trachyspora* as to the colour of the basidiocarp and the shape of the basidiospores, but the latter is always poroid besides having scattered clamps on the hyphae.

### **METULOIDEA G. Cunningh.,**

Bull. N.Z. Dept. Sci. Industr. Res. 164: 263, 1965.

Basidiocarps effused-reflexed to pileate, pileus brownish, hymenium hydroid to poroid; hyphal system trimitic with skeletal hyphae and more or less well-developed binding hyphae, generative hyphae with clamps; cystidia present or absent, developed as incrustated skeleto-cystidia; basidia clavate, tetrasterigmatic; basidiospores elliptic to subcylindrical, smooth, thin-walled, neither amyloid, dextrinoid nor cyanophilous. All species has a sweetish smell. Saprotrophic on broadleaved trees.

**Type species:** *Trametes tawa* G. Cunningh.

**Remarks.** The genus is related to *Steccherinum*, but differs by the presence of binding hyphae.

One hydroid rare species.

### **Metuloidea murashkinskyi (Burt) Miettinen & Spirin,**

Ann. Bot. Fenn. 53: 165, 2016. — *Hydnum murashkinskyi* Burt, Ann. Missouri Bot. Gard. 18: 477, 1931.

**Basidiocarps** effused-reflexed to pileate, coriaceous, pilei narrow, to 15 mm deep, semi-circular to elongated, single or fused,

upper surface cinnamon brown, zonate, tomentose, hymenium hydroid, spines up to 5 mm long, slender, subulate, 4–6 per mm, sometimes fusing making the hymenium irpicoid or subporoid, greyish brown, pileate margin distinct, margin in effused parts well-developed, yellow-brown. With a strong, sweet anise-like smell.

**Hyphal system** trimitic, generative hyphae with clamps, binding hyphae yellowish, 1.5–2.5 µm wide, richly branched, skeletal hyphae thick-walled to subsolid, yellow to brown, mostly 2.5–5 µm wide, in spines sometimes to 8 µm wide, pileus context a mixture of generative hyphae, skeletal hyphae and binding hyphae, spine trama dominated by skeletal hyphae, subhymenial hyphae thin-walled, ab. 2 µm wide.

**Cystidia** rather few, visible as apically encrusted skeletal hyphae, encrusted part to 80 µm long and 8–12 µm wide, extending into the hymenium, usually absent from spine tips.

**Basidiospores** 3.3–4.5 × 1.7–2.3 µm, subcylindrical.

**Substrate.** On dead fallen stems and branches of deciduous trees, often *Quercus* or *Populus*.

**Distribution.** Rare in Central Europe, gradually becoming more common eastwards. originally described from West Siberia.

**Identification.** The brown pileus, the trimitic hyphal system, and the strong anise-like smell make this a highly characteristic species.

## **MUCRONELLA Fr.,**

Hymen. Europ. p. 629, 1874.

Basidiocarps simple, unbranched to branched, hanging teeth, rarely more than 1 cm long, whitish to pale cream, hyphal system monomitic, hyphae with clamps, cystidia absent, basidia with 4 sterigmata, basidiospores thin-walled, smooth and amyloid to faintly amyloid, on dead wood of different kinds. Cosmopolitan genus.

**Type species:** *Mucronella calva* (Fr.) Fr.

**Remarks.** The genus has often been placed in Clavariaceae because of the thin, needle shaped basidiocarps. However, those of *Mucronella* re hanging in strong contrast to all other clavarioid genera with erect basidiocarps. DNA investigations have shown that *Mucronella* is related to some genera in Hericiaceae and the difference between genera like *Dentipellis* and *Mucronella* is that the former has a continuous subiculum between the teeth and distinctly ornamented and strongly amyloid basidiospores.

### **Key to species**

1. Basidiospores globose, 3–4 µm in diameter, basidiocarps occurring on dead polypores, rare species ..... **M. polyporacea**
1. Basidiospores elliptic to subglobose, longer than 4 µm, on dead wood ..... **2**
2. Basidiospores 4.5–6.3 µm wide, basidiocarps white, up to 6 mm long ..... **M. bresadolae**
2. Basidiospores 3.5–4.5 µm wide, basidiocarps cream to yellow, up to 3 mm long ..... **3**
3. Cystidia present, clavate, up to 25 µm long, subiculum between the spine rather distinctive, ..... **M. styriaca**
3. Cystidia absent, subiculum absent or faintly visible ..... **4**
4. Basidiocarp cream to pale ochraceous, common species ..... **M. calva**
4. Basidiocarp yellow or pale orange, rare species ..... **M. flava**

## **Mucronella calva (Alb. & Schw.:Fr.) Fr.,**

Hymen. Europ. p. 629, 1874. – *Hydnum calvum* Alb. & Schein., Consp. Fung. p. 271, 1805. – *Mucronella minutissima* Peck, N. Y. State Mus. Rep. 44:22, 1891.

**Basidiocarps** usually in clusters, pendant, 1–3 mm long and tapering, white to pale cream, soft when fresh, fragile when dry.

**Hyphal system** monomitic; hyphae thin-walled, with clamps, 3–6 µm wide.

**Basidiospores** 4–6 × 2.5–3 µm, elliptic to oblong, very faintly amyloid.

**Substrata.** On decayed deciduous wood.

**Distribution.** Rather rare species, but known from the coniferous forest in Fennoscandia and thorough the mountains areas in Central Europe.

**Remarks.** The species is easy to recognize due to the tiny hanging needle like basidiocarps, often in large numbers on the substrate.

## **Mucronella bresadolae (Quel.) Corner,**

Beiheft Nova Hedwigia 33:172, 1870. – *Clavaria bresadolae* Quel., Fl. Mycol. France p. 458, 1888.

**Basidiocarps** pendant, often occurring in groups, single or rarely forked from the base, 2–6 mm long, up to 1 mm in diameter at the base, white to very pale cream, subiculum if present only as thin layer of almost transparent hyphae among spines.

**Hyphal system** monomitic; hyphae thin-walled to slightly thick-walled, 2.5–10 µm wide.

**Cystidia** 25–45 × 3–4.5 µm, rare to common in the hymenium, smooth, thin-walled.

**Basidiospores** 5–8.5 × 4.5–6 µm, broadly elliptic to subglobose and amyloid.

**Substrata.** On decayed coniferous wood.

**Distribution.** Known from Norway, Sweden (?) and France, Switzerland and Austria.

**Remarks.** The species is recognized by its large basidiospores, the long and white needle like basidiocarps.

### **Mucronella flava** Corner,

Ann. Bot. 17:356, 1953.

**Basidiocarps** hanging, unbranched, single, but usually occurring in groups, 1-2 mm long and tapering, pale yellow to orange yellow, stipe barely distinctive.

**Hyphal system** monomitic; hyphae thin-walled to slightly thick-walled, with clamps, 3.5-15 µm wide.

**Cystidia** absent.

**Basidiospores** 4-5 x 2.5-3.5 µm, elliptic, amyloid.

**Substrata.** On decayed deciduous wood.

**Distribution.** Known only from Yugoslavia.

**Remarks.** The microscopical characters of this species are identical with those of the much more common *M. calva*, it may be interpreted as a colour variant to this species.

### **Mucronella polyporacea** Velenovsky,

Ceske Houby, 4-5:735, 1922.

**Basidiocarps** hanging, single, 1-3 mm long and tapering, white to pale cream, soft when fresh, fragile when dry.

**Hyphal system** monomitic; hyphae thin-walled to slightly thick-walled, with clamps, 3.5-10 µm wide.

**Cystidia** absent.

**Basidiospores** 3-4 µm in diameter, subglobose, amyloid.

**Substrata.** On dead polypores, originally described from *Gloeophyllum odoratum*.

**Distribution.** Known only from Czech republic.

**Remarks.** The species is recognized by its small globose basidiospores and its habitat on dead polypores.

### **Mucronella styriaca** Maas-Geest.,

Persoonia 9:271, 1977.

**Basidiocarps** hanging, single or in clusters, slightly stipitate with a 1 mm long constricted base, sometimes forked from the base, 1-3 mm long and tapering, white to pale cream when fresh, drying yellowish to pale straw coloured, soft when fresh, fragile when dry, subiculum present among spines as a very thin layer of hyphae.

**Hyphal system** monomitic; hyphae thin-walled to slightly thick-walled, with clamps, 3.5-10 µm wide.

**Cystidia** 20-25 µm long, smooth, thin-walled, slightly projecting.

**Basidiospores** 5.5-7.5 x 3.8-5 µm, pip-shaped to almost triangular, amyloid.

**Substrata.** On decayed deciduous wood.

**Distribution.** Known only from Steiermark in Austria.

**Remarks.** The species is recognized by its pip-shaped amyloid basidiospores and the small cystidia.

## **MYCOACIA** Donk,

Medd. Nederl. myc. Ver. 18-20:150, 1931.

**Basidiocarps** resupinate, adnate, effused, ceraceous, consisting of a thin subiculum bearing dense hymenial aculei, mostly 1-3 mm long, conical or cylindrical, apically tapering, in some cases penicillate; margin finely fimbriate, pruinose or indeterminate thinning out; hyphal system monomitic, hyphae about 2-3 µm wide, thin-walled, with clamps, parallel in the aculeal trama; thin-walled cystidiols present, apically encrusted or not; in the type species apical hyphae strongly encrusted and may be looked upon as cystidia organs; basidia narrowly clavate, in a dense palisade; basidiospores subcylindrical, narrowly elliptic to suballantoid.

**Type species:** *Hydnum fuscoatrum* Fr.

**Remarks.** *Mycocacia* is recognized by its hydroid basidiocarps, dense consistency and with a dense palisade of narrow basidia.

### **Key to European species**

1. Hyphal system dimitic with skeletal hyphae, basidia bisterigmatic ..... **M. bispora**
1. Hyphal system monomitic, basidia tetrasterigmatic ..... **2**
2. Basidiospores short, 3.5-4.5(-5.5) µm, suballantoid; hymenium not red in KOH ..... **M. aurea**
2. Basidiospores longer, 4.5-6 µm, straight, narrowly elliptic or subcylindrical; hymenium red in KOH, at least in young specimens ..... **3**
3. Thick-walled cystidia or apical hyphae cystidia like and strongly encrusted present ..... **4**
3. Cystidia absent ..... **5**
4. Mature basidiocarps dark brown to almost black, cystidia needle like and thin walled, no scent when fresh ... **M. fuscoatra**
4. Mature basidiocarps ochraceous, cystidia conical, thickwalled, scent sweet when fresh ..... **M. nothofagi**
5. Young basidiocarps yellow drying ochraceous, red with 3% KOH ..... **M. uda**
5. Young basidiocarps greyish, ochraceous to pale brown, no reaction with 3% KOH ..... **M. squalina**

**Mycoacia aurea (Fr.) Erikss. & Ryvardeen,**

Cort. N. Europe 4:877, 1976. - *Hydnum aureum* Fr., El. fung. 1:137, 1828.

**Basidiocarp** resupinate, adnate, effused and often rather large; subiculum thin, white, membraneous, in old parts cracking on drying; aculei dense, 2-3 mm long, subcylindrical, often branched in 2 or 3 apices, as a rule also serrate with small lateral projections, ceraceous, creamish when young, yellow-ochraceous when mature; margin light-coloured, under the lens finely fibrillose or indeterminately thinning out.

**Hyphal system** monomitic; hyphae thin-walled, with clamps, 2-3  $\mu\text{m}$  wide, in the aculeal trama densely parallel, in the thickening subhymenium intertwined into a pseudoparenchymatic context, in the aculeal apices glued together to projecting bundles; in young basidiocarps hyphal texture clean, but in old ones more or less loaded with crystals.

**Cystidia** and cystidiols usually none, but sometimes there are near the aculeal apices projecting hyphal ends that could be designated as cystidiols.

**Basidiospores** 3,5-4,5(-5,5) x 1,5-2  $\mu\text{m}$ , suballantoid, adaxially concave.

**Substrata.** On decayed deciduous wood.

**Distribution.** Rather rare species but distributed in S. Scandinavia.

**Remarks.** Well distinguished from the other species of N. Europe in the short, allantoid basidiospores and the absence of cystidial organs. It does not react to KOH.

**Mycoacia bispora (Stalpers) Spirin & Zimitr.,**

Nov. sist. Niz. Rast. 37:183, 2004. - *Resinicium bisporum* Stalpers, Persoonia 9:145, 1976.

**Basidiocarp** resupinate, effused, pale yellowish when young, then ochraceous, ceraceous when fresh, hydroid with dense aculei, which are about 2 mm long, cylindrical or narrowly conical, tapering to the sterile apex; margin thinning out, not especially differentiated but in dry specimens lighter in colour than the rest of the basidiocarp; subiculum thin, in old basidiocarps cracking on drying.

**Hyphal system** dimitic; skeletal hyphae thick-walled, mostly 3-4  $\mu\text{m}$  wide, parallel packed in the central part of the aculei and forming a trama well separated from the subiculum which is composed of richly intertwined, thin-walled hyphae, 2-3  $\mu\text{m}$  wide and provided with clamps; rich occurrence of crystals in the texture, especially in the subiculum of the aculei.

**Cystidial elements** present in the hymenium, almost cylindrical, 20-30 x 4-5  $\mu\text{m}$ , apically slightly enlarged into a head, which when intact, is covered with a globule of resinous, yellowish matter.

**Basidiospores** 4-5,5 x 2,5-3  $\mu\text{m}$ , narrowly elliptic.

**Substrata.** On dead hardwood.

**Distribution.** Central Europe, in N. Europe found only in Denmark.

**Remarks.** The species looks very much like *Mycoacia uda*, but is easily distinguished by its skeletal hyphae.

**Mycoacia fuscoatra (Fr.) Donk,**

loc. cit. p. 152. - *Hydnum fuscoatrum* Fr., Syst. mycol 1:416, 1821.

**Basidiocarp** resupinate, effused, adnate, when young ceraceous, cream-coloured, citric or ochraceous-yellow, when mature firmer, darkening to brown or black-brown and when old almost black; subiculum thin, fertile only in the marginal part, aculei dense, conical to subcylindrical, apically tapering to the apex, which is fimbriate to penicillate under the lens, spine bases often joined in pairs or in small groups of aculei; margin in young basidiocarps fimbriate under the lens, pruinose or indeterminately thinning out; young yellow parts of the basidiocarp turning red by drops of KOH.

**Hyphal system** monomitic; hyphae thin-walled, 2-3  $\mu\text{m}$  wide, with clamps, densely parallel in the aculeal trama, projecting in the aculeal apex, such projecting hyphae as a rule strongly encrusted and may look like differentiated cystidia; beside the crystalline encrustation also many non-crystalline grains in the texture which dissolve and in young basidiocarps turn red in KOH.

**Cystidia** 30-40 x 4-5  $\mu\text{m}$ , thin-walled, needle-like cystidiols in the hymenium, projecting beyond the basidia, and cystidia-like, encrusted hyphae in the apical part of the aculei.

**Basidiospores** 5-6 x 2-2,5  $\mu\text{m}$ , subcylindrical.

**Substrata.** On dead deciduous wood.

**Distribution.** Not rare and widespread in Europe

**Remarks.** The dark coloured mature specimens are usually easy to recognize, but young, light coloured specimens are often confused with those of *M. uda*. The sharp-pointed cystidiols and the encrusted apical hyphae are good separating characters.

**Mycoacia nothofagii (G. H. Cunningh.) Ryvardeen,**

Nova Hedwigia 34:534, 1981. - *Odontia nothofagi* G. H. Cunningh., Trans. Royal. Soc. New Zeal. 86:88, 1959.

**Basidiocarp** resupinate, annual, adnate, effused, hydroid, individual teeth to 10 mm long, soft waxy when fresh and then with a strong sweet scent, hard and dense when dry, ochraceous to pale grey when fresh, drying brown, sometimes with a violet tint, margin pale ochraceous, subiculum thin and concolorous with the margin when fresh

**Hyphal system** monomitic, generative hyphae with clamps, in the subhymenium thin-walled and agglutinated in dry specimens, 2-3.5  $\mu\text{m}$  wide, in the trama and subiculum more thick-walled and up to 5  $\mu\text{m}$  wide.

**Cystidia** abundant, conical, thick-walled, first smooth, then more heavily encrusted with age, 40-60 x 8-12  $\mu\text{m}$  and projecting up to 15  $\mu\text{m}$ .

**Basidiospores** 4.5-6 x 2-2,5  $\mu\text{m}$ , cylindrical to slightly elliptic.

**Substrata.** On much decayed deciduous wood.

**Distribution.** Found in Spain and England.

**Remarks.** The long and dense spines, the strong scent in fresh condition and the abundant encrusted cystidia should make this species easy to recognize.

**Mycoacia squalina (Fr.) M. P. Christ.,**

Dansk Bot. Arkiv 19, no 2:p. 177, 1960. - *Hydnum squalinum* Fr., Syst. Mycol. 1:420, 1821.

**Basidiocarp** resupinate, adnate, effused, greyish ochraceous to pale brownish, spines in dense masses, individual spines or teeth 3-5 mm long, sharply pointed, subiculum thin. cream coloured.

**Hyphal system** monomitic; hyphae without clamps (acc. to Christ.) 2-4 µm wide, smooth or with loosely attached crystals.

**Cystidia** present as small subfusiform cystidiols, about 16 µm long.

**Basidiospores** 5-6 x 2.4-2,8 µm long, narrowly elliptic.

**Substrata.** On much decayed deciduous wood,

**Distribution** Evidently rare, known from Denmark and Sweden.

**Remarks.** Its long and sharply pointed teeth in greyish-ochraceous to brown colours make this species rather characteristic.

**Mycoacia uda (Fr.) Donk,**

loc. cit. p. 151. - *Hydnum udum* Fr., Syst. mycol. 1: 422, 1821.

**Basidiocarp** resupinate, adnate, effused, mostly of small to moderate size, citric to sordidly yellow, when old ochraceous; subiculum thin, fertile only in the marginal part, aculei conical to subcylindrical, ceraceous, mostly 1-2 mm long, seldom more, as a rule simple, but sometimes apically divided or basally joined; margin thinning out, pruinose or finely fimbriate under the lens; young yellow parts of the basidiocarp turn deep red in a drop of KOH.

**Hyphal system** monomitic; hyphae with clamps, 2-3 µm wide, with thin or slightly thickened walls, parallelly packed in the aculeal trama; subhymenial hyphae densely intertwined; in mature specimens aculeal trama filled with rod-like crystals, apical hyphae end more or less encrusted.

**Cystidia** present as small subfusiform cystidiols, about 25 µm long, somewhat projecting and apically provided with a cap of non-crystalline matter, easily dissolved in mounting media.

**Basidiospores** 5-6 x 2-2,5 µm, narrowly elliptic.

**Substrata.** On deciduous wood, such as *Alnus*, *Betula*, *Corylus* and *Fagus*.

**Distribution.** Evidently rare in the Nordic countries except for in the southernmost part.

**Remarks.** Rather easy to recognize by the yellow colour and the reaction to KOH, but microscopical investigation is necessary as young basidiocarps of *M. fuscoatra* are macroscopically similar.

**MYCOBONIA Pat.,**

Bull. Soc. Mycol. Fr. 10:76, 1894.

Basidiocarps pileate, annual, dimidiate to reniform, upper surface yellowish, glabrous, lower surface yellowish becoming often darker when dried, covered with minute sterile spines, context thin and dense, hyphal system dimitic, generative hyphae hyaline and with clamps, vegetative hyphae arboriform of the *Bovista* type with mostly dichotomously branching, solid to thick-walled and hyaline, no reacting in Melzer's reagent, basidia clavate tetrasterigmatic, basidiospores hyaline, thin-walled and cylindrical to elliptic, cystidia absent, causing a white rot in dead deciduous wood. Tropical American genus with two species.

**Type species:** *Peziza flava* Sw:Fr.

**Remarks.** The genus is related to *Polyporus* s. str having the same microstructure, but easily separated by having a densely spiny lower side.

**Key to species**

- 1. Basidiospores cylindrical to navicular, 5-7.5 µm wide ..... **M. flava**
- 1. Basidiospores elliptic, 9-11 µm wide..... **M. brunneoleuca**

**Mycobonia flava (Berk.) Pat.,**

Bull. Soc. Mycol. Fr. 10:76, 1894. - *Peziza flava* Swartz Nov. Gen. Sp. Plant. Prodromus p. 150, 1788. - *Peziza flava* Sw: Fr. Syst. Mycol. 2:161, 1822.

**Basidiocarp** pileate annual, dimidiate to reniform or flabellate, up to 8 cm wide and 4 cm measured radially, rarely more than 4 mm thick, flexible and tough when fresh, dense and hard when dry, stipe short expanding evenly into the pileus, yellow to ochre when fresh, when dry some specimens become pale purplish to rusty isabelline, lower surface pale ochre to yellow when dry, rarely more dark-coloured, covered with numerous tiny sterile conical spines of same colour, up to 0.5 mm long, context whitish to ochre, dense.

**Hyphal system** dimitic; generative hyphae difficult to observe in dry specimens, 2-4 µm wide, thin-walled and hyaline, arboriform binding hyphae dominate the basidiocarp, hyaline, thick-walled to solid, richly branched with tapering apices, in main stem up to 5 µm thick.

**Basidiospores** 15-22 x 5-7.5 µm, cylindrical to slightly navicular.

**Substrata.** On dead wood of deciduous trees.

**Distribution** Widespread in Central and South America from the Yucatan peninsula to Northern Argentina, but nowhere common.

**Remarks.** The delicate yellow basidiocarps with the numerous tiny spines on the lower side make it easy to recognize the



species in the field with a lens. To the naked eye the lower surface of young specimens can easily be taken for being glabrous.

**Mycobonia brunneoleuca (Berk. & M. A. Curtis) Pat.,**

Essai Taxonom. P. 75, 1900. – *Hydnum brunneoleucum* Berk. & M. A. Curtis, Trans. Linn. Soc. Lond. 22:129, 1857.

**Basidiocarps, hyphal system and basidia** as in *M. flava*.

**Basidiospores** 17-22 x 9-11 µm, elliptic.

**Substrate.** Dead deciduous trees.

**Distribution.** Unknown because of confusion with *M. flava*, since only a microscopical examination will separate the two species. In the Kew Fungarium there are confirmed specimens from Cuba, Mexico and Venezuela, but its distribution is certainly wider.

**MYCOLEPTODONOIDES Nikol.,**

Bot. Meter. Not. Syst. Sect. Cryptog. Acad. Sci. USSR 8:117, 1952.

Basidiocarps multipileate, pilei fan shaped, glabrous, hydroid, context homogenous, spines concolours with pileus, hyphal system monomitic with clamps, cystidia absent, basidia tetrasterigmatic, oil filled terminal hyphae present, basidiospores smooth, non amyloid. On dead hardwood.

**Type species:** *Hydnum aitchisonii* Berk.

Remarks. The genus comes close to *Climacodon* and further DNA sequencing will eventually show whether the two genera are taxonomic synonyms.

**Mycoleptodonoides aitchisonii (Berk.) Maas Geest.,**

Persoonia 1:411, 1961. – *Hydnum aitchisonii* Berk, Grevillea 4:137, 1876. – *Hydnum tapeinum* Masee, Kew Bull. 1899, p. 171. – *Hydnum cucullatum* Pat. & Hariot, Bull. Mus. Nat. Hist. Paris 8:131, 1902.

**Basidiocarp** multipileate, individual pilei up to 6 cm wide and long, varying in shape but mostly flabelliform, dimidiate or basally substipitate, entire or lobed, sometimes imbricate; when young cream white but in time darkening, pileus becoming ochraceous to pale yellowish brown, glabrous to finely velutinate, slightly radially wrinkled; spines up to 7 mm long whitish when fresh, drying dense and reddish brown, context up to 4 mm thick at base, homogenous, pale yellowish brown.

**Hyphal system** monomitic; hyphae with clamps, 3-12 µm wide, thin- to thick-walled, frequently branched.

**Cystidia** none, but some hyphae are oil filled and are gloeocystidia like.

**Basidiospores** 5.5-6.5 x 2-3 µm, elliptic.

**Substrata.** On dead hardwood.

**Distribution.** East Asian species, the type came from Kashmir.

**Remarks.** The imbricate hydroid basidiocarps reminds one of *Creolophus* species, and ultimately the species may be transferred to this genus.

**MYCORRHAPHIUM Maas-Geesteranus,**

Persoonia 2:394, 1962.

Basidiocarps centrally to laterally stipitate, lower side densely hydroid, hyphal system dimitic with generative and skeletal hyphae, gloeocystidia present or absent, basidiospores smooth, thin-walled, hyaline and without reaction in Melzer's reagent, widespread genus, but not common.

**Type species:** *Steccherinum adustulum* Banker.

**Remarks.** The genus may be related to *Donkia*, which however has a monomitic hyphal system and sessile basidiocarps. *Mycocleptodonoides* Nikolav. is macroscopically similar, but separated by a monomitic hyphal system.

**Key to species**

- 1. African species ..... 2
- 1. Species from other areas ..... 4
  
- 2. Basidiocarp citric yellow ..... **M. citrinum.**
- 2. Basidiocarp differently coloured ..... 3
  
- 3. Stipe densely hairy and cinnamon coloured..... **M. ursinum**
- 3. Stipe glabrous, whitish to ochraceous ..... **M. africanum**
  
- 4. Basidiocarp white when fresh, becoming ochraceous, basidiospores 4.5-6 x 2.8-3.5 µm, gloeocystidia present; tropical Asia ..... **M. stereoides.**
- 4. Basidiocarp ochraceous to pale dingy brown/grey, spores shorter than 4.5 µm, gloeocystidia absent: temperate species.....5
  
- 5. Basidiocarp 2-8 cm diam. often in clusters, basidiospores cylindrical, 3 x 1-1.5 µm..... **M. adustulum**
- 5. Basidiocarp 1-2 cm diam. spores ellipsoidal, 3-4 x 2-2.5 µm ..... 6

6. Generative hyphae with simple septa, European species ..... **M. pusillum**.  
 6. Generative hyphae with clamps, American species ..... **M. adustum**

**Mycorrhaphium adustum (Banker) Ryvar den,**

Mem. NY Bot. Garden 49: 345, 1994. - *Steccherinum adustum* Banker, Mem. Torrey Bot. Club 12:133, 1906.

Basidiocarps and microscopical characters are more or less identical to those of *M. pusillum*, and the only reliable character to separate the latter is the septation of the generative hyphae. See the key above.

**Mycorrhaphium adustum (Schwein.) Maas-Geester.,**

Persoonia 2:394, 1962. - *Hydnum adustum* Schwein. Schr. Naturf. Ges. Leipzig. 1:103, 1822.

**Basidiocarps**, stipitate, single or in groups, sometimes fused together, sometimes in overlapping in clusters on dead hard wood, especially oak pileus 2.5-7.5 cm wide; stipe (when present) 2-3 cm long and 1-2 cm thick, lateral and velvety, pileus white when young and tan in age, first minutely velvety to glabrous and will bruise smoky-gray, margins often black in age, lower side with spines, 1-3 mm long, fused, and appearing forked at their tips, first white becoming pinkish-brown or purplish and brown to almost black by age.

**Hyphal system** diitic, generative hyphae with clamps, 2-4 mm wide, skeletal hyphae solid and of same width.

**Basidiospores** 2.5-4 x 1-1.5 µm, cylindrical.

**Substrate:** On the ground.

**Distribution:** Eastern North America.

**Remarks.** The colour change from fresh to dry, and the fairly small cylindrical spores are distinguishing characters.

**Mycorrhaphium africanum Mossebo & Ryvar den,**

Mycotaxon 88:230, 2003.

**Basidiocarp** centrally to laterally stipitate, pileus 4-7 cm wide, funnel-shaped or semi-circular, pileus first white, then pale brown to reddish brown with pinkish spots, smooth, glabrous, slightly concentrically zonate, radially veined when dry, margin flat and wavy when fresh, slightly incised when dry, stipe glabrous, whitish, becoming ochre when dry, 3-5 cm long, 3-6 mm in diameter, slightly widened toward the pileus, context white and dense, white becoming pale brown when dry, lower side densely hydroid, spines up to 3 mm long, first whitish then pale brown when dry.

**Hyphal system** dimitic, skeletal hyphae confined to the trama of the spines, hyaline and thick-walled, 3-5 µm diam, more or less parallel, generative hyphae with clamps, thin-walled and strongly branched in the subhymenium, 2-4 mm wide, in the context of pileus and stipe distinctly thick-walled, very sparingly branched and with rather scattered clamps, 3-5 mm diam.

**Cystidia** not seen, cystidioles pointed, 12-14 x 4-5 µm present among the basidia.

**Basidiospores** 4.5-5 x 2 µm, cylindrical.

**Substrate:** On the ground among litter.

**Distribution.** Known only from the type locality in Cameroon.

**Remarks.** The whitish to brown colours and the small cylindrical spores characterise this species.

**Mycorrhaphium citrinum Ryvar den,**

Mem. NY Bot. Garden 49:346, 1994.

**Basidiocarp** centrally to laterally stipitate, pileus 1-2.5 cm wide, circular to fan shaped or semi-circular, slightly lobed to deeply incised in one specimen, flat to centrally depressed, citric yellow to pale yellowish-brown, glabrous, slightly concentrically zonate, slightly wrinkled from the centre of the pileus, margin deflexed in dry condition, flat and wavy when fresh, stipe glabrous, bright citric yellow, 1.5-2.5 mm diam and with rhizomorphs from the base., spines densely crowded, pale citric yellow, 1-3 mm long, stipe slightly expanding towards the pileus, centrally to laterally attached, in one specimen split in the top as if three individual pilei have become fused, context white to pale citric yellow in stipe and pileus.

**Hyphal system** dimitic, skeletal hyphae confined to the trama of the spines, hyaline and thick-walled, 3-5 µm diam, more or less parallel, generative hyphae with clamps, thin-walled and strongly branched in the subhymenium, 2-4 mm wide, in the context of pileus and stipe distinctly thick-walled, very sparingly branched and with rather scattered clamps, 3-5 mm diam.

**Cystidia** not seen, cystidioles pointed, 10-15 x 4-5 µm.

**Basidiospores** 3-3.5 x 2-2.5 µm subcylindrical to oblong elliptic.

**Substrate:** On the ground among litter.

**Distribution.** Known only from Zambia.

**Remarks.** The species is easy to recognize by its stipitate bright citric yellow and hydroid basidiocarp.

**Mycorrhaphium pusillum (Fr.) Maas Geesteranus,**

Persoonia 2:398, 1962. - *Hydnum pusillum* Fr., Syst. Mycol 1:407, 1821.

**Basidiocarp** annual, stipitate; single or compounded with 2-3 pilei, the latter 12-20 mm I diameter, round to applanate or flabelliform, glabrous, white to cream coloured to ochraceous sometimes with some pale brown zones, margin sharp and even, spines 0.8-1.2 mm long, pale cream to pale ochraceous,

**Hyphal system:** dimitic, skeletal hyphae 3-5 mm in diameter, generative hyphae 2.5 - 3.5 µm wide and simple septate.

**Gloeocystidia** rare, 10-12 x 4.3-5.4 µm and smooth.

**Basidiospores** 2.7-3.6 x 1.0-2.2, elliptic.

**Substrate:** On the ground, but also reported from dead wood.

**Distribution.** European species known from Finland and southern Europe.

**Remarks.** The small spores are and the pale colour of the basidiocarps are characteristic for this rare species.

### ***Mycorrhaphium stereoides* (Cooke) Maas-Geest.,**

Verhand. Avd. Naturkunde Kon. Ned. Akad. Wetensch. 2 series, part 60, no 3:152, 1971. – *Hydnum stereoides* Cooke, Grevillea 20: 90, 1892. – *Hydnum insulare* Pat., Leaflet. Phillip. Bot. 6:2251, 1914.

**Basidiocarp** laterally stipitate; simple or compounded with several pilei, the latter up to 25 cm wide, circular to flabelliform, slightly depressed in centre, smooth, concentrically zoned, glabrous, white when fresh becoming ochraceous when dry, spines up to 19 m long and 0.2–0.4 mm wide, concolorous with pileus when fresh, drying yellowish to brownish when dry.

**Stipe** up to 8 cm long and 1–4 cm wide central to eccentric, finely felted becoming glabrous, white becoming discoloured as the spines.

**Hyphal system:** monomitic, generative hyphae 2–9 µm wide and with clamps.

**Gloecystidia** common, up to 25 µm long and 3–7 µm wide.

**Basidiospores** 4.5–6 × 2.8–4 µm, broadly elliptic.

**Substrate:** On the ground, but also reported from dead wood.

**Distribution.** Asian species known from Pakistan and eastwards to the Philippine Islands.

**Remarks.** The large stipitate basidiocarps, the elliptic spores and presence of gloecystidia, make this a distinct species.

### ***Mycorrhaphium ursinum* Decock & Ryvarden,**

Synopsis Fung. 42: 26, 2020.

**Basidiocarp** laterally stipitate; pileus up to 5 mm wide, semi-circular and deeply incised in up to 10 narrow lobes, soft when fresh, dense and hard when dry, flat to slightly depressed at stipe attachment, glabrous, dull, cinnamon coloured when fresh, becoming black with age, slightly concentrically zonate, margin flat and wavy, stipe up to 15 mm long, dark cinnamon coloured, densely hirsute, becoming almost hydroid as the hairs become agglutinated in an irregular fashion, spines densely crowded, finely pruinose (strong lens!) initially ochraceous, becoming greyish to almost black with age, dense and with a blackish core, about 1 mm long and up to 100 µm in diameter.

**Hyphal system:** dimittic, skeletal hyphae confined to the trama of the spines, hyaline and thick-walled, 2–5 µm diam, more or less parallelly arranged in the spines and the spine tomentum, generative hyphae with clamps, thin-walled, 2–4 µm wide.

**Cystidia** not seen.

**Basidiospores** globose to subglobose, 2.5–3.5 µm in diameter.

**Substrate:** On the ground among litter.

**Distribution.** Known only from the type locality in Gabon, but has probably a wide distribution in the Central African equatorial forest.

**Remarks.** The species is easy to recognize by densely hairy, cinnamon coloured stipe and a deeply incised pileus. The globose spores are also distinctive for this African species.

The basidiocarps of *M. ursinum* reminds one of *Auriscalpium dissectum* Maas Geest. & Rammeloo, which also has a deeply incised pileus, a hydroid hymenophore, a hairy stipe and growth place in the rain forest of Central Africa in Democratic Republic of Congo (Maas Geesteranus and Rammeloo 1979, Ryvarden 2001). *Auriscalpium dissectum* is differentiated in having pip- to drop shaped, slightly ornamented, larger basidiospores (i. e. 4.5–5.6 × 3.5–4 µm).

## **ODONTICIUM Parmasto,**

Consp. System. Corticiac. p. 126, 1968. – *Granulocystis* Hjortstam.

Basidiocarps resupinate, effused, membranaceous, hymenophore odontoid to hydroid, usually cream coloured, hyphal system monomitic (pseudodimitic), hyphae with simple-septa, thin- to thick-walled, hyaline. Cystidia absent. Basidia tetrasterigmatic and simple septate, basidiospores cylindrical to ellipsoid, smooth, thin-walled, IKI–.

**Type species.** *Odonticum romellii* (S. Lundell) Parmasto.

**Remarks.** *Odonticum* is characterized by a odontoid to hydroid hymenophore, monomitic to pseudodimitic hyphal system with simple-septate hyphae and smooth, non-amyloid basidiospores.

### **Key to species**

1. Spores allantoid to subcylindrical ..... **O. romellii**
1. Spores subglobose to elliptic ..... **O. subhelveticum**

### ***Odonticum romellii* (Lundell) Parmasto,**

Consp. Syst. Cort. p. 126, 1968. — *Odontia romellii* Lundell, in J. Erikss., Symb. Bot. Ups. 16: 124, 1958.

**Basidiocarps** resupinate, closely adnate, effused, often extending over several dm<sup>2</sup>, consistency tough, hymenium odontoid, composed of dense aculei, mostly 0.5–1 mm long, conical to subcylindrical, apically hispid, sometimes irregularly joined and with several tips, in rare cases subporoid, whitish to cream-coloured, old basidiocarps pale greyish white, margin thinning out and fertile throughout, rarely finely fibrillose and sterile.

**Hyphal system** monomitic, hyphae simple septate, in subiculum and aculei 4–5 µm wide, straight, parallel, thick-walled, with numerous constrictions, at aculei apices thin-walled and with obtuse tip, in the very thin subiculum also some thin-walled, narrower (2.5–3 µm) hyphae, subhymenial hyphae thin-walled, 2–3 µm wide.

**Basidiospores** 4–4.5 × 1.2–1.5 µm, allantoid to sub-allantoid.

**Substrate.** On decayed coniferous wood, mostly collected on *Pinus* logs in dry, open forest.

**Distribution.** Not uncommon in the northern boreal conifer forest. Also rarely found in mountainous regions further south in Europe and in Scotland.

**Remarks.** There should be no problem in recognizing *O. romellii* because of its tough consistency, its simple septate, thick-walled hyphae and allantoid basidiospores.

### **Odonticium subhelveticum (Parmasto) nom. prov.**

*Cristella subhelvetica* Parmasto, Eesti NSV Tead. Akad. Toim., Biol. Seer. 14: 223, 1965.

**Basidiocarps** resupinate, loosely adnate, effused, pellicular and soft, whitish, cream-coloured to ochraceous, hymenium odontoid, composed of small, dense aculei, 4–6 per mm, apically fimbriate, up to 2 mm high, subiculum very thin and ochraceous and with hyphal cords, margin thinning out, mostly fimbriate and with hyphal cords.

**Hyphal system** monomitic, hyphae simple septate, subicular hyphae slightly thick-walled, 3–6 µm wide, in hyphal cords up to 9 µm wide, tramal hyphae 4–5 µm wide with single core hyphae slightly wider, sometimes encrusted.

**Basidiospores** 3–4 × 2–2.5 µm, subglobose to elliptic.

**Substrate.** On decayed hardwood stems, branches and twigs. The type was collected on *Fagus* sp.

**Distribution.** Described from Armenia and specimens have been seen from Norway, Sweden, Russia and Germany.

**Remarks.** The odontoid basidiocarp, simple-septate hyphae, presence of hyphal cords, and partly incrustated hyphae characterize the species.

### **ODONTIOCHAETE Rick,**

Annls. mycol. 38:60, 1940.

Original generic description: “*Odontia dendrophysibus ornate*”.

**Type species:** *Odontiochaete alba* Rick.

**Remarks.** The dendrohyphidia seems to be the important character for a definition of this unknown genus.

### **Odontiochaete alba Rick, op. cit.**

**Basidiocarps** hydroid, spines up to 4 mm long, acute, white with dendroid branched apical hyphae.

**Spores** 4 × 1.5 µm, hyaline, allantoid (translated from Latin).

**Distribution:** Rio Grande do Sul in Brazil.

The type is apparently lost and the status of the genus remains unclear.

### **ODONTIOPSIS Hjortst. & Ryvar den,**

Mycotaxon 12:180, 1980

Basidiocarps resupinate, effused, adnate, distinctly odontoid, hyphal system monomitic, with clamps, cystidia absent, encrusted and projecting hyphae present in aculei, basidia tetrasterigmatic, spores more or less globose, smooth, thin walled and non-amyloid. On dead hardwood. Monotypic genus.

**Type species:** *Odontiopsis hyphodontia* Hjortst. & Ryvar den.

**Remarks.** The genus is recognized by the hydroid basidiocarps with projecting aculei hyphae and the strongly light refracting basal hyphae reminding about skeletal hyphae. The genus may be related to *Schizopora*, but lacks the typical cystidial organs of that genus.

### **Odontiopsis hyphodontia Hjortstam & Ryvar den,**

Mycotaxon 12:180, 1980.

**Basidiocarp** resupinate, effused, adnate slightly loosening when dry, irregularly odontoid to hydroid, ochraceous, aculei fimbriate with projecting hyphae.

**Hyphal system** monomitic; hyphae with clamps, up to 5 mm wide, the basal ones thick walled and almost like skeletal hyphae, strongly refractive, apical hyphae strongly encrusted.

**Basidiospores** 4–5 × 4.5 µm, globose to subglobose.

**Substrata.** On dead hard wood.

**Distribution.** Known only from the type locality in Tanzania.

**Remarks.** The species may remind one about a *Schizopora* species, but lacks all cystidial elements and have strongly encrusted aculei hyphae.

### **PHAEORADULUM Pat.,**

Bull. Soc. Mycol. Fr. 16:178, 1900.

Basidiocarp resupinate, coriaceous, pale to dark brown, hydroid, hyphal system monomitic, cystidia present, basidiospores smooth and pale brown. On hard wood. Known only from Guadeloupe

**Type species:** *Phaeoradulum guadelupensis* Pat.

**Remarks.** The dark spores and the hydroid hymenophore characterize this genus. It is seemingly related to *Coniophora* separated mainly by its hydroid basidiocarp.

### **Phaeoradulum guadelupensis Pat.,**

Bull. Soc. Mycol. Fr. 16:178, 1900

**Basidiocarp** resupinate, coriaceous to dark, brown and hydroid,

**Hyphal system** monomitic, hyphae with??

**Cystidia** 40 x 60 x 8-10 µm, cylindrical and smooth.

**Spores** 10-12 x 6 µm, smooth and pale brown.

**Substrate.** Known only from dead stems of *Daphnopsis caribaea* (Thymelaeaceae).

**Distribution.** Known only from Guadeloupe.

**Remarks.** The dark spores and the hydroid hymenophore characterize this rare species.

### **PHELLODON P. Karsten,**

Rev. Mycol. 3: 19, 1881.

Basidiocarps more or less stipitate, often in clusters, pileus pale brown to black, usually smooth, round to irregular, often many basidiocarps grown together to more complex basidiocarp, hymenophore densely hydroid, ochraceous to greyish or black often with paler margins, spines up to 4 mm long, hyphal system monomitic with simple septa, spores ornamented and hyaline, generally smaller than 5 µm in largest dimension. All species are ectomycorrhizal with different trees. Wide-spread genus.

**Type species** *Phellodon niger* (Fr.) P. Karsten.

**Remarks.** The genus is recognized by its hydroid and tough, rather small basidiocarps contrasting the much softer ones seen in other hydroid genera like *Hydnum* and *Bankera*. *Hydnellum* also has tough basidiocarps, but these are thicker and more robust besides that all species have coloured basidiospores.

#### **Key to species**

1. Stipe glabrous, context homogenous..... 2
1. Stipe hirsute to adpressed velutinate, context duplex ..... 4
2. Growing below logs, spores 2.8-3.8 x 2.5-3 µm, rare boreal species ..... **P. secretus**
2. Growing in open habitats, spores 3.5 .4.5 x 2.5-3.5 µm, common wide spread species..... 3
3. Context and pileus purplish to dark slate grey **P. melaleucus**
3. Context and ochraceous to yellowish brown..... **P. tomentosus**
4. Pileus dark grey to bluish black ..... **P. niger**
4. Pileus differently coloured ..... 5
5. Spores 3.5-4.5 µm long, usually with hardwood trees like *Fagus* and *Quercus* ..... **P. confluens**
5. Spores 3.1-3.6 µm long, usually with conifers..... **P. tomentosus**

### **Phellodon confluens (Pers.) Pouzar,**

Ceská Mykol. 10: 74, 1956. – *Hydnum confluens* Pers., Mycol. Europ. 2: 165, 1825. – *Hydnum amicum* Quel., Grevillea 8: 115, 1880.

**Basidiocarps** stipitate, corky and tough pileus round to incised, 3-9 cm wide, often confluent in clusters, pileus round, oval to irregular, flat or slightly depressed, pitted and irregular, often developing new pilei, glabrous, whitish grey becoming dark brown to almost black with age, lower surface densely hydroid, individual spines up to 3 mm long, white to gray, context duplex, epically in the stipe, pinkish brown to dark brown, slightly spicy in taste.

**Stipe** 10–40 x 10-20 mm, tomentose and grey to dark brown.

**Hyphal system** monomitic, hyphae simple septate, hyaline, 3-6 µm wide.

**Spores** elliptic, 3.5-4. x 3-4 µm, hyaline and spiny.

**Habitat.** On the ground and ectomycorrhizal with trees such as *Fagus* and *Quercus*, rarely with coniferous trees.

**Distribution.** Follows *Quercus* in Scandinavia to Trøndelag, central Sweden and southern Finland and throughout Europe and follows the host trees throughout the Northern Hemisphere.

**Remarks.** The species is recognized by the pale brown pileus.

### **Phellodon melaleucus (Fr.) P. Karsten,**

Rev. Mycol. 3: 19, 1881. – *Hydnum melaleucum* Fr., Observ Mycol. 1:134, 1815.

**Basidiocarps** stipitate, often several together in clusters, corky and tough, pileus round to incised, often slightly depressed centrally, 2-8 cm wide, finely radially veined, finely tomentose, dull, pale to greyish brown, becoming darker by age and in wet weather, margin sharp, undulating, whitish to cream or pale brown, hymenophore densely hydroid, individual spines first white then brown, up to 3 mm long, context zoned, light to reddish brown, taste mild to slightly bitter, becomes green with KOH.

**Stipe** 1-3 x 0.3-1 cm, often irregular, smooth to fibrillose, glabrous, pale to dark brown.

**Hyphal system** monomitic, hyphae simple septate, hyaline to pale brown, 3-5 µm wide.

**Spores** 3.5-4.5 x 2.7-3.5 µm, elliptic.

**Habitat.** On the ground and ectomycorrhizal with both deciduous and conifer trees, often seen in forests with blueberry (*Vaccinium myrtillus*).

**Distribution.** North to central Scandinavia and throughout Europe and the Northern hemisphere.

**Remarks.** The species is recognized by the glabrous and duplex stipe and the dark pileus. The similar *P. niger* has a tomentose stipe.

### **Phellodon niger (Fr.) P. Karsten,**

Rev. Mycol. 3: 19, 1881. – *Hydnum niger* Fr., Observ Mycol. 1:134, 1815.

**Basidiocarps** stipitate, corky and tough, pileus round to incised, 3-8 cm wide, bluish becoming black with irregular often with sharp margin, slightly tomentose, but usually with irregular protuberances and clusters of hyphae, often striate and distinctly concentrically zoned, lower surface densely hydroid, individual spines up to 3 mm long, greyish blue, context dense and mostly duplex, with intermixed pale and darker zones from almost white to dark blue.

**Stipe** 2-5 x 1-2 cm, often irregular, tomentose, hard, more or less concolorous with the pileus.

**Hyphal system** monomitic, hyphae simple septate, hyaline to pale brown, 3-5 µm wide.

**Spores** elliptic, 3.5-4.5 x 2.7-3.5 µm.

**Habitat.** On the ground and ectomycorrhizal with both deciduous and conifer trees.

**Distribution.** Follows *Pinus sylvestris* to Northern Norway at 70 N, but rare in the northern part of Skandinaia. Throughout the Northern hemisphere.

**Remarks.** The dark colour is distinct for this species. It may that there are different ecotypes connected to different host trees, but there is little knowledge about such connections and their taxonomic implications.

### **Phellodon secretus Niemelä and Kinnunen,**

Karstenia 43: 38, 2003.

**Basidiocarp** terrestrial, stipitate, 1-5 cm in diam., very thin, 0.3-3.5 mm thick, small, slender and fragile, single or confluent, pileus plane or funnel-shaped or irregularly roundish and lobed, cottony soft throughout, at first white with ash-grey tint, later darker grey or with a hue of sepia, evenly coloured paler towards the margin spines first white, then light greyish white, individual spines sharp, slender, dense, up to 1.5 mm long, context pale, stains olivaceous in 3 % KOH. Fresh basidiocarp odourless, as dry with very faint spicy scent.

**Stipe** black, glabrous, thin, 0.3- 2.3 mm long and of even thickness, brittle when dry.

**Hyphal system** monomitic, hyphae simple-septate, 3-4.7 µm wide, in context and stipe covered with minute, scattered, amyloid granules.

**Basidiospores** 2.8- 3.8 x 2.5-3 µm, globose and spiny.

**Habitat.** Growing below fallen logs and probably ectomycorrhizal with *Pinus sylvestris*.

**Distribution.** Continental areas of the Fennoscandia, but easily overlooked due it its hidden habitat.

**Remarks.** The small size, its hidden habitat and the small spores make this a very distinct species. *P. tomentosus* is brown coloured with a zonate pileus and usually larger than *P. secretus*. *P. niger* and *P. confluens* have a well-developed tomentum in their stipe, and their spores are larger than those of *P. secretus*.

### **Phellodon tomentosus (L.) Banker,**

Mem. Torrey bot. Club. 12: 171, 1906. – *Hydnum tomentosus* L. Spec. pl. 2: 1178, 1753.

**Basidiocarps** stipitate, corky and tough pileus round to incised, 3-8 cm wide, often confluent in clusters, pileus round to irregular often with radial lines or zones, finely tomentose, pale brown to grey or reddish brown, often with darker zones towards the centre, lower surface densely hydroid, individual spines up to 3 mm long, white to gray, context pale brown in pileus, darker in the stipe, taste mild to slightly bitter.

**Stipe** 10-30 x 3-8 mm, pale to dark brown, smooth to slightly fibrillose.

**Hyphal system** monomitic, hyphae 3-6 µm wide and simple septate.

**Basidiospores** 3.5-4. x 2.5-3.2 µm, elliptic, hyaline and spiny.

**Habitat.** On the ground and ectomycorrhizal with coniferous trees, seemingly most commonly with *Picea*, often on sandy and poor soils.

**Distribution.** Follows *Pinus* to Northern Norway at 70 N, but rare north of the polar circle. Throughout the Northern hemisphere.

**Remarks.** The pale brown zones on a glabrous pileus and stem are distinct.

### **PHYSODONTIA Ryvar den & Solheim,**

Mycotaxon 6:375, 1977.

Basidiocarps resupinate, closely adnate, odontoid, whitish or pale cream-coloured, very thin and porose-reticulate between the aculei, soft-ceraceous, when dry fragile; hymenial aculei very small and dense; margin indistinct; Hyphal system monomitic, hyphae very thin-walled, with clamps at all septa; in the hymenium numerous narrow obtuse, smooth cystidia, gloeocystidia very numerous, rounded or oblong, thin-walled, plasmatic contents granular, oily, light-refracting (in phase); basidia small, tetrasterigmatic; spores elliptic, small, smooth, thin-walled and non-amyloid.

**Type species:** *Physodontia lundellii* Ryvar den & Solheim.

**Remarks.** The genus is unique by its combination of two types of cystidia and small basidiospores.

### **Physodontia lundellii Ryvarden & Solheim,**

Mycotaxon 6:376, 1977.

**Basidiocarp** resupinate, closely adnate, odontoid, soft and ceraceous in the living state, when dried loose and fragile, whitish to pale cream-coloured; very thin and porose between the aculei, which are very small, about 0.1-0.3 mm long in the dry state, cylindrical, tapering apically and provided with projecting hair-like cystidia (lens); margin mostly indistinct, partly finely fimbriate.

**Hyphal system** monomitic; hyphae with clamps, thin-walled, 1.5-2.5(-4)  $\mu\text{m}$  wide.

**Cystidia** of two kinds:

1) hymenial cystidia in the apical part of the aculei, tapering towards the blunt apex, thin-walled, non-encrusted and without inclusions in the protoplasm, with basal clamp.

2) numerous gloeocystidia, 15-20(-30)  $\times$  6-12  $\mu\text{m}$ , terminal, rarely intercalary, rounded or oblong, thin-walled, with basal clamp, filled with oily, granular plasmatic contents, light-refracting in when viewed under phase contrast.

**Basidiospores** 3-4  $\times$  2-2.4  $\mu\text{m}$ , elliptic.

**Habitat.** Decayed coniferous wood.

**Distribution.** Rather rare, found in scattered localities in Fennoscandia.

**Remarks.** The different types of cystidia combined with a hydroid basidiocarp and small basidiospores make this to a distinct species.

### **RADULODON Ryvarden,**

Can. Journ. Bot. 50:2073, 1972.

Basidiocarps resupinate, light coloured, effuse, adnate, odontoid with dense teeth, 1-3 mm long, cylindrical or flattened, smooth or apically fimbriate; subiculum white, varying in thickness but mostly thin; hyphal system monomitic; hyphae with clamps, thin- to slightly thick-walled, 2-3  $\mu\text{m}$  wide,; cystidia lacking or present as thin-walled gloeocystidia; young basidia clavate, older ones often sinuous or constricted; basidiospores 4-8  $\mu\text{m}$  in diameter, globose, smooth, with somewhat thickened walls and non-amyloid, boreal species.

**Type species:** *R. americanus* Ryvarden.

**Remarks.** The genus characterized by its hydroid basidiocarps and subglobose, slightly thick-walled spores.

### **Radulodon erikssonii Ryvarden,**

loc. cit. p. 2075.

**Basidiocarp** resupinate, closely adnate, effuse, of moderate size, in the living state ceraceous, when dried firm membranaceous; hymenium hydroid with dense teeth, 1-3 mm long, conical with acute apex, when young white, then yellow and finally pale buff, especially when dried; margin white, usually indeterminate; subiculum white in section, mostly thin 0.1-0.3 mm.

**Hyphal system** monomitic; hyphae 2-3  $\mu\text{m}$  wide, with clamps; subhymenial hyphae thin-walled, those of the subiculum with thickened walls, in the tooth-trama more or less parallel, in the subiculum more irregularly intertwined.

**Cystidia** 35-50(-70)  $\times$  6-8(-12)  $\mu\text{m}$ , thin-walled, clavate or fusiform gloeocystidia, often narrowed to an obtuse apex..

**Basidiospores** 6-8  $\times$  5-6  $\mu\text{m}$ , sub-globose to globose with smooth, somewhat thickened walls.

**Substrate.** On decayed wood of *Populus remula*

**Distribution.** Widespread in Fennoscandia, but nowhere common.

**Remarks.** Distinguished from the American species *R. americanus* by the presence of gloeocystidia.

### **RADULODONTIA Hjortstam & Ryvarden,**

Mycotaxon 25: 31, 2008.

Basidiocarps resupinate effused, strongly hydroid, pale ochraceous, hyphal system monomitic, generative hyphae with clamps, cystidia absent, basidia tetrasterigmatic, basidiospores pyriform, hyaline, thin walled, smooth and non-amyloid and non dextrinoid, on dead hardwoods.

**Type species:** *Radulodontia pyriformis* Hjortstam & Ryvarden.

**Remarks.** The pyriform spores make this a distinct genus.

### **Radulodontia pyriformis Hjortstam & Ryvarden,**

Mycotaxon 25: 31, 2008.

**Basidiocarps** resupinate, effused, hymenophore strongly hydroid, pale ochraceous, spines conical, often aggregated and provided with small outgrowths, usually 1-2 mm long and 0.25-0.5 mm wide near the base, without reaction in Melzer or Cotton blue.

**Hyphal system** monomitic; hyphae hyaline and with clamps, in the subiculum with abundant crystalline encrustations, subicular hyphae packed together, becoming thick-walled, 2-3  $\mu\text{m}$  wide, aculeal hyphae thin-walled, about of the same width.

**Basidiospores** 6-8  $\times$  3.5-4  $\mu\text{m}$ , pyriform.

**Substrate.** Different deciduous trees.

**Distribution.** Known only from the Magdalena province in Colombia.

**Remarks.** The species can easily be recognized by its strongly hydroid hymenophore, absence of cystidia and the pyriform spores. The spores are somewhat reminiscent of those of *Cylindrobasidium*, but otherwise there is no conformity.

## **RADULOMYCES M.P. Christ.,**

Dansk bot. arkiv 19: 230, 1960.

Basidiocarps resupinate, closely adnate, effused, ceraceous, hygrophanous when wet; hymenium smooth, tuberculate or raduloid; hyphae with clamps, mostly thin-walled or in the subiculum slightly thick-walled; no cystidia; basidia clavate, more or less sinuous, filled with conspicuous oil-drops, normally with 4 sterigmata; basidiospores elliptic - subglobose - globose, with oil-rich protoplasm, and smooth, somewhat thickened walls, non-amyloid, non-cyanophilous.

**Type species:** *Thelephora confluens*. Fr.

**Remarks.** See below.

## **Radulomyces molaris (Fr.) M.P. Christ.,**

Dansk bot. ark. 19: 232, 1960. - *Radulum molare* Fr., Elench. Fung. 1: 151, 1828.

**Basidiocarp** resupinate, closely adnate, orbicular - confluent or effused, closely adnate or in old specimens partly detachable when dry, ceraceous when wet, membranaceous when dried, greyish or lurid yellowish, sometimes violaceous in the living state, old specimens darkening; hymenium raduloid with irregular teeth, varying in size and shape, 2-5 mm long, in the young state apically finely fimbriate.

**Hyphal system** monomitic; hyphae with clamps, subhymenial ones about 2 µm wide; subicular hyphae about 3 µm, forming a basal layer of more or less parallel hyphae and similar hyphae in the centre of the teeth. The whole fungus and especially the hymenium is hygrophanous, therefore varying in appearance with humidity.

**Basidiospores** 8-11(-13) x 6.5-8 µm, elliptic.

**Substrate.** Dead hardwood trees.

**Distribution.** Quite common in the temperate zone and north to Finnmark in Noway.

**Remarks.** The species is recognized by its fairly large, slightly thick-walled basidiospores.

## **SARCODON P. Karsten,**

Rev. Mycol. 3:20, 1881.

Basidiocarps more or less stipitate, fleshy, pileus smooth to squamose, whitish to deep brown, hymenophore densely hydroid, context soft, azonate, hyphal system monomitic, hyphae often inflated, simple septate or with clamps, cystidia absent, basidiospores ornamented and coloured. Terrestrial and ectomycorrhizal with different host trees. Widespread genus with many species.

**Type species.** *Hydnum imbricatum* L: Fr.

**Remarks.** The genus is usually easy to recognize due to its fleshy and spiny basidiocarps. The related genus *Hydnellum* is separated by tougher basidiocarps and generally smaller spores. Previously *Sarcodon* was a genus with many species, but DNA sequencing has shown that many of the species should be transferred to *Hydnellum* as done here.

### **Key to European species**

1. Hyphae with clamps..... 2
1. Hyphae with simple septa..... **S. regalis**
  
2. Growing close to *Picea*, pileus with large brown scales..... **S. imbricatus**
2. Growing close to *Pinus*, pileus smooth or only depressed scaly at the centre..... 3
  
3. Pileus flat, first velutinate then glabrous, stipe greenish to grey at base..... **S. leucopus**
3. Pileus adpressed scaly at centre, stipe whitish to brown at the base..... **S. quamosus**

## **Sarcodon imbricatus (L: Fr.) P. Karsten,**

Rev. Mycol. 3: 20, 1881. - *Hydnum imbricatus* L.: Fr., Species plant. 2:1178. - Syst. Mycol. 1: 398, 1821. - *Hydnum subquamosus* Batsch., Elench. Fung. P. 111, 1783. - *Hydnum cervinum* Pers., Obs. Mycol. 1: 74, 1796.

**Basidiocarps** pale to dark brown, more or less centrally stipitate, up to 25 cm in diameter, fleshy when fresh, tougher when old, pileus first flat soon strongly centrally depressed, strongly scaly often in centre rings with lifted scales, finely so at the margin, in the old basidiocarps often more or less glabrous with flattened scales, spines decurrent, up to 12 mm long, first pale brown, later deep brown, context up to 3 cm thick, whitish with brown zones or lines darker towards the base, taste bitter.

**Stipe** up to 8 cm high and 2 to 3 cm in diameter, ventricose to flattened, first whitish then brown and hollow,

**Hyphae** with clamps, up to 15 µm wide.

**Basidiospores** 7-8.2 x 5-5.5 µm, brown, coarsely angular and of irregular outline.

**Substrate.** On the ground and ectomycorrhizal with *Picea*, often in long lines.

**Distribution.** Follows *Picea*, but rather rare north of the Polar circle. Circumpolar in the coniferous forest.

**Remarks.** The brown, usually strongly scaly pileus makes this a distinct species. Further the spines are not decurrent on the stipe. Microscopically it is easily separated from the macroscopical similar species *S. squamosus* by its hyphae with clamps, these being simple septate in the latter species.



### **Sarcodon leucopus (Pers.) Maas Geest.,**

Svensk Bot. Tidskr. P63:415, 1969. - *Hydnum leucopus* Pers., Mycol. europ. 2:158, 1825. - *Hydnum subpalidum* Snell & Dick, Lloydia 25:162, 1962. - *Hydnum ustale* Harris. Can. J. Bot. 42:1215, 1964.

**Basidiocarps** pale brown, more or less centrally stipitate, up to 20 cm in diameter, fleshy when fresh, tougher when old, pileus first pulvinate, soon flat to slightly centrally depressed, smooth, finely velutinate, but soon glabrous and soft when fresh, brown to pale purplish brown, spines decurrent, up to 5 mm long, first whitish, then grey to brown to purplish brown, context white, becoming greenish to pink when cut, soft, fibrous up to 1 cm thick, spicy smell and bitter taste.

**Stipe** up to 7 cm high and 2 to 3 cm in diameter, cylindrical, often eccentric, finely felted becoming slightly fibrillose to glabrous, whitish, by age grey or greenish at the base.

**Hyphae** with clamps, up to 20 µm wide.

**Basidiospores** 7-9 x 5-7 µm, brown and coarsely angular and of irregular outline.

**Substrate.** On the ground and ectomycorrhizal with *Pinus*.

**Distribution.** Follows *Pinus*, but rather rare north of the Polar circle. Circumpolar in the coniferous forest.

**Remarks.** The smooth, brown to purplish pileus, the whitish stipe becoming grey to greenish at the base by maturity, are good field characteristics. The spores are also larger than in the other *Sarcodon* species with brownish pileus.

### **Sarcodon regalis Maas Geest.,**

Verhand. Kon. Nederl. Akad. Wetensch. Natur. 2. Seer, part 65: 106, 1976.

**Basidiocarps** stipitate, pileus up to 10 cm in diameter, flat to slightly convex, scaly to smooth and fibrillose, those at the margin adnate, yellowish brown, greyish brown to dark brown, spines up to 4 mm long, 2 mm wide, decurrent on stipe, pale brown becoming purplish, context up to 10 mm thick in centre, white to yellowish pale grey, becoming wine red under upper surface.

**Stipe** up to 6 cm long and 2 cm in diameter, simple or branched, tomentose or with short fibrils, in upper part pale orange brown to pinkish brown, pale violet in lower part.

**Hyphae** up to 20 µm in pileus and simple septate.

**Spores** 5.6 - 6.1 x 4 - 5 µm, brownish and irregular.

**Substrate.** On the ground in deciduous forests.

**Distribution.** Known from England.

**Remarks.** Characterized by the smooth pileus, the subglobose spores, the pale context in pileus and the subglobose spores.

### **Sarcodon squamosus (Schaeff.) Quel.,**

Enrich. Fung. p. 188, 1886 - *Hydnum squamosum* Schaeff., Fungi Bavar. IV: 99, 1774. - *Hydnum badium* Pers., Mycol. Europ. 2:155, 1825.

**Basidiocarps** pale to dark brown, more or less centrally stipitate, up to 15 cm in diameter, fleshy when fresh, tougher when old, pileus flat or only slightly centrally depressed degree, adpressed scaly in the centre, smooth in the peripheral part of the pileus, spines decurrent, up to 10 mm long, first pale brown, later deep brown, context up to 2 cm thick, whitish with brown zones or lines darker towards the base, taste bitter.

**Stipe** up to 8 cm high and 2 to 3 cm in diameter, ventricose to finely felted, first whitish becoming brown and hollow,

**Hyphal system** monomitic, hyphae with clamps, up to 15 µm wide.

**Basidiospores** 7-8.2 x 5-5.5 µm, brown, coarsely angular and of irregular outline.

**Substrate.** On the ground and ectomycorrhizal with *Pinus* spp.

**Distribution.** Follows *Pinus*, but rather rare north of the Polar circle. Circumpolar in the coniferous forest.

**Remarks.** *S. squamosus* is similar to *S. imbriactus*, but is thinner and usually not as robust as the latter and has a smoother pileus being scaly only in the central part of the pileus. Its connection with *Pinus* sp will often be sufficient to identify it in the forest.

## **SARCODONTIA Schulzer,**

Verh. Zool.-bot. Ges. Wien 16:41, 1886.

Basidiocarp resupinate or on vertical substrate forming nodes with fertile undersides; hymenophore of long, conical aculei; the whole fungus (incl. sterile mycelium) from the beginning yellow; hymenophore in the living state ceraceous, when dried rather hard; hyphal system monomitic, generative hyphae with clamps, subicular hyphae very thick-walled; no cystidia; basidia clavate, often sinuous or constricted, tetrasterigmatic; basidiospores elliptic - subglobose.

**Type species:** *Sarcodontia crocea* (Fr.) Kotlaba.

**Remarks** *Sarcodontia* agrees in some respects with *Radulodon* (shape of basidia and basidiospores, presence of clamps, thickness of spore wall) but differs in the nature of the subicular hyphae and in the presence of a yellow pigment. This does react red in KOH as it does in e.g. *Mycocacia uda*.

### **Sarcodontia crocea (Fr.) Kotlaba,**

Ceskà Mykol. 7:117, 1953. - *Hydnum croceum* Fr., Elench. Fung. p. 137, 1828.

**Basidiocarp** adnate, totally resupinate or on vertical substrate nodulose, effuse or pulvinate, ceraceous - carneous in the living state, when dried firm, hymenophore hydroid with 5-15(-20) mm long, dense, conical aculei, tapering to an acute apex; margin varying, partly thickened and velutinous, the young hymenophore yellow, but the aculei turning into a reddish colour, on drying darkening to chamois or dirty brown; subiculum white in sections, varying in thickness, often 0.2-0.5 mm.

**Hyphal system** monomitic; generative hyphae with clamps, thin-walled, 2-3.5 µm wide.

**Basidiospores** 4,5-6,5x3-4 µm, smooth and thick-walled.

**Substrate.** In N. Europe found only on cultivated *Malus*, but in continental Europe also on other hard wood trees, e.g. *Pyrus*, *Prunus*, *Sorbus*, and *Fraxinus*.

**Distribution.** Widespread in South Europe. In N. Europe found only in Gotland (Sweden).

**Remarks.** Conspicuous and easily distinguished species.

## **SCHIZOPORA Velen.,**

České Houby p. 638, 1922.

Basidiocarps annual, resupinate or rarely with narrow, imbricate pilei over a decurrent tube layer; pore surface and subiculum cream to pale buff, the pores regular, angular to daedaleoid or hymenophore irregularly hydneous from splitting of dissepiments; hyphal system di- or monomitic; generative hyphae moderately thick-walled, with clamps; skeletal hyphae thick-walled, often ending as long nonseptate terminal segments with transitions to embedded cystidial elements; cystidia or fusoid or capitate hyphal ends present; hyphae at dissepiment edges encrusted; basidiospores elliptic to subglobose, hyaline, negative in Melzer's reagent. Causes a white rot of dead hardwoods, rarely on conifers. Small cosmopolitan genus of which three species occur in Europe.

**Type species:** *Polyporus laciniatus* Velen. (= *Hydnum paradoxum* Schrad.: Fr.).

**Remarks.** Usually the typical generative hyphae of this genus with thickened walls and narrow width will be sufficient to recognize the genus. The bulbous swollen cystidia or hyphal ends are also diagnostic for the genus, but can be difficult to find in some specimens. Its representatives are some of the most common polypores and especially *S. paradoxa* seems very well adapted to fruit on exposed substrate, such as attached dead branches, dead trunks etc., thus usually easy to observe. With training the distinct cream to ochraceous colour of the basidiocarp will be sufficient for a field determination of the genus, which however should always be checked microscopically. The morphological variation in the genus in the tropics is great and the specific pattern is not always easy to clarify.

One hydroid species included here.

### **Schizopora paradoxa (Schrad.: Fr.) Donk,**

Persoonia 5:76, 1967. - *Hydnum paradoxum* Schrad.: Fr., Syst. Mycol. 1:424, 1821; Elench. Fung. 1:150, 1828. - *Hydnum paradoxum* Schrad., Spic. Flora Germ. 1:179, 1794.

**Basidiocarps** resupinate, often extensive, on vertical substrata often with small nodules with fertile underside but no real pilei, tough, white to cream-coloured or darkening with age (greyish-ochraceous-brownish), 1-5 mm thick; hymenophore usually split and irregularly hydroid with flattened teeth, or labyrinthine to lacerate-denticulate if poroid, pores of varying sizes, on sloping substrata more or less prolonged, near the margin the pores are shallow or net-like; margin normally not differentiated; subiculum cream to pale buff, fibrous, up to 2 mm thick; tube layer concolorous and continuous with context, up to 3 mm thick.

**Hyphal system** dimitic, but skeletal hyphae may be few; generative hyphae predominant, with thin or somewhat thickened walls, more or less branched, 2-3 µm in diam., with clamps at all septa; skeletal hyphae 3-4(-5) µm wide, thick-walled and with a narrow lumen, sinuous, hyaline or yellow, reaching a length of 100-350 µm; hyphal ends on the edges of the dissepiments obtuse, encrusted with granular crystals.

**Cystidia** present in variable numbers, usually capitate and provided with a rounded cap of a crystalline or resinous substance.

**Basidiospores** 5.5-6.5 x 3.5-4.5 µm, usually with 1 oil-drop.

**Substrata.** Usually on dead hardwoods, but also known on conifers.

**Distribution.** Widely distributed in Europe and north to 70°N in Norway.

**Remarks.** Usually *S. paradoxa* will have a far more split and irregular, often partly hydroid pore surface than *S. radula*, but a microscopical examination should be done to verify the visible determination.

## **SCOPULOIDES (Massee) v Höhnel & Litsch.,**

Wiener Festschr. 57:58, 1908. - *Peniophora* subgenus *Scopuloides* Massee, J. Linn. Soc. London (Bot.) 25:154, 1890.

Basidiocarps resupinate, closely adnate, totally attached, odontoid; hyphal system monomitic; subiculum thin, composed of parallelly arranged hyphae, thin-walled or with slightly thickened walls, subhymenial layer rather dense but not firm; all hyphae without clamps; cystidia numerous, conical, thick-walled, abundantly encrusted in the upper part; projecting hyphal ends present, usually septate and encrusted, with obtuse apex; basidia small, slightly thickened towards the base, normally with 4 sterigmata, without basal clamp; basidiospores smooth, thin-walled, in the type species short allantoid, not amyloid, not dextrinoid, not cyanophilous.

**Type species:** *Peniophora hydroides* Cooke & Massee in Cooke.

**Remarks.** The genus is characterized by its two types of cystidia, small allantoid spores and simple septate generative hyphae.

### **Scopuloides rimosa (Cooke) Jülich,**

Persoonia 11:422, 1982. - *Peniophora rimosa* Cooke, Grevillea 9: 94, 1881. - *Peniophora hydroides* Cooke & Massee, Grevillea 16:77, 1888.

**Basidiocarp** resupinate, effuse, subgelatinous, semi translucent when fresh and wet, whitish or greyish when dried, thin, hymenium odontoid and at least in older specimens distinctly cracked in irregular pieces, individual aculei crowded, velutinous by projecting cystidia and hyphal ends (lens 50 x), margin thinning out, usually with numerous projecting cystidia.

**Hyphal system** monomitic; subiculum as a rule very thin and composed of relatively long-celled hyphae, parallelly arranged

next to the substratum, with somewhat thickened walls, 4-7 µm wide, subhymenium with densely interwoven hyphae, all hyphae without clamps.

**Cystidia** of two kinds:

- a) metuloids basally thick-walled, about 40-60 x 8-12 µm, often projecting 10-30 µm above the basidia, conical, more rarely obtuse, strongly encrusted.
- b) hyphal cystidia especially in the top of the hymenial aculei, usually projecting 20-50 µm or more, septate and strongly encrusted.

**Basidiospores** 3.5-4(-5) x 1.8-2(-2.2) µm, short-allantoid.

**Substrate.** On hardwoods, rarely on coniferous wood.

**Distribution.** Rather common in herb-rich temperate and subtemperate forests.

**Remarks.** The two types of cystidia, the short allantoid basidiospores and the odontoid hymenial surface, make this a distinct species.

## **SISTOTREMA Fr.**

Syst. mycol. 1:426, 1821. - *Urnobasidium* Parm., Consp. Syst. Cort. p. 38, 1968. - *Galzinella* Parm., Consp. Syst. Cort. p. 39, 1968.

Basidiocarps resupinate - subpileate - stipitate, mostly white, soft, when dried brittle, hymenium smooth, grandinoid, odontoid, poroid or even sublamellate; hyphae monomitic, thin-walled or basal hyphae with slightly thickened walls, hyphal contents as a rule with oily inclusions; cystidia mostly lacking but in some species present as enclosed gloecystidia or even as projected leptocystidia; basidia urniform, mostly with 6-8, rarely 2-4 sterigmata; basidiospores smooth, globose - elliptic - oblong - allantoid, thin-walled, non-cyanophilous, non-amyloid and non-dextrinoid. Most species grow on wood, while other are ectomycorrhizal or occur bark of dead, but still attached branches as well as on soil, plant debris, humus or dead polypores.

**Type species:** *Sistotrema confluens* Fr.

**Remarks.** The genus is above all characterized by the urniform basidia, usually with 6-8 sterigmata although there is number of tetrasterigmatic species.

### **Key to European species with grandinoid to hydroid hymenophore.**

1. Hymenial surface sublamellate, irpicoid hydroid, grandinoid or more or less poroid ..... **Key A**
1. Hymenial surface smooth, not treated here.

#### **Key A**

1. Basidiocarps stipitate ..... **S. confluens**
1. Basidiocarps resupinate..... **2**
2. Hymenial surface more or less poroid..... **3**
2. Hymenial surface grandinoid to hydroid ..... **5**
3. Basidia 2-4 sterigmatic; basidiospores globose..... **S. albolutea**
3. Basidia 6-8 sterigmatic; basidiospores broadly ovate to suballantoid ..... **4**
4. Basidiospores suballantoid ..... **S. dennisii**
4. Basidiospores broadly ovate to elliptic..... **S. muscicola**
5. Basidiocarp hydroid-odontoid, basidiospores 7-9 x 3-3.5 µm ..... **S. raduloides**
5. Basidiocarps grandinoid, basidiospores 3.5-6 x 1.5-3 µm..... **6**
6. With brownish cystidia..... **S. resinicystidium**
6. Without cystidia..... **7**
7. Basidia with 4 sterigmata, spores subreniform ..... **S. hispanicum**
7. Basidia with 6-8 sterigmata, spores suballantoid to cylindrical ..... **S. brinkmannii**

### **Sistotrema brinkmannii (Bres.) John Eriksson,**

Kung. Fysiogr. Sällsk. Lund Förh. 18: 17, 1948. - *Odontia brinkmannii* Bres., Ann. Mycol. 1:88, 1903.

**Basidiocarp** resupinate, effuse, small to moderate size, soft, when dried very brittle, in the living state white, when dry white-cream-coloured-pale ochraceous; subiculum starting as a delicate, porulose layer, under the lens finely fibrillose; hymenium becoming more or less grandinoid with sparse to dense aculei, rounded - conical - subcylindrical, usually less than 1 mm long; margin not especially differentiated.

**Hyphal system** monomitic; hyphae with clamps, 3-6 µm wide, those of the subiculum loosely interwoven in an open texture, in the subhymenium denser and more richly branched, some straight basal hyphae with somewhat thickened walls, other hyphae thin-walled; protoplasm rich in oily inclusions as drops (in the living state) or irregular strands; crystalline mat-

ter frequent, especially abundant in old basidiocarps, which finally get a chalky consistency.

**Basidia** 12-20(-24) x 3-5(-7)  $\mu\text{m}$ , at first ovoid, then urniform, with 6-8 sterigmata (in single basidia rarely 4) and with a basal clamp.

**Basidiospores** (3.5-)4-4.5(-5.5) x 2-2.2(-2.5)  $\mu\text{m}$ , suballantoid with the adaxial side more or less concave.

**Substrate.** Mostly on much decayed wood, but may be found on all kinds of debris as well as on peat, soil, old paper, dead basidiocarps of Aphyllophorales, it develops rapidly during humid periods and may be found from early spring to late autumn.

**Distribution.** Very common, both in deciduous and coniferous forests, in gardens etc. in all parts of N. Europe but seems to be more frequent southwards.

### **Sistotrema confluens Fr.,**

Syst. mycol. 1:426, 1821.

**Basidiocarp** generally pileate but may sometimes be resupinate on underside of leaves etc., mostly 1-2 cm wide, more or less flabellate and often radially incised, with a lateral, seldom central, tapering stipe with blackish base; pilei as a rule concrescent with several stipes; the whole fungus in the living state white or pale cream-coloured, but with age or when bruised turning yellow or brownish, soft in the living state, young basidiocarps very brittle when dried, old ones more tough; upper side of the basidiocarp smooth or irregularly-concentrically wavy or wrinkled, under the lens adpressed tomentose; hymenophore varying from reticulate pores or flattened, irpicoid plates, sometimes lamelloid, to 1-2 mm long cylindrical spines; smell distinct and characteristic, described by some people as vanilla, by others as "disagreeable".

**Hyphal system** monomitic; hyphae thin-walled, 2-3  $\mu\text{m}$  wide, with many oil-drops; hyphal inflations (to 5 or 7  $\mu\text{m}$ ) sometimes present; hyphal direction mainly parallel in the trama of the stipe, pileus and hymenophore.

**Basidia** (12) -14-18(-22) x 3.5-4.5(-6)  $\mu\text{m}$  with 6-8 sterigmata, occasionally with four, first subglobose, when mature urniform.

**Basidiospores** 4.5-6 x 2-2.5  $\mu\text{m}$ , narrowly elliptic – suballantoid.

**Substrate.** On the ground among mosses and fallen leaves and other litter in deciduous or coniferous forests, less often in open fields.

**Distribution.** In Scandinavia north to "limes norrlandicus", mostly rare but locally more frequent,

### **Sistotrema hispanicum Duenas, Ryvar den & Telleria,**

in Duenas & Telleria Ruizia 5:130, 1988 (April). – *Sistotrema quadrisporum* Hallenberg & Hjortstam, Mycotaxon 31:442, 1988 (May)

**Basidiocarp** resupinate, grandinoid, mostly rather thin, soft when fresh, brittle when dried, white when young, later cream coloured, margin not differentiated.

**Hyphal system** monomitic; all hyphae with clamps, subhymenial ones thin-walled, short-celled and richly branched, up to 5  $\mu\text{m}$  wide, the basal ones form a compact trama with numerous crystals.

**Basidia** 15-20 x 4.5-6  $\mu\text{m}$ , suburniform and tetrasterigmatic.

**Basidiospores** 4.5-6 x 2-2.5  $\mu\text{m}$ , elliptic to subreniform.

**Substrate.** The type was found on *Erica* sp. but may also occur on hardwoods.

**Distribution.** Originally described from Northern Spain, but has later been found in Central Europe.

**Remarks.** It is similar to *S. brinkmannii*, but separated by its tetrasterigmatic basidia and larger basidiospores.

### **Sistotrema muscicola (Pers.) Lund. in Lund. & Nannf.,**

Fungi exs. succ. n. 145, 1947. - *Hydnum muscicola* Pers., Myc. Europ. II:181, 1825.

**Basidiocarp** resupinate, effuse, mostly small, when fresh soft and delicate, easily squeezed, when dries brittle, white-cream to sulphur-yellow (old herbarium material buff-coloured to brown); hymenium hydroid - irpicoid with teeth 1-2 mm long, cylindrical, conical or more or less flattened or poroid, at first reticulate with thin, fimbriate or more or less lacerate dissepiments, 1-2 mm high; pores mostly angular, 2-4 per mm; subiculum thin, porulose, the young state arachnoid; margin similar.

**Hyphal system** monomitic; hyphae fibulate, 2-5  $\mu\text{m}$  wide, thin-walled, those of the subiculum and the vertical hyphae of the hymenophore straight with sparse clamps and branches; subhymenial hyphae densely branched and intertwined; hyphal protoplasm with numerous oil-drops or in the dried material with irregular strands of oily matter and contracted protoplasm; generally, no rhizomorphic strands.

**Basidia** 14-20 x 4-7  $\mu\text{m}$ , urniform, usually hexasterigmatic.

**Basidiospores** 3-4.5 x 2.5-3.5  $\mu\text{m}$ , globose – elliptic.

**Substrate.** On all kinds of debris and litter, small sticks, leaves and other plant debris on the ground, on much decayed frondose or coniferous wood, and also on humus, living mosses and lichens, often together with *Tylospora*, *Amphinema* and other fungi with similar ecology.

**Distribution.** Rare in N. Europe but widely distributed in the north temperate zone. Malençon found it to be frequent ("assez commun") in Morocco.

**Remarks.** The ecology and the small globose spores are distinctive for this species.

### **Sistotrema radulooides (Karst.) Donk,**

Fungus 26:4, 1956. - *Hydnum radulooides* P. Karsten, Symb. Myc. Fenn. XII, Medd. Soc. F.F.I. Fenn. 9:110, 1883.

**Basidiocarp** resupinate, closely adnate, effuse, first light coloured with small papilliform aculei, then pale buff and odonti-

oid - hydroid, with normally cylindrical, rarely irregular teeth, 1-4 mm long, as a rule conically acute but sometimes obtuse; hymenial surface pruinose; subiculum thin, at first arachnoid, then finely porulose and finally membranaceous; margin indeterminate thinning out, sometimes finely fibrillose.

**Hyphal system** monomitic; hyphae with clamps and oily inclusions, basal hyphae and those of the central part of the aculei 2-6 µm wide, with somewhat thickened walls, straight and sparsely branched, subhymenial hyphae thin-walled, 2-3 µm wide, richly branched.

**Basidia** 18-23 x 5-7 µm, urniform and with (4-)6-8 sterigmata.

**Basidiospores** (6-)7-9 x (2.5-)3-3.5 µm, subcylindrical - subfusiform, apically obtuse, often broader below the middle, thin-walled, often clinging together in groups of 4-6.

**Substrate.** On much decayed deciduous wood with a preference for *Populus tremula*, but also on other kinds of deciduous wood (e.g. *Betula*, *Quercus*, *Malus*), rarely on coniferous wood such as *Picea*.

**Distribution.** *S. radulooides* seems to have a mainly eastern distribution in N. Europe.

**Remarks.** The morphology with a distinct hydroid hymenophore and rather large spores, are usually characteristic for this rare species.

### **Sistotrema resinocystidium Hallenb.,**

Mycotaxon 11:466, 1980.

**Basidiocarp** resupinate, adnate, thin (50-100 µm when dried), effuse, when young hypochnoid - porulose, then continuous and firm of consistency; hymenium almost smooth to more or less tuberculate - grandinoid, in the living state white - cream-coloured, when dried darkening, pale buff to pale ochraceous; margin not especially differentiated.

**Hyphal system** monomitic; all hyphae with clamps, often with oily contents; basal hyphae few, 2-4.5 µm wide, with thin or slightly thickened walls, straight and sparsely branched, subhymenial hyphae about 2-2.5 µm, very thin-walled, richly branched.

**Gloeocystidia** present and usually fairly numerous, up to 50 µm long and 8 µm wide, sinuous, often with moniliform constrictions, thin-walled.

**Basidia** 17-30 µm long, narrowly urniform to almost tube like with a widened, rounded basal part, 5-6 µm wide, and a tubular neck, 3.5-4.5 µm wide, (4-)6-7(-8) sterigmata.

**Basidiospores** 4-5.5 x 2-3 µm, elliptic - subovoid.

**Substrate.** On decayed deciduous and coniferous wood (*Quercus*, *Betula*, *Picea* and *Pinus*).

**Distribution.** Rare species but widely distributed in the northern hemisphere.

**Remarks.** The gloeocystidia and the elliptic subovoid spores characterize this rare species.

### **SPONGIPELLIS Pat.,**

Hym. Europ., p. 140, 1887.

Basidiocarps annual, pileate, broadly attached, dimidiate, sessile to effused-reflexed, rarely resupinate; pileus tomentose to smooth, white to ochraceous; hymenophore poroid to hydroid; pores circular to sinuous; tubes concolorous with pore surface; context white to cream, mostly duplex, lower part fibrous and dense, upper part looser and more cottony; hyphal system monomitic; generative hyphae with clamps; cystidia or other sterile elements absent; spores elliptic to globose, smooth, hyaline, thick-walled, negative in Melzer's reagent. On living and dead hardwoods, causing a white rot.

**Type species:** *Spongipellis spumea* (Fr.) Pat.

**Taxonomic synonyms:**

*Fibropellis* Vlasák & Spirin (*Polyporus delectans* Peck).

*Irpiciporus* Murrill (*Irpex mollis* Berk. & M.A. Curtis = *Hydnum pachydon* Pers.).

**Remarks.** The genus is close to *Tyromyces*, but is distinguished by the distinct duplex consistency, and especially the thick-walled, subglobose to elliptic spores. One species with hydroid hymenophore is included here.

### **Spongipellis pachydon (Pers.) Kotl. & Pouzar,**

Česká Mykol. 19:77, 1965. - *Hydnum pachydon* Pers., Mycol. Europ. 2:174, 1825. - *Irpex mollis* Berk. & M.A. Curtis, Hooker's J. Bot. Kew Gard. Misc. 1:236, 1849.

**Basidiocarps** annual, pileate, sessile to effused-reflexed or rarely resupinate, pilei dimidiate to broadly attached and elongated, single or imbricate with partly incised or lobed pilei, up to 5 cm wide and long and about 1 cm thick at the base, frequently with a decurrent hymenophore, coriaceous when fresh, dense and hard when dry; pileus white to cream, then ochraceous, azonate, at first finely tomentose, soon glabrous, smooth or with fine radial lines or sharp ridges; hymenophore white to ochraceous, light brownish in older parts, along the margin with dentate, flattened, short lamellae which soon are split to flattened teeth which become more or less cylindrical and tapering, thus, the inner parts close to the base are distinctly hydroid while more peripheral parts are hydroid, teeth up to 10 mm long at the base; context white to pale cream, azonate, up to 8 mm thick; trama in the teeth dense and agglutinated, in old teeth as soaked with a resinous substance.

**Basidiospores** 6-6.5 x 5-6 µm, ovoid to subglobose or globose, thick-walled.

**Substrata.** Living hardwoods, commonly on oak in the Southeast.

**Distribution.** Eastern hardwood forests south to the Gulf Coast region where it is rather common, also known from Europe.

**Remarks.** This species is easy to recognize because of the distinctly hydroid hymenophore and the small, ovoid to subglobose spores.

## **STEECHERICIUM D. A. Reid,**

Kew Bull. 17:270, 1963.

Basidiocarps pileate, effused, sessile to dimidiate, membranaceous, hymenium odontoid to hydroid, cream-coloured, pinkish to pale brown, aculei subulate, distinctly conical or more rarely cylindrical, context whitish, hyphal system dimitic or pseudodimitic, generative hyphae thin-walled, with clamps, skeletal hyphae thick-walled, without clamps, gloeocystidia present, basidia subclavate, tetrasterigmatic, basidiospores elliptic, thin-walled, finely asperulate and amyloid.

**Type species:** *Steccherinum fistulatum* G. Cunningh. = *S. seriatum* (Lloyd) Maas Geest.

**Remarks.** The genus is above all characterized by its hydroid hymenium and small, asperulate amyloid basidiospores.

### **Steccherinum seriatum (Lloyd) Maas Geest.,**

Proc. K. Neder. Akad. Wet. Ser. C, 69:325, 1966. – *Hydnum seriatum* Lloud, Lloyd Mycol. Writ. 7:1196, 1923. – *Steccherinum fistulatum* G. Cunningh. Trans. Royal. Soc. N. Z. 85:598, 1956.

**Basidiocarps** pileate to reflexed, pileus up to 5 cm wide, sub tomentose to radially fibrillose, smooth or somewhat zonate, pale ochraceous to pale brown in old specimens, spines up to 2.5 mm long, crowded, subulate to almost cylindrical, as a rule simple, rarely branched, subiculum whitish, tough, in dried specimens 0.2-0.5 mm thick.

**Hyphal system** dimitic; generative hyphae thin-walled with clamps, more or less branched, 2.5-6 µm wide, in the spine trama parallel together with skeletal hyphae, often oil filled at the apex, 3-6 µm wide.

**Gloeocystidia** smooth, thin-walled to slightly thick walled, straight, up to 8 µm wide, often bent into the hymenium.

**Basidiospores** 2.5-3.5 x 2-2.5 µm, elliptic, asperulate and amyloid.

**Substrate.** On different hardwoods.

**Distribution.** Paleotropical species.

**Remarks.** The densely spiny basidiocarp and the small, asperulate and strongly amyloid spores characterize this species.

## **STECCHERINUM S. F. Gray,**

Nat. Arr. Br. Pl. 1:651, 1821.

Basidiocarps resupinate, firmly adnate or detachable, effused, reflexed to subpileate or pileate, in consistency tough membranaceous, hymenium odontoid to hydroid, cream-coloured to a shade of pinkish, reddish-orange or brownish, aculei distinctly conical or more rarely cylindrical or flattened, scattered to crowded, smooth or with fimbriate apices, in some species with verruculose sides, subiculum mostly rather thin but well developed, whitish, cream-yellowish or sometimes pale brown, margin with hairy filaments, paler than the fertile part, often rhizomorphic with pale ochraceous or brownish strings; hyphal system dimitic or pseudodimitic, generative hyphae thin-walled, with or without clamps, skeletal hyphae thick-walled, without clamps, some characteristically encrusted at the apices and penetrating the hymenial layer as pseudocystidia, as a rule numerous and thick-walled, mostly in the aculei but also in the smooth hymenium between the aculei, rarely as more or less well differentiated metuloid cystidia, encrusted part cylindrical or more rarely conical, with blunt or slightly pointed apices; basidia subclavate, with four sterigmata and with a basal clamp in most species, basidiospores elliptic to subcylindrical, thin-walled and smooth, non-amyloid and non-dextrinoid.

**Type species:** *Hydnum ochraceum* Pers.:Fr.

**Remarks.** *Steccherinum* is above all characterized by its hydroid hymenium, encrusted cystidia, and relatively uniform and small, thin-walled basidiospores. The hyphal system is considered as dimitic. It is related to *Junghuhnia* and *Antrodiella*. The genus includes numerous tropical species which unless spores are observed, are difficult to name properly.

### **Key to European species**

1. Hyphae without clamps, basidiocarps resupinate ..... 2
1. Hyphae with clamps, basidiocarps resupinate or pileate ..... 3
2. Basidiocarp loosening from the substratum, ochraceous buff, aculei cylindrical, 0.4-0.6 mm long, basidiospores 3-3.5 x 2-2.5 µm ..... **S. subcrinale**
2. Basidiocarp not easily loosening, cream-coloured, aculei more or less conical, 0.1-0.3 mm long, ..... **S. cremeoalbum**
3. Basidiocarps pileate ..... 3
3. Basidiocarps resupinate ..... 8
3. Basidiocarp widely effused, reddish-orange, aculei 1-3 mm long, pseudocystidia often of the metuloid type, basidiospores 4-4.5 x 2.5-3 µm ..... **S. robustus**
3. Not with this combination of characteristics ..... 4
4. Spores allantoid ..... **S. albidum**
4. Spores different ..... 5
5. Spores 6- 8 x 3-4 µm ..... **S. oreophilum**
5. Spores smaller ..... 6

6. Spores subglobose .....	<b>S. bourdotii</b>
6. Spores differently shaped .....	7
7. Pileus radially fibrillose, margin fimbriate, pinkish cinnamon to pale brown, very rare species.....	<b>S. laeticolor</b>
7. Pileus velvutinous, margin felted, pale ochraceous, common and widespread species .....	<b>S. ochraceum</b>
8. Basidiocarps loosely adnate, normally pale violaceous or grey-reddish, margin filamentous, rhizomorphs pale brown or violaceous, often several cm long .....	<b>S. fimbriatum</b>
8 Basidiocarps closely adnate, white to cream-coloured, rhizomorphs absent or indistinct.....	9
9. Basidiospores 3.5-4.5 x 2-2.2 µm, on <i>Pinus</i> , known only from Portugal .....	<b>S. straminellum</b>
9. Basidiospores larger .....	10
10. Growing on gymnosperms, spores 2-2.2 µm wide .....	<b>S. litschaueri</b>
10 Growing on hardwoods, spores wider than 2.2 µm.....	11
11. Spores narrowly elliptic to sub cylindrical 5-6 x 2.5-3 µm .....	<b>S. setulosum</b>
11. Spores elliptic, 4-5 x 2-2.3 µm.....	<b>S. corneum</b>

## Description of species

### **Steccherinum albidum Legon & Roberts,**

Czech Mycol. 54:7, 2002.

**Basidiocarp** resupinate to effused reflexed, tough and pliable, up to 2 cm long, 1 cm wide and 2 mm thick at base, pileus slightly fibrillose, first whitish-cream drying pale ochraceous to pallid orange brown, hymenial surface hydroid, 5-6 teeth per mm, each 2-3 mm long, cylindrical with a slightly pointed and penicillate apex, whitish when fresh drying pale ochraceous, margin white and wide, up to 3 mm wide.

**Hyphal system** dimitic; generative hyphae with clamps thin-walled to slightly thick walled, 2-5 µm wide, skeletal hyphae thick-walled, tortuous, 2-5 µm wide.

**Cystidia** 80-90 x 6-9 µm, numerous, tubular to cylindrical and coarsely encrusted.

**Basidiospores** 3-3.5 x 1.5 µm, slightly allantoid.

**Substrate.** On hardwoods like *Fagus*,

**Distribution** Known from the type locality in England besides southern Finland.

**Remarks** The species is recognized by its pileate basidiocarps and the small suballantoid spores.

### **Steccherinum aridum Svrček,**

Ceska Mykol. 27:205, 1973. – *Steccherinum cremeoalbum* Hjortstam, Mycotaxon 19:507, 1984.

**Basidiocarp** resupinate, closely adnate, effuse, thin, not easily separated from the substratum, whitish-cream, at first grandinoid, then somewhat odontoid, aculei 0.1-0.3 mm long and 4-6 per mm, mostly conical and slightly fimbriate at the tip, concolorous with the smooth hymenium between the aculei, margin distinctly fibrillose, rhizomorphs whitish, usually paler than the hymenium.

**Hyphal system** dimitic; generative hyphae simple-septate, thin-walled, smooth, more or less encrusted, 2-3(-4) µm wide, skeletal hyphae thick-walled, sparsely branched, richly encrusted, 2.5-3.5 µm wide.

**Cystidia** numerous, encrusted towards the widened tip, usually very long with the encrusted part 40-60 x 7-10 µm.

**Basidiospores** 3.5-4 x 2-2.2 µm, subglobose, thin-walled, smooth.

**Substrate.** Dead hardwoods.

**Distribution** Known from a few localities in Sweden and Denmark.

**Remarks** The species resembles *S. subcrinale* in lacking clamps and having similar basidiospores, though slightly larger. Furthermore, the short-celled terminal hyphae which are very conspicuous in *S. subcrinale* are lacking and the aculei are much shorter.

### **Steccherinum bourdotii Saliba & A. David,**

Cryptogam. Mycol. 9:100, 1988.

**Basidiocarp** resupinate to effused reflexed, easily detached, reflexed part up to 1.5 cm wide, sessile to partly dimidiate, pileus whitish, tomentose to hirsute and concentrically zoned, hymenial surface hydroid, whitish to ochraceous or cream coloured, individual spines 2-2.5 mm long, shorter towards the margin, conical, entire or with bifurcate and finely grandinoid due to projecting cystidia (lens!), context 3-5 mm thick, slightly duplex, with a lower zone concolorous with the spines and with an upper zone lighter and more whitish, margin narrow and whitish.

**Hyphal system** dimitic; generative hyphae with clamps, 2-3 µm wide, skeletal hyphae dominating thick-walled, 3-5 µm wide.

**Cystidia** 45-100 x 6-8 µm numerous, more or less encrusted over their entire length, projecting above the hymenium.

**Basidiospores** 3.5-4.5 x 4.5-5.5 µm, subglobose.

**Substrate.** Different hardwoods such as *Acer*, *Alnus*, *Carpinus*, *Robinia*, *Quercus* and *Ulmus*,

**Distribution.** Widespread in southern and central Europe, but not recorded from Scandinavia. Bernicchia is of the opinion that it follows *Carpinus* in its distribution.

**Remarks.** The subglobose spores characterize this species.

#### **Steccherinum corneum (Pilát) Parmasto,**

Conspect. Syst. Cort. p. 173, 1968. – *Mycoleptodon corneum* Pilát, Bull. Soc. Mycol. Fr. 49:306. 1934.

**Basidiocarp** resupinate, adnate, cartilaginous and hard and dense when dry, hymenial surface hydroid, dirty grey to brownish, individual spines 1-2 mm long, conical with a penicillate apex of projecting skeletal hyphae, subiculum cartilaginous to bony hard and dense, subresinous and brown, margin narrow and whitish.

**Hyphal system** dimitic; generative hyphae with clamps, 3-4 µm wide, skeletal hyphae dominating, thick-walled, 3-5 µm wide.

**Cystidia** 70-90 x 6-7 µm, numerous, clavate to subfusoid, densely encrusted and projecting above the hymenium.

**Basidiospores** 4-5 x 2-2.3 µm, elliptic

**Substrate.** The type was collected on *Prunus padus*.

**Distribution.** Originally described from Central Siberia in Russia, European distribution unknown.

**Remarks.** The dense resupinate basidiocarp with fairly oblong elliptic basidiospores are distinct for this species.

**Basidiocarps** resupinate, cream coloured, effused, grandinoid to odontoid, individual aculei up to 0,3 mm long, 4-5 per mm, margin fibrillose.

**Hyphal system** dimitic, generative hyphae simple septate, 2-3 µm wide, skeletal hyphae 2.5-3.5 µm

**Cystidia** 100-200 x 5-10 µm, numerous, conical, encrusted,

**Basidiospores** 3.5-3 x 2- 2.3 µm, semi globose.

**Substrate** Dead hardwoods

**Distribution.** Known from Sweden.

**Remarks.** The simple septate generative hyphae are characteristic for this rare species.

#### **Steccherinum fimbriatum (Pers.: Fr.) John Eriksson.**

Symb. Bot. Ups. 16:134, 1958. - *Hydnum fimbriatum* Pers.:Fr., Syst. mycol. 1:421, 1821.

**Basidiocarp** strictly resupinate, loosely adnate, often widely spread over the substratum, hymenium odontoid, fairly soft but tough, in the living state usually pale violaceous or grey-reddish, in the herbaria dark ochraceous or sometimes greyish, even yellowish-grey, aculei conical, penicillate, about 0.2-0.3 mm long and 4-5 per mm, subiculum concolorous and slightly paler, 0.1-0.2 mm thick, margin more or less filamentous to rhizomorphic with several cm long threads composed of generative and skeletal hyphae.

**Hyphal system** dimitic; generative hyphae thin-walled, 3.5-4 µm wide, with clamps and sparse ramifications, in the aculeal trama together with skeletal hyphae skeletal hyphae thick-walled, (2.5)-3 µm wide, rarely branched, without clamps, interwoven with generative hyphae, subhymenial layer thin, with short-celled hyphae, always with clamps.

**Cystidia** numerous in the aculei, rarer or lacking in the hymenial layer between the aculei, strongly encrusted towards the obtuse apex, the encrusted part normally 40-50 x 8-10 µm.

**Basidiospores** 3.2-3.5(-4) x (2-) 2.2-2.5 µm, ellipsoid, smooth, thin-walled.

**Substrate.** On bark as well as on decorticated deciduous wood, more rarely observed on *Juniperus* and other coniferous substrata.

**Distribution.** Widespread in Europe, but not common.

**Remarks.** The odontoid greyish to brown basidiocarp with a distinct fimbriate margin, make the species rather easy to recognize in the field.

#### **Steccherinum laeticolor (Berk. & M. A. Curtis) Banker,**

Mycologia 4:316, 1912. – *Hydnum laeticolor* Berk. & M. A. Curtis, Grevillea 1:99, 1973.

**Basidiocarp** effused reflexed, pileus up to 2mm wide, radiately fibrillose with 1 -2 slightly sulcate zones, pale ochraceous, margin fimbriate, hymenial surface hydroid, pinkish cinnamon to pale brown at least when dry, teeth up to 2 mm long, 0.1-0.3 mm in diameter, slightly irregularly distributed on the hymenial surface, cylindrical to slightly flattened, tapering, apex sometime whitish encrusted and fimbriate, margin fimbriate, subiculum pale buff to ochraceous,

**Hyphal system** dimitic generative hyphae with clamps, up to 3.5 µm wide, thin to slightly thick walled, skeletal hyphae thick walled to solid, 4-6 µm wide.

**Cystidia** numerous in the aculei, 6-9 µm in diameter, occasionally much wider and noted up to 18 µm, thick-walled to solid, heavily encrusted, projecting up to 35 µm,

**Basidiospores** not seen in type

**Substrate.** Hard woods?

**Distribution.** Rare species, described from South Carolina, USA, in Europe unknown distribution

**Remarks.** The vivid colours and the fimbriate margin should be good characters for recognizing the species in the field.

#### **Steccherinum litschaueri (Bourdot & Galzin) John Eriksson,**

Symb. Bot. Ups. 16:134, 1958. - *Mycoleptodon litschaueri* Bourdot & Galzin, Hym. de France p. 441, 1928.

**Basidiocarp** strictly resupinate, closely adnate, effuse, medium-sized, when dried more or less membranaceous, white to pale ochraceous, margin fimbriate, indistinctly rhizomorphic, not or only slightly loosening from the substratum, hymenium



odontoid to hydroid, aculei scattered, usually 0.4-1 mm long, smooth, subcylindrical, when dried often darker than the hymenium, subiculum thin, concolorous.

**Hyphal system** dimitic with clamped generative hyphae, 3.5-4 µm wide, often richly branched, skeletal hyphae mainly in the aculeal trama, normally 3.5-5 µm wide.

**Cystidia** (Pseudocystidia) numerous in the aculei, often more than 200 µm long, thick-walled and 4-7 µm wide, not differentiated from the skeletal, widened towards the apex and strongly encrusted in the upper part.

**Basidiospores** (4-)4.5-5.5 x 2-2.2 µm, subcylindrical to cylindrical.

**Substrate.** It is known from both coniferous and deciduous wood (*Alnus*).

**Distribution.** Rare species, known only from continental parts of the area.

**Remarks.** The rhizomorphic margin and the cylindrical spores are diagnostic.

### **Steccherinum ochraceum (Pers.:Fr.) S.F. Gray,**

Nat. Arrang. Br. Pl. 1:651, 1821. - *Hydnum ochraceum* Pers.:Fr., Syst. mycol. 1:414, 1821. - *Steccherinum meridiochraceum* Saliba & David, Cryptgam. Mycol. 9:97, 1988. - *Steccherinum pseudochraceum* Saliba & David, Cryptgam. Mycol. 9:97, 1988. - *Hydnum rhois* Schw. Schr. Naturf. Ges. Leipzig 1:103, 1822. - *ibid.* Fr. Elenchus Fung. 1:134, 1828. - *Hydnum pudorinum* Fr., Elench. Fung. 1:133, 1828.

**Basidiocarp** effuse, usually small to medium sized, resupinate, effused reflexed or with revolute margin, pileus when present up to 1.5 cm wide, smooth or somewhat zonate, velutinous, hymenium odontoid, pale ochraceous to salmon-coloured, aculei more or less conical to almost cylindrical, as a rule simple, rarely branched, in younger basidiocarps scattered and about 3-5 per mm, in more developed ones slightly crowded, approximately 0.5-1 mm long, young aculei apically fimbriate, subiculum whitish, tough, in dried specimens 0.2-0.5 mm thick, margin usually distinct, felted, whitish to pale ochraceous, 0.5-1 mm wide, rhizomorphs normally not present.

**Hyphal system** dimitic; generative hyphae thin-walled, 2.5-3.5 µm wide w. clamps, skeletal hyphae thick-walled, 2-2.5 µm.

**Cystidia** (pseudocystidia) numerous, especially in the aculei, but also occurring frequently in the hymenial layer between the aculei, strongly encrusted in the widened upper part, generally more than 100 µm long and with a width in the encrusted part of 7-10(-12) µm, blunt, projecting 20-30 µm above the basidia.

**Basidiospores** 3.2-3.5(-4) x (2-) 2.2-2.5 µm, elliptic.

**Substrate.** On different hard woods.

**Distribution.** Known all over the continent with isolated localities as far north as in Alta in Norway at 70° north.

**Remarks.** The light orange to pale straw coloured pileate and densely hydroid basidiocarps will make it possible to recognize it in the field.

### **Steccherinum oreophilum Lindsey & Gilbn.,**

Mycologia 69:194, 1977.

**Basidiocarp** annual, effused reflexed, dimidiate to sessile, adnate, pileus up to 4 mm wide and 6 cm long, white to cream coloured, tomentose to hispid, and azonate, hymenial surface first irregularly poroid, but soon the walls split and the surface becomes hydroid with round to irregular flattened teeth, cream coloured, context white and tough, less than 1 mm thick.

**Hyphal system** dimitic, generative hyphae with clamps, 3-5 µm wide, often richly branched, skeletal hyphae mainly in the aculeal trama, straight occasionally branched, 3-5 µm wide.

**Cystidia** 50-130 x 8-10 µm, numerous in the aculei, thick-walled, strongly encrusted in the upper part and projecting up to 30 µm.

**Basidiospores** 6-8 x 3-4 µm, subcylindrical to cylindrical.

**Substrate.** Originally described from *Populus*, but also known from other hardwoods.

**Distribution.** Unknown since it has up to recently been mixed up *Irpex lacteus*, which however has simple septate generative hyphae.

**Remarks.** The clamped generative hyphae make it easy to separate it from *I. lacteus* which morphologically is almost indistinguishable.

### **Steccherinum queletii (Bourdot & Galzin), Hallenb. & Hjortstam,**

Mycotaxon 31:443, 1988. - *Odontia queletii* Bourdot & Galz., Bull. Soc. Myc. France 30:270, 1914.

**Basidiocarp** resupinate, adnate, orbicular - confluent, white or yellowish in the living state, yellow-ochraceous when dried; hymenophore odontoid with dense short aculei, 0.5-1 mm long, on a thin subiculum; margin thinning out indeterminately or sometimes finely pubescent.

**Hyphal system** monomitic; hyphae thin-walled, with clamps at all septa, 2-3 µm wide, densely united into a conglutinate tissue both in the centre of the aculei and in the subiculum.

**Cystidia** numerous, 50-100 x 6-12 µm, fusiform, with an apical, conical, encrusted part, 35-50 µm long; walls thin in the young cystidia, e.g. in the aculeal apices, then thickened; adventitious septa often seen.

**Basidia** clavate, 15-25 x 4-5 µm, with 2-4 sterigmata and with basal clamp.

**Basidiospores** narrowly ellipsoid, 5-6 x 3-3.5 µm.

**Habitat.** On branches of *Abies alba*, both on still attached and fallen ones.

**Distribution.** Widespread in Europe to southern part of Scandinavia.

**Remarks.** The host is rather distinctive, but more collections are needed to ascertain its true distribution and host range.

**Steccherinum robustius (John Eriksson. & Lund.) John Eriksson,**

Symb. Bot. Ups. 16:134, 1958. - *Mycoleptodon robustior* Eriksson. & Lund. in Lund. & Nannf., Fung. exs. succ., no. 2147 p. 26, 1953.

**Basidiocarp** resupinate, widely effuse, normally several dm and in some cases a meter or more in length, not reflexed or pileate but at the margin slightly loosening and detachable in pieces, hymenium odontoid to hydroid, in the living state reddish orange, in the herbaria fading into pale orange or dirty yellow to greyish, aculei elongate - conical, sometimes flattened, especially near the edge, crowded (0.5-)1-3 mm long, 3-4 per mm, of firm consistency, rarely fimbriate but often verrucose along the sides, subiculum yellowish, in section whitish, thin, in dried specimens about 0.1-3 mm thick, margin yellowish, especially when fresh, 1-5 mm broad, fimbriate, rhizomorphs sparse.

**Hyphal system** dimitic, generative hyphae thin- or slightly thick-walled, branched 3(-4)  $\mu\text{m}$  wide, with clamps, skeletal hyphae thick-walled, without clamps but with simple, adventitious septa, 2.5-3  $\mu\text{m}$  wide, hyaline to slightly yellowish (in KOH), in the aculeal trama often present as pseudocystidia, in the subiculum transitional stages are easily observed between thin-walled and clamped generative hyphae and clamp less skeletal hyphae, hyphae from the marginal zone usually more or less encrusted.

**Cystidia** (Pseudocystidia) numerous, strongly encrusted towards the widened apex, in the thickening hymenium present as metuloid cystidia (as in *Peniophora*) usually with a distinct pale yellow colour (in KOH), encrusted part 20-30 x 8-12(-15)  $\mu\text{m}$ .

**Basidiospores** 4-5 x 2.5-3  $\mu\text{m}$ , ellipsoid, thin-walled, smooth.

**Substrate.** In fertile and herb-rich natural forests with *Ulmus* and *Fraxinus*, on humid and calcareous soil.

**Distribution.** Scattered in Europe and known north to Southern Sweden.

**Remarks.** The species is recognized by its large cystidia and basidiospores which are larger than those of *S. ochraceum*.

**Steccherinum setulosum (Berk. & M. A. Curtis) L. W. Miller,**

Mycologia 27:362, 1935. - *Hydnum setulosum* Berk. & M. A. Curtis, Grevillea 1:100, 1973.

**Basidiocarp** resupinate, closely adnate, effused, up to 3 mm thick, hymenial surface clay coloured to isabelline or light brown, odontoid to hydroid, teeth abundant, dense and in part cartilaginous and brittle, cylindrical, tapering, margin fimbriate, subiculum pale buff.

**Hyphal system** dimitic, generative hyphae with clamps, 3-5  $\mu\text{m}$  wide, often richly branched, skeletal hyphae mainly in the aculeal trama, normally 3.5-5  $\mu\text{m}$  wide.

**Cystidia** numerous in the aculei, up to 100 x 6-8  $\mu\text{m}$  long, thick-walled, strongly encrusted in the upper part, projecting in right angles from the teeth.

**Basidiospores** 5-6 x 2.5-3  $\mu\text{m}$ , narrowly elliptic to subcylindrical.

**Substrate.** On different hard woods in North America, in Europe reported from ....

**Distribution.** Widely distributed in North America from where it was described, in Europe known from ..

**Remarks.** The strictly resupinate basidiocarp and the narrowly elliptic basidiospores characterize this species.

**Steccherinum straminellum (Bres.) Melo,**

Mycotaxon 54:126, 1995. - *Odontia straminella* Bres. Atti. Inst. Reale Accad. Rovereto Sci. Ser.3, 8:131, 1902.

**Basidiocarp** resupinate, effused, adnate, white to pale ochraceous, hymenial surface odontoid to hydroid, spines up to 0.5 mm long and 0.1-0.2 mm wide mostly scattered, but in some parts crowded, cylindrical to more commonly flattened, simple sometimes connate. Slightly fimbriate at apex, subiculum white, margin fimbriate, in parts with hyphal strands, easily separated from the substrate with a scalpel.

**Hyphal system** dimitic, generative hyphae thin- to slightly thick walled, branched and with clamps, skeletal hyphae thick-walled, 3-5  $\mu\text{m}$  wide, dominating in the basidiocarp.

**Cystidia** 7-15  $\mu\text{m}$  wide, frequent in the spines arising from skeletal hyphae, numerous, thick-walled, apically thin walled, strongly encrusted in the upper part

**Basidiospores** 3.5-4.5 x 2-2.2  $\mu\text{m}$ , elliptic to subcylindrical.

**Substrate.** Known from different species of *Pinus*.

**Distribution.** Known only from Portugal.

**Remarks.** *S. straminellum* is undoubtedly related to *S. litschaueri*, which is separated by having spines up to 1 mm and with spores reaching a length of 5.5  $\mu\text{m}$ .

**Steccherinum subcrinale (Peck) Ryvardeen,**

Norw. J. Bot. 25:294, 1978. - *Hydnum subcrinale* Peck, N.Y. State Mus. Bull. 167:27, 1913.

**Basidiocarp** loosely resupinate, pliable and easily separated from the substratum, ochraceous buff - isabelline - cinnamon buff, aculei 0.4-0.6 mm long and 4-7 per mm, cylindrical and at least when dried, conspicuously sinuous, smooth or very slightly penicillate in the apices, subiculum concolorous or whitish, thin, soft cottony, generally with ochraceous rhizomorphs.

**Hyphal system** dimitic with hyphae of three types:

- 1) generative hyphae thin-walled, straight and uniform, regularly branched, as a rule 2-4  $\mu\text{m}$  wide;
- 2) hyphae next to the subhymenial layer strikingly short-celled and frequently branched, in some cases also basidia-bearing, often easily observed as terminal hyphae in the aculei;
- 3) skeletal hyphae thick-walled, rarely branched, 2-4  $\mu\text{m}$  wide, partly penetrating the basidial layer as encrusted cystidia but occurring also in the hymenial tissue between the aculei, all hyphae without clamps.

**Cystidia** (Pseudocystidia) frequent in the aculei, apically widened, obtuse, and usually encrusted, rare or lacking in the hymenium between the aculei, encrusted part 20–40 x 6–8 µm.

**Basidiospores** (2.5–)3–3.5 x 2–2.2(–2.5) µm, elliptic.

**Substrate.** *Picea*, *Fagus* and *Betula*.

**Distribution.** A rare species in N. Europe where it has been found a few times in Denmark and Norway.

**Remarks.** *S. aridum* and *S. subcrinale* have an isolated position in the genus. Judging from their hyphal characteristics they are undoubtedly closely related. For further information, see Ryvarden (1978).

## **TOMENTELLA (Pers.) Pat.,**

Basidiocarps resupinate, effused byssoid to tomentose, hymenophore smooth, even, granular to hydroid, variable coloured, hyphal system monomitic, rarely dimitic, hyphae with clamps or simple septa, hypha variable coloured, mostly brownish in mature basidiocarps, cystidia variably present, basidia di or mostly tetrasterigmatic, spores brownish, elliptic to globose, ornamented and brown when mature, On the ground, often ectomycorrhizal, on wood of all kinds, often on debris or humus. Cosmopolitan with numerous species.

**Type species:** *Thelephora ferruginea* Pers.:Fr. = *Tomentella crinalis* (Fr.) M. Larsen.

**Remarks.** The genus is usually easy to recognise microscopically because of the brownish ornamented elliptic to globose spores and the coloured basidiocarps variable from pale brown to greenish, purplish to almost blackish brown. Only one distinctly hydroid species is included here.

### **Tomentella crinalis (Fr.) M. J. Larsen,**

Taxon 16:511, 1967 – *Hydnum crinalis* Fr., Epicr. syst. Mycol. p. 516, 1836.

**Basidiocarps** resupinate, effused in small patches, loosely adnate, rusty brown, warted to typically hydroid, tomentose to membranous, subiculum concolours, margin often paler.

**Hyphal system** dimitic, generative hyphae with clamps, 2–3.5 µm wide, skeletal hyphae widespread in subiculum, 1.3 µm wide, brownish, hyphal strands often present, up to 25 µm wide and brown, somewhat irregular and densely interwoven.

**Basidiospores** 7–10 µm in diameter, globose or slightly irregular, brown, warted, often with bifurcate warts.

**Habitat.** Mostly on hardwoods of all kinds, rarely on gymnosperms.

**Distribution.** Almost cosmopolitan.

**Remarks.** Rather easily recognized because of the odontoid to hydroid brown basidiocarps and the globose, brown and ornamented spores.

## **TRECHISPORA P. Karsen.,**

Hedwigia 29:147, 1890. - *Hydnodon* Banker.

Basidiocarps resupinate or dimidiate, thin to thick, pruinose to arachnoid to membranaceous, fragile, smooth, grandinoid, odontoid or poroid, light coloured; hyphal system monomitic or dimitic, all septa with clamps, hyphae often encrusted, ampullate septa common, subhymenial hyphae usually short-celled and more or less triangular in shape, skeletal hyphae rare, hyphoid cystidia rarely present; basidia short-cylindrical, cylindrical or more rarely clavate or pedunculate, tetrasterigmatic, basidiospores small, usually with thickened wall, smooth or ornamented, subglobose to elliptical, rarely irregular or allantoid, neither dextrinoid nor amyloid. Large cosmopolitan genus with numerous species.

**Type species:** *Trechispora onusta* Karst (= *Trechispora mollusca* (Pers.:Fr.) Liberta).

**Remarks** After the exclusion of *Phlebiella vaga* (Fr.) Karst. and allied species *Trechispora* becomes a fairly uniform genus. For a thorough revision of the genus, see Karl-Henrik Larsson 1992.

### **Trechispora farinacea (Pers.: Fr.) Liberta,**

Taxon 15:318, 1966. - *Hydnum farinaceum* Pers.: Fr., Syst. Mycol. I: 419, 1821.

**Basidiocarp** resupinate, effuse, fragile, thin to moderately thick, smooth to grandinoid to odontoid, when smooth porose or cracked, whitish to ochraceous, sometimes with white, cushion like, byssoid, conidia forming mycelium either growing in contact with the fertile mycelium or separate, margin thinning out, sometimes fibrillose, cordons not so often seen.

**Hyphal system** monomitic, subicular hyphae mostly few but frequently seen at the margin, thin-walled, straight, mainly 2–3 µm wide, with ampullate septa, subhymenial hyphae broader, short-celled, richly branched, often inflated to triangular shape and 2.5–5(–6) µm, all septa with clamps.

**Basidiospores** 4–4.5(–5) x 3.3–3.7 µm, subglobose to broadly elliptical, densely verrucose with the warts evenly spread around the spore, slightly thick-walled.

**Conidia arthroconidia**, cylindrical or irregular with remnants of clamps easily seen, about 5 x 2.5 µm, formed through fragmenting of straight, short-celled hyphae. This anamorph is called *Osteomorpha fragilis* Arnaud ex Watling & Kendrick.

**Substrate.** On well decayed wood both of deciduous trees and conifers.

**Distribution.** Widespread and the most common species of the genus found in all parts of the world.

**Remarks** *T. farinacea* is here taken in the broad sense which includes several taxa which definite delimitation needs further study.

## **TRICHAPTUM** Murrill,

Bull. Torrey Bot. Club 31:608, 1904.

Basidiocarps annual, resupinate, effused-reflexed or pileate; pileus hispid to adpressed tomentose, gray or dirty white to blackish; hymenophore irpicoid, lamellate or poroid, mostly pale brownish to purplish when actively growing; tube layer purplish brown; context distinctly duplex, lower part dense and dark, upper part paler and soft-fibrous; hyphal system ditrititic; generative hyphae with clamps; skeletal hyphae dominating and conspicuous; binding hyphae rarely present, hyphal cystidia abundant, thin- to thick-walled, subulate to clavate, smooth or apically incrustated; spores cylindrical, often slightly curved, smooth, hyaline, thin-walled, negative in Melzer's reagent. On dead conifers and hardwoods, causing a white rot. Cosmopolitan genus.

**Type species:** *Polyporus trichomallus* Berk. & Mont. (a synonym of *Trichaptum perrottetii* (Lév.) Ryvarden, based on the same type specimen).

**Synonym:** *Hirschioporus* Donk (*Polyporus abietinus* Fr.).

**Remarks.** The genus is characterized by the purplish to violet hydroid surface in actively growing specimens, fading to buff or pale brown in age and on drying. Microscopically the dimitic hyphal system, cylindrical spores and cystidia are diagnostic. The genus includes several poroid species as well.

**Key to hydroid species** - for complete treatments of the genus, see Ryvarden (2022a, 2022b and 2024).

1. Growing on conifers, pileate..... **T. fusco-violaceum**
1. Growing on hard woods, resupinate to effused-reflexed or sessile..... **2**
2. Basidiocarps dimidiate to semistipitate, pileus hirsute, pores 3-5 per mm with dentate dissepiments, spores 2-2.5 µm wide..... **T. biforme**
4. Basidiocarps resupinate to effused, pileus velutinate, hymenophore hydroid, spores 1.5-2 mm wide..... **T. griseofuscens**

### **Trichaptum biforme (Fr. in Klotzsch) Ryvarden,**

Norw. J. Bot. 19:237, 1972. - *Polyporus biformis* Fr. in Klotzsch., Linnaea 8:486, 1833. - *Polyporus pergamenus* Fr., Epicr. Syst. Mycol., p. 480, 1836-1838.

**Basidiocarps** annual, sessile; pilei solitary or imbricate, dimidiate to flabelliform or petaloid, up to 6 cm wide and 3 mm thick; pileus gray to buff, hirsute to glabrous with age, zonate; margin acute; pore surface purplish to violaceous or fading to pale buff, often becoming ipirciform, the pores angular, 3-5 per mm; dissepiments become thin and lacerate or splitting to form spines; context pale buff, azonate, tough-fibrous, up to 1.5 mm thick; tube layer violaceous or concolorous with context, up to 2 mm thick.

**Cystidia** 20-35 x 4-6 µm, abundant, fusoid, slightly thick-walled, mostly apically incrustated.

**Basidiospores** 6-8 x 2-2.5 µm, cylindrical, straight or slightly curved.

**Substrata.** Dead hardwoods in many genera, rarely on conifers.

**Distribution.** Throughout the temperate zone and the southern boreal zone.

**Remarks.** This is one of the most common polypores in the temperate forests.

### **Trichaptum fusco-violaceum (Ehrenb.:Fr.) Ryvarden,**

Norw. J. Bot. 19:237, 1972. - *Hydnum fusco-violaceum* Ehrenb.:Fr., Syst. Mycol. 1:421, 1821.

**Basidiocarps** annual, usually effused-reflexed, rarely sessile or resupinate; pilei single or imbricate, often laterally fused, up to 1.5 x 8 x 0.3 cm; pileus whitish to gray, tomentose to slightly hirsute, azonate; margin whitish to pale brown; hymenophore with radially elongated, lacerate, short lamellae, along the margin irregularly poroid becoming hydroid, bright purplish when fresh, fading to ochraceous or pale brown with age or drying; trama of tubes or teeth pale brown and dense, hymenophore up to 2 mm thick; context usually duplex with a lower layer with colour and consistency as the tube layer, and an upper white, dense, cottony layer intergrading with the tomentum on pileus, less than 1 mm thick.

**Cystidia** abundant, fusoid to clavate, thick-walled, usually apically incrustated, imbedded or projecting to 15 µm, 4-7 µm in diam.

**Basidiospores** 6-7 x 2-2.5 µm, cylindrical, slightly curved.

**Substrata.** Dead wood of conifers. *Pinus* seems to be a preferred substratum.

**Distribution.** Circumglobal in the north temperate zone.

**Remarks.** Morphologically this species is similar to the poroid *T. abietinum*.

### **Trichaptum griseofuscens (Mont.) Ryvarden & Iturriaga,**

Mycologia 95: 1074, 2003. - *Irpex griseofuscens* Mont., Ann. Sci. nat. Bot. Ser. 4, no 1:137, 1854.

**Basidiocarps** annual, resupinate to effused reflexed, up to 4 cm long, 2 cm wide and 5 mm thick, flexible and tough, pileus semicircular to elongated, pale brown to clay brown, dull, adpressed velutinate, faintly zonate, lower side hydroid, when young and along the margin with shallow angular pores where the walls soon split up to round to flattened teeth, up to 4 mm long and 1 mm wide, concolorous with the pileus, context 0.5 mm thick, duplex, with a denser lower part and a looser upper part with the adpressed tomentum.

**Cystidia** 12-16 x 4-6 µm, abundant, fusoid, smooth.

**Basidiospores** 6-7 x 1.5-2 µm, cylindrical.

**Distribution.** Neotropical species from South America to Florida.

**Remarks.** The species is unique in the genus with its coarsely hydroid hymenophore and the finely velutinate clay to brown coloured pileus.

### **XYLODON (Pers.) S. F. Gray,**

Nat. Arr. British Plants 1:649, 1821. – *Sistotrema* sect. *Xylodon* Pers. Syn. Meth. Fung. 552, 1801.

Basidiocarps resupinate, effuse, usually adnate, never pileate, fibrous but soft and easily squeezed when fresh and wet, more friable and tough when dried, whitish or pale ochraceous, hymenial surface varying from poroid, smooth or finely tuberculate to odontoid with aculei which may be small and conical, or longer (1-2 mm, sometimes more) and more or less cylindrical, in some species flattened in an irpicoid manner, the apices of the aculei fimbriate or penicillate under the lens, cystidia or cystidial organs of some kind usually present but varying in nature, in simplest cases hardly differentiated from sterile hyphal ends but often as conspicuous thick-walled cystidia, originating deep in the hyphal texture, sometimes with simple secondary septa. In some species cystidia or cystidioles arise in the subhymenium and then smaller sterile hyphal ends, ending in the hymenium, often capitate and apically covered by a crystalline or resinous exudate, hyphal system monomitic, rarely dimitic with skeletal hyphae, generative hyphae mostly about 3 µm wide, somewhat thick-walled, richly branched, with small distinct clamps except for a few species (only one in Europe), basidia small to medium sized, subclavate to subcylindrical, more or less constricted in a suburniform way, basidiospores thin-walled, very rarely thick-walled, smooth, non-amyloid, all species causing white rot in the substrata, cosmopolitan genus with a white rot.

**Type species:** *Odontia quercina* Pers.

**Remarks.** *Xylodon* is above all characterized by its uniform, rather narrow, slightly thick-walled hyphae and rather small basidiospores. The typical hyphae make it possible to recognize the genus instantly with some experience.

The genus was previously treated as a part of *Hyphodontia* s. lato which today are restricted to species with lagenocystidia.

### **Hyphodontia quercina (Fr.) John Eriksson,**

Symb. bot. Ups. 16:1:105, 1958. – *Hydnum quercinum* Fr., Syst. mycol. 1:423, 1821.

**Basidiocarp** resupinate, usually orbicular at first, then confluent and effuse, adnate, ceraceous when wet and fresh, fibrous and rather tough when dried, whitish at first, then cream-coloured and finally ochraceous, hymenophore odontoid or almost raduloid, aculei variable, conical to subcylindrical, about 2-3 mm long in mature specimens but often smaller, apically more or less fimbriate under the lens, subiculum in dried specimens often more or less cracked, margin variable, indeterminate and pruinose in young specimens, more determinate in mature ones, sometimes with a narrow, fibrillose sterile zone.

**Hyphal system** monomitic, hyphae about 2-3 µm wide, distinct, clamped, thickened in the subiculum, parallel in the centre of the aculei, irregularly intertwined in the subiculum, sterile hyphal ends in the hymenium mostly capitate with apical encrustation, in the aculeal apices obtuse or tapering to almost subulate, globose swellings on the hyphae of the aculeal trama often present.

**Cystidia** none, but capitate sterile hyphal ends in the hymenium, varying in number, from rather frequent to very few, in some specimens also a few subulate cystidioles are observed.

**Basidiospores** 6-7,5 x 2,5-3 µm, cylindrical, adaxial side somewhat concave.

**Substrata.** On deciduous wood, mostly on fallen branches or on dead, but still attached ones. It is not restricted to *Quercus* ssp., but is collected on all sorts of hardwood trees.

**Distribution.** Follows the *Quercus* zone on all continents.

**Remarks.** *H. quercina* has a variable morphology and has therefore often been incorrectly interpreted. This is true especially in young specimens, in which the aculei are still small (less than 1 mm). Such specimens are similar to *H. crustosa*. Under the microscope it is distinguished, because of its larger basidia and basidiospores and because of the lack or very low frequency of subulate cystidioles.

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