FUNGI IN AUSTRALIA

J. Hubregtse

Part 4

Basidiomycota

Agaricomycotina – II

Pucciniomycotina

Septobasidium clelandii

F.N.C.V

Est. 1880

FUNGI IN AUSTRALIA

Part 4

Basidiomycota

Agaricomycotina – II
Pucciniomycotina

Revision 2.2

August 28, 2019

Agaricomycotina:	Auriculariales	Boletales
	Cantharellales	Dacrymycetales
	Geastrales	Gomphales
	Hymenochaetales	Phallales
	Polyporales	Russulales
	Thelephorales	Tremellales
Pucciniomycotina:	Atractiellales	Septobasidiales

Author: J. Hubregtse
fia.hubregtse@gmail.com

Published by the
Field Naturalists Club of Victoria Inc.
E-published at http://www.fncv.org.au/fungi-in-australia/
Typeset using LaTeX

F.N.C.V
Est. 1880

Citation:

This work may be cited as:

Hubregtse J (2019) *Fungi In Australia*, Rev. 2.2,
E-published by the Field Naturalists Club of Victoria Inc., Blackburn, Victoria, Australia. Web address http://www.fncv.org.au/fungi-in-australia/

Ownership of intellectual property rights

Creative Commons licence

This document was prepared with public domain software. **LibreOffic**e was used to produce the text, and the book was formatted in LaTeX, using TeXstudio.

CONTENTS

CHAPTER 1

AGARICOMYCOTINA

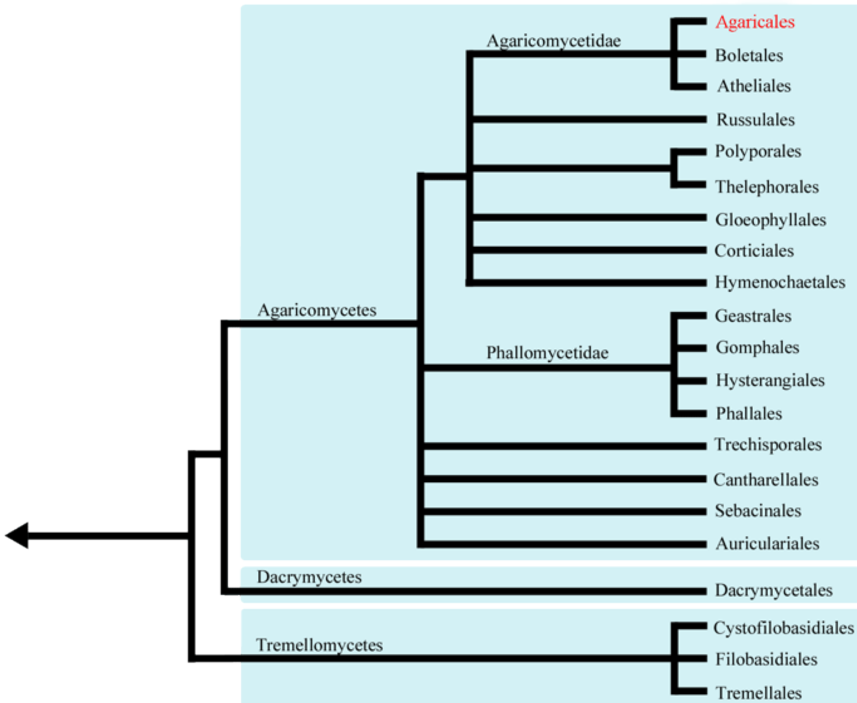


Figure 1.1: Subphylum Agaricomycotina

Allmost all basidiomycetes described in *Fungi In Australia* are from the subphylum Agaricmycotina (see Figure 1.1). The largest of the 21 orders that currently constitute Agaricomycotina is the Agaricales, which has over 60% of the species, and is covered in *Fungi in Australia – Basidiomycota: Agaricomycotina – I*. The remaining 20 orders are covered in this part, *Fungi in Australia – Basidiomycota: Agaricomycotina – II*.

CHAPTER 2

SPECIES DESCRIPTIONS – AGARICOMYCOTINA

2.1 Order: Auricularales

Auriculariales, according to Kirk *et al.* (2008) contains 1 family (Auriculariaceae), 32 genera and 198 described species. The order is still in flux because molecular phylogenetic studies such as the one by Zhou and Dai (2013) are updating the phylogenetic relationships in the order.

Auriculariales Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Order:	Auriculariales

Families

Auricularicaceae

Currently, according to "The Catalogue of Life" website http://www.catalogueoflife.org, Auriculariales contains 1 family (Auriculariaceae), 9 genera and 151 described species. However, a further 28 genera and 113 described species are *incertae sedis* (not assigned). With such a large number of unassigned species it is evident that a more comprehensive taxon-sampling is required before the phylogeny of the Auriculariales can be determined.

Phylogenetic analysis carried out by Weiß *et al.* (2001, 2004) revealed that species of fungi with "auricularioid" basidia were not necessarily closely related and that the genus *Auricularia* has more in common with *Exidia* and its allies.

Auriculariaceae – consists of 9 genera with 151 described species. Its type genus is *Auricularia*, which contains 28 species. The majority of species in this family are wood-rotters and most produce gelatinous fruit-bodies. Some of these fruit-bodies may be ear-shaped (as in the genus *Auricularia*), button-shaped, lobed, or effused. Their spore-bearing surfaces may be smooth, warted, veined, toothed (as in the genus *Pseudohydnum*), or poroid (as in the genera *Elmerina* and *Protomerulius*) (Zhou and Dai 2013).

Auricularia cornea

References

Kirk PM, Cannon PF, Minter DW and Stalpers JA (2008). *Ainsworth and Bisby's dictionary of the Fungi.* (10th ed.) CAB International: Wallingford (UK).

Weiß M and Oberwinkler F (2001) "Phylogenetic relationships in Auriculariales and related groups – hypotheses derived from nuclear ribosomal DNA sequences." *Mycological Research* **Vol. 105(4), pp. 403–414**

Weiß M, Selosse MA, Rexer KH, Urban A and Oberwinkler F (2004)."*Sebacinales*: a hitherto overlooked cosm of heterobasidiomycetes with a broad mycorrhizal potential." *Mycological Research* **Vol. 108(9), pp. 1003–1010**

Zhou LW and Dai YC (2013) "Phylogeny and taxonomy of poroid and lamellate genera in the Auriculariales (Basidiomycota)" *Mycologia* **Vol. 105(5), pp. 1219–1230**

Fam. Auriculariaceae

Auricularia cornea

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Auriculariaceae

Auricularia cornea

Auricularia polytricha

Biology

Saprotrophic basidiomycete; fruit-bodies occur annually, either solitary or gregarious, on dead wood in tropical and subtropical forests.

Fruit-body Description

A fleshy, rubbery-gelatinous ear-like fruit-body with a narrow lateral attachment. The fruit-body can be up to 150 mm across and very thin, 1–3 mm thick. **Upper Surface** velvety-hairy, individual hairs clearly distinguishable under a hand lens, hairs up to 0.2 mm long; greyish brown to deep brown. **Lower Surface** spore-bearing surface smooth, sometimes wrinkled, sometimes pruinose; purplish brown, plum-coloured, or brown. **Spore Print** White

Microscopic Features

Basidiospores 14–16 × 5–6 μm, curved, cylindrical or bean-shaped. Basidia 45–55 × 4–5 μm, elongated cylindrical with 3 transverse septa.

Comments

A similar species, *A. auricula*, is difficult to separate from *A. cornea* in the field. The main difference is the length of the hairs on the pileus surface: for *A. cornea* they are up to 0.2 mm long, while those of *A. auricula* are up to 0.1 mm long. This difference becomes difficult to judge in older fruit-bodies.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 290 [D CP]**

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 72 [D I]** (as *Auricularia polytricha*)

Lowy B (1952) "The Genus Auricularia". *Mycologia* **Vol. 44, pp. 657–691 [D P]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 64 [D CP]**

D=Description; **I**=Illustration; **CI**=Colour Illustration; **P**=Photo; **CP**=Colour Photo

Fam. Auriculariaceae

Auricularia delicata

Fam. Auriculariaceae

Auricularia delicata

Biology

Saprotrophic basidiomycete; fruit-bodies occur annually, either solitary or gregarious, on dead wood in tropical and subtropical forests.

Fruit-body Description

A flabby, rubbery-gelatinous rounded bracket with a narrow lateral attachment. The fruit-body can be up to 80 mm across and 2–4 mm thick. **Upper Surface** velvety-hairy, individual hairs clearly distinguishable under a hand lens, hairs variable in length; creamy grey to brown. **Lower Surface** spore-bearing surface wrinkled with low, uneven ridges, in a honeycomb pattern of irregular depressions; creamy grey to brown. **Spore Print** White

Microscopic Features

Basidiospores 10–13 $\times$ 5–6 μm, curved, cylindrical or bean-shaped, with 2–3 prominent oil globules. Basidia 40–55 $\times$ 4–5 μm, elongated cylindrical with 3 transverse septa.

Comments

Auricularia delicata is commonly found in the tropics and is readily identified by the irregular pattern of ridges or cells on its lower surface.

References

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 74 [D I]**

Lowy B (1952) “The Genus Auricularia”. *Mycologia* **Vol. 44, pp. 657–691 [D P]**

Fam. Auriculariaceae

Pseudohydnum gelatinosum

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Auriculariaceae

Pseudohydnum gelatinosum

Biology

Saprotrophic basidiomycete; solitary or in small loose colonies on dead wood, decaying logs, or woody debris.

Fruit-body Description

Up to 50 mm broad, bracket-shaped or tongue-like, broadly convex or plane, margin often lobed; surface dry, smooth or slightly rough; colour light to dark bluish grey, becoming greyish brown; flesh gelatinous, soft, translucent. **Lower Surface** covered in spines up to 3 mm long, running down the stipe; colour translucent white to pale grey, often with a bluish tint. **Stipe** lateral, usually short and stubby, but when growing on a horizontal surface may be up to 50 mm long. **Spore Print** White

Microscopic Features

Basidiospores 5–6 × 4.5–5.5 μm, globose to subglobose, smooth. Basidia usually two- to four-spored, 10–15 × 7–9 μm, pyriform to oblong, longitudinally septate. Hyphae septate, with clamp connections.

Comments

Pseudohydnum gelatinosum grows directly on rotting wood and is readily recognised by its gelatinous nature and whitish soft spines on the underside of the fruit-body. It is relatively common and is not easily confused with any other type of fungus. *P. gelatinosum* is a widespread cosmopolitan species.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 671 [D CP]**

Breitenbach J and Krãnzlin F (1995) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 62 [D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 292 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 174 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 82 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 91 [CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 66 [D I]**

Fam. Incertae sedis

Ductifera sucina

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Incertae sedis

Ductifera sucina

Exidia sucina *Gloeotromera sucina*

Biology

Saprotrophic basidiomycete; found in small to large colonies on wet decaying angiosperm or gymnosperm bark and wood.

Fruit-body Description

Fruit-bodies originating as firm-gelatinous pustules, becoming pulvinate (cushion-like), smooth or convoluted, coalescing to form irregular patches 100 mm or more long and up to 12 mm thick; surface smooth, wax-like; colour semi-translucent, dingy white or pallid yellowish brown, drying to brownish.
Spore Print Not observed

Microscopic Features

Basidiospores 12–15 × 5–7.5 μm (mean 13.3 ± 0.8 × 6.3 ± 0.7 μm, Q=2.13 ± 0.24 n=30), short cylindrical to broadly ellipsoidal, granular, smooth. Basidia (metabasidia) 20–31 × 16–22 μm, clavate, 4-celled, longitudinally cruciate-septate; sterigmata 30–45 × 2.5–5 μm. Gloeocystidia up to 80 μm long, elongate clavate or subfusiform, contents granular. Clamp connections present.

Comments

Ductifera sucina is recognised by its clear, semi-translucent, dingy white fruit-bodies, often coalescing to form patches 100 mm or more long and up to 12 mm thick. There are many species of gelatinous fungi, so microscopic examination is recommended for a positive identification. Microscopically this species can be readily identified by its stalked basidia and conspicuous granular gloeocystidia. *D. sucina* received its current name when Wells (1958) combined *Exidia sucina* and a number of other synonyms. DNA analysis (Weiß and Oberwinkler (2001); Zhou and Dai (2013)) clearly shows that *D. sucina* is part of the order Auriculariales, but is not within the family Auriculariaceae. At present its phylogenetic position in the order Auriculariales is uncertain, hence its family is classified as Incertae sedis.

References

McNabb RFR (1966) "New Zealand Tremellales – II". *New Zealand Journal of Botany* **Vol. 4, pp. 533–545** **[D I]**

Weiß M and Oberwinkler F (2001) "Phylogenetic relationships in Auriculariales and related groups – hypotheses derived from nuclear ribosomal DNA sequences". *Mycological Research* **Vol. 105(4), pp. 403–415**

Wells K (1958) “Studies of some Tremellaceae. II. The genus *Ductifera*”. *Mycologia* **Vol. 50(4), pp. 407–416**

Zhou L-W and Dai Y-C (2013) “Phylogeny and taxonomy of poroid and lamellate genera in the Auriculariales (Basidiomycota)”. *Mycologia* **Vol. 105(5), pp. 1219–1230**

2.2 Order: Boletales

Boletales is one of the larger orders of fleshy Agaricomycetes, containing species with diverse morphologies. About 77% of the species have fruit-bodies that are either boletoid (e.g. *Boletus*, *Suillus*) or gilled (e.g. *Paxillus*, *Phylloporus*). The remaining species have morphologies that are either gasteroid (*Scleroderma*, *Rhizopogon*, *Astraeus*), resupinate (*Coniophora*, *Serpula*), merulioid (*Leucogyrophana*), or toothed (*Gyrodontium*) (Binder and Hibbett 2006; Binder *et al.* 2010).

Boletales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Subclass	Agaricomycetidae
Order:	Boletales

Families
ca. 20; See text

According to Kirk *et al.* (2008) the Boletales contain 17 families, 96 genera and about 1300 species, but more recently "The Catalogue of Life" website http://www.catalogueoflife.org has it containing 20 families, 121 genera, and roughly 2000 described species. It is evident from these figures that the taxonomy of the Boletales is still in flux. Brief descriptions of the latest 20 families are given below.

Amylocorticiaceae – consists of 7 genera with 46 described species. Its type genus is *Amylocorticium*. Most of the species in this order are wood-rotters (Binder *et al.* 2010)

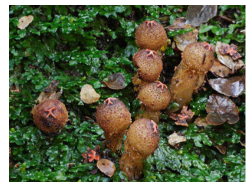
Podoserpula pusio

Boletaceae – consists of 54 genera with 1213 described species. Its type genus is *Boletus*, which contains 395 species. The majority of species in this family have fleshy boletoid fruit-bodies.

Boletus edulis

Phlebopus marginatus

Boletinellaceae – consists of 3 genera with 23 described species. Its type genus is *Boletinellus*, which contains 6 species. A well known genus in this family is *Phlebopus*.



Calostoma rodwayi

Calostomataceae – consists of 1 genus, *Calostoma*, with 24 described species. The species in this family are stalked puffballs.

Coniophoraceae – consists of 4 genera with 27 described species. Its type genus is *Coniophora*, which contains 24 species.

Astraeus hygrometricus

Diplocystaceae – consists of 5 genera with 16 described species. Its type genus is *Diploderma*, which contains 1 species. A well known genus in this family is *Astraeus*.

Gasterellaceae – consists of 1 genus with 1 species, *Gasterella luteophila*.

Gastrosporiaceae – consists of 1 genus with 2 species, *Gastrosporium asiaticum* and *G. simplex*.

Gomphidiaceae – consists of 5 genera with 43 described species. Its type genus is *Gomphidius*, which contains 18 species. The mushrooms in this family are gilled. A similar named genus, *Gomphus*, is not related to this family.

Gyroporaceae – consists of 1 genus, *Gyroporus*, with 17 described species.

Hygrophoropsidaceae – consists of 2 genera with 27 described species. Its type genus is *Hygrophoropsis*, which contains 16 species. The mushrooms in this family are gilled.

Jaapiaceae – consists of 1 genus with 2 species, *Jaapia argillacea* and *J. orchroleuca*, both of which have resupinate fruit-bodies.

Paxillaceae – consists of 10 genera with 94 described species. Its type genus is *Paxillus*, which contains 35 species. This family contains a mixture of fungi with gilled or pored fruit-bodies.

Paxillus involutus

Protogastraceae – consists of 1 genus with 1 species, *Protogaster rhizophilus.*

Rhizopogonaceae – consists of 3 genera with 219 described species. Its type genus is *Rhizopogon,* which contains 217 species.

Sclerodermataceae – consists of 9 genera with 76 described species. Its type genus is *Scleroderma*, which contains 55 species. Another well known genus in this family is *Pisolithus.* The majority of species in this family are puffballs.

Scleroderma albidum

Sclerogastraceae – consists of 1 genus, *Sclerogaster*, with 13 described species.

Serpulaceae – consists of 3 genera with 24 described species. Its type genus is *Serpula*, which contains 11 species. The species in this family are wood rotters (causing brown rot) and contain the aggressive house-infecting dry rot fungus *Serpula lacrymans*.

Suillus luteus

Suillaceae – consists of 6 genera with 118 described species. Its type genus is *Suillus*, which contains 98 species.

Tapinellaceae – consists of 3 genera with 8 described species. Its type genus is *Tapinella*, which contains 3 species.

References

Binder M and Hibbett DS (2006) "Molecular systematics and biological diversification of Boletales." *Mycologia* **Vol. 98(6), pp. 971–981**

Binder M, Larsson K-H, Matheny PB and Hibbett DS (2010) "Amylocorticiales ord. nov. and Jaapiales ord. nov.: Early diverging clades of Agaricomycetidae dominated by corticioid forms." *Mycologia* **Vol. 102(4), pp. 865–880**

Kirk PM, Cannon PF, Minter DW and Stalpers JA (2008). *Ainsworth and Bisby's dictionary of the Fungi.* (10th ed.) CAB International: Wallingford (UK).

Fam. Amylocorticiaceae

Podoserpula pusio

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Amylocorticiaceae

Podoserpula pusio

Craterellus pusio *Craterellus multiplex*

Biology

Saprotrophic basidiomycete; solitary, in small groups, or caespitose on well rotted wood, or on the ground near rotting stumps, or on a dense layer of decaying leaf litter, in native forests and plantations, including pines.

Fruit-body Description

Up to 100 mm or more high, consisting of a vertical stem, which is usually simple, but on rare occasions branched, bearing up to 8 or more pilei, decreasing in size towards the apex, attached to the stem via a short stipe up to 5 mm long. **Pilei** up to 30 mm across, variable in shape, circular, reniform (kidney-shaped) to spathulate (spoon-shaped), stem through the centre, margin lobed and wavy; upper surface smooth, dry, suede-like, yellowish to orange-brown; lower surface (hymenium), consists of a complex system of folds, corrugations, and nodules; these features may sometimes be inconspicuous; colour pinkish orange.
Spore Print White

Microscopic Features

Basidiospores 3.5–4.5 × 3–3.5 μm, ellipsoidal to subglobose, smooth, slightly thick-walled. Basidia four-spored, 24–36 × 5–6 μm, elongate clavate. Clamp connections present.

Comments

Podoserpula pusio is commonly known as the Pagoda Fungus, because its unusual multi-tiered structure resembles a pagoda, making this species unmistakable in the field. Fruit-bodies can be found on well-rotted wood, decaying vegetable matter or in soil close to rotting wood.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 326 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 282 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 177 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 61 [D CP]**

Reid DA (1963) "Fungi venezuelani: VI (New or Interesting Records of Australasian Basidiomycetes: IV). *Podoserpula* Reid: A New Genus Based on *Craterellus pusio* Berk. (*C. multiplex* Cooke & Massee)". *Kew Bulletin* **Vol. 16(3), pp. 437–445 [D I]**

Young AM (2005) *A field guide to the fungi of Australia*. University of New South Wales Press: Sydney. **p. 97** **[D I]**

Fam. Boletaceae

Austroboletus lacunosus

© Jurrie Hubregtse

© Virgil Hubregtse

Fam. Boletaceae

Austroboletus lacunosus

Austroboletus cookei

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground in eucalypt forests.

Fruit-body Description

Pileus (Cap) Diameter to 150 mm or more; initially roundish then convex; surface dry, felty, suede-like; colour varies from yellowish brown to dark brown; usually with some tissue hanging from the rim (appendiculate margin). **Pore Surface** surface soft, brownish pink changing to ochraceous as spores mature. **Pores** up to 1 mm across, mostly round, not angular. **Tubes** broadly adnexed, up to 20 mm long. **Stipe (Stem)** Central; generally up to 160 mm long and 25 mm thick; tall, slender when mature; surface dry, covered in a coarse network of deep ridged pits (lacunose); colour pale ochre. **Spore Print** Pale brown

Microscopic Features

Basidiospores 14.5–16.5 × 7.5–8.5 μm, broadly fusiform, ellipsoidal, ornamented, warty, mainly around the centre. Basidia four-spored.

Comments

This species is readily recognised by its large size, deeply reticulated stipe and brown suede-like pileus. In Western Australia there is a related species *Austroboletus occidentalis*, which looks very similar.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 187 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 63 [CP]**

Watling R and Gregory NM (1986) "Observations on the Boletes of the Cooloola Sandmass, Queensland and Notes on Their Distribution in Australia". *Proceedings of the Royal Society of Queensland* **Vol. 97, pp. 97–128 [D]**

Fam. Boletaceae

Boletellus emodensis

© Arthur Carew

© Arthur Carew

Fam. Boletaceae

Boletellus emodensis

Biology

Mycorrhizal? Most likely a saprotrophic basidiomycete; generally solitary or in small groups, amongst leaf litter or on decaying wood, in eucalypt or mixed forests.

Fruit-body Description

Pileus (Cap) Diameter to 100 mm or more; hemispherical to convex; margin with membranous veil fragments (the veil initially covers the pore surface); surface covered with pale brown, coarse, shaggy, pyramidal scales; colour red or brown. **Flesh** pale, turns blue when bruised. **Pore Surface** yellow to old-gold; turns blue-green on bruising. **Pores** circular; 1–2 per mm. **Tubes** greenish yellow, depressed around the stipe. **Stipe (Stem)** Central; generally up to 150 mm long and 20 mm thick; surface fibrillose, dry; colour uniformly pale brown, may have reddish tints. **Spore Print** Brown

Microscopic Features

Basidiospores 16–21 × 6.5–10 μm, elongate-fusoid (tapering at both ends), with longitudinal furrows and minute cross-striations. Basidia four-spored, 24–25 × 10–12 μm, clavate.

Comments

Boletellus emodensis is widespread; some of the countries it has been found in are Vietnam, Borneo, Malaya and Singapore. Most boletes are mycorrhizal, but to date no mycorrhizal partner has been identified, therefore this species is assumed to be saprotrophic. There are a number of other species that look similar to *B. emodensis* but none of these has minute cross-striations on the spores.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 188 [D CP]**

Watling R and Gregory NM (1986) "Observations on the Boletes of the Cooloola Sandmass, Queensland and Notes on Their Distribution in Australia". *Proceedings of the Royal Society of Queensland* **Vol. 97, pp. 97–128 [D]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 187 [D I]**

Fam. Boletaceae

Boletellus obscurecoccineus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Boletaceae

Boletellus obscurecoccineus

Biology

Mycorrhizal? Most likely a saprotrophic basidiomycete; generally solitary amongst leaf litter in eucalypt or mixed forests.

Fruit-body Description

Pileus (Cap) Diameter to 70 mm or more; initially hemispherical then expanding to broadly convex; surface smooth or suede-like to the touch; colour rose-red to red. **Pore Surface** lemon yellow to yellow, dulling as spores mature; tubes and pores have a soft consistency. **Pores** angular with 5–6 sides; up to 1.5 mm wide. **Tubes** lemon yellow throughout, do not change colour when bruised. **Flesh** pale yellowish in pileus, yellow in stipe apex, becoming paler towards the base. **Stipe (Stem)** Central; up to 95 mm long and up to 20 mm thick; yellow at the apex, becoming red to magenta towards the base, covered with a scattering of pale scales. **Spore Print** Dull brown

Microscopic Features

Basidiospores 15–19 × 6–7 μm, elongate-subfusoid (somewhat spindle-shaped), with longitudinal furrows, not cross-striations. Basidia four-spored, 41–53 × 10–15 μm, clavate.

Comments

Boletellus obscurecoccineus is readily recognised by its smooth red pileus, yellow pores, and pale scales on its stipe. Most boletes are mycorrhizal, but to date no mycorrhizal partner has been identified, therefore this species is assumed to be saprotrophic. This species is widespread throughout Australia. It was originally found in Java, and is also known in Africa, Borneo, New Guinea and Japan. Phylogenetic analysis performed by Halling *et al.* (2015) showed that Australian specimens of *B. obscurecoccineus* form a well defined clade, but unfortunately the authors did not have access to the type species material from Java to make a comparison.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 304 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 188 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 154 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 62 [D CP]**

Halling RE, Fechner N, Nuhn M, Osmundson T, Soytong K, Arora D, Binder M and Hibbett D (2015) "Evolutionary relationships of *Heimioporus* and *Boletellus* (Boletales), with an emphasis on Australian taxa including new species and new combinations in *Aureoboletus*, *Hemileccinum* and *Xerocomus*". *Australian Systematic Botany* **Vol. 28, pp. 1–22**

Watling R and Gregory NM (1986) "Observations on the Boletes of the Cooloola Sandmass, Queensland and Notes on Their Distribution in Australia". *Proceedings of the Royal Society of Queensland* **Vol. 97, pp. 97–128** **[D]**

Fam. Boletaceae

Chalciporus piperatus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Boletaceae

Chalciporus piperatus

Boletus piperatus

Biology

Mycorrhizal basidiomycete; solitary to gregarious on the ground, mainly in association with conifers.

Fruit-body Description

Pileus (Cap) Diameter to 50 mm, rarely up to 100 mm; initially convex, becoming broadly convex; surface at first slightly viscid then becoming dry, smooth; colour can vary from yellow-brown to reddish brown. **Pore Surface** yellow-brown to reddish brown, becoming coppery as spores mature; surface turns brown when bruised. **Pores** angular, largish 1–2 per mm, pores often wider near the stipe. **Tubes** decurrent or subdecurrent, up to 10 mm long. **Stipe (Stem)** Central; generally up to 80 mm long and 15 mm thick; smooth, dry, similar colour to pileus; has yellow mycelium at the base. **Spore Print** Brown to dull cinnamon

Microscopic Features

Basidiospores 8–11 × 4–5 μm, spindle-shaped to ellipsoidal, smooth.

Comments

This small bolete is readily recognised by its small size and yellow-brown coloration. It is an introduced species from the northern hemisphere. Although normally mycorrhizal with conifers, it has been found to form an association with Myrtle Beech *Nothofagus cunninghamii*, and thus may threaten existing native mycorrhizal fungi.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd edn. Ten Speed Press: Berkeley, CA. **p. 517 [D P]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 190 [D CP]**

Læssøe T (1998) *Mushrooms.* Dorling Kindersley: London. **p. 185 [D CP]**

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 279 [D CP]**

Fam. Boletaceae

Fistulinella mollis

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Boletaceae

Fistulinella mollis

Biology

Mycorrhizal? (the mycorrhizal status of this bolete has not been confirmed) basidiomycete; generally solitary on the ground amongst leaf litter, or on rotting wood, in eucalypt forests.

Fruit-body Description

Pileus (Cap) Diameter to 80 mm or more; initially hemispherical then expanding to broadly convex; surface smooth, viscid, shiny, sometimes pitted due to soft consistency of the flesh; colour yellowish brown to reddish brown. **Pore Surface** pinkish with a soft texture, and with a deep sulcus (ditch) around the stipe. **Pores** up to 1 mm diameter; irregular. **Tubes** up to 25 mm deep. **Stipe (Stem)** Central; up to 80 mm long and up to 12 mm thick; relatively slender; surface smooth, may have viscid patches; colour whitish, with brownish tints, particularly towards the base. Basal mycelium white and conspicuous. **Spore Print** Brown

Microscopic Features

Basidiospores 12–18 × 4–5 μm, elongate-subfusoid (somewhat spindle-shaped), smooth. Basidia four-spored, 32–40 × 9–12 μm, clavate. Clamp connections absent in all tissue.

Comments

The marshmallow-like texture of the flesh of this bolete makes it readily identifiable in the field. The fruit-bodies tend to decay quickly because they are readily attacked by maggots and other fungi.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 306 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 191 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 222 [D I]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 64 [CP]**

Fam. Boletaceae

Gymnogaster boletoides

© Paul George

© Paul George

Fam. Boletaceae

Gymnogaster boletoides

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground (epigeous) amongst litter in wet sclerophyll forests dominated by Myrtaceae such as eucalypts.

Fruit-body Description

Stipitate fruit-body, up to 35 mm high, 50 mm across, ovoid, subglobose, with a pileal disc on top; most of the fruit-body consists of the fertile portion (hymenophore). **Pileus (Head)** consisting of a small disc, up to 10 mm across, depressed; surface dry, matt; colour dark brown to reddish-brown. **Hymenophore (fertile region)** fully exposed; surface consisting of small irregular labyrinthine chambers tending to radiate out from the columella (internal stipe extension); colour pale when young, becoming lemon-yellow to olive-yellow. **Stipe (Stem)** cylindrical, central, tapered towards base, generally 5–15 × 3–8 mm; surface slightly grooved, minutely pruinose; colour yellow at apex, then red, becoming dark red towards the base. **Context (Flesh)** fleshy, firm, becoming softer with age; when bruised or cut, fertile region of the fruit-body immediately stains greenish-blue, eventually fading to greyish brown. **Spore Print** Pale brown

Microscopic Features

Basidiospores 11–13 × 7–8 μm, almond-shaped (amygdaliform) to lemon-shaped (citriform), smooth, with a pronounced apiculus. Basidia mostly four-spored but also one- or two-spored, 22–44 × 9–14 μm, cylindrical-clavate to clavate. Clamp connections absent.

Comments

Gymnogaster boletoides is readily recognised by its distinctive subglobose fruit-body, up to 35 mm high and 50 mm across, consisting largely of a bright yellowish fertile section with irregularly shaped chambers, a small reddish brown pileal disc on the apex, and a small reddish stipe below. All parts of the fertile region of the fruit-body stain greenish-blue immediately when bruised or cut. *G. boletoides* seems to be uncommon. It is a unique Australian species, found along the east coast of Australia from Queensland to Victoria.

References

Cribb JW (1956) "The gasteromycetes of Queensland – II. Secotiaceae". *Papers from the Department of Botany, University of Queensland* **Vol. 3(13), pp. 107–111** [D]

Gelardi M, Fechner N, Halling RE, Costanzo F (2017) "*Gymnogaster boletoides* J.W. Cribb (Boletaceae, Boletales), a striking Australian secotioid bolete". *Austrobaileya* **Vol. 10(1), pp. 121–129** **[D CP]**

Halling RE, Nuhn M, Osmundson T, Fechner N, Trappe JM, Soytong K, Arora D, Hibbett DS, Binder M (2012) "Affinities of the *Boletus chromapes* group to *Royoungia* and the description of two new genera, *Harrya* and *Australopilus*". *Australian Systematic Botany* **Vol. 25, pp. 418–431**

Fam. Boletaceae

Phylloporus rhodoxanthus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Boletaceae

Phylloporus rhodoxanthus

Biology

Mycorrhizal basidiomycete; generally solitary, scattered, or in small groups on the ground; in Australia usually grows in association with eucalypts.

Fruit-body Description

Pileus (Cap) Diameter to 120 mm or more; initially convex, becoming broadly convex, finally plane, often with a central depression, or with an uplifted margin; surface dry, minutely felty to nearly smooth; colour variable, ranging from reddish brown to yellowish. **Chemical test** application of ammonia solution produces a blue colour reaction. **Lamellae (Gills)** Attachment adnate to decurrent; distant or nearly so; thick, sometimes forking, sometimes with cross-veins; colour bright yellow to ochre, when bruised slowly turning green or bluish. **Stipe (Stem)** Central, sometimes eccentric; generally up to 75 mm long and 25 mm thick; usually stout, attenuated downwards; surface smooth, but with fine scales towards the base; colour yellow, sometimes with a reddish tint; basal mycelium yellow. **Spore Print** Brown

Microscopic Features

Basidiospores 10–16 × 4.5–6.5 μm, narrowly ellipsoidal to spindle-shaped, smooth. Basidia four-spored, 40–58 × 8–13 μm, clavate. Clamp connections absent.

Comments

Phylloporus rhodoxanthus is commonly known as a gilled bolete. Chemical, morphological and DNA analysis definitely places this species amongst the boletes (Kretzer and Bruns 1999). It can be recognised by its robust stature, felty brown to reddish brown pileus, and yellow lamellae that stain green or bluish when bruised. This is a relatively small genus; its species are found in tropical forests worldwide. The work done by Neves *et al.* (2012) did not include any Australian specimens of *P. rhodoxanthus*, which would have been useful; results from their analysis tend to suggest that more species will need to be analysed in order to gain a better understanding of this genus.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 480 [D P]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 185 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 218 [D CI‘]**

Kretzer AM and Bruns TD (1999) “Use of atp6 in Fungal Phylogenetics: An Example from the Boletes”. *Molecular Phylogenetics and Evolution* **Vol. 13(3), pp. 483–492**

Neves MA, Binder M, Halling R, Hibbett D and Soytong K (2012) “The phylogeny of selected *Phylloporus* species from NUC-LSU and ITS sequences, and descriptions of new species from the Old World”. *Fungal Diversity* **Vol. 55(1), pp. 109–123**

Fam. Boletinellaceae

Phlebopus marginatus

© Virgil Hubregtse

© Jurrie Hubregtse

Fam. Boletinellaceae

Phlebopus marginatus

Phlebopus portentosus *Phaeogyroporus portentosus*
Boletus marginatus

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground in association with eucalypts.

Fruit-body Description

Pileus (Cap) Diameter to 600 mm or more; initially convex, expanding to broadly convex or almost plane, sometimes with the centre a little depressed, at maturity margin often undulate or irregular; surface dry, felty, suede-like, finely warty, with age tending to crack; colour varies from yellowish brown to brown, often with greenish tints. **Pore Surface** soft, yellow, or orange yellow, often with a with greenish tinge, becoming more brownish as spores mature, bruising to brown or a greenish black; more or less adnexed, with a sulcus (ditch) around the stipe. **Pores** up to 0.75 mm across, moderately large, mostly round, largely irregular. **Tubes** up to 30 mm long. **Stipe (Stem)** Central, sometimes eccentric; generally up to 200 mm long and 150 mm thick; very stout, swollen and bulbous towards the base; surface dry, felty, smooth; colour dingy yellow-brown to dingy olive-brown, darker towards the base. **Spore Print** Brown to olive-brown

Microscopic Features

Basidiospores 7.5–10 × 5–7 μm, ellipsoidal, smooth, slightly thick-walled. Basidia four-spored, 18–25 × 4–6 μm, clavate. Clamp connections present.

Comments

Phlebopus marginatus is Australia's largest terrestrial fungus. With its brownish pileus and yellowish pored surface, it can be readily identified by its huge size alone. This bolete is also found in New Zealand, Indonesia, and Sri Lanka. Some interesting phylogenetic analyses done by Binder and Bresinsky (2002) and Binder and Hibbett (2006) show that *Phlebopus* species are more closely related to *Scleroderma* species than to other boletes.

References

Binder M and Bresinsky A (2002) "Derivation of a polymorphic lineage of Gasteromycetes from boletoid ancestors". *Mycologia* **Vol. 94 (1), pp. 85–98**

Binder M and Hibbett DS (2006) "Molecular systematics and biological diversification of Boletales". *Mycologia* **Vol. 98 (6), pp. 971–981**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 192** **[D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 236** **[D I]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 61** **[CP]**

McNabb RFR (1968) "The Boletaceae of New Zealand". *New Zealand Journal of Botany* **Vol. 6(2), pp. 137–176** **[D I]** (as *Phaeogyroporus portentosus*)

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 188** **[D I]**

Fam. Calostomataceae

Calostoma fuscum

© Arthur Carew

© Arthur Carew

Fam. Calostomataceae

Calostoma fuscum

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground amongst leaf litter in wet eucalypt forests.

Fruit-body Description

The fruit-body consists of a puffball supported on a thick stipe; total height up to 100 mm. **Puffball** up to 25 mm diameter, globose when young, may flatten with age; consists of three layers. **Outer Layer** (exoperidium) consists of a protective hemispherical cap, dark brown, warty on the outside and smooth on the inside, with reddish imprint of the starfish-shaped peristome (decoration around the pore through which the spores are ejected). This protective cap is disposed of in one piece as the fruit-body matures. **Intermediate Layer** (mesoperidium) smooth, dark brown, with a starfish-shaped peristome on top, which is initially red and may fade with age. **Inner Layer** (endoperidium or spore sac) is the sac that contains the gleba (spore mass), and is attached to the peristome. **Stipe** central, up to 20 mm thick; brown, consisting of intertwined strands of gelatinous mycelium. **Spore Print** White

Microscopic Features

Basidiospores 10–13 × 6.5–8.5 μm, ellipsoidal, finely pitted.

Comments

This extraordinary puffball is easily identified by its tall stipe of intertwined strands of gelatinous mycelium, white spore mass and the red starfish-shaped decoration encircling the pore at the apex of the puffball. Phylogenetic analyses performed in the 2000s by Binder and Bresinsky (2002) show that this puffball is evolutionarily related to the Bolete mushrooms.

References

Binder M and Bresinsky A (2002) "Derivation of a polymorphic lineage of Gasteromycetes from boletoid ancestors". *Mycologia* **Vol. 94 (1), pp. 85–98**

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 112 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 225 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 195 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 90 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 102 [CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 203 [D I]**

Fam. Calostomataceae

Calostoma rodwayi

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Calostomataceae

Calostoma rodwayi

Biology

Mycorrhizal basidiomycete; occurs in small groups on the ground in leaf litter or amongst bryophytes in Myrtle Beech *Nothofagus cunninghamii* forest.

Fruit-body Description

The fruit-body consists of a puffball supported on a thick stipe; total height up to 60 mm. **Puffball** up to 20 mm diameter, globose when young, may flatten with age; consists of three layers. **Outer Layer** (exoperidium) flakes off in patches as the fruit-body matures; a lobed patch attached to the starfish-shaped peristome (decoration around the pore through which the spores are ejected) is the last to fall off. **Intermediate Layer** (mesoperidium) surface covered in blister-like warts, dark brown, with a red starfish-shaped peristome on top. **Inner Layer** (endoperidium or spore sac) is the sac that contains the gleba (spore mass) and is attached to the peristome. **Stipe** central, up to 40 mm tall and up to 20 mm thick; brown, consisting of intertwined strands of gelatinous mycelium. **Spore Print** White

Microscopic Features

Basidiospores 10–18 $\times$ 8–15 μm, ellipsoidal to subglobose, finely pitted.

Comments

Calostoma rodwayi can be readily identified by its short stature. It is found only in association with *Nothofagus cunninghamii* and its puffball is covered in warty scales.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 225 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 91 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 102 [CP]**

Fam. Diplocystidiaceae

Astraeus hygrometricus

© Arthur Carew

© Jurrie Hubregtse

Fam. Diplocystidiaceae

Astraeus hygrometricus

Biology

Mycorrhizal basidiomycete; found on the ground in parks or gardens near exotic trees, either solitary or in small groups.

Fruit-body Description

Initially egg-shaped, diameter up to 30 mm; splitting to become star-shaped. **Rays** (exoperidium) 5–12 acute rays, up to 1 mm thick and up to 80 mm across; when moist will expand or recurve, and on drying will roll inwards; inner surface whitish, becoming smoky grey to cigar brown; at maturity surface extensively cracked. **Spore sac** (endoperidium) up to 30 mm across; sessile (without a stalk), thin, papery, felty; pale buff to to smoky grey; opening by an irregular or poorly defined apical pore. **Spore Print** Chocolate brown

Microscopic Features

Basidiospores 8.5–16 μm, including ornamentation, globose, densely ornamented.

Comments

The distribution of *Astraeus hygrometricus* seems to be worldwide. It usually occurs on poor soils in coniferous or mixed woods. It is readily identified by its hygroscopic trait.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd edn. Ten Speed Press: Berkeley, CA. **p. 705 [D P]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 86 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 103 [CP]**

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 336 [D CP]**

Phosri C, Watling R, Martin MP and Whalley AJS (2004) "The genus *Astraeus* in Thailand". *Mycotaxon* **Vol. 89(2), pp. 453–463 [D P]**

Fam. Paxillaceae

Paxillus cuprinus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Paxillaceae

Paxillus cuprinus

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground in sunny locations, in association with introduced trees belonging to the Betulaceae, such as *Betula* (Birch), *Alnus* (Alder), *Corylus* (Hazel), *Ostrya* (Hop-hornbeam), and occasionally *Pinus* (pine).

Fruit-body Description

Pileus (Cap) Diameter 50 to 120 mm; at first convex with a strongly inrolled margin, less so with age, becoming plane and centrally depressed; surface slightly viscid when moist, slightly felty, glabrous and shiny when dry or with age, often areolate or cracked in dry exposed locations; colour grey-brown, soon becoming ochraceous brown then coppery brown, darker towards the centre. **Chemical test** pileal surface turns reddish brown to purplish brown when 50% ammonia solution is applied. **Lamellae (Gills)** Attachment decurrent; often anastomosing and forked towards the stipe, close; colour whitish to yellow-brown when young, maturing rusty brown; staining red-brown when bruised, turning brown-black several minutes after bruising. **Stipe (Stem)** Central; generally 24 to 50 mm long and 5 to 25 mm thick; normally shorter than the diameter of the pileus, cylindrical or slightly tapering downwards; surface dry, longitudinally fibrillose; colour greyish yellow to ochraceous brown; staining red-brown when bruised, turning brown-black several minutes after bruising. **Spore Print** Brown

Microscopic Features

Basidiospores 7–9.5 × 4.5–6 μm, ovoid to amygdaloid (almond-shaped), often with an apical constriction, smooth. Basidia four-spored, 27–46 × 8–10 μm, cylindro-clavate. Clamp connections present.

Comments

Paxillus curpinus it is not native to Australia, and was almost certainly introduced. In the field its identifying features are its association with exotic trees belonging to the Betulaceae in parks and gardens, its ochraceous to coppery brown colour, inrolled margin, and decurrent lamellae. This species belongs to the *Paxillus involutus* complex of species. The phylogenetic study by Jargeat *et al.* (2014) establishes species boundaries for the European members of the *P. involutus* complex and describes habitat preferences. This information can assist in the identification of the 4 species (*P. involutus*, *P. cuprinus*, *P. ammoniavirescens*, *P. obscuriporus*) which constitute this complex. The species that are most easily identified are *P. ammoniavirescens*, which produces a striking emerald green reaction on the pileus from a drop of ammonia solution, and *P. obscuriporus*, which can be identified by the heavily built fruit-body, short stout stipe and robust inrolled margin – often up to 25 mm wide. Separating *P. involutus* and *P. cuprinus* is a little more challenging. *P. involutus* has a broader host range, which includes conifers, and prefers dark, shaded habitat, whereas *P. cuprinus* prefers sunny locations with *Betulaceae*, and its spores predominantly have a constricted apex.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 183 [D CP]** (as *Paxillus involutus*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 36 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 202 [D CP]** (as *Paxillus involutus*)

Henrici A and Kibby G (2014) "*Paxillus* – an end to confusion?". *Field Mycology* **Vol. 15(4), pp. 121–127 [D CP]**

Jargeat P, Chaumeton J-P, Navaud O, Vizzini A, Gryta H (2014) "The *Paxillus involutus* (Boletales, Paxillaceae) complex in Europe: Genetic diversity and morphological description of the new species *Paxillus cuprinus*, typification of *P. involutus* s.s., and synthesis of species boundaries". *Fungal Biology* **Vol. 118, pp. 12–31 [D CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 169 [D I]** (as *Paxillus involutus*)

Fam. Sclerodermataceae

Pisolithus albus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Sclerodermataceae

Pisolithus albus

Biology

Mycorrhizal basidiomycete; solitary or gregarious on the ground amongst leaf litter in or near sclerophyll forests, or on disturbed soil, always in association with *Eucalyptus* spp.

Fruit-body Description

Up to 80 mm wide and 200 mm or more high; at first globose, becoming pyriform or clavate, when mature eroding from the top down, eventually to a sterile base; **Peridium** dry, smooth, thin, membranous outer skin, at first white, then dirty off-white to brownish, sometimes various shades of brown to dark brown, when mature splits and crumbles from the top; **Gleba** spores develop within peridioles (cell-like structures) which at maturity can be up to 4 mm across; at first they are white, then turn yellow and finally ochraceous; the peridioles are encased in a dark brown to blackish gelatinous substance, which becomes brittle and crumbles away at maturity, exposing the spore mass. **Spore Print** Ochraceous brown to olive-brown

Microscopic Features

Basidiospores 8.5–10.5 × 8.5–10.5 μm, (including spines), globose, densely spiny (echinate). Basidia not observed. Clamp connections present.

Comments

Identifying *Pisolithus* species is difficult, because their morphologies are similar. The DNA work done by Anderson *et al.* (2001) indicates that there are only two common species of *Pisolithus* in Australia. The more common of these is *P. albus*; the other is *P. marmoratus.* Usually they can be separated by the colour of their spore mass. The spore mass of *P. albus* is usually ochraceous to olive-brown, whereas the spore mass of *P. marmoratus* is usually brown to dark brown.

References

Anderson IC, Chambers SM and Cairney JWG (1998) "Molecular determination of genetic variation in *Pisolithus* isolates from a defined region in New South Wales, Australia". *New Phytologist* **Vol. 138, pp. 151–162** (as *P. tinctorius*)

Anderson IC, Chambers SM and Cairney JWG (2001) "ITS-RFLP and ITS sequence diversity in *Pisolithus* from central and eastern Australian sclerophyll forests". *Mycological Research* **Vol. 105(11), pp. 1304–1312**

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 122 [D CI]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 212** **[D I]**

Fam. Sclerodermataceae

Scleroderma albidum

© Virgil Hubregtse

© Virgil Hubregtse

Fam. Sclerodermataceae

Scleroderma albidum

Scleroderma radicans *Scleroderma flavidum* forma *macrosporum*
Scleroderma tuberoideum

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground, occasionally partially buried amongst leaf litter; often associated with *Eucalyptus* spp.

Fruit-body Description

Up to 50 mm across; subglobose (nearly round), often flattened on top, tapering to a whitish stem-like base, occasionally sessile; **Peridium** (external skin) 1.5–2.5 mm or more thick, firm, covered with numerous ochraceous scales which may fall off with age, leaving a smooth or cracked skin; spores are ejected through an irregular or star-like rupture at the apex when the skin folds backwards; colour cream to yellowish ochraceous, almost whitish towards the base. **Gleba** at first firm and white, then umber and powdery. **Spore Print** Dull dark brown

Microscopic Features

Basidiospores 12.5–14.5 (-16) μm in diameter (including the ornamentation), globose, covered in spines or warts, never with ridges. Clamp connections absent.

Comments

For a preliminary identification of *Scleroderma albidum* the fruit-body would be up to 50 mm across, pale yellowish or ochraceous with or without brown scales, usually tapering to a smallish irregular-shaped whitish stem-like base, in some specimens the base can be almost absent; the outer skin (peridium) must be more than 1.5 mm thick and leathery; at maturity a star-like opening usually appears as the peridium folds back, revealing the umber-coloured spore mass. For positive identification, microscopic characteristics such as spore size and ornamentation type need to be taken into account. There are about 8 described *Scleroderma* species for Australia. By using the key produced by Sims *et al.* (1995) it is possible to identify most of these. Some interesting DNA work done by Binder and Bresinsky (2002) and Binder and Hibbett (2006) shows that *Scleroderma* and boletes are closely related.

References

Binder M and Bresinsky A (2002) "Derivation of a polymorphic lineage of Gasteromycetes from boletoid ancestors". *Mycologia* **Vol. 94 (1), pp. 85–98**

Binder M and Hibbett DS (2006) “Molecular systematics and biological diversification of Boletales”. *Mycologia* **Vol. 98 (6), pp. 971–981**

Cunningham GH (1944) *The Gasteromycetes of Australia and New Zealand.* (reprinted in 1979) *Bibliotheca Mycologica*, **Band 67, pp. 120–121 [D I]** (as *Scleroderma flavidum* forma *macrosporum* and *Scleroderma radicans*)

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 561 [D I]**

Sims KP, Watling R and Jeffries P (1995) “A revised key to the genus *Scleroderma*”. *Mycotaxon* **Vol. 56, pp. 403–420**

Fam. Sclerodermataceae

Scleroderma cepa

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Sclerodermataceae

Scleroderma cepa

Scleroderma flavidum

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground, occasionally partially buried amongst leaf litter; often associated with *Eucalyptus* spp.

Fruit-body Description

Up to 50 mm or more across; subglobose (nearly round), often flattened on top, often lobed, firm when young, usually sessile, the base consists of a mass of rhizomorphs which occasionally form an inconspicuous stem-like base; colour pallid straw, yellow, or ochraceous, fruit-body uniformly coloured. **Peridium** (external skin) 1.5–2.5 mm or more thick, relatively smooth, tough, leathery, dehiscing by irregular rupture, with age becoming recurved and stellate. **Gleba** at first firm, dark brown, then mouse grey and powdery. **Spore Print** Mouse grey

Microscopic Features

Basidiospores 8.5–13 μm in diameter (including ornamentation), globose, densely echinulate (covered with spines), never with ridges. Basidia and cystidia not observed. Clamp connections absent.

Comments

For a preliminary identification of *Scleroderma cepa* the fruit-body would need be up to 50 mm or more across, sessile, uniformly yellowish, with the outer skin (peridium) more than 1.5 mm thick, leathery, not velvety, dehiscing by irregular rupture, becoming stellate and exposing a mouse grey spore mass. For positive identification, microscopic characteristics such as spore size and ornamentation type need to be taken into account. There are about 8 described *Scleroderma* species for Australia. By using the key produced by Sims *et al.* (1995) it is possible to identify most of these. Some interesting DNA work done by Binder and Bresinsky (2002) and Binder and Hibbett (2006) shows that *Scleroderma* and boletes are closely related.

References

Binder M and Bresinsky A (2002) "Derivation of a polymorphic lineage of Gasteromycetes from boletoid ancestors". *Mycologia* **Vol. 94 (1), pp. 85–98**

Binder M and Hibbett DS (2006) "Molecular systematics and biological diversification of Boletales". *Mycologia* **Vol. 98 (6), pp. 971–981**

Cunningham GH (1944) *The Gasteromycetes of Australia and New Zealand.* (reprinted in 1979) *Bibliotheca Mycologica*, **Band 67, p. 120** **[D I]** (as *Scleroderma flavidum*

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 557** **[D I]**

Sims KP, Watling R and Jeffries P (1995) "A revised key to the genus *Scleroderma*". *Mycotaxon* **Vol. 56, pp. 403–420**

Fam. Sclerodermataceae

Scleroderma verrucosum

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Sclerodermataceae

Scleroderma verrucosum

Lycoperdon verrucosum *Scleroderma maculatum*
Scleroderma nitidum *Scleroderma capensis*
Scleroderma tenerum

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground amongst leaf litter; often associated with *Eucalyptus* spp.

Fruit-body Description

Up to 50 mm across; subglobose (nearly round), often flattened on top, tapering to a whitish, long, thick, stem-like base with white mycelial cords; **Peridium** (external skin) thin, less than 1 mm thick, leathery, covered with numerous brownish scales which may fall off with age, leaving a smooth skin; spores are ejected through an irregularly torn opening; colour yellowish, ochraceous or umber. **Gleba** at first firm and white, then olive-brown, finally dingy grey or umber and powdery. **Spore Print** Olive-brown to dingy grey

Microscopic Features

Basidiospores 8–12 μm in diameter (including the ornamentation), globose, covered in spines or warts, never with ridges. Clamp connections absent.

Comments

Scleroderma verrucosum, like most other *Scleroderma* species, is difficult to identify in the field, and usually both macroscopic and microscopic features need to be examined before a positive identification can be made. For a preliminary identification of *Scleroderma verrucosum* the fruit-body would be up to 50 mm across, yellowish or ochraceous with brown scales, tapering to a robust irregular-shaped whitish stem-like base; the outer skin (peridium) must be less than 1 mm thick, leathery, and the opening from where the spores can escape must be an irregular tear. There are about 8 described *Scleroderma* species for Australia. By using the key produced by Sims *et al.* (1995) it is possible to identify most species. Some interesting DNA work done by Binder and Bresinsky (2002) and Binder and Hibbett (2006) shows that the *Scleroderma* and boletes are closely related.

References

Binder M and Bresinsky A (2002) "Derivation of a polymorphic lineage of Gasteromycetes from boletoid ancestors". *Mycologia* **Vol. 94 (1), pp. 85–98**

Binder M and Hibbett DS (2006) "Molecular systematics and biological diversification of Boletales". *Mycologia* **Vol. 98 (6), pp. 971–981**

Cunningham GH (1944) *The Gasteromycetes of Australia and New Zealand.* (reprinted in 1979) *Bibliotheca Mycologica*, **Band 67, p. 119 [D I]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 559 [D I]**

Læssøe T (1998) *Mushrooms.* Dorling Kindersley: London. **p. 263 [D CP]**

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 332 [D CP]**

Sims KP, Watling R and Jeffries P (1995) "A revised key to the genus *Scleroderma*". *Mycotaxon* **Vol. 56, pp. 403–420**

Fam. Serpulaceae

Austropaxillus infundibuliformis

© Jurrie Hubregtse

© Paul George

Fam. Serpulaceae

Austropaxillus infundibuliformis

Paxillus infundibuliformis

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground in eucalypt forests.

Fruit-body Description

Pileus (Cap) Diameter to 110 mm or more; centrally depressed; with age becoming deeply funnel-shaped (infundibuliform), sometimes lobed; surface dry, minutely fibrillose, chamois-like; margin inrolled; ranging in colour from yellow ochre to brown. **Lamellae (Gills)** Attachment decurrent; close, obviously forked; colour pale cream when young, maturing to yellow-brown or brown; bruising dark brown. **Stipe (Stem)** Usually central but sometimes lateral; generally up to 50 mm long and 20 mm thick; sometimes slightly swollen near the lamellae; dry, smooth, slightly velvety; similar colour to lamellae. **Spore Print** Brown

Microscopic Features

Basidiospores 10–17 × 5–7.5 μm, long ellipsoidal, smooth. Basidia four-spored. Clamp connections present, confined to the lamellae.

Comments

Austropaxillus infundibuliformis is readily recognised by its golden colour, decurrent forked lamellae and funnel shape. There is a very similar and related species, *A. muelleri*, which is usually smaller, paler, and has a pileus that is glutinous when moist.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 286 [D CI]** (as *Paxillus infundibuliformis*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 181 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 203 [D I]** (as *Paxillus infundibuliformis*)

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 62 [CP]** (as *Paxillus infundibuliformis*)

Fam. Suillaceae

Suillus granulatus

© Ivan Margitta

© Paul George

Fam. Suillaceae

Suillus granulatus

Biology

Mycorrhizal basidiomycete; solitary or in groups on the ground, always associated with introduced species of pine (*Pinus* spp.).

Fruit-body Description

Pileus (Cap) Diameter to 150 mm or more; hemispheric to conic when young, then convex to plane, sometimes slightly wavy or distorted; surface smooth, viscid to glutinous when moist, dull silky when dry; colour light brown, yellow-brown to red-brown. **Flesh** whitish to yellowish, not changing colour when cut. **Pore Surface** initially bright yellow then maturing to old gold; when immature may exude clear or milky droplets. **Pores** up to 1 mm diameter; broadly adnate; circular. **Tubes** up to 10 mm long, same colour as pores. **Stipe (Stem)** Central; up to 80 mm long and 20 mm thick; robust, more or less equal; surface smooth, usually covered with granules towards the apex; colour whitish, becoming yellowish to dingy cinnamon with age. **Spore Print** Yellowish brown

Microscopic Features

Basidiospores 8–11 × 3–5 μm, long ellipsoidal (somewhat spindle-shaped), smooth. Basidia four-spored, 20–40 × 5–9 μm, clavate. Clamp connections absent in all tissue.

Comments

In Australia, *Suillus granulatus* is always found in association with *Pinus* spp. and is readily recognised by its viscid pileus, yellowish pored surface, pale stipe, and absence of any annulus. This species was introduced into Australia, possibly to aid the growth of pines in pine plantations.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 502 [D P]**

Breitenbach J and Krãnzlin F (1991) *Fungi of Switzerland* Vol. 3: Boletes and agarics 1st part. Verlag Mykologia: Luzern, Switzerland. **p. 78 [D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 194 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 213 [D CP]**

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 292 [D CP]**

Young AM (2005) *A field guide to the fungi of Australia*. University of New South Wales Press: Sydney. **p. 190** **[D I]**

Fam. Suillaceae

Suillus luteus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Suillaceae

Suillus luteus

Biology

Mycorrhizal basidiomycete; solitary or in groups on the ground, always associated with introduced species of pine (*Pinus* spp.).

Fruit-body Description

Pileus (Cap) Diameter to 100 mm or more; hemispherical when young, convex to plane, sometimes slightly wavy or distorted, partial veil tissue often hanging from margin; surface smooth, viscid to glutinous when moist, dull silky when dry; colour yellowish brown, brown or chestnut brown. **Flesh** whitish to yellowish, not changing colour when cut. **Pore Surface** initially pale yellow then yellow, maturing to olive-yellow; when young covered with a whitish partial veil. **Pores** up to 1 mm diameter; circular; adnexed to adnate. **Tubes** up to 15 mm long; same colour as pores. **Stipe (Stem)** Central; up to 80 mm long and up to 25 mm thick; robust, more or less equal; surface smooth, usually covered with granules towards the apex; colour whitish, becoming yellowish to dingy cinnamon with age, darker brown towards the base. **Annulus** persistent, membranous, skirt-like, initially whitish, developing purple tints, but usually stained brown with spore deposit. **Spore Print** Yellowish brown

Microscopic Features

Basidiospores 7–10 × 3–4 μm, long ellipsoidal (somewhat spindle-shaped), smooth. Basidia four-spored, 18–26 × 5–7 μm, clavate. Clamp connections absent in all tissue.

Comments

Suillus luteus is recognised by its stature, its glutinous brown pileus, and its distinctive annulus. It is an introduced species found in association with pine trees (*Pinus* spp.).

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 500 [D P]**

Breitenbach J and Krãnzlin F (1991) *Fungi of Switzerland* Vol. 3: Boletes and agarics 1st part. Verlag Mykologia: Luzern, Switzerland. **p. 80 [D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 195 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 210 [D I]**

Phillips R (2006) *Mushrooms*. Macmillan: London. **p. 292** **[D CP]**

Young AM (2005) *A field guide to the fungi of Australia*. University of New South Wales Press: Sydney. **p. 191** **[D I]**

Fam. Tapinellaceae

Pseudomerulius curtisii

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Tapinellaceae

Pseudomerulius curtisii

Tapinella curtisii *Meiorganum curtisii*
Paxillus curtisii

Biology

Saprotrophic basidiomycete; solitary or scattered on decaying wood, causing brown rot.

Fruit-body Description

Pileus (Cap) Diameter 20 mm or more; roughly semicircular, margin inrolled and lobed; surface dry, rough, scurfy, with appressed fibrils; colour pale honey-yellow to yellowish brown. **Lamellae (Gills)** Radiating from area of attachment; distant, thick, irregularly corrugated or wrinkled, some are forked, anastomosing (interconnections, interveining) between lamellae; colour pale yellow to orangey yellow. **Stipe (Stem)** None (fruit-body laterally attached). **Spore Print** pale brownish yellow

Microscopic Features

Basidiospores 3.5–4 $\times$ 1.5–2 μm, oblong to short cylindric, smooth. Basidia four-spored, 15–18 $\times$ 3.5–4.5 μm, narrowly clavate. Clamp connections present.

Comments

Pseudomerulius curtisii is a relatively small bracket that usually grows on decaying logs. It is readily identified by its pale yellowish scurfy pileus and pale yellow to orangey yellow fleshy wrinkled lamellae. This species is also found in the northern hemisphere. The paper by Baldoni *et al.* (2014) shows the phylogenetic relationships of *P. curtisii*, and its close relationship to the genus *Tapinella*.

References

Baldoni DB, Coelho G, Jacques RJS, Silveira RMB, Grebenc T and Antoniolli ZI (2012) “Brown rotting fungus closely related to *Pseudomerulius curtisii* (Boletales) recorded for the first time in South America”. *Mycosphere* **Vol. 3(5), pp. 533–541** **[D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 185** **[D CP]** (as *Meiorganum curtisii*)

Gibertson RL and Hemmes DE (1997) “Notes on Hawaiian Coniophoraceae”. *Mycotaxon* **Vol. 65, pp. 427–442** **[D I]** (as *Meiorganum curtisii*)

Fam. Tapinellaceae

Tapinella panuoides

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Tapinellaceae

Tapinella panuoides

Paxillus panuoides

Biology

Saprotrophic basidiomycete; solitary, scattered or in caespitose clumps, prefers woody pine mulch or decaying wood (logs, stumps, etc.); causes brown rot.

Fruit-body Description

Pileus (Cap) Diameter 150 mm or more; fan- or mussel-shaped, planoconvex, margin inrolled and lobed; surface dry, smooth or finely hairy, with a fibrillose zone near the point of attachment; colour pale tan, yellowish brown or orangey brown. **Lamellae (Gills)** Radiating from area of attachment; close, thick, irregularly corrugated or wrinkled, some are forked, anastomosing (interconnections, interveining) between lamellae; colour yellowish to orangey. **Stipe (Stem)** Absent, or when present very rudimentary; laterally attached. **Spore Print** Brownish

Microscopic Features

Basidiospores 4.5–5.5 $\times$ 13–4 μm (mean $5.1 \pm 0.3 \times 3.6 \pm 0.2$ μm, Q=1.42 ± 0.10, n = 30), ellipsoidal, smooth, thin-walled. Basidia four-spored, 30–40 $\times$ 5–7 μm, narrowly clavate. Clamp connections present.

Comments

Tapinella panuoides is readily identified by its distinctive fan-shaped pileus, absence or near absence of a lateral stipe, and by its lamellae which usually are wrinkled, forked or connected by cross-veins. This species is also found in the northern hemisphere. The paper by Baldoni *et al.* (2012) shows the phylogenetic relationships of the genus *Tapinella*. It is closely related to *Pseudomerulius*. The family Tapinellaceae contains only three genera: *Bondarcevomyces, Pseudomerulius* and *Tapinella*.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi*. 2nd edn. Ten Speed Press: Berkeley, CA. **p. 476** **[D P]** (as *Paxillus panuoides*)

Baldoni DB, Coelho G, Jacques RJS, Silveira RMB, Grebenc T and Antoniolli ZI (2012) "Brown rotting fungus closely related to *Pseudomerulius curtisii* (Boletales) recorded for the first time in South America". *Mycosphere* **Vol. 3(5), pp. 533–541** **[D CP]**

Bougher NL and Syme K (1998) *Fungi of Southern Australia*. University of Western Australia Press: Nedlands. **p. 288** **[D CI]**

Fuhrer B (2009) *A field guide to Australian fungi*. Bloomings Books: Melbourne. **p. 185** **[D CP]**

Gibertson RL and Hemmes DE (1997) "Notes on Hawaiian Coniophoraceae". *Mycotaxon* **Vol. 65, pp. 427–442** **[D I]** (as *Meiorganum curtisii*)

Hood IA (2003) *An introduction to fungi on wood in Queensland*. School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **pp. 136–137** **[D I]** (as *Paxillus panuoides*)

2.3 Order: Cantharellales

Cantharellales is a smallish order containing 7 families, 49 genera and about 670 species ("Catalogue of Life" website http://www.catalogueoflife.org). The species in this order have diverse morphologies, including cantharelles, corals, toothed fungi, lichens, and crusts. The taxonomy of the Cantharellales is still in flux; the most recent phylogenetic analysis of the order was carried out by Veldre *et al.* (2013).

Brief descriptions of the 7 families in the order Cantharellales are given below.

Cantharellales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Order:	Cantharellales

Families
ca. 7; See text

Aphelariaceae – consists of 3 genera with 21 described species. Its type genus is *Aphelaria*, which contains 19 species. Most of the species in this family have clavarioid fruit-bodies and are terrestrial.

Botryobasidiaceae – consists of 7 genera with 100 described species. Its type genus is *Botryobasidium*, which contains 55 species. The species in this family are mainly wood- and litter-rotters with corticoid fruit-bodies that form thin web-like crusts.

Cantharellaceae – consists of 7 genera with 174 described species. Its type genus is *Cantharellus*, which contains 124 species. The fruit-bodies of species in this family have a resemblance to agarics but have smooth, wrinkled, or gill-like spore-bearing surfaces (hymenophores).


Cantharellus concinnus

Ceratobasidiaceae – consists of 10 genera with 81 described species. Its type genus is *Ceratobasidium*, which contains 20 species. Species in this family are mainly saprotrophic, occurring in the soil and producing crust-like fruit-bodies on dead stems and leaf-litter.

Clavulinaceae – consists of 4 genera with 96 described species. Its type genus is *Clavulina*, which contains 72 species. This family contains a diverse group of fungi; those in *Clavulina* have club- and coral-like fruit-bodies, while those in *Multiclavula* are lichens (Lawrey JD *et al.* 2007); and there are other genera that contain crust-like fruit-bodies.

Clavulina tasmanica

Hydnaceae – consists of 14 genera with 129 described species. Its type genus is *Hydnum*, which contains 30 species. The majority of fruit-bodies in this family have a stipe and pileus, and a distinctive spore-bearing surface that consists of tooth-like spines.

Hydnum aff. *repandum*

Tulasnellaceae – consists of 4 genera with 63 described species. Its type genus is *Tulasnella*, which contains 52 species. The species in this family typically produce jelly-like patches on the underside of fallen wood or in leaf litter.

References

Lawrey JD, Binder M, Diederich P, Molina MC, Sikaroodi M and Ertz D (2007) "Phylogenetic diversity of lichen-associated homobasidiomycetes". *Molecular Phylogenetics and Evolution* **Vol. 44, pp. 778–789**

Veldre V, Abarenkov K, Bahram M, Martos F, Selosse M-A, Tamm H, Kõljalg U and Tedersoo L (2013) "Evolution of nutritional modes of Ceratobasidiaceae (Cantharellales, Basidiomycota) as revealed from publicly available ITS sequences". *Fungal Ecology* **Vol. 6, pp. 256–268**

Fam. Cantharellaceae

Cantharellus concinnus

Fam. Cantharellaceae

Cantharellus concinnus

Cantharellus cibarius var. *australiensis* *Cantharellus cinnabarinus* var. *australiensis*

Biology

Saprotrophic (or mycorrhizal?) basidiomycete (most likely mycorrhizal as some other species in the genus such as *Cantharellus cinnabarinus* are known to be mycorrhizal); rarely solitary, usually in gregarious groups on the ground in deep litter in mixed eucalypt forest.

Fruit-body Description

Pileus (Cap) Diameter to 55 mm or more; initially knob-like, becoming flattened, then funnel-shaped or infundibuliform, margin often irregular and scalloped; surface smooth, dry; colour apricot to pinkish apricot or orange to pinkish orange. **Lamellae (Gills)** Attachment decurrent, resembling folds; moderately distant, often forked, paler than pileus. **Stipe (Stem)** Central; generally up to 40 mm long, tapered towards the base, same colour as pileus. **Spore Print** White

Microscopic Features

Basidiospores 6–9 × 5–7 μm, ellipsoidal to broadly ovoid, smooth. Clamp connections present.

Comments

This species is readily recognised by its bright apricot colour, funnel shape and decurrent lamellae. Although it is easily recognised, there is still debate amongst some mycologists about its identity, which could be resolved using molecular DNA analysis. In Australia at present there are 3 recognised species in the genus *Cantharellus* (Eyssartier and Buyck 2001). It is most likely that in there are still a number of undescribed species; this could be resolved by more field studies.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 312 [D CI]**

Eyssartier G and Buyck B (2001) "Notes on the Australian Species Described in the Genus *Cantharellus* (Basidiomycetes)". *Australian Systematic Botany* **Vol. 14, pp. 587–598 [D I]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 35 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 158 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 28 [D CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 95 [D I]**

Fam. Cantharellaceae

Craterellus australis

© Paul George

© Virgil Hubregtse

Fam. Cantharellaceae

Craterellus australis

Cantharellus cinereus var. *australis*

Biology

Most likely a mycorrhizal basidiomycete; solitary or in scattered groups or caespitose clusters on the ground in damp areas amongst mosses, or in leaf litter.

Fruit-body Description

Pileus (Cap) Diameter to 40 mm or more; when young convex, becoming trumpet- or deep funnel-shaped, opening into the hollow stipe, margin often splitting; surface dry, rough, may have coarse hairs; colour blackish or blackish brown, margin often pale. **Lamellae (Gills)** Attachment decurrent; lamellae consist of shallow ridges, markedly forked, whitish or greyish, sometimes with purplish tints. **Stipe (Stem)** Central; generally up to 35 mm long and 6 mm thick; hollow; surface dry, smooth, matt; colour blackish. **Spore Print** White

Microscopic Features

Basidiospores 7–10 × 5–7 μm, ellipsoidal to subglobose, smooth. Basidia four-spored, 56–72 × 7–11 μm, long cylindrical with robust sterigmata up to 8 μm long. Clamp connections absent.

Comments

Craterellus australis is recognised by the blackish to blackish-brown funnel-shaped fruit-body, with lamellae consisting of whitish ridges that are often forked, and with a distinct hollow blackish stipe. It can readily be separated from *C. cornucopioides* which is more trumpet-shaped, is usually brownish, and has no lamellae-like ridges and no distinct stipe.

References

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 24 [D I]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 66 [CP]**

Fam. Cantharellaceae

Craterellus cornucopioides

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Cantharellaceae

Craterellus cornucopioides

Biology

Most likely a mycorrhizal basidiomycete; occurs solitary, in scattered groups or caespitose clusters on the ground in damp areas amongst mosses, or in leaf litter.

Fruit-body Description

Up to 140 mm high and 60 mm across, trumpet- to funnel-shaped, thin, tough, hollow, with a flared mouth and a short stipe. **Inner Surface** slightly felt-like, roughened or finely scaly; colour typically dark brown to blackish, but sometimes yellow, brown, or grey. **Outer Surface** hymenium, smooth, slightly wrinkled (not ridged); colour usually an ash-grey bloom, brownish, rarely salmon or yellow. **Stipe** short, usually blackish. **Spore Print** White

Microscopic Features

Basidiospores 11–17 × 7–11 μm, broad ellipsoidal, smooth. Basidia two-spored, 70–90 × 8–10 μm, slenderly clavate. Clamp connections absent.

Comments

Craterellus cornucopioides is not easily spotted amongst the leaf litter and mosses on the forest floor but, once found, it is readily identified by its trumpet-like shape. There are no other species with which it can be easily confused. DNA analysis done by Dahlman *et al.* (2000) showed that various species of trumpet-shaped *Craterellus* that were separated on colour or spore size, such as *C. fallax* or *C. konradii*, are variants of *C. cornucopioides*. *Craterellus cornucopioides* was officially classified as being mycorrhizal, based on its perceived close association with *Cantharellus*. *Craterellus tubaeformis*, which was previously called *Cantharellus tubaeformis*, is known to be mycorrhizal (Trappe 2004), therefore it is highly likely that *C. cornucopioides* is also mycorrhizal.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd edn. Ten Speed Press: Berkeley, CA. **p. 666** **[D P]**

Breitenbach J and Krãnzlin F (1986) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 374** **[D CP]**

Dahlman, M, Danell, E, and Spatafora, JW (2000) "Molecular systematics of *Craterellus* : cladistic analysis of nuclear LSU rDNA sequence data". *Mycological Research* **Vol. 104(4), pp. 388–394**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 287** **[D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi*. Fungimap: South Yarra, Victoria. **p. 60** **[D CP]**

Læssøe T (1998) *Mushrooms*. Dorling Kindersley: London. **p. 275** **[D CP]**

McCann IR (2003) *Australian fungi illustrated*. Macdown Productions: Vermont, Victoria. **p. 66** **[CP]**

Phillips R (2006) *Mushrooms*. Macmillan: London. **p. 274** **[D CP]**

Trappe MJ (2004) "Habitat and host associations of *Craterellus tubaeformis* in northwestern Oregon". *Mycologia* **Vol. 96(3), pp. 498–509**

Young AM (2005) *A field guide to the fungi of Australia*. University of New South Wales Press: Sydney. **p. 96** **[D I]**

Fam. Cantharellaceae

Craterellus sinuosus

© Virgil Hubregtse

© Virgil Hubregtse

Fam. Cantharellaceae

Craterellus sinuosus

Pseudocraterellus sinuosus *Pseudocraterellus undulatus*

Biology

Mycorrhizal basidiomycete; solitary or in scattered groups or caespitose clusters on the ground in damp areas amongst mosses, or in leaf litter. In Australia usually associated with *Nothofagus* species.

Fruit-body Description

Diameter to 15 mm or more; flat or very shallow, becoming trumpet- or deeply funnel-shaped, usually without a perforated centre, margin wavy, often splitting. **Inner Surface** dry, rough, may have coarse hairs; colour varies from a pale grey-brown to light drab. **Outer Surface** hymenium, smooth or slightly wrinkled (not ridged); colour pallid to a pale grey brown. **Stipe** up to 30 mm long and 3 mm thick; tapering to base; surface dry, smooth; colour similar to outer surface. **Spore Print** White to pale ochraceous

Microscopic Features

Basidiospores 8.5–11 × 6.5–9 μm, ellipsoidal, smooth. Basidia four-spored, 40–60 × 7–11 μm, long cylindrical. Clamp connections absent.

Comments

Craterellus sinuosus is a rare species and its small size and drab colour makes it difficult to see on the forest floor amongst the litter. It is recognised by its trumpet-like shape and light brownish grey colour. In Australia it is usually found in association with *Nothofagus* species but in the northern hemisphere it is found in mixed woodland. The taxonomy of this species is difficult: only recently Dahlman, Danell and Spatafora (2000), using DNA analysis, showed that it belongs to the genus *Craterellus*. It is still not known if *Craterellus sinuosus* belongs to a complex of similar species or if it is a very variable species. Some mycologists, such as E.J.H. Corner (see Petersen 1969) have grouped *C. calyculus*, *C. subundulatus* and *Craterellus sinuosus* together as being a single species. Since *Craterellus sinuosus* was named in 1836 (earlier than the other two species) its name will most likely have precedence.

References

Burt EA (1914) "The Thelephoraceae of North America II Craterellus". *Annals of the Missouri Botanical Gardens* **Vol. 1, pp. 327–350** [D P]

Dahlman M, Danell E and Spatafora JW (2000) "Molecular systematics of *Craterellus* : cladistic analysis of nuclear LSU rDNA sequence data". *Mycological Research* **Vol. 104(4), pp. 388–394**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 288** **[D CP]** (as *Pseudocraterellus sinuosus*)

Petersen RH (1969) "Notes on Cantharelloid Fungi – II Some new taxa on Pseudocraterellus". *Persoonia* **Vol. 5(3), pp. 211–223** **[D P]** (as *Pseudocraterellus sinuosus*)

Fam. Clavulinaceae

Clavulina coralloides

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Clavulinaceae

Clavulina coralloides

Clavulina cristata

Biology

Mycorrhizal basidiomycete; solitary, gregarious or caespitose on the ground; most likely associated with species from the Myrtaceae such as *Eucalyptus* spp.

Fruit-body Description

Coralloid, erect, up to 80 mm tall and 40 mm broad, branched 3–4 times, tips usually with multiple tooth-like projections; surface smooth; colour white, becoming creamy with age; base consisting of fused branches. **Spore Print** White

Microscopic Features

Basidiospores 7.5–10 × 6.5–9 μm, (mean 8.8 ± 0.6 × 7.8 ± 0.5 μm, Q=1.13 ± 0.07 n=30), subglobose to broadly ovoid, smooth, hyaline with large drops. Basidia two-spored, 45–65 × 4–6.5 μm, cylindro-clavate. Clamp connections present.

Comments

Clavulina coralloides is a small white coral fungus that grows on the ground, scattered to gregarious amongst leaf litter, usually in eucalypt forests. The fruit-body may be single or multi-branched; branches are usually smooth, with tips that have several short tooth-like projections (cristate). *C. coralloides* is widely distributed in Europe and North America, where presumably it is mycorrhizal with conifers and hardwoods (Breitenbach and Krãnzlin 1995). Although the morphology of the Australian species and the northern hemisphere species are very similar, I have not been able to find a publication where DNA evidence is cited to suggest that northern hemisphere and Australian species are the same. This species seems to have quite a variable morphology and mycorrhizal habit, which could suggest that it may consist of a complex of species. To clarify this situation more genetic evidence needs to be collected.

In many field guides the epithet *cristata*, coined by the Danish mycologist Theodor Holmskjold in 1790, is used. However, Linnaeus described the same fungus in *Species plantarum* in 1753 with the epithet *coralloides*. Therefore by precedence the correct epithet to use is *coralloides*.

References

Breitenbach J and Krãnzlin F (1995) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 352** **[D CP]** (as *Clavulina cristata*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 201** **[D CP]** (as *Clavulina cristata*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 161** **[D CP]**

Petersen RH. (1988) "The clavarioid fungi of New Zealand". *New Zealand Department of Scientific and Industrial Research* **Bulletin 236, pp. 1–170** (as *Clavulina cristata var. zealandica*)

Fam. Clavulinaceae

Clavulina rugosa

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Clavulinaceae

Clavulina rugosa

Clavaria rugosa

Biology

Mycorrhizal basidiomycete; solitary, gregarious or caespitose on the ground; associated with exotic trees such as pine and spruce.

Fruit-body Description

Clubs can be up to 100 mm high, and 7–15 mm thick; simple to very sparsely branched, often thickened towards the apex, marked with longitudinal wrinkles or grooves, with blunt apices; white to a dirty cream; **Spore-bearing Surface** whole of the club surface is spore-bearing **Stipe** almost non-existent. **Spore Print** White

Microscopic Features

Basidiospores 9–13.5 × 7.5–12 μm, subglobose to broadly ellipsoidal, smooth, hyaline with large drops. Basidia two-spored, 60–75 × 5–9 μm, cylindro-clavate. Clamp connections present.

Comments

This coral fungus is identified by its whitish colour and simple longitudinally grooved or wrinkled blunt clubs. It is an introduced species that is associated with exotic trees.

References

Breitenbach J and Krãnzlin F (1995) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 354 [D CP]**

Grey E (2013) "*Clavulina rugosa*: an introduced coral fungus". *The Victorian Naturalist* **Vol. 130(2), pp. 81–83 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 86 [D CP]**

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 345 [D CP]**

Fam. Clavulinaceae

Clavulina tasmanica

© Arthur Carew

© Arthur Carew

Fam. Clavulinaceae

Clavulina tasmanica

Biology

Mycorrhizal basidiomycete; solitary, gregarious or caespitose on the ground in damp eucalypt forest.

Fruit-body Description

Up to 70 mm high and 7 mm thick; simple to very sparsely branched clubs, which are split at apex into 2 to 6 branches. **Spore-bearing Surface** colour dark ashen grey with a whitish to tan bloom; bloom is the result of very long cystidia (100–200 μm). **Stipe** up to 4 mm thick; paler than club. **Spore Print** White

Microscopic Features

Basidiospores 8.5–12.5 $\times$ 7–10.5 μm, subglobose to broadly ellipsoidal, smooth, thin-walled.

Comments

This coral fungus is identified by its colour and the relatively unique whitish to tan bloom.

References

Petersen RH (1984) "Notes on clavarioid fungi. XVIII. A preliminary outline of *Clavulina* in Southern Australia". *Nova Hedwigia* **Vol. 37, pp. 19–35** **[D]**

Fam. Hydnaceae

Hydnum aff. *repandum*

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Hydnaceae

Hydnum aff. *repandum*

Biology

Mycorrhizal basidiomycete; solitary to gregarious on the ground amongst leaf litter under *Eucalyptus* spp.

Fruit-body Description

Pileus (Cap) Diameter to 40 mm or more; convex when young, becoming plane with a central depression, sometimes irregular in shape, margin usually inrolled; surface velvety at first, smooth, dry; colour variable, pale yellow to brownish yellow; flesh white, soft, fragile. **Spines (Teeth)** Adnate or sometimes decurrent; generally up to 3 mm long and 0.3 mm thick, tapering to a rounded tip, fragile; colour white to cream. **Stipe (Stem)** Central; generally up to 50 mm long and 10 mm thick; surface with felty patches when young, smooth, dry; colour whitish to cream. **Spore Print** White

Microscopic Features

Basidiospores 6–8 × 6–7.5 μm, subglobose to globose, with drops or granular content. Basidia three or four-spored, 40–65 × 4–7 μm, slenderly clavate to cylindrical. Clamp connections present.

Comments

The most common species of *Hydnum* seen in Australia eucalypt forests was believed to be *Hydnum repandum*, because its morphology is similar to that of the northern hemisphere *H. repandum*. In Europe, the *H. repandum* and *H. rufescens* complex of species all form ectomycorrhizal relationships with plants in the Pinaceae and Fagaceae (pines and broad-leaved trees)(Grebenc *et al.* 2009). However, unlike northern hemisphere *Hydnum* spp., Australian *Hydnum* spp. form an ectomycorrhizal relationship with plants in the Myrtaceae, including *Eucalyptus*, *Leptospermum*, and *Melaleuca*. Moreover, recent phylogenetic analysis by Feng *et al.* (2016) of Australian *Hydnum* spp. has shown that they are not members of the northern hemisphere *H. repandum* complex, and what has normally been accepted here as a single species called *H. repandum* has been shown to be a complex of at least 4 undescribed species. During forays we have encountered two different morphological types of *Hydnum* in eucalypt forests. We have referred to these as *Hydnum* 'yellow' and *Hydnum* 'brown'. *Hydnum* 'yellow' is described here as *Hydnum* aff. *repandum*. *Hydnum* 'brown' has a brown pileus up to 30 mm across, with a distinctly radially fibrillose surface. Its flesh is not brittle, but flexible and tougher than that of *Hydnum* 'yellow'. Both morphological types are microscopically very similar. In the absence of phylogenetic evidence, the best way to handle this situation is to refer to both types as *Hydnum* aff. *repandum*.

References

Feng B, Wang X-H, Ratkowsky D, Gates G, Su See Lee SS, Grebenc T and Yang ZL (2016) "Multilocus phylogenetic analyses reveal unexpected abundant diversity and significant disjunct distribution pattern of the Hedgehog Mushrooms (*Hydnum* L.)". *Scientific Reports* DOI: 10.1038/srep25586. **Vol. 6:25586, pp. 1–11.**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 242** **[D CP]** (as *Hydnum repandum*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 208** **[D CP]**

Grebenc T, Martín MP and Kraigher H (2009) "Ribosomal ITS diversity among the European species of the genus *Hydnum* (Hydnaceae)". *Anales del Jardín Botánico de Madrid* **Vol. 66, pp. 121–132.**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 72** **[CP]** (as *Hydnum repandum*)

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 94** **[D CP]** (as *Hydnum repandum*)

Fam. Hydnaceae

Hydnum crocidens

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Hydnaceae

Hydnum crocidens

Biology

Mycorrhizal basidiomycete; solitary to gregarious on the ground amongst leaf litter under *Leptospermum* spp.

Fruit-body Description

Pileus (Cap) Diameter to 30 mm or more; convex when young, becoming plane with a central depression, sometimes irregular in shape; surface finely felty at first, becoming glabrous with felty patches at the margin, dry; colour white to creamy white, developing pale brownish stains with age; flesh white, soft. **Spines (Teeth)** Adnate; generally up to 4 mm long and 0.3 mm thick, tapering to a rounded tip, fragile; colour white, becoming cream with age. **Stipe (Stem)** Central, occasionally eccentric; up to 30 mm long and 5 mm thick; surface finely felty when young, smooth, dry; colour white. **Spore Print** White

Microscopic Features

Basidiospores 6.5–8.5 × 6.5–8 μm, (mean $7.6 \pm 0.5 \times 7.2 \pm 0.5$ μm, Q=1.05 ± 0.06 n=30), subglobose to globose, with granular content. Basidia four-spored, 40–62 × 4–7 μm, slenderly clavate to cylindrical. Clamp connections present.

Comments

This species is recognised by its white to creamy white fruit-body, normally with a central stipe and non-decurrent spines. It grows on the ground in association with *Leptospermum* spp. At present this is the only described Australian *Hydnum*, which was described by Cooke in 1890. It is also found in New Zealand. Recent phylogenetic analysis by Feng *et al.* (2016) shows that *H. crocidens* is closely related to the *H. repandum* complex of species.

References

Cunningham GH (1958) "Hydnaceae of New Zealand Part I. – The Pileate Genera *Beenakia*, *Dentinum*, *Hericium*, *Hydnum*, *Phellodon* and *Steccherinum*". *Transactions of the Royal Society of New Zealand* **Vol. 85(4), pp. 585–601** **[D I]** (as *Dentinum crocidens*)

Feng B, Wang X-H, Ratkowsky D, Gates G, Su See Lee SS, Grebenc T and Yang ZL (2016) "Multilocus phylogenetic analyses reveal unexpected abundant diversity and significant disjunct distribution pattern of the Hedgehog Mushrooms (*Hydnum* L.)". *Scientific Reports* DOI: 10.1038/srep25586. **Vol. 6:25586, pp. 1–11.**

Maas Geesteranus RA (1964) "Notes on Hydnums – II". *Persoonia* **Vol. 3(2), pp. 155–192** **[D I]**

2.4 Order: Dacrymycetales

Dacrymycetales is a small order of jelly fungi, containing 1 family (Dacrymycetaceae), 13 genera and about 156 species ("Catalogue of Life" website http://www.catalogueoflife.org). The recent phylogenetic study of the Dacrymycetes, which was carried out by Shirouzu *et al.* (2013), was a large-scale analysis of the Dacrymycetes, including nearly all genera except the rarely collected genus *Dacryonaema*. This study has produced a reliable description of the phylogeny of the Dacrymycetes.

Dacrymycetales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Dacrymycetes
Order:	Dacrymycetales

Families
Dacrymycetaceae

Dacrymycetaceae – consists of 13 genera with 156 described species. Its type genus is *Dacrymyces*, which contains 60 species. The species in this family are all jelly fungi. Their fruit-body morphology can be pulvinate, resupinate, turbinate, cylindrical, spathulate, dendroid or cupulate. The Australian and New Zealand species belonging to this family have been thoroughly studied by McNabb (1964, 1965a, 1965b, 1965c, 1965d, 1965e, 1966, 1973).


Calocera sinensis

References

McNabb RFR (1964) "Taxonomic studies in the Dacrymycetaceae I. Cerinomyces Martin". *New Zealand Journal of Botany* **Vol. 2, pp. 415–424.**

McNabb RFR (1965a) "Taxonomic studies in the Dacrymycetaceae II. Calocera (Fries) Fries". *New Zealand Journal of Botany* **Vol. 3, pp. 31–58.**

McNabb RFR (1965b) "Taxonomic studies in the Dacrymycetaceae III. Dacryopinax Martin". *New Zealand Journal of Botany* **Vol. 3, pp. 59–72.**

McNabb RFR (1965c) "Taxonomic studies in the Dacrymycetaceae IV. Guepiniopsis Patouillard". *New Zealand Journal of Botany* **Vol. 3, pp. 159–169.**

McNabb RFR (1965d) "Taxonomic studies in the Dacrymycetaceae V. Heterotextus Lloyd". *New Zealand Journal of Botany* **Vol. 3, pp. 215–222.**

McNabb RFR (1965e) "Taxonomic studies in the Dacrymycetaceae VI. Femsjonia Fries". *New Zealand Journal of Botany* **Vol. 3, pp. 223–228.**

McNabb RFR (1966) "Taxonomic studies in the Dacrymycetaceae VII. Ditiola Fries". *New Zealand Journal of Botany* **Vol. 4, pp. 546–558.**

McNabb RFR (1973) "Taxonomic studies in the Dacrymycetaceae VIII. Dacrymyces Nees ex Fries". *New Zealand Journal of Botany* **Vol. 11, pp. 461–524.**

Shirouzu T, Hirose D, Oberwinkler F, Shimomura N, Maekawa N and Tokumasu S (2013). "Combined molecular and morphological data for improving phylogenetic hypothesis in Dacrymycetes". *Mycologia* **Vol. 105(5), pp. 1110–1125.**

Fam. Dacrymycetaceae

Calocera australis

© Virgil Hubregtse

© Virgil Hubregtse

Fam. Dacrymycetaceae

Calocera australis

Biology

Saprotrophic basidiomycete; found in small to large colonies on wet rotting angiosperm wood.

Fruit-body Description

Usually up to 8 mm high; simple, slender club-like, spatula-like or apically expanded; consistency firm-gelatinous; colour variable, occasionally a dingy white, pallid brownish-yellow or yellow to orange (all colours may be present in a single colony), and finally drying to a reddish brown. **Spore Print** White

Microscopic Features

Basidiospores 11–14 × 4–5.5 μm, slightly curved-cylindrical, when mature becoming 3-septate. Basidia tuning-fork-like, two-spored; clamp connections absent.

Comments

Calocera australis can be recognised by its small club-shaped (clavate) to spatula-shaped (spathulate) fruit-body, which can grow up to 8 mm in height. Depending upon environmental conditions, the colour can vary from a pallid brownish-yellow to orange. This species is often found growing on dead eucalypt wood in wet forest, and is also found in New Zealand. For positive identification, microscopic examination is recommended.

References

McNabb RFR (1965) "Taxonomic Studies in the Dacrymycetaceae II. *Calocera* (Fries) Fries". *New Zealand Journal of Botany* **Vol. 3, pp. 31–58. [D I]**

Fam. Dacrymycetaceae

Calocera fusca

© Virgil Hubregtse

© Jurrie Hubregtse

Fam. Dacrymycetaceae

Calocera fusca

Biology

Saprotrophic basidiomycete; found in small to large colonies on wet rotting wood.

Fruit-body Description

Usually up to 25 mm or more high; simple club-like or sparingly forked; consistency firm-gelatinous; colour variable, bright yellow to yellow-orange, occasionally a dingy white, drying to a reddish or brownish yellow. **Spore Print** Not observed

Microscopic Features

Basidiospores 8–12.5 × 3.5–4.5 μm, slightly curved-cylindrical, when mature with one septum (i.e. only one dividing wall within the spore). Basidia tuning-fork-like, two-spored; clamp connections present.

Comments

Calocera fusca is one of the larger *Calocera* species, which can readily be separated from the more common *Calocera sinensis* by its larger size. This species is also found in New Zealand.

References

McNabb RFR (1965) "Taxonomic Studies in the Dacrymycetaceae II. *Calocera* (Fries) Fries". *New Zealand Journal of Botany* **Vol. 3, pp. 31–58. [D I]**

Fam. Dacrymycetaceae

Calocera sinensis

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Dacrymycetaceae

Calocera sinensis

Biology

Saprotrophic basidiomycete; found in small to large colonies on moist dead wood.

Fruit-body Description

Small, usually less than 10 mm high and 1 to 2 mm thick; simple club-like or sparingly forked; consistency firm-gelatinous; bright yellow to yellow-orange, drying to a reddish or brownish yellow. **Spore Print** Not observed

Microscopic Features

Basidiospores 10–13 × 3–5 μm, bean-shaped with one septum (i.e. only one dividing wall within the spore). Basidia tuning-fork-like, two-spored; clamp connections present.

Comments

Calocera species, such as *C. clavata* and *C. fusca*, have similar morphology but differ in microscopic characteristics.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 290 [D CP]** (as *Calocera* sp.)

McNabb RFR (1965) "Taxonomic Studies in the Dacrymycetaceae II. *Calocera* (Fries) Fries". *New Zealand Journal of Botany* **Vol. 3, pp. 31–58. [D I]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 65 [D I]**

Fam. Dacrymycetaceae

Heterotextus miltinus

© Jurrie Hubregtse

© Paul George

Fam. Dacrymycetaceae

Heterotextus miltinus

Biology

Saprotrophic basidiomycete; scattered or gregarious on dead twigs or small dead branches.

Fruit-body Description

Diameter generally up to 10 mm; height 9 mm; bell-shaped; has a stipe and pileus; consistency gelatinous, margin often irregular; colour orange-yellow to orange-red; **Stipe** central, short, stout, narrow at the base and expanding towards the pileus to almost the pileus width; **Pileus** cup-shaped or as a flattened disc. **Spore Print** White

Microscopic Features

Basidiospores 15–18 × 4.5–5.5 μm, becoming 5–6 septate at maturity, smooth, curved-cylindrical, sausage-shaped. Clamp connections present.

Comments

Although *Heterotextus miltinus* displays considerable variation in shape and colour, it is recognised by its largish (up to 10 mm across) fruit-body, its short thick stipe, and spores that are 5–6 septate at maturity. This species is found in both Australia and New Zealand. A similar species, *H. peziziformis* is generally smaller, usually less than 5 mm across, and its spores are only 2–3 septate at maturity.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 291 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 91 [CP]**

McNabb RFR (1965) "Taxonomic studies of the Dacrymycetaceae V. *Heterotextus* Lloyd". *New Zealand Journal of Botany* **Vol. 3, pp. 215–222. [D I]**

2.5 Order: Geastrales

Geastrales Taxonomic Classification	
Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Subclass	Pallomycetidae
Order:	Geastrales
Families	
Geastraceae	

Geastrales is a small order with truffle-like and earth-star-shaped fruit-bodies, containing 1 family (Geastraceae), 10 genera and about 95 species ("Catalogue of Life" website http://www.catalogueoflife.org). The phylogenetic study by Hosaka *et al.* (2006) showed that Geastrales has its own order in the subclass Pallomycetidae, and that this order is related to the Gomphales and Phallales. Many of the species in this order are morphologically very similar, making identification difficult; this is especially so with the earth-star-shaped species. *Geastrum triplex*, commonly known as the "collared earth-star", is widely distributed in both the northern and southern hemispheres. Phylogenetic analysis carried out by Kasuya *et al.* (2012) shows that the geographically dispersed *Geastrum triplex* may be a complex of different species.

Geastraceae – consists of 10 genera with 95 species. Its type genus is *Geastrum*, which contains 77 species. A well known species in this family is *Sphaerobolus stellatus*, commonly known as "shotgun fungus" or "cannonball fungus", which colonises wood-based mulches and may throw black, spore-containing globs up to several metres.

Geastrum triplex

References

Hosaka K, Bates ST, Beever RE, Castellano MA, Colgan W, Dominguez LS, Geml J, Giachini AJ, Kenney SR, Nouhra ER, Simpson NB, Spatafora JW and Trappe JM, (2006) "Molecular phylogenetics of the gomphoid-phalloid fungi with an establishment of the new subclass Phallomycetidae and two new orders." *Mycologia* **Vol. 98, pp. 949–959.**

Kasuya T, Hosaka K, Uno K and Kakishima M (2012) "Phylogenetic placement of *Geastrum melanocephalum* and polyphyly of *Geastrum triplex*." *Mycoscience* **Vol. 53(6), pp. 411–426.**

Fam. Geastraceae

Geastrum fornicatum

© Richard Hartland

© Richard Hartland

Fam. Geastraceae

Geastrum fornicatum

Geastrum fenestratum

Biology

Saprotrophic basidiomycete, solitary or scattered to densely gregarious in litter under trees in dry woodlands or mallee scrub.

Fruit-body Description

Initially (immature fruit-body) globose, submerged, becoming superficial; diameter up to 80 mm; colour brown. **Rays** (exoperidium) outer surface splitting, to about the middle of the fruit-body, into 4-5 thick, firm, pointed rays to 35 mm long, which peel back and under until they are more or less erect, thus elevating the spore sac; rays stand on the tips of upward-pointing rays which form a cup-like, debris-encrusted structure at the base of the fungus; rays not hygroscopic. **Spore sac** (endoperidium) diameter up to 17 mm, depressed-globose to urn-shaped, finely felty, brown to pale buff, sits on a short pedicel (stalk) 3 mm long. **Peristome** (the opening through which the spores are discharged) simple, pore-like. **Spore mass** (gleba) brown to dark brown, powdery when mature. **Spore Print** Dark brown

Microscopic Features

Basidiospores 4.5–7.0 μm (excluding ornamentation), globose, warty, covered with short narrow truncate projections.

Comments

With its distinctive morphology, *Geastrum fornicatum* is unlikely to be confused with any other earthstar in Australia. In the southern hemisphere, this species is also found in South Africa. It is widely distributed in North America (Arora 1986; Phillips 1991), and is listed as rare and vulnerable in Europe (Phillips 1981, 2006). In the northern hemisphere this fungus grows in deciduous forests, and the spore size is 3.5 – 4.5 μm, noticeably smaller than for the Australian species. The difference in habitat and spore size suggests that the Australian species deserves further investigation.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi*. 2nd ed. Ten Speed Press: Berkeley, CA. **p. 701** **[D P]**

Cunningham GH (1979) "The Gasteromycetes of Australia and New Zealand". *Bibliotheca Mycologica* Bd 67 Reprint. (as *Geastrum fenestriatum*) **p. 175** **[D]**

Fuhrer B (2009) *A field guide to Australian fungi*. Bloomings Books: Melbourne. **p. 217** **[D CP]**

Grey P and Grey E (2005) *Fungi down under*. Fungimap: Melbourne. **p. 87** **[D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia*. Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 632** **[D I]**

McCann IR (2003) *Australian fungi illustrated*. Macdown Productions: Vermont, Victoria. **p. 95** **[CP]**

Phillips R (1981) *Mushrooms and other fungi of Great Britain and Europe*. Pan Books: London. **p. 254** **[D CP]**

Phillips R (1991) *Mushrooms of North America*. Little, Brown: Boston. **p. 286** **[D CP]**

Phillips R (2006) *Mushrooms*. Macmillan: London. **p. 334** **[D CP]**

Watling R (2003) *Fungi*. The Natural History Museum: London. **p. 36** **[CP]**

Young AM (1994) *Common Australian fungi: a naturalist's guide*. UNSW Press: Sydney. **p. 134** **[D CI]**(as *Geastrum fenestriatum*)

Fam. Geastraceae

Geastrum tenuipes

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Geastraceae

Geastrum tenuipes

Geastrum pectinatum var. *tenuipes*

Biology

Saprotrophic basidiomycete; either solitary or gregarious on the ground amongst leaf litter or decaying vegetable matter.

Fruit-body Description

Fruit-body globose to flattened when young, submerged, becoming superficial; diameter up to 50 mm; outer surface rough, with some debris or dirt adhering, splitting to become star-shaped, opening up to 70 mm across and 60 mm tall; colour light brown to greyish brown. **Rays** (exoperidium) 6 to 12 pointed rays, fleshy, up to 5 mm thick initially, flaking away in irregular patches, leaving exposed an ochraceous fibrous layer, not hygroscopic. **Spore sac** (endoperidium) up to 20 mm across; subglobose to urn-shaped, often farinose, grey-brown to lead grey in colour, its base has furrowed striations and it sits on a slender stalk. **Stalk** pedicel up to 7 mm long and up to 1.5 mm wide, light or dark coloured. **Peristome** (the opening through which the spores are discharged) is on the apex of the spore sac, it is prominent, narrowly conical, grooved and concolorous with the spore sac. **Spore mass** (gleba) ferruginous, powdery when mature. **Spore Print** Dark brown

Microscopic Features

Basidiospores 5.5–7.5 μm (including ornamentation), globose, warty, covered with short flat-topped warts.

Comments

Geastrum tenuipes is readily recognised by its grey spore sac with a "beaked" mouth and a uniquely furrowed base sitting on a prominent stalk, and by the light brown star (exoperidium) with 6 to 12 pointed rays. This species is native to Australia but it has often been confused with the northern hemisphere species *G. pectinatum*, which usually has a much shorter stipe and does not have a collar with striations at the base of the spore sac. Separating *G. tenuipes*, *G. pectinatum* and a number of other *Geastrum* species has been made possible by the work done by Zamora *et al.* (2015), where both DNA and morphological analysis were used to study a group of *Geastrum* species. As a result of their study, they have been able to revise the taxonomy of a number of *Geastrum* species, listing the characteristic features by which they can be identified.

References

Cunningham GH (1944) *The Gasteromycetes of Australia and New Zealand.* (reprinted in 1979) *Bibliotheca Mycologica*, **Band 67, pp. 162–163** **[D I]** (as *G. pectinatum*)

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 617** **[D I]** (as *G. pectinatum*)

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 96** **[CP]** (as *G. pectinatum*)

Zamora JC, Calonge FD and Martin MP (2015) "Integrative taxonomy reveals an unexpected diversity in *Geastrum* section *Geastrum* (Geastrales, Basidiomycota)". *Persoonia* **Vol. 34, pp. 130–165** **[D CP]**

Fam. Geastraceae

Geastrum triplex

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Geastraceae

Geastrum triplex

Geastrum indicum

Biology

Saprotrophic basidiomycete; either solitary or gregarious on the ground amongst leaf litter or decaying vegetable matter.

Fruit-body Description

Initially (immature fruit-body) bulb-shaped, ball-shaped, with a small, acute, beak-like area at the apex; diameter up to 50 mm; outer surface rough, splitting to become star-shaped, opening up to 100 mm across; colour light brown to greyish brown. **Rays** (exoperidium) 4–8 pointed rays, fleshy, up to 5 mm thick, not hygroscopic; rays tend to bend back under the fruit-body, usually cracking and forming a broad cup or saucer in which the spore sac is seated; inner surface smooth, cream, pinkish brown to tan. **Spore sac** (endoperidum) up to 30 mm across; sessile (without a stalk), thin, papery, smooth; pale to dark tan, greyish or reddish brown, when fresh with a paler ring around the raised mouth. **Peristome** (the opening through which the spores are discharged) conical, distinct, usually surrounded by a paler area; the opening (ostiole) circular or ellipsoidal, distinctly fibrillose. **Spore mass** (gleba) brown to dark brown, powdery when mature. **Spore Print** Dark brown

Microscopic Features

Basidiospores 3.5–5.5 μm, globose, round, warty, covered with short narrow truncate projections.

Comments

Although *Geastrum triplex* is possibly the most common large *Geastrum* in Australia, positively identifying it in the field can be difficult. The distinguishing characters to look for are its relatively large size, the pronounced "beak" on the immature fruit-body, the thick, star-like rays, a saucer-like depression in which the spore sac is seated and, on the spore sac, a conical fibrillose mouth with a paler surrounding area. What makes identification difficult is that all of these field characteristics may not be present at any one time.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 703** **[D P]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 217** **[D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 628** **[D I]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 96** **[CP]** (as *Geastrum indicum*)

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 335** **[D CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 208** **[D CP]**

Fam. Geastraceae

Sphaerobolus stellatus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Geastraceae

Sphaerobolus stellatus

Biology

Saprotrophic basidiomycete; gregarious or in clusters on rotting wood, woodchips, plant debris and herbivore dung.

Fruit-body Description

Very small, up to 2.5 mm across; semiglobose, usually partly buried in a whitish mycelial mat, whitish to dull ochraceous, the upper outer surface (peridium) is often rimose (cracked), then splitting star-like with 4–9 minute orange-coloured rays, exposing a single spore-containing peridiole ("egg"). The peridiole is ejected by the sudden reversal of the receptacle, leaving a translucent white sphere in the centre of the split fruit-body. **Peridiole** consists of a gleba ball up to 1.5 mm diameter, very sticky, dark brown to blackish, containing both sexual basidiospores and asexual gemmae (chlamydospores). **Spore Print** White to yellowish

Microscopic Features

Basidiospores 5.5–8 × 2–3.5 μm, cylindrical, some curved, smooth.

Comments

Sphaerobolus stellatus, commonly known as the "Cannonball Fungus", is readily recognised in the field: the small semiglobose fruit-body with its orange star-like opening is unique. The gleba ball can be ejected up to a range of 6 metres. The fungus is phototropic, ejecting its gleba ball towards the light. *Sphaerobolus stellatus* belongs to a genus that has three recognised species worldwide, the other two being *S. iowensis* and *S. ingoldii.* Macroscopically these species cannot be separated, and it is even extremely difficult to separate them on microscopic details, but DNA analysis has conclusively shown that there are three species (Geml *et al.* 2005). Since it seems that *S. stellatus* is the most common of these species, it is used here as the representative species.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 781** **[D P]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 222** **[D CP]**

Geml J, Davis DD and Geiser DM (2005) "Systematics of the genus *Sphaerobolus* based on molecular and morphological data, with the description of *Sphaerobolus ingoldii* sp. nov". *Mycologia* **Vol. 97(3), pp. 680–694** **[D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 93** **[CP]**

Phillips R (2006) *Mushrooms*. Macmillan: London. **p. 337** **[D CP]**

2.6 Order: Gomphales

Gomphales contains 3 families, 10 genera and about 480 species ("Catalogue of Life" website http://www.catalogueoflife.org). Phylogenetic relationships between Geastrales, Gomphales, Hysterangiales and Phallales are now well established. Within these orders the species are characterised by a wide range of fruiting body morphologies: stalked ramarioid–clavarioid, club, gilled, toothed, and sequestrate (Giachini *et al.* 2010; Hosaka *et al.* 2006).

Gomphales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Subclass	Pallomycetidae
Order:	Gomphales

Families
Clavariadelphaceae
Gomphaceae
Lentariaceae

Clavariadelphaceae – consists of 2 genera with 28 species. Its type genus is *Clavariadelphus*, which contains 21 species. The 2 genera are *Beenakia*, which has stipitate species with a pileus and toothed hymenium, and *Clavariadelphus*, which has species with coral or club-like fruit-bodies.

Beenakia dacostae

Gomphaceae – consists of 14 genera with 427 species. Its type genus is *Gomphus*, which contains 18 species. This family has a wide range of morphologies: ramarioid–clavarioid (e.g. *Ramaria* and *Phaeoclavulina*), gilled (e.g. *Gloeocantharellus*), cantharelloid–gomphoid (e.g. *Gomphus* and *Turbinellus*), and truffle-like (e.g. *Destuntzia*).

Ramaria lorithamnus

Lentariaceae – consists of 3 genera with 25 species. Its type genus is *Lentaria*, which contains 19 species. The majority of species in this family are ramarioid–clavarioid.

References

Giachini AJ, Hosaka K, Nouhra ER, Spatafora JW and Trappe JM (2010) "Phylogenetic relationships of the Gomphales based on nuc-25S-rDNA, mit-12SrDNA and mit-atp6-DNA combined sequences". *Fungal Biology* **Vol. 114, pp. 224–234**

Hosaka K, Bates ST, Beever RE, Castellano MA, Colgan W, Dominguez LS, Geml J, Giachini AJ, Kenney SR, Nouhra ER, Simpson NB, Spatafora JW and Trappe JM (2006) "Molecular phylogenetics of the gomphoid-phalloid fungi with an establishment of the new subclass Phallomycetidae and two new orders". *Mycologia* **Vol. 98, pp. 949–959**

Fam. Clavariadelphaceae

Beenakia dacostae

© Jurrie Hubregtse

© Arthur Carew

Fam. Clavariadelphaceae

Beenakia dacostae

Biology

Saprotrophic basidiomycete; solitary or in small groups, usually on dry woody debris beneath old fallen eucalypt logs or on old tree fern trunks (caudices).

Fruit-body Description

Pileus (Cap) Diameter to 25 mm or more; round or irregular fan-shaped, slightly concave, ageing flat to wavy; surface dry, smooth; margin often coarsely lobed and slightly incurved; colour white when fresh, becoming cream to ochre with age. **Spines (Teeth)** Up to 10 mm long, decurrent, crowded, soft, slender, tapering to a point; white at first, becoming a light olive-brown as spores mature. **Stipe (Stem)** Central, sometimes eccentric or lateral; generally up to 30 mm long and 3 mm thick; woody, smooth; white mycelium at the base. **Spore Print** Pale olive-brown

Microscopic Features

Basidiospores 7–9 × 2.5–3 μm, elongated tear-drop-shaped, finely ornamented. Basidia four-spored, 18–32 × 5–6.5 μm, subclavate.

Comments

Beenakia dacostae is the first species of this genus. The genus is named after the town Beenak in Victoria, where the type specimen was collected.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd edn. Ten Speed Press: Berkeley, CA. **p. 717–718** **[D P]**

Cunningham GH (1958) "Part I. – The Pileate Genera *Beenakia, Dentinum, Hericium, Hydnum, Phellodon* and *Steccherinum*". *Transactions of the Royal Society of New Zealand* **Vol. 85(4), pp. 585–601** **[D]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 206** **[D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 74** **[D CP]**

Reid DA (1955) "New or Interesting Records of Australian Basidiomycetes". *Kew Bulletin* **Vol. 10(4), pp. 631–648** **[D]**

Fam. Gomphaceae

Ramaria filicicola

© Jurrie Hubregtse

© Virgil Hubregtse

Fam. Gomphaceae

Ramaria filicicola

Ramaria sinapicolor *Clavaria lorithamnus*

Biology

Most likely a mycorrhizal basidiomycete; usually forming gregarious coral-like tufts on the ground amongst leaf litter, generally in wet sclerophyll forest and rainforest, but also occurring with *Pinus* spp.

Fruit-body Description

Consists of a dense cluster of branches, up to 100 mm in height and 60 mm in width, emerging from a white mycelial mat which is attached to woody litter. **Branches** are upright, cylindrical, sometimes flattened towards the base, forked, whitish to pale pinkish buff, becoming buff-brown as spores mature. **Apices** dull white, tapered with 2–5 pointed protrusions. **Spore Print** Ochre-brown

Microscopic Features

Basidiospores 5.5–7.5 × 3–4.5 μm, ellipsoidal, ornamented with low profile warts. Basidia four-spored, 32–50 × 5–8 μm, clavate. Clamp connections present.

Comments

Ramaria filicicola is recognised by its dull white to buff fruit-body and the slender upright nature of its branches. It is a relatively common species and is found in eucalypt and pine forests. In most early records this species has been misidentified as *R. gracilis*, a northern hemisphere species to which it has a high degree of resemblance.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 211 [D CP]**(as *Ramaria gracilis*)

Young AM (2014) “Australian coralloid fungi IV – *Ramaria filicicola*”. *Muelleria* **Vol. 13 pp. 385–390 [D P]**

D=Description; **I**=Illustration; **CI**=Colour Illustration; **P**=Photo; **CP**=Colour Photo

Fam. Gomphaceae

Ramaria lorithamnus

© Virgil Hubregtse

© Paul George

Fam. Gomphaceae

Ramaria lorithamnus

Ramaria sinapicolor *Clavaria lorithamnus*

Biology

Mycorrhizal basidiomycete; usually gregarious coral-like tufts on the ground amongst leaf litter, generally in wet sclerophyll forest or rainforest.

Fruit-body Description

Consists of coral-like tufts made up of individual slender fruit-bodies up to 100 mm or more tall and up to 5 mm thick at the base; branched once or twice but rarely three times, becoming thinner towards the apices; apices are minutely digitate; surface dry, smooth; colour pale-yellow to yellow, completely without apricot-pink tints, bruising to a pinkish brown; flesh whitish and brittle. **Spore Print** Ochre-brown

Microscopic Features

Basidiospores 6–10 × 4–6 μm, ellipsoidal, ornamented with low profile warts. Basidia four-spored, 45–50 × 7–8 μm, clavate. Clamp connections absent.

Comments

Ramaria lorithamnus is recognised by the slender yellow tufts of fruit-bodies, usually with one or two branchings, and with apices that are slightly digitate. Similar looking species include *R. flaccida*, which usually has more than 2 branchings and pointy apices, and *Clavaria amoena*, which only occasionally grows in dense tufts, has no branching, and the apices are rounded.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 211 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 87 [CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 91 [D I]**

2.7 Order: Hymenochaetales

Hymenochaetales contains 4 families, 56 genera and about 883 species ("Catalogue of Life" website http://www.catalogueoflife.org). This order is well supported by molecular phylogenetic evidence (Larsson *et al.* 2006), but its internal structure is still in flux. There are still 11 genera that have not been assigned to a family. To complicate the taxonomy of this order there is a broad variety of the fruit-body types. The majority of species are corticioid fungi and poroid fungi, but there are also several clavarioid fungi and agarics.

Hymenochaetales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Subclass	Pallomycetidae
Order:	Hymenochaetales

Families
Hymenochaetaceae
Repetobasidiaceae
Rickenellaceae
Schizoporaceae

Hymenochaetaceae – consists of 37 genera with 661 species. Its type genus is *Hymenochaete*, which contains 147 species. This family contains the majority of described species in the Hymenochaetales (mostly polypores), a number of stereoid fungi, and a few hydnoid fungi. All species in this family are characterised by brown pigments that turn black in KOH (xanthochroic reaction).

Coltricia australica

Repetobasidiaceae – consists of 2 genera with 16 species. Its type genus is *Repetobasidium*, which contains 12 species. This phylogenetically defined family contains species with resupinate and stereoid fruit-bodies.

Rickenellaceae – consists of 1 genus, *Rickenella*, with 9 species. *Rickenella* species are agarics and associate with mosses.

Rickenella fibula

Schizoporaceae – consists of 16 genera with 145 species. Its type genus is *Schizopora*, which contains 7 species. This family contains the bulk of corticioid fungi (e.g. *Hyphodontia* and *Xylodon*). The genus *Xylodon* is one of the largest genera of wood-rotting fungi.

Xylodon australis

References

Larsson K-H, Parmasto E, Fischer M, Langer E, Nakasone KK and Redhead SA (2006) "Hymenochaetales: a molecular phylogeny for the hymenochaetoid clade". *Mycologia* **Vol. 98, pp. 926–936**

Fam. Hymenochaetaeae

Coltricia australica

© Jurrie Hubregtse

© Virgil Hubregtse

Fam. Hymenochaetaeae

Coltricia australica

Coltricia oblectans *Coltricia cinnamomea*
Polyporus oblectans

Biology

Mycorrhizal basidiomycete; grows in association with eucalypt species; solitary or in small groups, usually on the ground on compacted or sandy soils.

Fruit-body Description

Pileus (Cap) Diameter to 50 mm or more; more or less round in outline, flat or depressed in the centre, central depression usually has erect fibrils; the surface is covered with silky-shiny appressed fibrils radiating from the centre; colour cinnamon-brown, usually with concentric bands of colour. **Flesh** blackens with 10% KOH solution. **Pore Surface** reddish brown to greyish brown. **Pores** 3–4 per mm, polygonal or angular, thin-walled. **Tubes** up to 2 mm long; paler than context. **Stipe (Stem)** Usually central; generally up to 30 mm long and 5 mm thick; almost equal, thickening at the apex; sometimes flattened with longitudinal folds, velvety, yellowish brown to reddish brown (not black). **Spore Print** Yellowish brown

Microscopic Features

Basidiospores 6–7.5 × 4–5.5 μm, broadly ellipsoidal, smooth, thin-walled. Basidia four-spored, 14–21 × 6–8 μm, clavate. Clamp connections absent.

Comments

Coltricia australica is a distinctive little polypore, with its central reddish brown stipe, silky-shiny cinnamon-brown pileus and brown pore surface making this species readily identifiable. *Coltricia australica* fruit-bodies have the habit of fusing together when they touch. Phylogenetic analysis performed by Tedersoo *et al.* (2007) revealed that the Australian species of *C. cinnamomea* was not consistent with its type species and that the Australian species was a new species. Zhou and Tedesoo (2012) named the Australian species *C. australica*.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 568** **[D CP]** (as *Coltrica cinnamomea*)

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 316** **[D CI]** (as *Coltricia oblectans*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 249** **[D CP]** (as *Coltrica cinnamomea*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 181** **[D CP]**

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 284** **[D I]** (as *Coltricia oblectans*)

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 80** **[CP]** (as *Coltrica cinnamomea*)

Tedersoo L, Suvi T, Beaver K and Saar I (2007) "Ectomycorrhizas of *Coltricia* and *Coltriciella* (Hymenochaetales, Basidiomycota) on Caesalpiniaceae, Dipterocarpaceae and Myrtaceae in Seychelles". *Mycological Progress* **Vol. 6, pp. 101–107** **[D I]**

Zhou L-W and Tedersoo L (2012) "*Coltricia australica* sp. nov. (Hymenochaetales, Basidiomycota) from Australia". *Mycotaxon* **Vol. 122, pp. 123–128**

Fam. Hymenochaetaeae

Coltriciella dependens

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Hymenochaetaeae

Coltriciella dependens

Poria tasmanica *Coltricia dependens*
Coltriciella tasmanica

Biology

Mycorrhizal basidiomycete; grows in association with eucalypt species; solitary or in small groups, on the underside of decaying burnt wood or rotting wood that is on the ground.

Fruit-body Description

Pileus (Cap) Diameter to 30 mm or more; more or less round in outline, pendent (hanging down), conical at first, becoming flat disc-like, with a centrally attached stipe, touching fruit-bodies fuse together; surface furry, finely hairy; colour yellow-brown to brown. **Pore Surface** Surface yellowish brown to cinnamon, margin paler, furry, finely hairy. **Pores** 2–3 per mm, pore opening covered with very fine hairs, velvety. **Tubes** up to 1 mm long. **Stipe (Stem)** Usually centrally attached to pileus; generally up to 5 mm long; about 2 mm thick, almost equal, thickening at the apex; surface hairy, velvety; colour same as pileus. **Spore Print** Yellowish brown

Microscopic Features

Basidiospores 7–10.5 × 4.5–6 μm, spores varying in shape from broadly ellipsoidal to pip-shaped, distinctly ornamented, thick-walled. Basidia four-spored, 10–18 × 5–6 μm, clavate. Clamp connections absent.

Comments

This species is easily overlooked because it grows on the underside of decaying or burnt wood. Once spotted, the fruit-bodies are readily recognised by their yellow-brown to cinnamon colour and furry pored surface. Although the fruit-bodies grow on dead wood this does not indicate that they are saprotropic. Studies carried out by Tedersoo *et al.* clearly show that this species is mycorrhizal. The bulk of its vegetative mycelium is in the soil, while only some penetrates the woody substrate where it produces its fruit-bodies.

References

Buchanan PK and Ryvarden L (1993) "Type Studies in the Polyporaceae 24*. Species Described by Cleland, Rodway and Cheel". *Australian Systematic Botany* **Vol. 6, pp. 215–235** **[D]**

Cunningham GH (1965) "Polyporaceae of New Zealand". *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin*** **164, p. 196** **[D I]** (as *Coltricia dependens*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 250 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 200 [D CP]**

Reid DA (1963) "New or Interesting Records of Australasian Basidiomycetes: V". *Kew Bulletin* **Vol. 17(2), pp. 267–308 [D I]** (as *Coltriciella tasmanica*)

Tedersoo L, Suvi T, Beaver K, Saar I (2007) "Ectomycorrhizas of *Coltricia* and *Coltriciella* (Hymenochaetales, Basidiomycota) on Caesalpiniaceae, Dipterocarpaceae and Myrtaceae in Seychelles". *Mycological Progress* **Vol. 6, pp. 101–107**

Fam. Rickenellaceae

Rickenella fibula

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Rickenellaceae

Rickenella fibula

Biology

Bryophilous basidiomycete; scattered in moss beds, always associated with moss. There is a mycorrhizoid relationship with mosses, which are directly invaded through the perforation of the chloro- or caulonema cell walls (stems from which the leafy parts grow) Kost (1988). The mosses are not adversely affected by this relationship.

Fruit-body Description

Pileus (Cap) Diameter to 10 mm or more; initially hemispherical, becoming convex then plano-convex with a deep central depression, margin sometimes translucent-striate, crenate (sculpted or wavy); surface smooth, silky, minutely radially fibrillose (need hand lens to see); colour when young yellow-orange to bright orange, with age fading to yellowish but remaining darker in the centre. **Lamellae (Gills)** Attachment strongly decurrent (running down the stipe); distant, sometimes with cross-veins; colour whitish or creamy, sometimes with an orange tint. **Stipe (Stem)** Central; generally up to 30 mm long and 1.5 mm thick; slender, fragile, translucent; surface smooth, dry, sometimes covered with minute fibrils; colour same as pileus. **Spore Print** White

Microscopic Features

Basidiospores 5–7 × 2.5–4.5 μm, elongate-ellipsoidal, smooth. Basidia four-spored, 20–28 × 4–6 μm, slender clavate. The minute fibrils on the pileus and stipe are very large cystidia that are up to 100 μm (0.1 mm) long. Clamp connections present.

Comments

Rickenella fibula is readily identified by its association with moss, its bright orange-yellow fruit-body, centrally depressed pileus, decurrent lamellae and slender translucent stipe. This species is also relatively common in the northern hemisphere.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia*. University of Western Australia Press: Nedlands. **p. 214 [D CI]**

Breitenbach J and Krãnzlin F (1991) *Fungi of Switzerland* Vol. 3: Boletes and agarics 1st part. Verlag Mykologia: Luzern, Switzerland. **p. 316 [D CP]**

Fuhrer B (2009) *A field guide to Australian fungi*. Bloomings Books: Melbourne. **p. 166 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi*. 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 139** **[D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia*. Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 315** **[D CP]**

Kost G (1988) "Interactions between Basidiomycetes and Bryophyta". *Endocytobiosis and Cell Research* **Vol. 5, pp. 287–308** **[D I]**

McCann IR (2003) *Australian fungi illustrated*. Macdown Productions: Vermont, Victoria. **p. 58** **[CP]**

Phillips R (2006) *Mushrooms*. Macmillan: London. **p. 88** **[D CP]**

Fam. Rickenellaceae

Rickenella swartzii

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Rickenellaceae

Rickenella swartzii

Agaricus swartzii *Omphalina swartzii*
Mycena swartzii

Biology

Bryophilous basidiomycete; scattered in moss beds, always associated with moss. There is a mycorrhizoid relationship with mosses, which are directly invaded through the perforation of the chloro- or caulonema cell walls (stems from which the leafy parts grow) (Kost 1988). The mosses are not adversely affected by this relationship.

Fruit-body Description

Pileus (Cap) Diameter to 10 mm or more; initially conical, becoming convex then nearly plane, sometimes centrally depressed, margin sometimes translucent-striate, crenate (sculpted or wavy); surface smooth, silky, fibrillose when young (seen under hand lens); colour dark brown to dark purplish brown at the centre (disc), becoming pale tan to pale orange-brown towards the margin. **Lamellae (Gills)** Attachment strongly decurrent (running down the stipe); distant, sometimes with cross-veins; colour whitish or creamy. **Stipe (Stem)** Central; generally up to 30 mm long and 1.5 mm thick; slender, fragile, translucent; surface smooth, dry, covered with minute fibrils (seen under hand lens); colour pale yellowish brown to brownish orange, darkening towards the apex. **Spore Print** White

Microscopic Features

Basidiospores 5–7 $\times$ 2.5–3.5 μm, elongate-ellipsoidal, smooth. Basidia four-spored, 15–22 $\times$ 4–5 μm, slender clavate. The minute fibrils on the pileus and stipe are very large cystidia that are up to 100 μm (0.1 mm) long. Clamp connections present.

Comments

Rickenella swartzii is readily identified by its association with moss, its distinctive two-toned pileus (dark purple-brown in the centre to pale orange-brown towards the margin), its deeply decurrent lamellae and thin stipe. In some field guides this species is identified by the misapplied name *Rickenella setipes* sensu Raithelhuber, which was based on the species description of *Agaricus setipes*, which was most likely a species of *Mycena* (Kuyper 1984).

References

Bas C, Kuyper TW, Noordeloos ME and Vellinga ME (1995) *Flora Agaricina Neerlandica* Vol. 3. A A Balkema: Rotterdam. **pp. 157–158 [D I]**

Breitenbach J and Krãnzlin F (1991) *Fungi of Switzerland* Vol. 3: Boletes and agarics 1st part. Verlag Mykologia: Luzern, Switzerland. **p. 316** **[D CP]** (as *Rickenella setipes*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 167** **[D CP]** (as *Rickenella setipes*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 139** **[D CP]** (as *Rickenella setipes*)

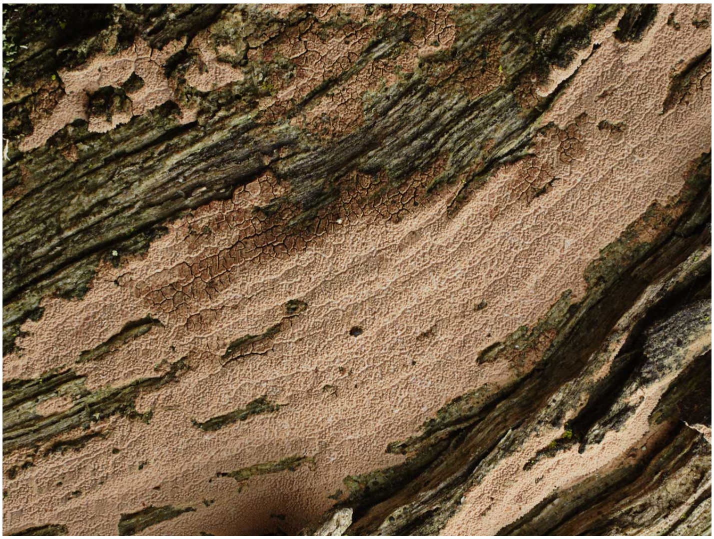
Kost (1988) "Interactions between Basidiomycetes and Bryophyta". *Endocytobiosis and Cell Research* **Vol. 5, pp. 287–308** **[D I]**

Kuyper TW (1984) "Notulae ad Floram Agaricinam Neerlandicam — VI-VII *Rickenella* and *Omphalina*". *Persoonia* **Vol. 12(2), pp. 188**

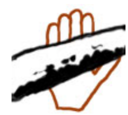
Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 88** **[D CP]**

Fam. Schizoporaceae

Xylodon australis



© Jurrie Hubregtse



© Jurrie Hubregtse

Fam. Schizoporaceae

Xylodon australis

Hyphodontia australis

Biology

Saprotrophic basidiomycete; fruit-body forms an adhering layer on dead wood such as fallen logs, causing white rot.

Fruit-body Description

Crust-like, lies flat against the substrate (resupinate), up to 3 mm thick, with a distinct margin; surface spore-bearing (hymenium), crustaceous, covered with small pimples, distinctly cracked into small polygons; colour when young pale brown, then brown with reddish tints, with age becoming dull buff to chestnut.
Chemical test application of KOH solution produces a violet colour reaction.
Spore Print White

Microscopic Features

Basidiospores 6–7.5 × 4–4.5 μm, ellipsoidal, smooth, thin-walled. Basidia four-spored, 20–30 × 4–5 μm, clavate. Clamp connections present.

Comments

Xylodon australis is a crust fungus found on dead wood, and is readily recognised by its light brownish colour, pimpled and polygonal cracked surface. It is found in Australia, New Zealand, and South America.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 279** **[D CP]** (as *Hyphodontia australis*)

Greslebin A and Rajchenberg M (2000) "The genus *Hyphodontia* in the Patagonian Andes forests of Argentina". *Mycologia* **Vol. 92(6), pp. 1155–1165** **[D I]**

Hjortstam K (1995) "Two New Genera and some New Combinations of Corticioid Fungi (Basidiomycotina, Aphyllophorales) from Tropical and Subtropical Areas". *Mycotaxon* **Vol. 54, pp. 183–193** **[D]**

2.8 Order: Phallales

Phallales contains 2 families, 56 genera and about 174 species ("Catalogue of Life" website http://www.catalogueoflife.org). Most of the species in this order are known as "stinkhorns". Their main characteristics are that they develop from an "egg", have an upright fruit-body, and produce foul smelling gleba (glutinous spore mass). The Phallales are a prime example of interactions of fungi with insects. The foul smelling gleba is particularly attractive to flies, which feed upon the gleba and then proceed to disperse the spores (Tuno N 1998).

Phallales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Subclass	Pallomycetidae
Order:	Phallales

Families
Claustulaceae
Phallaceae

Claustulaceae – consists of 5 genera with 11 species. Its type genus is *Claustula*, which contains 1 species. Many of the species in this family are lattice stinkhorns.

Phallaceae – consists of 35 genera with 161 species. Its type genus is *Phallus*, which contains 29 species. The species in this family are predominantly stinkhorns and false truffles.

Aseroë rubra

References

Tuno N (1998) "Spore dispersal of *Dictyophora* fungi (Phallaceae) by flies". *Ecological Research* **Vol. 13, pp. 7–15**

Fam. Phallaceae

Aseroë rubra

© Jurrie Hubregtse

© Arthur Carew

Fam. Phallaceae

Aseroë rubra

Biology

Saprotrophic basidiomycete; found on the ground in humus-rich soils or on deep forest litter, either solitary or in small groups.

Fruit-body Description

Immature fruit-body dingy white, egg-like, diameter up to 40 mm; egg is broken open as fruit-body expands. **Mature fruit-body** consists of a whitish to pinkish, hollow, cylindrical stem up to 80 mm tall and up to 30 mm thick, flattened at the top with a red star-like structure up to 130 mm across, with up to 10 arms, each one branching into 2 thin tentacles; with foul smelling olive to brown spore mass (gleba) at the base of each arm, surrounding the central disc. **Spore Print** gleba dark olive-brown

Microscopic Features

Basidiospores 5–7 × 1.5–3 μm, cylindrical, smooth.

Comments

Aseroë rubra was the first fungus recorded in Australia. The record was made from the shore of Recherche Bay near Hobart, Tasmania, on 1 May 1792 by Jacques Labillardière, a French biologist who was appointed to Bruni d'Entrecasteau's expedition in search of Lapérouse.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 228 [D CP]**

Gates, GM and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd ed. The Tasmanian Field Naturalists Club: Hobart. **p. 210 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 95 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 687 [D CI]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 94 [CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 193 [D CI]**

Fam. Phallaceae

Clathrus archeri

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Phallaceae

Clathrus archeri

Anthurus archeri

Biology

Saprotrophic basidiomycete; found on the ground in humus-rich soils or on deep forest litter, either solitary or in small groups.

Fruit-body Description

Immature fruit-body dingy white, egg-like, up to 40 mm diameter; egg is broken open at the apex as fruit-body expands. **Mature fruit-body** from a common stipe 4–6 bright red arms expand upwards through the ruptured egg, initially fused at the tips but soon spreading outwards; they are reticulated and pitted and covered in a dark olive-brown gleba that smells like rotting meat. The fruit-body fully expanded is up to 160 mm across. **Stipe** up to 60 mm long, and 25 mm thick; red and whitish at the base, often hidden in the ruptured egg (volva). **Spore Print** gleba dark olive-brown

Microscopic Features

Basidiospores 4–7 × 1.5–2.5 μm, cylindrical, smooth.

Comments

This attractive red starfish-shaped fungus is readily identifiable. It is native to Australia, but can now be found in Europe and North America.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd edn. Ten Speed Press: Berkeley, CA. **p. 774 [D CP]**

Breitenbach J and Krãnzlin F (1995) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 398 [D CP]** (as *Anthurus archeri*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 231 [D CP]**

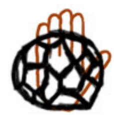
Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 339 [D CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 195 [D I]**

Fam. Phallaceae

Ileodictyon gracile

© Jurrie Hubregtse



© Jurrie Hubregtse

Fam. Phallaceae

Ileodictyon gracile

Clathrus gracilus

Biology

Saprotrophic basidiomycete; solitary or gregarious on the ground in native forest, amongst leaf litter, on compost, mulch, in garden beds, and on lawns.

Fruit-body Description

Immature fruit-body up to 40 mm diameter, ovoid (egg-shaped), globose to subglobose, smooth, whitish, and attached to the substrate with white mycelial strands; eventually ruptures to release a whitish, rapidly expanding spherical fruit-body. **Mature fruit-body** a hollow open lattice-like structure ranging from 40–200 mm diameter (the receptacle); arms up to 5 mm thick, typically broader where they join, smooth, whitish, coated with patches of foetid smelling brown gleba (spore mass). **Spore Print** Brown (Gleba)

Microscopic Features

Basidiospores 4.5–6.5 × 2–3 μm, narrowly ellipsoidal to cylindrical, smooth. Basidia six- to eight-spored, 25–50 × 4–6.5 μm, cylindrical to narrowly ventricose. Clamp connections present.

Comments

Ileodictyon gracile is a beautiful fungus, commonly referred to as a bird-cage, basket, or lattice fungus. The open ball-shaped lattice with smooth arms makes this species readily identifiable, although care needs to be taken because there is a similar closely related species, *I. cibarium*. The macroscopic and microscopic morphologies of these species largely overlap. The main difference between the two species is in the way they emerge from the peridium (the egg). *Ileodictyon gracile* is sinuously folded inside the peridium and expands in a similar way to a balloon or an air mattress being inflated. As a result the arms are smooth, not wrinkled. By contrast, *I. cibarium* is packed concertina-like and expands in a similar fashion to an accordion being expanded, and as a result the arms are wrinkled, not smooth.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 118 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 232 [D CP]** (as *Ileodictyon cibarium*)

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 99 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 684** **[D]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 94** **[CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 197** **[D I]**

Fam. Phallaceae

Mutinus aff. *albotruncatus*

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Phallaceae

Mutinus aff. *albotruncatus*

Biology

Saprotrophic basidiomycete; sometimes solitary but usually gregarious on humus-rich soils and amongst forest litter.

Fruit-body Description

Immature fruit-body up to 15 mm long and to 8 mm across, ovoid (egg-shaped), with white basal mycelium; usually partially covered by soil; surface smooth; colour white. **Mature fruit-body** stalk-like receptacle, up to 60 mm high and 8 mm thick, usually curved, cylindrical, equal, fertile region tapering to a blunt tip, hollow, spongy, fragile; surface slightly textured, with a net-like pattern; colour white. **Fertile zone** up to 20 mm long; tapering towards a blunt point; surface pitted, slightly reticulated, raised network of various sized meshes; colour golden yellow to orangey yellow. **Gleba** borne on the fertile region, brown to grey-brown, foetid. **Spore Print** Gleba brownish

Microscopic Features

Basidiospores 2.5–4 $\times$ 1–2 μm, (mean $3.2 \pm 0.2 \times 1.5 \pm 0.1$ μm, Q=2.16 ± 0.22 n=30), cylindrical, smooth.

Comments

This species of stinkhorn is recognised by its white spike, with a golden yellow fertile zone, which is usually covered by a sticky brownish gleba. It is morphologically similar to *M. albotruncatus* (Silva *et al.* 2015), except for the colour of the fertile region. Other similar species that have been reported in Australia are *M. boninensis*, *M. borneensis* and *M. caninus*, but these differ by having a fertile zone with some red colouring. *Mutinus* is an understudied genus and at present there are 38 species listed in "Index Fungorum". It is quite possible that there are a number of unnamed species still to be described from Australia. Unlike other fungi, stinkhorns distribute their spores by using an odorous spore-rich slime (gleba) to attract flies and other insects, which then carry the spores away to other places.

References

Cunningham GH (1944) *The Gasteromycetes of Australia and New Zealand.* (reprinted in 1979) *Bibliotheca Mycologica*, **Band 67, pp. 91–93 [D]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 681 [D]**

Silva BDB, Cabral TS, Martìn MP, Marinho P, Calonge FD, and Baseia IG (2015) "*Mutinus albotruncatus* (Phallales, Agaricomycetes), a new phalloid from the Brazilian semiarid, and a key to the world species". *Phytotaxa* **Vol. 236(3), pp. 237–248** **[D CP]**

2.9 Order: Polyporales

Polyporales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Order:	Polyporales

Families
ca. 11; See text

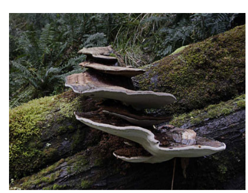
Polyporales contains 11 families, 240 genera and about 3280 species ("Catalogue of Life" website http://www.catalogueoflife.org). The taxonomy of the Polyporales is still in flux. The phylogenomic and phylogenetic analyses carried out by Binder *et al.* (2013) provide an overview of evolutionary relationships in the Polyporales that will serve as road map for future studies. The species within this order are saprotrophic; most of them are wood-rotters and the majority produce a white rot. They also have diverse morphologies, and include many polypores and corticioid fungi as well as a few agarics (mainly in the genus *Lentinus*).

Cystostereaceae – consists of 6 genera with 17 species. Its type genus is *Cystostereum*, which contains 7 species. The majority of species in this family have crust or corticioid fruit-bodies.

Fomitopsidaceae – consists of 33 genera with 389 species. Its type genus is *Fomitopsis*, which contains 42 species. The majority of species in this family are bracket fungi, some well known genera being *Antrodia*, *Laetiporus*, *Piptoporus* and *Postia*.

Fomitopsis lilacinogilva

Ganodermataceae – consists of 8 genera with 282 species. Its type genus is *Ganoderma*, which contains 201 species. The vast majority of species in this family are bracket fungi and occur in the genus *Ganoderma*, which is probably the most morphologically complex genus of polypores (Ryvarden L 2000).



Ganoderma australe

Grammotheleaceae – consists of 1 genus, *Theleporus*, with 6 species. The majority of species in this family have crust or corticioid fruit-bodies. The genus *Theleporus* was described by Fries in 1847, making it one of the oldest genus names among polypores and corticioid fungi (Zhou L-W *et al.* 2012).

Limnoperdaceae – consists of 1 genus, *Limnoperdon*, with 1 species.

Meripilaceae – consists of 6 genera with 68 species. Its type genus is *Meripilus*, which contains 6 species. Many species in this family have compound flexible fruit-bodies such as those in the genus *Grifola*, or multi-layered brackets such as those in the genus *Rigidoporus*.

Rigidoporus laetus

Meruliaceae – consists of 58 genera with 618 species. Its type genus is *Merulius*, which contains 2 species. The majority of species in this family have crust or corticioid fruit-bodies (e.g. *Steccherinum*) , but there are also a number of genera with stiped leathery fruit-bodies (e.g. *Cymatoderma* and *Podoscypha*).

Podoscypha petalodes

Phanerochaetaceae – consists of 24 genera with 322 species. Its type genus is *Phanerodontia*, which contains 4 species. The majority of species in this family have crust or corticioid fruit-bodies.

Polyporaceae – consists of 98 genera with 1499 species. Its type genus is *Polyporus*, which contains 283 species. This is a large and morphologically diverse family, containing bracket fungi (e.g. *Australoporus*, *Hexagonia* and *Ryvardenia*), gilled fungi (e.g. *Lentinus* and *Panus*), stipitate pored fungi (e.g. *Microporus* and *Polyporus*), and leathery pored fungi (e.g. *Trametes*).

Lentinus arcularius

Sparassidaceae – consists of 2 genera with 11 species. Its type genus is *Sparassis*, which contains 10 species. Most species in this family have compound fruit-bodies made up of fan-like (flabelliform) elements. They are found predominantly in the northern hemisphere, but there is possibly 1 undescribed species found in Australia (Light W *et al.* 2009).

Xenasmataceae – consists of 3 genera with 26 species. Its type genus is *Xenasma*, which contains 11 species. The majority of species in this family have crust or corticioid fruit-bodies.

References

Binder M, Justo A, Riley R, Salamov A, Lopez-Giraldez F, Sjökvist E, Copeland A, Foster B, Sun H, Larsson E, Larsson K-H, Townsend J, Grigoriev IV and Hibbett DS (2013) "Phylogenetic and phylogenomic overview of the Polyporales". *Mycologia* **Vol. 105(6), pp. 1350–1373**

Light W and Woehrel M (2009) "Clarification of the Nomenclatural Confusion of the Genus *Sparassis* [Polyporales: Sparassidaceae] in North America". *Fungi* **Vol. 2(4), pp. 10–15**

Ryvarden L (2000) "Studies in Neotropical Polypores 2: A Preliminary Key to Neotropical Species of Ganoderma with a Laccate Pileus". *Mycologia* **Vol. 92(1), pp. 180–191**

Zhou L-W and Dai Y-C (2012) "Wood-inhabiting fungi in southern China 5. New species of *Theleporus* and *Grammothele* (Polyporales, Basidiomycota)". *Mycologia* **Vol. 104(4), pp. 915–924**

Fam. Fomitopsidaceae

Fomitopsis lilacinogilva

© Paul George

© Paul George

Fam. Fomitopsidaceae

Fomitopsis lilacinogilva

Polyporus lilacinogilva *Polystictus lilacinogilvus*
Trametes lilacinogilva

Biology

Saprotrophic basidiomycete; occurs solitary or in overlapping tiers on dead wood such as fallen logs, or on upright stumps, producing a brown cubical rot.

Fruit-body Description

Diameter to 100 mm or more; laterally attached, irregular in shape, fan-shaped, kidney-shaped or semicircular, sometimes as a crust or pad; margin rounded, smooth. **Upper Surface** furrowed, crusty, overlain with coarse flattened hairs; colour pinkish, brownish, often zoned. **Pored Surface** smooth, 4–5 pores per mm; colour lilac to pinkish lilac, colour most intense at the margin of the fruit-body. **Flesh** corky, tough, pinkish brown or tinted pinkish lilac. **Spore Print** White

Microscopic Features

Basidiospores 6–9 $\times$ 2–3 μm, ellipsoidal, smooth. Basidia four-spored.

Comments

The lilac colour of *Fomitopsis lilacinogilva* pores is a very distinctive feature that helps in the field identification of this fungus. This species can be quite destructive, because it is found not only on fallen logs and tree stumps, but also on structural timbers, red gum sleepers and timber barriers, causing brown rot. *Fomitopsis lilacinogilva* is recorded from all Australian States and also from New Zealand, Papua New Guinea, South Africa and South America.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 252 [D CP]**

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 198 [D I]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 78 [CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 73 [D I]**

D=Description; **I**=Illustration; **CI**=Colour Illustration; **P**=Photo; **CP**=Colour Photo

Fam. Fomitopsidaceae

Laetiporus portentosus

© Virgil Hubregtse

© Virgil Hubregtse

Fam. Fomitopsidaceae

Laetiporus portentosus

Polyporus portentosus *Polyporus eucalyptorum*
Piptoporus portentosus

Biology

Saprotrophic basidiomycete; solitary or in small groups on dead or living *Eucalyptus* or *Nothofagus* spp. It causes brown cubical rot on dead trees; on live trees it causes heart rot.

Fruit-body Description

Radius to 300 mm or more, width up to 400 mm; laterally attached bracket, when young forming a nodular or globular body, with age becoming hoof-shaped; margin always blunt, rounded and smooth. **Upper Surface** glabrous (smooth), becoming cracked with age; colour at first whitish, becoming biscuit brown to greyish brown with age. **Pored Surface** smooth, 1–3 pores per mm; colour at first pale yellow, becoming dingy white with age. **Flesh** white, corky; texture polystyrene foam-like. **Spore Print** White

Microscopic Features

Basidiospores 9.5–13.5 × 5.5–8 μm, broadly ellipsoidal, thick-walled, with a prominent apiculus and a central oil drop. Basidia four-spored, 30–45 × 9–12 μm, clavate. Clamp connections absent.

Comments

Laetiporus portentosus is readily identified in the field by its colour and polystyrene-foam-like texture. Even pieces of the fruit-body found on the forest floor can be identified by the polystyrene-foam-like texture. When Rajchenberg (1995) moved this species from the genus *Polyporus* into the genus *Laetiporus* he noted that there were some features in this species that were not consistent with genus *Laetiporus*, but that for the time being it would be the best place to put this species. DNA analysis done by Linder and Banik (2008) showed without a doubt that *Laetiporus portentosus* does not belong in the *Laetiporus* genus. Further work is required before the actual genus of this fungus can be identified.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 264 [D CP]**

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 188 [D I]**

Linder DL and Banik MT (2008) "Molecular phylogeny of *Laetiporus* and other brown rot polypore genera in North America". *Mycologia* **Vol. 100(3), pp. 417–430**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 77 [CP]**

Rajchenberg M (1995) "A taxonomic study of the Subantarctic Piptoporus (Polyporaceae, Basidiomycetes) II". *Nordic Journal of Botany* **Vol. 15(1), pp. 105–119 [D P]**

Fam. Fomitopsidaceae

Phaeolus schweinitzii

© Jurrie Hubregtse

© Virgil Hubregtse

Fam. Fomitopsidaceae

Phaeolus schweinitzii

Coltricia schweinitzii

Biology

Parasitic and saprotrophic basidiomycete; annual, solitary or in small groups on the ground; parasitic on the roots and heartwood of living conifers such as Douglas fir, spruce, and larches, and saprobic on the dead wood once the tree has died. It produces brown to reddish brown cubic rot.

Fruit-body Description

Pileus (Cap) Diameter to 300 mm or more and to 40 mm thick; initially cushion-shaped, pilei variable in shape, and can be solitary or imbricate, circular or irregularly lobed; surface velvety or woolly, undulating, often with enclosed plants or twigs; colour zonate, when young orange to yellow and brown towards the centre, margin yellow to orange-yellow to greenish yellow, with age the whole pileus becoming rust-brown and finally blackish. **Flesh** initially soft-fibrous and yellowish brown, becoming firm and dark rust-brown with age. **Pore Surface** orange to bright yellow when young, becoming brownish to reddish-brown with age; promptly turning brown when bruised. **Pores** 1–3 per mm; decurrent; angular, almost slot-like, or labyrinthine. **Tubes** up to 10 mm long, same colour as pores. **Stipe (Stem)** More or less central when present; up to 60 mm long and 50 mm thick; usually tapered downwards; irregularly cylindrical; usually brown or concolorous with pileus. **Spore Print** White

Microscopic Features

Basidiospores 5.5–8.5 × 3.5–5.5 μm, broadly ellipsoidal to ovoid, hyaline, smooth, thin-walled. Basidia four-spored, 20–28 × 4.5–6 μm, cylindro-clavate. Clamp connections absent.

Comments

Phaeolus schweinitzii is a polypore that is most readily identified when it is young and in its growing phase, because this is when its pileus is brightly coloured with yellow, orange and brown hues and has a woolly matt surface. As it ages it turns a dark brown and also loses its woolly surface, making identification much more difficult. *P. schweinitzii* is a northern hemisphere species. In North America and Eurasia it is a common root and butt pathogen, predominantly of conifers, with symptoms normally appearing in mature trees. Early Australian records of this species were shown to have been misidentified (Simpson and May 2002). Some of the specimens were later re-identified as *Inonotus albertinii*, which has brown spores. It seems that *P. schweinitzii* has been introduced into Australia in recent times, and was first observed in Australia at the Royal Botanic Gardens Melbourne in 1995 (Simpson and May 2002).

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi*. 2nd ed. Ten Speed Press: Berkeley, CA. **p. 570** **[D P]**

Breitenbach J and Krãnzlin F (1986) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 318** **[D CP]**

Læssøe T (1998) *Mushrooms*. Dorling Kindersley: London. **p. 220** **[D CP]**

Phillips R (2006) *Mushrooms*. Macmillan: London. **p. 302** **[D CP]**

Simpson JA and May TW (2002) "*Phaeolus schweinitzii* in Australia". *Australasian Plant Pathology* **Vol. 31, pp. 99–100** **[D P]**

Fam. Fomitopsidaceae

Postia aff. *caesia*

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Fomitopsidaceae

Postia aff. *caesia*

Biology

Saprotrophic basidiomycete; solitary or in imbricate (overlapping) groups on fallen dead wood or stumps. Causes brown rot.

Fruit-body Description

Fruit-body semicircular, 10–50 mm or more broad, projecting 10–40 mm from the substrate; often with a broad lateral attachment, or sometimes dorsally attached to the underside of dead wood. **Upper Surface** surface finely velvety at first, becoming radially wrinkled, tuberculate, often with a dark reticulate structure when dry; colour white when young, becoming bluish, but may be ochre to light brown with only a slight blue colour, may be weakly zoned; margin undulating, acute, white. **Lower Surface** fertile surface pored, pores rounded-angular to lacerated. 4–5 per mm, tubes 4–5 mm long; colour white to blue-grey. Consistency soft and sponge-like when fresh, firm when dry. **Spore Print** White

Microscopic Features

Basidiospores 4–5 × 1–2 μm (mean 4.7 ± 0.2 × 1.3 ± 0.2 μm, Q=3.64 ± 0.65, n=30), cylindro-elliptic, allantoid, smooth, hyaline, with drops. Amyloid. Basidia four-spored, 10–13 × 5–6 μm, cylindro-clavate. Clamp connections present.

Comments

This species is a member of the cosmopolitan *Postia caesia* complex that contains closely related brown-rot polypore species with fruit-bodies that stain blue when bruised or with age, making them easy to recognise. In the northern hemisphere there are approximately 20 named species in this complex (Miettinen *et al.* 2018; Pildain *et al.* 2013; Yao *et al.* 2005). Recent molecular phylogenetic studies by Miettinen *et al.* (2018) on New Zealand and Australian material strongly suggests that the Australian species belongs to the *P. caesia* complex but has not yet been named. Until it is named, it would be preferable to call this species *Postia* aff. *caesia*.

References

Breitenbach J and Krãnzlin F (1995) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 272** **[D CP]**

Fuhrer BA (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 270** **[D CP]** (as *Postia caesia*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi*. 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 191** **[D CP]** (as *Postia subcaesia*)

Miettinen O, Vlasák J, Rivoire B, Spirin V (2018) "*Postia caesia* complex (Polyporales, Basidiomycota) in temperate Northern Hemisphere". *Fungal Systematics and Evolution* **Vol. 1, pp. 101–129** **[D CP]**

Papp V (2014) "Nomenclatural novelties in the *Postia caesia* complex". *Mycotaxon* **Vol. 129(2), pp. 407–413**

Pildain MB and Rajchenberg M (2013) "The phylogenetic position of *Postia* s.l. (Polyporales, Basidiomycota) from Patagonia, Argentina". *Mycologia* **Vol. 105(2), pp. 357–367**

Yao YJ, Pegler DN, Chase MW (2005) "Molecular variation in the *Postia caesia* complex". *FEMS Microbiology Letters* **Vol. 242(1), pp. 109–116**

Fam. Fomitopsidaceae

Postia aff. *lactea*

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Fomitopsidaceae

Postia aff. *lactea*

Tyromyces lacteus sensu Cunningham

Biology

Saprotrophic basidiomycete; solitary or in imbricate (overlapping) groups on dead conifer wood and hardwood, usually on fallen trunks and branches, as well as on stumps. Causes brown rot.

Fruit-body Description

Fruit-body 30–50 mm or more broad, projecting 10–25 mm from the substrate, fan-shaped to semi-circular, broadly laterally attached. **Upper Surface** surface smooth to coarse hairy (tomentose), tufted towards the base; colour white, with a pale pinkish-brown tint towards the base. **Lower Surface** fertile surface pored, pores rounded or angular, 4–5 per mm; colour white to cream. Consistency soft and sponge-like when fresh, firm when dry. **Spore Print** White

Microscopic Features

Basidiospores 3.5–5 × 1–2 μm (mean 4.3 ± 0.3 × 1.3 ± 0.2 μm, Q=3.41 ± 0.52, n=30), cylindro-elliptic, allantoid, smooth, hyaline. Basidia four-spored, 9–15 × 3.5–5 μm, subclavate to clavate. Clamp connections present.

Comments

Species of *Postia* aff. *lactea* are recognised by their soft fleshy whitish fruit-body, with a hairy upper surface, growing on wood where they produce a brown rot. This species has a close affinity to *Tyromyces lacteus* described by Cunningham (1965) using Australian and New Zealand material. The Australian and New Zealand material was assumed to be the same species as that found in the Europe. Since then, phylogenetic evidence has re-arranged the Polyporales and now fleshy species that produce brown rot are placed in the genus *Postia* and species that produce a white rot are placed in the genus *Tyromyces*. The European species *Tyromyces lacteus*, which the Australian material was named after, is in fact a white-rot fungus and hence still belongs in the genus *Tyromyces*. It is possible that *Postia* aff. *lactea* may be a complex of species.

Australian polypores are understudied, and DNA analysis will be needed to separate these cryptic species so that they can eventually be named.

References

Cunningham GH (1965) “Polyporaceae of New Zealand”. *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin* 164, p. 121**

Fuhrer BA (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 270** **[D CP]** (as *Postia lactea*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 190** **[D CP]** (as *Postia lactea*)

Pildain MB and Rajchenberg M (2013) "The phylogenetic position of *Postia* s.l. (Polyporales, Basidiomycota) from Patagonia, Argentina". *Mycologia* **Vol. 105(2), pp. 357–367**

Fam. Fomitopsidaceae

Postia pelliculosa

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Fomitopsidaceae

Postia pelliculosa

Oligoporus pelliculosus *Tyromyces pelliculosus*

Biology

Saprotrophic basidiomycete; solitary or in imbricate (overlapping) groups on fallen dead wood or stumps of *Eucalyptus* and *Nothofagus* spp. Causes brown rot.

Fruit-body Description

Fruit-body 10–50 mm or more broad, projecting 10–40 mm from the substrate, semicircular to fan-shaped, with a narrow lateral attachment. **Upper Surface** surface shaggy, hairy, hairs radially striate; colour can be either reddish dark brown or blackish. **Lower Surface** fertile surface pored, pores 2–5 per mm, rounded-angular with fringed (fimbriate) mouths; colour white to cream. Consistency soft and sponge-like when fresh, firm when dry. **Spore Print** White

Microscopic Features

Basidiospores 4–6 × 2–4 μm (mean $5.2 \pm 0.5 \times 3.1 \pm 0.5$ μm, Q=1.69 ± 0.23, n=30), ellipsoidal, smooth, hyaline. Basidia four-spored, 12–22 × 5–7 μm, cylindro-clavate. Clamp connections present.

Comments

Postia pelliculosa can be recognised by its shaggy reddish dark brown or blackish pileus, and whitish to cream pored surface. This species can be found in Argentina, Australia and New Zealand. Recent molecular phylogenetic studies by Pildain and Rajchenberg (2013) was on material found growing on *Nothofagus* spp. This species still requires further study: it still remains to be ascertained that the brown and black variants and those that grow on *Nothofagus* spp. and *Eucalyptus* spp. are the same species or whether they belong to a species complex.

References

Cunningham GH (1965) "Polyporaceae of New Zealand". *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin*** **164, p. 124** **[D I]** (as *Tyromyces pelliculosus*)

Buchanan KP, Hood IA (1992) "New species and new records of Aphyllophorales (Basidiomycetes) from New Zealand". *New Zealand Journal of Botany* **Vol. 30, pp. 95–112** **[D I]**

Fuhrer BA (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 271** **[D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi*. 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 191** **[D CP]**

Pildain MB and Rajchenberg M (2013) “The phylogenetic position of *Postia* s.l. (Polyporales, Basidiomycota) from Patagonia, Argentina”. *Mycologia* **Vol. 105(2), pp. 357–367**

Fam. Ganodermataceae

Amauroderma rude

© Jurrie Hubregtse

© Paul George

Fam. Ganodermataceae

Amauroderma rude

Biology

Saprotrophic basidiomycete; often found on buried wood, or on decayed wood, solitary or occasionally in small groups.

Fruit-body Description

Pileus (Cap) Diameter to 80 mm or more; convex at first, becoming flattened and then slightly depressed; irregular in shape, often with grass or twigs embedded; surface dry, velvety; colour zoned light and dark brown; usually woody. **Pore Surface** white to greyish. **Pores** up to 4 per mm; reach the stipe and may go down it a short way; turn red immediately on bruising, eventually the bruise will turn black. **Stipe (Stem)** Central or slightly eccentric; generally up to 130 mm long 20 mm thick, irregularly shaped; velvety to smooth; dark brown. **Spore Print** Brown

Microscopic Features

Basidiospores 7–10 $\times$ 6–8 μm, ellipsoidal, finely punctate (dotted with minute scales or pits).

Comments

Amauroderma rude is usually found on the ground in association with buried decaying wood, and it is readily identified by the red colour when the whitish pores are bruised. A similar species is *A. rugosum*, which has rust-brown pores.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **pp. 245&, 247 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 63 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 74 [CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 69 [D I]**

Fam. Ganodermataceae

Ganoderma australe

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Ganodermataceae

Ganoderma australe

Biology

Saprotrophic and weak parasitic basidiomycete; solitary or layered, perennial (a new fertile layer is added each year), occurs on a wide variety of dead or living trees. On living trees it grows where damage has occurred, in areas where the sapwood has been removed. It causes white heart rot in living trees.

Fruit-body Description

Diameter to 500 mm or more; laterally attached, bracket-like, irregular in shape, fan-shaped or semicircular, margin blunt, smooth, white when growing. **Upper Surface** rugose (wrinkled), with prominent concentrically zoned undulations; colour light to dark chocolate brown. **Pored Surface** smooth, creamy white when new fertile layer is being formed, bruising red-brown then turning dark brown, becoming brown as spores mature; pores round, small, 2.5–5 per mm. **Flesh** pithy when young, becoming woody with age. **Spore Print** Rust-brown to brown

Microscopic Features

Basidiospores 9–12 $\times$ 5.5–9 μm, ellipsoidal but truncated at one end, ornamented, double walled. Basidia four-spored. Clamp connections present, best seen in fruit-body margin.

Comments

Ganoderma australe is recognised by its shelf- or bracket-like form, the dull brown upper surface, and by the creamy white to light brown pored surface. Its distribution is in Australia, New Zealand and the Pacific region. There has been much confusion between *Ganoderma australe* and a closely related species *G. applanatum*. DNA analysis (Smith and Sivasithamparam 2003) has shown that *G. applanatum* is a northern hemisphere species and *G. australe* is the Australian species.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia*. University of Western Australia Press: Nedlands. **p. 320** **[D CI]**

Fuhrer B (2009) *A field guide to Australian fungi*. Bloomings Books: Melbourne. **p. 253** **[D CP]** (as *Ganoderma applanatum*)

Hood IA (2003) *An introduction to fungi on wood in Queensland*. School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 318** **[D I]**

Smith BJ and Sivasithamparam K (2003) "Morphological studies of *Ganoderma* (Ganodermataceae) from the Australian and Pacific regions". *Australian Systematic Botany* **Vol. 16, pp. 487–503 [D I]**

Young AM (2005) *A field guide to the fungi of Australia*. University of New South Wales Press: Sydney. **p. 73 [D I]**

Fam. Meripilaceae

Grifola colensoi

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Meripilaceae

Grifola colensoi

Polyporus colensoi *Polyporus multiplex*

Biology

Saprotrophic basidiomycete; typically growing on decayed wood and humus at the base of living eucalypt trees and *Nothofagus* spp. Causes brown cubical rot.

Fruit-body Description

Large compound fruit-body, up to 300 mm diameter and 200 mm high, or more; composed of numerous overlapping pilei. **Pileus** up to 100 mm or more long, 50 mm wide and 1–4 mm thick, with a rubbery texture; may be fan-, spoon- or spatula-shaped with a narrow stem, laterally attached to a central base; surface dry, smooth, rough to fibrillose; colour pale greyish brown to dark grey, with paler zones. **Spore-bearing Surface** (hymenium) has a labyrinth-like appearance when young, becoming irregularly pored; whitish cream at first, becoming darker with age; pores decurrent. **Pores** 1–3 × 1 mm, irregularly shaped, sometimes elongated. **Spore Print** White to cream

Microscopic Features

Basidiospores 4–6 × 3.5–5 μm, (mean $5.1 \pm 0.4 \times 4.2 \pm 0.4$ μm, n=20) globose to subglobose, smooth, thin-walled. Basidia four-spored, 18–24 × 5–6 μm, elongate clavate. Clamp connections present.

Comments

Grifola colensoi is a large fungus consisting of numerous overlapping pilei. Its size, colour and shape make this species readily identifiable. It grows on decaying wood, and causes brown cubical rot. If it is growing at the base of a tree it may also be responsible for butt rot.

References

Cunningham GH (1965) "Polyporaceae of New Zealand". *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin*** **164, p. 95 [D I]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 256 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 185 [D CP]**

D=Description; **I**=Illustration; **CI**=Colour Illustration; **P**=Photo; **CP**=Colour Photo

Fam. Meruliaceae

Cymatoderma elegans

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Meruliaceae

Cymatoderma elegans

Cymatoderma lamellatum *Cymatoderma elegans* var. *lamellatum*

Biology

Saprotrophic basidiomycete; solitary or in small colonies on decaying branches and logs in rainforests.

Fruit-body Description

Diameter to 120 mm or more and up to 225 mm in height; wine-glass or funnel-shaped, tough, leathery, radially wrinkled, margin ragged. **Upper surface** velvety, zoned concentrically in various shades of brown. **Lower surface** smooth, devoid of any warts or spines, with radial folds or ridges often branching and extending from the stipe to the margin; colour whitish grey to pale cream. **Stipe** central or off-centre, short, velvety, woody, brown. **Spore Print** White

Microscopic Features

Basidiospores 6–8 $\times$ 4–5 μm, ellipsoidal, smooth. Has thick-walled (metuloid) crystal-encrusted cystidia.

Comments

This impressive looking fungus is readily identified by its distinctive funnel shape and texture. *Cymatoderma elegans* is not unique to Australia; it can also be found in Africa, Asia and some Pacific Islands.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 279 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 176 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 77 [D CP]**

Reid DA (1958) "The Genus Cymatoderma Jungh. (Cladoderris)". *Kew Bulletin* **Vol 13(3), pp. 518–530 [D]** (as *Cymatoderma elegans* var. *lamellatum*)

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 82 [D I]**

Fam. Meruliaceae

Flavodon flavus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Meruliaceae

Flavodon flavus

Irpex flavus *Polystictus flavus*
Polyporus flavus *Trichaptum flavum*

Biology

Saprotrophic basidiomycete; forms large patches on bark or decorticated fallen wood; associated with white rot.

Fruit-body Description

Consisting of patches up to 100 × 500 mm or more, some effused-reflexed, effuse area up to 4 mm thick. Reflexed part (pileus) up to 10 mm or more across, margin ragged; surface smooth to velutinous; colour yellow to yellow-brown. Hymenial surface (spore-bearing surface) initially pored 2–3 per mm, then develops flattish columnar tooth-like structures or overlapping plates (irpicoid-poroid), 1–3 mm long; colour yellow, becoming yellow-brown over toothed area; margin 5 mm or more wide, sterile, tomentose, remaining yellow. **Context** soft, tough, leathery, yellow to yellow-brown. **Spore Print** Not observed

Microscopic Features

Basidiospores 4.5–6.5 × 2–3.5 μm, (mean $5.5 \pm 0.5 \times 2.8 \pm 0.2$ μm, Q=1.99 $\pm$ 0.14 n=30), obovate to tear-drop-shaped, many broadly ellipsoidal, smooth, hyaline. Basidia and cystidia not seen. Clamp connections absent.

Comments

This species can be recognised by its spore-bearing surface, which is yellowish, has largish pores when young and later develops flattish columnar tooth-like structures. The specimen examined produced a meagre spore print, which allowed a spore measurement to be made. The spore size agreed well with the size reported by Cunningham (1965). The macro-morphology of our specimens agreed well with the colour photographs and description produced by Padhiar *et al.* (2009). Due to the tough nature and the interwoven hyphae of this species, conclusive sighting of the basidia and cystidia was not made. Based on the morphological evidence it is reasonable to assume that this species is *Flavodon flavus*, which is a cosmopolitan species found in both northern and southern hemispheres, and is relatively common in tropical and sub-tropical regions.

References

Cunningham GH (1965) "Polyporaceae of New Zealand". *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin*** **164, p. 101** (as *Trichaptum flavum*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi*. 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 200 [D CP]**

Maas Geesteranus (1974) "Studies in the genera *Irpex* and *Steccherinum*". *Persoonia* **Vol. 7(4), pp. 443–581** (as *Irpex flavus*)

Padhiar A, Nagadesi PK, Albert S and Arya A (2009) "Morphology, Anatomy and Cultural Characters of Two Wood Decaying Fungi *Schizophyllum commune* and *Flavadon* [sic] *flavus*". *Indian Journal of Mycology and Plant Pathology* **Vol. 39(1), pp. 27–31 [D CP]**

Fam. Meruliaceae

Phlebia subceracea

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Meruliaceae

Phlebia subceracea

Acia subceracea *Mycoacia subceracea*

Biology

Saprotrophic basidiomycete; forms various-sized patches on moist rotting native wood, such as fallen branches and twigs.

Fruit-body Description

Resupinate (lies flat) patches, various sizes, can be as large as 300 mm or more long and 100 mm wide; surface in from the margin denticulate (finely toothed); teeth up to 1.5 mm long and to 0.5 mm in diameter, apex rounded-blunt, texture soft waxy; colour bright yellow, golden yellow, mustard yellow. **Chemical test** application of KOH solution produces no reaction, although the fungus may darken slightly. **Spore Print** White

Microscopic Features

Basidiospores 5–6 × 2–3 μm, ellipsoidal, smooth. Basidia four-spored, 12–26 × 4–6 μm, clavate to slenderly clavate.

Comments

Phlebia subceracea is recognised in the field as being bright yellow denticulate patches, usually on the underside of rotting native wood. There are at least two similar species in the northern hemisphere: *Mycoacia aurea*, which is more of a cream to pale yellow colour, and *M. uda*, which looks very similar to *P. subceracea* but reacts with KOH by turning purple-red. (see Breitenbach and Krãnzlin 1986). To date, these species have not been found in Australia.

References

Breitenbach J and Krãnzlin F (1986) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 160–162** **[D CP]** (as *Mycoacia subceracea*)

Fuhrer B (2009) *A field guide to Australian fungi*. Bloomings Books: Melbourne. **p. 243** **[D CP]** (as *Mycoacia subceracea*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi*. 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 203** **[D CP]** (as *Mycoacia subceracea*)

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi*. Fungimap: South Yarra, Victoria. **p. 76** **[D CP]** (as *Mycoacia subceracea*)

Wakefield EM (1930) "Australian Resupinate Hydnaceae". *Transactions of the Royal Society of South Australia* **Vol. 54, pp. 155–158** **[D]** (as *Acia subceracea*)

Fam. Meruliaceae

Podoscypha petalodes

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Meruliaceae

Podoscypha petalodes

Stereum floriforme *Podoscypha petalodes* subsp. *floriformis*

Biology

Saprotrophic basidiomycete; occasionally solitary, gregarious, or in caespitose tufts, or rosettes; on rotting wood, logs, and stumps; if on the ground it is above buried wood.

Fruit-body Description

Stipitate fruit-body; **Pileus** up to 80 mm high and 40 mm across; fan-shaped to funnel-shaped, usually with a split on one side, irregularly radially wrinkled, margin often thinning out; surface glabrous; colour ranging from pale golden-brown to chestnut brown, with darker concentric zones. **Hymenial surface** grey when fertile, ochre or pallid brown when sterile. **Stipe** up to 10 mm long and 4 mm thick, slightly velvety; sometimes fused, usually single, but may arise from a common mycelial base; colour same as or similar to hymenium. **Spore Print** White

Microscopic Features

Basidiospores 4–6 × 2.5–3.5 μm, ovate to ellipsoidal, smooth. Basidia four-spored, 25–40 × 5–6 μm, clavate. Clamp connections present.

Comments

Fruit-bodies of *Podoscypha petalodes* are readily recognised by their funnel shape and habit of forming caespitose or rosetted colonies at the base of trees or on the ground above buried wood. This species can also be found in Central America, East Indies, Pacific Islands and New Zealand.

References

Cunningham GH (1963) "The Thelephoraceae of Australia and New Zealand". New Zealand Department of Scientific and Industrial Research. ***Bulletin* 145, pp. 359; [D I]** (misidentified as *Podoscypha elegans*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 281 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 83 [CP]** (as *Podoscypha petaloides*)

Reid DA (1965) "A monograph of the stipitate stereoid fungi". *Nova Hedwigia* **Beih. 18, pp.224; [D I]** (as *Podoscypha petalodes* subsp. *floriformis*)

Fam. Meruliaceae

Rigidoporus laetus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Meruliaceae

Rigidoporus laetus

Coltricia laeta *Polyporus laetus*
Fomes laetus

Biology

Saprotrophic basidiomycete; solitary or forming overlapping tiers of shelf-like fruit-bodies on dead wood such as tree stumps and logs.

Fruit-body Description

Bracket-like, attached by a narrow lateral base, 30–60 mm wide, projecting 40–70 mm, and 5–10 mm thick; woody, firm, margin rounded. **Upper surface** glabrous, may become rough with age, radially striate, sometimes fluted laterally; colour orange or orange-rufous. **Lower surface** fertile surface, pored, 2–3 per mm, smooth; colour ranging from yellowish orange, pale orange, or orange to orange-rufous, darkening to deep brick-red. **Spore Print** White

Microscopic Features

Basidiospores 4.5–6 μm, globose or subglobose, smooth. Basidia four-spored, 10–12 × 4–5 μm, clavate. Clamp connections absent.

Comments

Rigidoporus laetus is usually found on decaying wood, and is most readily identified by its orange-rufous upper surface, pale orangey pored lower surface and fruit-body thickness of 5 mm or more. *Ridigoprus aureofulva* is similar, but its fruit-bodies are no more than 2 mm thick.

References

Buchanan PK and Ryvarden L (1988) "Type studies in the Polyporaceae – 18 Species described by G.H. Cunningham". *Mycotaxon*. **Vol. 31(1), pp. 1–38** **[D I]**

Cunningham GH (1965) "Polyporaceae of New Zealand". *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin*** **164, p. 304** **[D I]** (as *Coltricia laeta*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 272** **[D CP]**

Fam. Phanerochaeteceae

Byssomerulius corium

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Phanerochaeteceae

Byssomerulius corium

Merulius corium *Meruliopsis corium*

Biology

Saprotrophic basidiomycete; fruit-body forms adhering patches, usually on dead angiosperm (flowering plant) wood, and is associated with white rot.

Fruit-body Description

An adhering sheet that can be small to extensive, waxy, hard, and up to 2 mm thick; the outer margin may or may not be reflexed back from the wood. **Lower Surface** spore-bearing, white; covered by an irregular pattern of shallow pore-like depressions separated by a network of ridges. **Spore Print** White

Microscopic Features

Basidiospores 4–8 $\times$ 2–4 μm, ellipsoidal, smooth. Basidia may have 2 or 4 sterigmata but produce only 2 spores, 25–35 $\times$ 4–5 μm, slender-clavate. Clamp connections absent.

Comments

Most crust fungi are very difficult to identify, requiring tedious and painstaking microscopic examination; *Byssomerulius corium* thankfully has a pattern of shallow pits (pores) and ridges on the spore-bearing surface, making it readily identifiable.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 277 [D CP]**

Ginns JH (1969) "The Genus Merulius II. Species of Merulius and Phlebia Proposed by Lloyd". *Mycologia* **Vol. 61(2), pp. 357–372 [D]**

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 164 [D I]**

D=Description; **I**=Illustration; **CI**=Colour Illustration; **P**=Photo; **CP**=Colour Photo

Fam. Polyporaceae

Cerrena zonata

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Polyporaceae

Cerrena zonata

Irpex brevis *Antrodiella zonata*

Biology

Saprotrophic basidiomycete; found on dead wood such as fallen branches, or on upright stumps where it grows bracket-like in multiple tiers; caespitose.

Fruit-body Description

Brackets generally up to 50 mm broad, 30 mm long and 4 mm thick. **Upper Surface** smooth, polished; colour ochraceous or brownish orange, with or without concentric zones; margin acute. **Lower Surface** fertile surface consists of flattened teeth, irregular in length and shape, up to 3 mm long; colour pallid ochre. **Spore Print** White

Microscopic Features

Basidiospores 4–4.5 × 1.5–2 μm, ellipsoidal, smooth. Basidia 12–16 × 4–6 μm, clavate. Cystidia abundant or sparse, often encrusted, metuloid.

Comments

The bright ochraceous upper surface, and the lower surface with pallid ochre flattened teeth, make this species relatively easy to identify in the field. This species was transferred from the genus *Antrodiella* to the genus *Cerrena* based on DNA evidence (Yuan 2014).

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 247** **[D CP]** (as *Antrodiella zonata*)

Cunningham GH (1949) "New Zealand Polyporaceae. 11. The genus *Irpex*". New Zealand Department of Scientific and Industrial Research. Plant Diseases Division. *Bulletin* 82: **p. 8** **[D I]** (as *Antrodiella zonata*)

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 73** **[CP]** (as *Antrodiella zonata*)

Yuan H-S (2014) "Molecular phylogenetic evaluation of *Antrodiella* and morphologically allied genera in China". *Mycological Progress* **Vol. 13, pp. 353–364** **[D CP]**

Fam. Polyporaceae

Hexagonia vesparia

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Polyporaceae

Hexagonia vesparia

Hexagonia gunnii *Polyporus vesparius*
Osmoporus gunnii

Biology

Saprotrophic basidiomycete; usually solitary or in small groups on trunks and branches of dead or dying *Eucalyptus* species.

Fruit-body Description

More or less hoof-shaped, attached laterally by a broad base. **Pileus** up to 50 mm or more wide, projecting up to 30 mm, and up to 30 mm thick; surface at attachment tomentose (densely matted), becoming glabrous towards the margin, occasionally roughened with raised ridges; colour whitish when young, becoming brownish with age. **Lower Surface** hymenial surface initially white, with age becoming brownish, with a sterile border; pores angular, 1 to 3 mm wide, becoming more elongated towards the margin, 5 to 15 mm deep. **Context** corky-woody. **Spore Print** White

Microscopic Features

Basidiospores 15–22 $\times$ 6–8 μm, smooth, elongated, cylindrical with rounded ends, apiculate, with a round or oval guttule (oil drop), hyaline. Basidia four-spored, 35–42 $\times$ 8–9 μm, elongate-clavate. Clamp connections present in some of the hyphae.

Comments

Among wood-rotting polypores this species is one of the more conspicuous. It is readily identified by its more or less hoof-like shape, large 1 to 3 mm wide, angular to elongated pores, and by its large cylindrical spores. This species is more common in the southern regions of Australia.

References

Cleland JB (1976) *Toadstools and mushrooms and other larger fungi of South Australia Parts I and II 1934–1935.* The Flora and Fauna of South Australia Handbooks Committee: Adelaide. Photolitho reprint. **p. 223 [D P]** (as *Hexagonia gunnii*)

Cunningham GH (1965) "Polyporaceae of New Zealand". *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin*** **164, pp. 241–242 [D I]** (as *Osmoporus gunnii*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 259 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 185 [D CP]**

Fam. Polyporaceae

Laccocephalum sclerotinum

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Polyporaceae

Laccocephalum sclerotinum

Polyporus sclerotinus

Biology

Most likely a mycorrhizal basidiomycete; fruit-body develops from a small hypogeous sclerotium, in gravelly or sandy soils in mixed eucalypt forest. Fruit-body usually appears after fire, solitary or in small groups, on burnt soil.

Fruit-body Description

Pileus (Cap) Diameter to 30 mm or more; initially convex, then plano-convex to plane and occasionally becoming plano-concave; surface finely rough, glabrous, finely radially striate, with some concentric grooves(sulcate); colour orange-brown, reddish brown to chestnut, with some concentric darker rings; flesh becoming hard when dry. **Pore Surface** Pores decurrent, round or oval, concolorous with hymenial layer, 4–6 per mm. Hymenial surface white to greyish. **Stipe (Stem)** Central; generally up to 25 mm above ground and up to 6 mm diameter; irregularly round, grooved; surface dry, usually encrusted with soil and sand grains; colour fuscous brown. **Spore Print** White

Microscopic Features

Basidiospores 4.5–6.5 $\times$ 2–3.5 μm, (mean $5.5 \pm 0.4 \times 2.7 \pm 0.2$ μm, Q=2.05 ± 0.19 n=30), ellipsoidal to sub-cylindrical, smooth. Basidia four-spored, 11.5–19 $\times$ 4–6 μm, short-clavate. Clamp connections present.

Comments

Laccocephalum sclerotinum is conspicuous, as its reddish brown pileus is easily seen against the blackish burnt soil in which it grows and, with its white pored underside, it can be readily identified. The roughly subglobose scelrotia can be 1–2 cm in length and be buried to a depth of up to 15 cm or more. This Australian species was initially named by Leonard Rodway using a specimen he found at Mt Field in Tasmania in 1917.

References

Cunningham GH (1965) "Polyporaceae of New Zealand". *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin* 164, p. 85** (as *Polyporus sclerotinus*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 262 [D CP]** (as *Laccocephalum sclerotinium*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 187 [D CP]** (as *Laccocephalum sclerotinium*)

Fam. Polyporaceae

Lentinus arcularius

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Polyporaceae

Lentinus arcularius

Favolus arcularius *Polyporus arcularius*

Biology

Saprotrophic basidiomycete; solitary or in small groups on dead wood, such as fallen branches, causing a uniform white rot. If on the ground, it is on buried wood.

Fruit-body Description

Pileus (Cap) Diameter to 50 mm or more; initially convex, distinctly depressed in the centre, becoming funnel-shaped, sometimes with a central protrusion, margin slightly inrolled, acute, fringed-bristly; surface usually radially fibrillose, with age becoming smooth, usually scaly in the centre; colour light brown to darkish brown, zoned with concentric rings. **Pore Surface** whitish to light brown. **Pores** up to 0.5 to 2 per mm, elongated polygonal; becoming smaller towards the margin; usually slightly decurrent (running down the stipe). **Stipe (Stem)** Central to somewhat eccentric; generally up to 60 mm long and 20 mm thick; cylindrical; surface dry, smooth or slightly scaly; colour yellowish brown to brown. **Spore Print** White

Microscopic Features

Basidiospores 6–9 $\times$ 2–3 μm, cylindrical, smooth. Basidia four-spored, 15–22 $\times$ 4–6 μm, clavate. Clamp connections present.

Comments

Lentinus arcularius is readily recognised by the tough thin pileus with brownish fibrils on the surface and largish elongated polygonal pores underneath. There is significant molecular data to show that this species does not belong in the genus *Polyporus* but instead in the genus *Lentinus*, (see Zmitrovich 2010; Seelan 2015).

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 563 [D P]** (as *Polyporus arcularius*)

Breitenbach J and Krãnzlin F (1986) *Fungi of Switzerland* Vol. 2. Verlag Mykologia: Luzern, Switzerland. **p. 324 [D CP]** (as *Polyporus arcularius*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 268 [D CP]** (as *Polyporus arcularius*)

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 81 [CP]** (as *Polyporus arcularius*)

Seelan JSS, Sabah K, Justo A, Nagy LG, Grand EA, Redhead SA and Hibbett D (2015) "Phylogenetic relationships and morphological evolution in *Lentinus, Polyporellus* and *Neofavolus* emphasizing southeastern Asian taxa". *Mycologia* **Vol. 107(3), pp. 460–489**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 79** **[D I]** (as *Polyporus arcularius*)

Zmitrovich IV (2010) "The Taxonomical and Nomenclatural Characteristics of Medical Mushrooms in Some Genera of Polyporaceae". *International Journal of Medical Mushrooms* **Vol. 12(1), pp. 87–89**

Fam. Polyporaceae

Microporus xanthopus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Polyporaceae

Microporus xanthopus

Polyporus xanthopus *Coriolus xanthopus*
Trametes xanthopus *Polystictus xanthopus*

Biology

Saprotrophic basidiomycete; solitary to gregarious on dead wood, such as fallen twigs and branches, in tropical to subtropical rainforests; causes white rot.

Fruit-body Description

Pileus (Cap) Diameter to 100 mm or more and up to 2 mm thick; funnel-shaped, flesh thin, margin thin and wavy; surface dry, shiny, glabrous; colour concentric zones of various shades of brown, yellow, and sometimes black. **Pore Surface** white to pale grey or pale fawn. **Pores** diameter minute, 8–10 per mm, round; decurrent (extending a short distance down the stipe). **Stipe (Stem)** Central, occasionally eccentric; generally up to 40 mm long and 5 mm thick, expanding abruptly at the base to form a basal disc where it attaches to the substrate; surface smooth, shiny, glabrous; colour yellowish brown, basal disc yellowish. **Spore Print** White

Microscopic Features

Basidiospores 3.5–4.5 × 1–2 μm, smooth, narrow-cylindrical, slightly curved. Basidia four-spored, 7–9 × 3–5 μm, clavate. Clamp connections present.

Comments

Microporus xanthopus is an elegant funnel-shaped fungus, readily recognised by its thin, shiny, zoned brown pileus, whitish pored surface with very small pores, and yellowish basal disc at the point of attachment. This species is common in tropical and subtropical rainforest areas in Queensland, extending to New South Wales and also reported from Victoria.

References

Dutta S and Roy A (1985) "Notes on Microporus xanthopus (Fr.) Kuntze". *Nova Hedwigia* **Vol. 42, pp. 1–7 [D I]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 266 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 71 [D CP]**

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 244 [D I]**

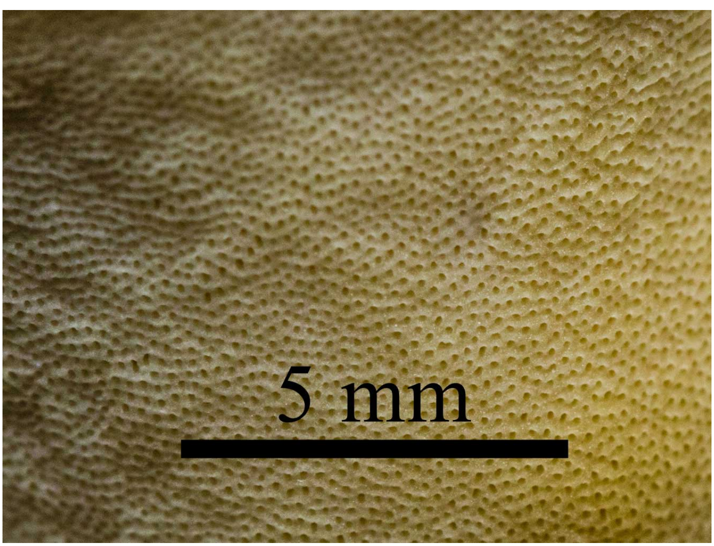
Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 76 [D CI]**

D=Description; **I**=Illustration; **CI**=Colour Illustration; **P**=Photo; **CP**=Colour Photo

Fam. Polyporaceae

Polyporus melanopus complex

© Jurrie Hubregtse



© Jurrie Hubregtse

Fam. Polyporaceae

Polyporus melanopus complex

Picipes melanopus *Polyporellus melanopus*

Biology

Saprotrophic basidiomycete; grows solitary or more usually in groups, on dead fallen branches or decaying wood in mixed eucalypt forest.

Fruit-body Description

Pileus (Cap) Diameter to 80 mm or more; spatulate when young, with age becoming more or less round in outline, with a wavy or undulate margin, usually depressed near stipe attachment; surface smooth, glabrous, often with some squamules arranged radially near stipe attachment; colour when young pale, becoming dark reddish-brown; flesh tough and leathery, becoming hard when dry. **Pore Surface** Hymenial surface whitish to ochre, with a 1–2 mm sterile margin. Pores decurrent, round or oval, concolorous with hymenial layer, 5–8 per mm, 75–150 μm diameter. **Stipe (Stem)** Usually eccentric to lateral; generally up to 40 mm long and 5 mm thick; almost equal, thickening at the apex; surface finely velvety; colour when young pale, with age becoming black. **Spore Print** Yellowish brown

Microscopic Features

Basidiospores 7–9 $\times$ 3–4 μm, (mean 7.9 $\pm$ 0.5 $\times$ 3.4 $\pm$ 0.2 μm, Q=2.35 $\pm$ 0.16 n=30), narrowly ellipsoidal to sub-cylindrical, smooth, thin-walled. Basidia four-spored, 14–19 $\times$ 5.5–8 μm, stubby-clavate. Clamp connections not observed.

Comments

This species can be readily identified in the field by its smooth, dark reddish-brown, tough leathery pileus, whitish to ochre coloured spore-bearing surface, with very small pores (5–8 per mm, best observed with a hand lens) and blackish stipe. For this species the observed macro and micro morphologies agree reasonably well with the species description of *Polyporus melanopus* by Cunningham (1965), where he had access to Australian material. The match with our observations and some northern hemisphere descriptions e.g. Breitenbach J and Krãnzlin F (1995) is not as close as we would like. *P. melanopus* used to belong to an artificial group of Polypores called the "Melanopus group", which contained species of Polypores with a black cuticle on the stipe. In the northern hemisphere, taxonomic and phylogenetic studies on species belonging to the "Melanopus group", using DNA analysis, has been undertaken, with the aim to identify specific species and to update their taxonomic position (Krüger *et al.* 2006; Zhou *et al.* 2016). This type of detailed study still needs to be carried out using Australian material.

References

Breitenbach J and Krãnzlin F (1995) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 326–327 [D CP]**

Cunningham GH (1965) "Polyporaceae of New Zealand". *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin*** **164, p. 85**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi*. 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 189 [D CP]**

Krüger D, Petersen RH, Hughes KW (2006) "Molecular phylogenies and mating study data in *Polyporus* with special emphasis on group "Melanopus" (Basidiomycota)". *Mycological Progress* **Vol. 5, pp. 185–206**

Zhou J-L, Zhu L, Chen H, Cui B-K (2016) "Taxonomy and Phylogeny of *Polyporus* Group *Melanopus* (Polyporales, Basidiomycota) from China". *PLoS ONE* **Vol. 11(8): e0159495. doi:10.1371/journal.pone.0159495**

Fam. Polyporaceae

Ryvardenia campyla

Fam. Polyporaceae

Ryvardenia campyla

Postia campyla *Polyporus campylus*
Tyromyces campylus *Grifola campyla*
Tyromyces falcatus

Biology

Saprotrophic basidiomycete; imbricate (multiple tiers of brackets) on dead angiosperm wood such as that of *Eucalyptus* and *Nothofagus* species. Causes brown rot.

Fruit-body Description

Usually with a few or numerous imbricate pilei normally originating from a common base. **Pileus** up to 60 mm or more wide, projecting up to 40 mm, and 20 mm thick; semicircular or fan-shaped, margin regular, acute or rounded; surface glabrous or slightly covered with short hair, often pitted; when conditions are moist, clear or amber droplets sometimes form on the surface; colour whitish towards the base, pinkish beige towards the margin. **Lower Surface** hymenial surface, white, pores circular, 2–3 per mm, pore mouths slightly hairy. **Flesh** when fresh, white, waxy, chalky. **Spore Print** Cream

Microscopic Features

Basidiospores 5–7 × 4–5 μm, broadly ellipsoidal, pip-shaped, with a prominent apiculus. Basidia four-spored, 15–33 × 4–8 μm, clavate, with numerous oil drops. Clamp connections present in some of the hyphae.

Comments

Ryvardenia campyla is recognised by growing on wood, with numerous imbricate, waxy, pinkish beige pilei with a white pored undersurface. There are at least two species of *Postia* with which *R. campyla* can be confused (see Rajchenberg and Buchanan 1996). *Postia brunnea* differs from *R. campyla* by having more brownish and thinner pilei, and *P. punctata* normally has whitish pilei. To be sure of identification microscopic features may need to be examined.

References

Buchanan PK and Ryvarden L (1988) “Type studies in the Polyporaceae — 18 Species described by G.H. Cunningham”. *Mycotaxon* **Vol. 31(1), pp. 1–38** **[D I]** (as *Tyromyces falcatus*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 272** **[D CP]**

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 184 [D I]**

Rajchenberg M (1994) "A taxonomic study of the subantarctic Piptoporus (Polyporaceae, Basidiomycetes) I". *Nordic Journal of Botany* **Vol. 14(4), pp. 435–449 [D I]**

Rajchenberg M and Buchanan PK (1996) "Two Newly Described Polypores from Australasia and Southern South America". *Australian Systematic Botany* **Vol. 9, pp. 877–885 [D I]**

Fam. Polyporaceae

Ryvardenia cretacea

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Polyporaceae

Ryvardenia cretacea

Postia cretacea *Piptoporus cretaceus*
Polyporus cretaceus

Biology

Saprotrophic basidiomycete; usually solitary, most commonly found on Myrtle Beech *Nothofagus cunninghamii* and on Mountain Ash *Eucalyptus regnans*, usually on rotting logs but occasionally on living trees. Causes brown rot.

Fruit-body Description

Up to 200 mm wide, projecting 120 mm and 50 mm thick; bracket-like, more or less applanate, occasionally shaped like a horse's hoof, attached to substrate by a broad lateral pseudo stipe, pileus margin rounded. **Upper Surface** when young glabrous, becoming pitted, with age may incorporate litter; colour from off-white to buff or grey. **Lower Surface** hymenial surface, white, pores circular, 2–3 per mm, in moist conditions often has exuded water droplets. **Tubes** up to 10 mm long, same colour as pores. **Flesh** when fresh, white, firm rubbery, chalky when dry. **Spore Print** White to cream

Microscopic Features

Basidiospores 6–7.5 $\times$ 4.5–6 μm, broadly ellipsoidal, pip-shaped, with a prominent apiculus. Basidia four-spored, 22–30 $\times$ 7–8 μm, clavate, with oil drops. Clamp connections present.

Comments

Ryvardenia cretacea is recognised by its bracket-like shape, its lateral pseudo stipe attachment, its relatively large size, pale upper surface and white pored lower surface, which exudes droplets when conditions are moist. It is most commonly found on Myrtle Beech *Nothofagus cunninghamii* and on Mountain Ash *Eucalyptus regnans*, usually on rotting logs but occasionally on living trees in Victoria and Tasmania. A similar looking fungus is *Laetiporus portentosus*, which is usually larger in size, does not exude droplets on its pored surface, and the texture of its flesh is less firm.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 273 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 193 [D CP]**

Rajchenberg M (1994) "A taxonomic study of the subantarctic Piptoporus (Polyporaceae, Basidiomycetes) I". *Nordic Journal of Botany* **Vol. 14(4), pp. 435–449 [D I]**

Reid DA (1957) "New or interesting records of Australasian Basidiomycetes III". *Kew Bulletin* **Vol. 12(1), pp. 127–143** **[D I]** (as *Polyporus cretaceus*)

Rajchenberg M and Pildain MB (2012) "Molecular studies reveal a speciation process within *Ryvardenia cretacea* (Polyporales Basidiomycota)". *Kurtziana* **Vol. 37(7), pp. 7–13**

Fam. Polyporaceae

Trametes coccinea

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Polyporaceae

Trametes coccinea

Polyporus coccineus *Pycnoporus coccineus*
Polystictus semisanguineus

Biology

Saprotrophic basidiomycete; sometimes solitary but usually gregarious on dead wood, causing a white soft-rot.

Fruit-body Description

Up to 100 mm or more across and 10 mm thick; when very young button- or cushion-shaped, becoming bracket-like, fan-shaped, semicircular, or irregular, often with embedded twigs, grass, or leaves. **Upper surface** smooth or finely fibrillose, sometimes zoned, occasionally pitted and uneven; colour uniformly orange-red, fading with age to a pinkish red. **Lower surface** pored, not bruising, pores almost reaching the margin; round or slightly angular, fine, 6–8 per mm; colour brilliant vermilion red. **Stipe** mostly absent, fruit-body attached laterally; if present it is short and tough; usually at the point of attachment reddish mycelium can be seen spreading through the substrate. **Flesh** orange-red, tough, corky. **Spore Print** White

Microscopic Features

Basidiospores 4–5 × 1.5–2.5 μm, narrowly ellipsoidal, smooth. Basidia four-spored, 10–13 × 4–6 μm, clavate. Clamp connections present.

Comments

Trametes coccinea is a common species, readily recognised by its colour and bracket-like shape. The pored surface will often retain its brilliant vermilion-red colour long after the upper surface has faded. This fungus is found on most types of dead wood. In Australia there is another species, *Trametes sanguinea*, which is found mainly in the northern regions of the continent, while in the northern hemisphere there is *T. cinnabarina*. All three species are morphologically very similar and require extensive laboratory examination to separate them. For convenience, specimens found in Victoria and Tasmania are considered to be *T. coccinea*, and those found in tropical regions of Australia are considered to be *T. sanguinea*. Phylogenetic analysis by Justo and Hibbett (2011) on the genus *Trametes* and closely related genera showed all four *Pycnoporus* species clustered within the *Trametes* clade. Li and He (2014) used this information to officially move the species in the genus *Pycnoporus* into the genus *Trametes*.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 330 [D CI]** (as *Pycnoporus coccineus*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 271 [D CP]** (as *Pycnoporus coccineus*)

Justo A and Hibbett S (2011) "Phylogenetic classification of *Trametes* (Basidiomycotina, Polypotales) based on a five-marker dataset". *Taxon* **Vol 60(6), pp. 1567–1583**

Li H-J and He S-H (2014) "Thre species of polypores new to China". *Mycosystema* **Vol. 33(5), pp. 967–975 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 78 [CP]** (as *Pycnoporus coccineus*)

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 80 [D CP]** (as *Pycnoporus coccineus*)

Fam. Polyporaceae

Trametes versicolor

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Polyporaceae

Trametes versicolor

Polyporus versicolor *Coriolus versicolor*
Polystictus versicolor

Biology

Saprotrophic basidiomycete; usually forming dense, overlapping tiers of shelf-like fruit-bodies on dead wood, generally hardwood, but sometimes on the wood of conifers. It causes white rot.

Fruit-body Description

Radius of individual fruit-bodies up to 70 mm or more, and thickness usually less than 3 mm; bracket- to shelf-like, fan-shaped, often semicircular or growing in circular rosettes, narrowly or broadly attached, margin may be lobed, wavy or coarsely pleated. **Upper surface** velvety, hairy, hairy tufts towards point of attachment, often brightly coloured, concentrically zoned with many colours, ranging from light browns and yellows to almost black, margin usually whitish to yellowish. **Lower surface** fertile surface, smooth, white to yellowish, pored, pore opening more or less round, minute, more than 3 pores per mm; tubes shallow, up to 2 mm long. **Flesh** thin, tough, leathery, whitish. **Spore Print** White

Microscopic Features

Basidiospores 5–6.5 × 1.5–2.5 μm, long ellipsoidal or bean-shaped, smooth. Basidia four-spored, 14–22 × 4–6 μm, clavate. Clamp connections present.

Comments

Trametes versicolor is a common wood rotting fungus, but because of its variability and similarity to other brackets it may be difficult to identify. The following characteristics must be present: the lower surface must have pores, the pores must be minute, more than 3 per mm, the upper surface must be velvety, or finely hairy, with contrasting colour zones, and the fruit-body must be tough and leathery.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 594 [D P]**

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 340 [D CI]**

Breitenbach J and Krãnzlin F (1986) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 288 [D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 274 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi*. 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 194** **[D CP]**

Phillips R (2006) *Mushrooms*. Macmillan: London. **p. 317** **[D CP]**

Young AM (2005) *A field guide to the fungi of Australia*. University of New South Wales Press: Sydney. **p. 81** **[D I]**

Fam. Polyporaceae

Tyromyces pulcherrimus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Polyporaceae

Tyromyces pulcherrimus

Aurantiporus pulcherrimus *Polyporus pulcherrimus*

Biology

Saprotrophic basidiomycete; fruit-bodies occur annually, either solitary or in overlapping tiers (imbricate), on the exposed heartwood of *Nothofagus* spp. and on some species of eucalypts such as snow gums. This infection causes in white rot of the heartwood.

Fruit-body Description

Bracket-shaped, up to 95 mm wide, projecting up to 70 mm, laterally attached (no stem). **Upper Surface** covered in thick erect tufts especially near point of attachment; colour when fresh bright salmon to bright strawberry red, with age colour fades. **Lower Surface** pored, pores up to 4 per mm; tubes up to 5 mm deep; colour concolorous with upper surface. **Flesh** soft, spongy, resinous. **Spore Print** White

Microscopic Features

Basidiospores 5–7 × 3.5–4.5 μm, broadly ellipsoidal to subglobose, smooth. Clamp connections present.

Comments

In the field, the bright reddish colour and soft spongy texture of the fruit-body are the main diagnostic features that assist in the identification of this species.

References

Buchanan PK and Hood IA (1992) "New species and new records of Aphyllophorales (Basidiomycetes) from New Zealand". *New Zealand Journal of Botany* **Vol. 30, pp. 95–112** **[D I]** (as *Aurantioporus pulcherrimus*)

Cunningham GH (1965) "Polyporaceae of New Zealand". *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin* 164, p. 121** **[D I]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 247** **[D CP]** (as *Aurantiporus pulcherrimus*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 180** **[D CP]** (as *Aurantiporus pulcherrimus*)

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 79** **[CP]** (as *Aurantiporus pulcherrimus*)

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 70** **[D I]** (as *Aurantiporus pulcherrimus*)

Fam. Steccherinaceae

Austeria citrea

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Steccherinaceae

Austeria citrea

Antrodiella citrea *Tyromyces citreus*
Polyporus citreus

Biology

Saprotrophic basidiomycete; typically growing on dead wood, most often on twigs or small branches. Usually found in damp sclerophyll forest. Causes white rot.

Fruit-body Description

Fruit-body sometimes resupinate, more commonly resupinate-reflex with a lobed pileus. When **resupinate**, the fruit-body may form a patch up to 50 mm by 90 mm on a branch. When **pileate**, the pileus may be 50 mm or more long, 20 mm or more wide and 2–4 mm thick, with a leathery texture; may be fan- or spatula-shaped, often lobed, laterally attached; surface dry, smooth to velvety; colour citric yellow fading to cream or brownish with age, often concentrically zoned. **Spore-bearing surface** (hymenium) is covered in minute pores with a sterile margin; colour pale citric yellow to white. **Pores** 5–9 per mm, predominantly round. **Spore Print** White

Microscopic Features

Basidiospores 2–3 $\times$ 1–2 μm, ellipsoidal, smooth, thin-walled, hyaline. Basidia four-spored, 9–14 $\times$ 3–4.5 μm, clavate. Clamp connections present.

Comments

This relatively small polypore, which is usually found on twigs and branches, is readily recognised by its bright citric yellow pileus and pale yellow to white pored surface, with minute pores. This species is found in Australia and New Zealand, where in the recent past it was known as *Antrodiella citrea*. Phylogenetic studies (Miettine *et al.* 2012; Miettine *et al.* 2016) have clearly shown that the genus *Antrodiella* was polyphyletic and needed to be revised. The revised classification by Miettine *et al.* (2016) showed that this species was unique and did not belong in the genus *Antrodiella* nor in any other known genus. A new genus *Austeria* (meaning southern) was created to accommodate this species.

References

Buchanan PK and Ryvarden L (2000) "New Zealand polypore fungi: six new species and a redetermination". *New Zealand Journal of Botany* **Vol. 38(2), pp. 251–263** (as *Antrodiella citrea*)

Cunningham GH (1965) “Polyporaceae of New Zealand”. *New Zealand Department of Scientific and Industrial Research.* ***Research Bulletin*** **164, p. 95** **[D I]** (as *Tyromyces citreus*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 247** **[D CP]** (as *Antrodiella citrea*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 198** **[D CP]** (as *Antrodiella citrea*)

Miettine O, Larsson E, Sjökvist, Larsso K-H (2012) “Comprehensive taxon sampling reveals unaccounted diversity and morphological plasticity in a group of dimitic polypores (Polyporales, Basidiomycota)”. *Cladistics* **Vol. 28, pp. 251–270**

Miettine O and Ryvarden L (2016) “Polypore genera *Antella*, *Austeria*, *Butyrea*, *Citripora*, *Metuloidea* and *Trulla* (Steccherinaceae, Polyporales)”. *Annales Botanici Fennici* **Vol. 53(1), pp. 157–172** **[D I]**

Ryvarden L (1984) “Type studies in the Polyporaceae 16. Species described by J.M. Berkeley, either alone or with other mycologists”. *Mycotaxon* **Vol. 20 (2), pp. 329–363** (as *Antrodiella citrea*)

Fam. Steccherinaceae

Flaviporus brownii

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Steccherinaceae

Flaviporus brownii

Baeostratoporus braunii *Leptoporus braunii*
Junghuhnia brownii *Polyporus rufoflavus*

Biology

Saprotrophic basidiomycete; found on dead wood such as fallen logs, where it grows solitary or in groups as resupinate patches, or bracket-like in multiple tiers.

Fruit-body Description

Usually bracket-like in multiple tiers and sometimes as resupinate patches. Resupinate patches can be up to 30 × 30 mm. Bracket form, up to 30 mm wide, 15 mm radius and 2–5 mm thick, irregular, shell-shaped or planar. **Upper surface** brownish yellow to brownish, often with darker brownish radial bands, when young finely furry, with age becoming smooth. **Lower surface** (hymenium) sulphur-yellow darkening to honey-yellow with age, pored with 8–10 pores per mm. **Spore Print** White

Microscopic Features

Basidiospores 1.5–3 × 1.5–2 μm, ellipsoidal, smooth. Basidia not observed. Cystidia abundant, strongly encrusted, metuloid. Clamp connections absent.

Comments

The brownish upper surface and the sulphur-yellow pored lower surface make this species relatively easy to identify in the field. This is a widespread species, most commonly found in tropical to sub-tropical regions, but less common in temperate or colder regions.

References

Cunningham GH (1949) "New Zealand Polyporaceae. 11. The genus *Irpex*". New Zealand Department of Scientific and Industrial Research. Plant Diseases Division. *Bulletin* 82: **p. 150** **[D I]** (as *Flaviporus brownei*)

Pires RM, Vásquez VM and Gugliotta AM (2016) "New records of polypores (Basidiomycota) from the state of São Paulo, Brazil". *Iheringia Serie Botanica* **Vol. 71(2), pp. 124–131** **[D CP]**

2.10 Order: Russulales

Russulales Taxonomic Classification	
Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Order:	Russulales
Families	
ca. 13; See text	

Russulales contains 13 families, 99 genera and about 2941 species ("Catalogue of Life" website http://www.catalogueoflife.org). This is a large and complex order, which contains all morphological types (resupinate, discoid, effuse-reflexed, clavarioid, gastroid and pileate). It also contains most of the hymenophore types (smooth, poroid, hydnoid, lamellate and labyrinthoid). The three main biological types — saphrotropic, ectomycorrhizal and parasitic — are also present in the Russulales (Larsson *et al.* 2003; Miller *et al.* 2006). The Russuloid agarics represent an independent evolutionary line of agarics, not directly related to the Agaricales. The Russulales have been well studied using DNA techniques, and it is a well supported monophyletic order, but there is still flux within the order as more specimens are sequenced.

Albatrellaceae – consists of 8 genera with 62 species. Its type genus is *Albatrellus*, which contains 25 species. The majority of fruit-bodies produced in this family have the typical mushroom morphology; other forms include false truffles and a single genus, *Byssoporia*, which has corticioid fruit-bodies.

Amylostereaceae – consists of 1 genus, *Amylostereum*, with 4 species. The species in this family produce crust-like and leathery-corky fruit-bodies on dead conifer wood. These fungi have a symbiotic relationship with wood wasps (*Siricdae*). The female wasp transfers the fungus when she places eggs inside the wood, then the larvae feed on the fungus while burrowing through the fungus-infested wood.

Auriscalpiaceae – consists of 8 genera with 72 species. Its type genus is *Auriscalpium*, which contains 9 species. This small family contains a variety of morphological fruit-bodies: stipitate-hydnoid (e.g. *Auriscalpium*), resupinate hymenium (spore-bearing surface) with teeth (e.g. *Dendtipratulum*) and agaricoid (e.g. *Lentinellus*).

Auriscalpium vulgare

Bondarzewiaceae – consists of 10 genera with 78 species. Its type genus is *Bondarzewia*, which contains 4 species. Many members of this family closely resemble Polyporales (and were formerly placed there). They are mainly wood-decaying species with either a poroid or a hydnoid hymenophore.

Echinodontiaceae – consists of 2 genera with 7 species. Its type genus is *Echinodontium*, which contains 5 species. The species of this family are largely confined to the northern hemisphere. The species belonging to *Echinodontium* tend to be woody bracket fungi, although species of *Laurilia* tend to resemble *Stereum.*

Gloeodontiaceae – consists of 1 genus, *Gloeodontia*, with 7 species. The species of this family are broadly effused crusts living on dead wood (Burdsall *et al.* 1976).

Hericiaceae – consists of 5 genera with 26 species. Its type genus is *Hericium*, which contains 13 species. The species in this family are all wood-rotters and they have coralloid or effused basidiocarps that are mostly strongly hydnoid. The best known Australian species in this family is *Hericium coralloides.*

Hericium coralloides

Hybogasteraceae – consists of 1 genus, *Hybogaster*, with 1 species *Hybogaster giganteus*, which has a large truffle-like fruit-body (Singer 1964).

Lachnocladiaceae – consists of 10 genera with 201 species. Its type genus is *Lachnocladium*, which contains 40 species. The species in this family are wood-rotters and the majority have corticioid or crust-like fruit-bodies.

Peniophoraceae – consists of 10 genera with 209 species. Its type genus is *Peniophora*, which contains 176 species. The species in this family have a cosmopolitan distribution and are primarily wood-rotters with corticioid or crust-like fruit-bodies.

Russulaceae – consists of 16 genera with 1933 species. Its type genus is *Russula*, which contains 1066 species. This is a large diverse family where the majority of species (over 1700) can be found in two genera, *Russula* and *Lactarius* in a traditional sense. Based on DNA evidence the traditional version of *Lactarius* was found not to be monophyletic and has now been split up into *Lactarius*, *Lactifluus* and *Multifurca*.


Russula flocktonae

Stephanosporaceae – consists of 8 genera with 35 species. Its type genus is *Stephanospora*, which contains 6 species. The species in this small family are known largely from Eurasia, New Zealand and Australia. They have truffle-like fruit-bodies and grow on the ground in rotting wood or plant debris (Lebel *et al.* 2015).

Stereaceae – consists of 19 genera with 286 species. Its type genus is *Stereum*, which contains 115 species. The majority of species in this family have bracket-like corticioid forms with a smooth hymenophore and smooth basidiospores. Most grow on dead wood and have adapted to resist drought conditions. One of the more common species in Australia is *Stereum ostrea*.

Stereum ostrea

References

Burdsall HH Jr and Lombard FF (1976) "The genus *Gloeodontia* in North America". *Memoirs of the New York Botanical Garden* **Vol. 28(1), pp. 16–31**

Buyck B, Hofstetter V, Eberhardt U, Verbeken A and Kauff F (2008) "Walking the thin line between *Russula* and *Lactarius*: the dilemma of *Russula* sect. *Ochricompactae*". *Fungal Diversity* **Vol. 28 pp. 15–40**

Larsson E and Larsson K-H (2003) "Phylogenetic relationships of russuloid basidiomycetes with emphasis on aphyllophoralean taxa". *Mycologia* **Vol. 95(6), pp. 1037–1065**

Lebel T, Castello MA and Beever RE (2015) "Cryptic diversity in the sequestrate genus *Stephanospora* (Stephanosporaceae: Agaricales) in Australasia". *Fungal Biology* **Vol. 119, pp. 201–208**

Miller SL, Larsson E, Larsson K-H, Verbeken A and Nuytinck J (2006) "Perspectives in the new Russulales". *Mycologia* **Vol. 98(6), pp. 960–970.**

Singer R (1964) "New genera of fungi – XII: *Hybogaster*". *Sydowia* **Vol. 17, pp. 12–16**

Fam. Auriscalpiaceae

Artomyces austropiperatus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Auriscalpiaceae

Artomyces austropiperatus

Clavicorona piperata

Biology

Saprotrophic basidiomycete; found in tufts or clusters on rotting wood in wet forests.

Fruit-body Description

Tufts slender, coral-like; up to 120 mm tall and 80 mm broad; whitish to pale fawn. **Base** short; surface covered with fine hair; colour same or slightly darker than branches. **Branches** spore-bearing surface smooth; branches expand at the tips into cup-like structures, and new branches arise from the rim. **Spore Print** White

Microscopic Features

Basidiospores 5–7 × 4–5 μm, broadly ellipsoidal to subglobose, slightly rough. Clamp connections present.

Comments

This species is identified in the field by its pale slender coral-like form growing on wood, with cup-like structures at the tips of its branches from which new branches arise, and also its distinctive peppery taste.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 314** **[D CI]** (as *Clavicorona piperata*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 200** **[D CP]** (as *Artomyces piperatus*)

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 88** **[D CP]** (as *Clavicorona piperata*)

D=Description; **I**=Illustration; **CI**=Colour Illustration; **P**=Photo; **CP**=Colour Photo

Fam. Auriscalpiaceae

Auriscalpium sp. "eucalypt earpick"

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Auriscalpiaceae

Auriscalpium sp. "eucalypt earpick"

Biology

Saprotrophic basidiomycete; in small to large groups, usually on the bark of the Narrow- or Broad-leaved Peppermint Gums.

Fruit-body Description

Pileus (Cap) Up to 20 mm broad, semicircular, kidney- or shell-shaped, convex; surface dry, initially densely covered with dark brown bristles which are lost with age; colour dark brown; flesh thin, tough, leathery. **Spines (Teeth)** Up to 2 mm long near margin, becoming up to 6 mm long near stipe attachment, 1 mm thick, tapering to a rounded tip, fragile; colour whitish to very pale tan, becoming more whitish as spores mature. **Stipe (Stem)** Lateral if present, up to 7 mm long, usually buried in fibrous bark, with a tuft of white mycelium at base. **Spore Print** White

Microscopic Features

Basidiospores 5.5–7 × 4.5–5.5 μm, (mean $6.2 \pm 0.3 \times 4.9 \pm 0.2$ μm, Q=1.25 ± 0.07 n=30), subglobose to ellipsoidal, ornamented with fine warts (verrucose). Basidia four-spored, 20–35 × 4–7 μm, clavate, with sterigmata up to 4.5 μm long. Gloeocyctidia 55–85 × 7–10 μm, curved, clavate with a long tail, protruding above basidia. Clamp connections present.

Comments

This species of *Auriscalpium* is readily identified by its small shell-shaped fruit-body and distinctive long spines. To date it has been found growing only on the bark of living Narrow- or Broad-leaved Peppermint Gums. It is most likely that this is an unnamed species that is unique to Australia. At present the only described *Auriscalpium* species in Australia is *A. barbatum* (Maas Geesteranus 1978), a species found in Western Australia. Another species not yet described is *Auriscalpium* "warrensis" (Gates and Ratkowsky 2016), a species found in Tasmania. DNA analysis of *Auriscalpium* species (see Larsson *et al.* 2003; Lickey *et al.* 2003; Miller *et al.* 2006) shows that they are very closely related to the genus *Lentinellus*, which has the identifying characteristic of serrate margins on the lamellae.

References

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 207 [D CP]**

Larsson E and Larsson K-H (2003) "Phylogenetic relationships of russuloid basidiomycetes with emphasis on aphyllophoralean taxa". *Mycologia* **Vol. 95(6), pp. 1037–1065**

Lickey EB, Hughes KW and Petersen R (2003) "Variability and Phylogenetic Incongruence of an SSU nrDNA Group I Intron in *Artomyces, Auriscalpium*, and *Lentinellus* (Auriscalpiaceae: Homobasidiomycetes)". *Molecular Biology and Evolution* **Vol. 20(11), pp. 1909–1916**

Maas Geesteranus RA (1978) "Notes on Hydnums – XI". *Persoonia* **Vol. 9(4), pp. 491–500 [D I]**

Miller SL, Larsson E and Larsson K-H (2006) "Perspectives in the new Russulales". *Mycologia* **Vol. 98(6), pp. 960–970**

Fam. Auriscalpiaceae

Lentinellus pulvinulus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Auriscalpiaceae

Lentinellus pulvinulus

Lentinellus hepatotrichus *Lentinellus pseudobarbatus*
Lentinellus hyracinus

Biology

Saprotrophic basidiomycete; solitary or in small groups on rotting wood or on the bark of living trees.

Fruit-body Description

Pileus (Cap) Diameter up to 35 mm or more; broadly convex, typically semicircular or fan-shaped, occasionally lobed, with a smooth inrolled margin; surface usually smooth at the margin, becoming hirsute (with coarse roughish hairs) towards the point of attachment; colour ochraceous-salmon to cinnamon. **Flesh** firm, fawn. **Lamellae (Gills)** Attachment adnate; moderately distant, margin coarsely and irregularly serrate; colour whitish to cream. **Stipe (Stem)** Usually absent, pileus normally laterally attached but occasionally may have a very short rudimentary stipe; the point of attachment is covered with dark coarse hairs. **Spore Print** White

Microscopic Features

Basidiospores 5.5–8 × 4–5.5 μm, ellipsoidal, almost hyaline, very finely ornamented. Basidia four-spored, 20–30 × 4–7 μm, clavate. Clamp connections present.

Comments

Lentinellus pulvinulus is a smallish ochraceous to cinnamon-coloured fan-shaped bracket, which has relatively distant serrate lamellae and is found on dead wood or bark. *Lentinellus pulvinulus* is a southern hemisphere species that is found in New Zealand, Southern Australia and Argentina. The work done by Petersen and Hughes (2004) showed that *Lentinellus pulvinulus* is closely related to another Argentinian species, *Lentinellus perstrictifolius*. This tends to suggest a Gondwanan origin for these species.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 108** **[D CP]** (as *Lentinellus* aff. *ursinus*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 104** **[D CP]**

Petersen RH and Hughes KW (2004) "A Preliminary Monograph of *Lentinellus* (Russulales)". *Bibliotheca Mycologica* Band **198,** J. Cramer (Gebr. Borntraeger Verlagsbuchhandlung): Berlin & Stuttgart.

Ratkowsky D and Gates G (2006) "*Lentinellus* Reconsidered". *The Tasmanian Naturalist.* **Vol. 128, pp. 8–10**

Segedin BA (1996) "A new species of *Lentinellus* (Hericiales, Lentinellaceae) and a revision of taxa attributed to *Lentinellus* in New Zealand". *New Zealand Journal of Botany* **Vol. 34, pp. 249–261** **[D I]**

Fam. Auriscalpiaceae

Lentinellus tasmanicus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Auriscalpiaceae

Lentinellus tasmanicus

Lentinellus tasmanica

Biology

Saprotrophic basidiomycete; solitary or in small groups on rotting wood.

Fruit-body Description

Pileus (Cap) Diameter up to 30 mm or more; typically semicircular or fan-shaped, occasionally lobed, centrally depressed, with a smooth inrolled margin; surface usually smooth at the margin, becoming hirsute (with coarse roughish hairs) towards the point of attachment; colour snuff-brown to light ochraceous-brown. **Lamellae (Gills)** Attachment adnate; moderately distant, margin coarsely and irregularly serrate; colour whitish to cream. **Stipe (Stem)** Central, usually eccentric to lateral; up to 12 mm long and 3 mm diameter; surface covered with coarse to fibrillose hairs; colour dark brown to fawn. **Spore Print** White

Microscopic Features

Basidiospores 3.5–5.5 × 3–4 μm, subglobose, ellipsoidal, almost hyaline and very finely ornamented. Basidia four-spored, 19–26 × 5–6 μm, cigar-shaped. Clamp connections present.

Comments

Lentinellus tasmanicus is usually found in the southern region of Australia and is recognised by its short brown hairy stipe and its irregularly serrated lamellae. It is more commonly found in Tasmania. A similar closely related species *L. crawfordii* is found in New Zealand.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 107** **[D CP]** (as *Lentinellus* aff. *omphalodes*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 104** **[D CP]**

Petersen RH and Hughes KW (2004) "A Preliminary Monograph of *Lentinellus* (Russulales)". *Bibliotheca Mycologica* Band **198,** J. Cramer (Gebr. Borntraeger Verlagsbuchhandlung): Berlin & Stuttgart.

Ratkowsky D and Gates G (2006) "*Lentinellus* reconsidered". *The Tasmanian Naturalist.* **Vol. 128, pp. 8–10**

Fam. Hericiaceae

Dentipellicula leptodon

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Hericiaceae

Dentipellicula leptodon

Odontia oleifera *Dentipellis isidioides*
Hydnum leptodon *Dentipellis leptodon*

Biology

Saprotrophic basidiomycete; usually in small groups in damp areas on rotting wood from native and introduced trees.

Fruit-body Description

Individual fruit-bodies effuse, resupinate, up to 70 mm long and 30 mm wide, with a distinct felty to woolly margin; spore-bearing area (hymenophore) consists of whitish, delicate, hanging spines. **Spines** (spore-bearing surface) generally 5 mm to 10 mm long and up to 1 mm across at the base, tapering to a rounded tip; delicate, fragile; colour white, becoming cream to pale brownish with age. **Spore Print** White

Microscopic Features

Basidiospores 3.5–4.5 $\times$ 2.5–3.5 μm, (mean 4.0 $\pm$ 0.3 $\times$ 2.8 $\pm$ 0.3 μm, Q=1.42 $\pm$ 0.11, n = 30), ellipsoidal, smooth, thin-walled, hyaline. Basidia four-spored, 15–20 $\times$ 4–5 μm, elongate clavate. Cystidia, some with a papillate apex. Clamp connections present.

Comments

Dentipellicula leptodon can be tentatively identified by its smallish whitish fruit-bodies, and by its long slender spines. It grows in damp areas on rotting wood, logs or stumps from native and introduced trees. This species can be confused with some *Steccherinum* species, but most of these are not white and their spines are usually shorter and more robust. This species was placed in the genus *Dentipellis* by Maas Geesteranus (1974) along with other morphologically similar species. A phylogenetic study into hydnoid fungi (fungi with spines) in the Russulales, by Zhou *et al.* (2013), showed that this species was not all that closely related to the other members in the genus *Dentipellis*. The similarity in fruit-bodies was most likely due to convergent evolution. A new genus *Dentipellicula* was created to contain this and other closely related species.

References

Cunningham GH (1959) "Hydnaceae of New Zealand. Part II. The genus *Odontia*". *Transactions of the Royal Society of New Zealand* **Vol. 85, pp. 65–103** **[D I]** (as *Odontia oleifera*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi*. 2nd end. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 207** **[D CP]** (as *Dentipellis leptodon*)

Maas Geesteranus (1974) "Studies in the genera *Irpex* and *Steccherinum*". *Persoonia* **Vol. 7(4), pp. 443–581** (as *Dentipellis leptodon*)

Gorjón SP and Greslebin AG (2012) "Type studies of the species of *Odontia* by GH Cunningham". *New Zealand Journal of Botany* **Vol. 50(3), pp. 289–301** **[D I]** (as *Dentipellis leptodon*)

Zhou L-W and Dai Y-C (2013) "Taxonomy and phylogeny of wood-inhabiting hydnoid species in Russulales: two new genera, three new species and two new combinations". *Mycologia* **Vol. 105(3), pp. 636–649**

Fam. Hericiaceae

Hericium coralloides

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Hericiaceae

Hericium coralloides

Biology

Saprotrophic basidiomycete; usually a solitary coral-like tuft on dead wood such as native and exotic logs and stumps.

Fruit-body Description

Coral-like tuft up to 300 mm or more across, consisting of a basal trunk up to 10 mm or more thick, with multiple branches, forming a compact branched framework from which tufts of irregularly hanging spines grow. **Spines** spore-bearing surface (hymenium) generally up to 10 mm long and 1 mm thick, tapering to an acute tip; fragile; colour white or cream, usually becoming cream with age. **Spore Print** White

Microscopic Features

Basidiospores 3–5 × 3–4 μm, ellipsoidal to subglobose, ornamented, very finely warty, thick-walled. Basidia four-spored, 30–45 × 5–6 μm, elongate clavate. Clamp connections present.

Comments

Hericium coralloides is a delicate and beautiful coral-like fungus, which is a pleasure to see. It is normally found on damp decaying wood in sheltered locations. Its pale colour and numerous short spines make it readily identifiable.

References

Breitenbach J and Krãnzlin F (1986) *Fungi of Switzerland* Vol. 2. Verlag Mykologia: Luzern, Switzerland. **p. 240 [D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 241 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 75 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 72 [CP]** (as *Hericium clathroides*)

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 327 [D CP]**

Fam. Russulaceae

Lactarius clarkeae

© Virgil Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Lactarius clarkeae

Biology

Mycorrhizal basidiomycete; solitary or in scattered groups on the ground amongst leaf litter, in association with eucalypts.

Fruit-body Description

Pileus (Cap) Diameter to 90 mm or more; convex when young, becoming plano-convex with a depressed centre, or funnel-shaped, margin strongly in-rolled; surface smooth, dry, velvety; colour varies from reddish fawn to apricot or orange. **Flesh** firm, brittle, white, not bruising, bleeding white milky latex when cut, latex drying brownish. **Lamellae (Gills)** Attachment adnate to subdecurrent; subdistant, occasionally forked; colour at first white, becoming pale cream. When damaged will ooze a white latex. **Stipe (Stem)** Central; generally up to 45 mm long and 25 mm thick; short, stout; surface dry, smooth, velvety; colour initially whitish, at maturity colour similar to that of the pileus. **Spore Print** White

Microscopic Features

Basidiospores 8–10.5 × 6.5–8 μm, ellipsoidal, with warts and ridges. Basidia four-spored, 50–85 × 8–14 μm, cylindrical clavate. Clamp connections absent.

Comments

Lactarius clarkeae is found in eucalypt forests and it is identified by its orange pileus and stipe, and white lamellae, which when damaged will ooze a white latex. A similar looking species is *Russula flocktonae*, which does not ooze latex when damaged.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia*. University of Western Australia Press: Nedlands. **p. 132 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi*. Bloomings Books: Melbourne. **p. 103 [D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi*. 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 100 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia*. Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 61 [D I]**

McNabb RFR (1971) "The Russulaceae of New Zealand 1. Lactarius DC ex S F Gray". *New Zealand Journal of Botany* **Vol. 9, pp. 46–66. [D]** (as *Lactarius clarkei*)

Stubbe D, Le HT, Wang X-H, Nuytinck J, Van de Putte K and Verbeken A (2012) "The Australasian species of *Lactarius* subgenus *Gerardii* (Russulales)". *Fungal Diversity* **Vol. 52, pp. 141–167.**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 147 [D I]**

Fam. Russulaceae

Lactarius deliciosus

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Lactarius deliciosus

Biology

Mycorrhizal basidiomycete; solitary or gregarious on the ground amongst leaf litter, in association with conifers (pine, spruce, etc.).

Fruit-body Description

Pileus (Cap) Diameter to 130 mm or more; when young broadly convex with a depressed centre, margin strongly inrolled, becoming shallowly funnel-shaped with undulating margin; surface smooth or slightly rough, viscid when moist, but often dry, with numerous small rust-orange blotches often arranged in concentric bands; colour varies from dull orange to carrot-orange or orange-brown, bruises and stains green with age. **Flesh** thick, brittle, pale yellow to orange, bleeding an orange milky latex when cut. **Lamellae (Gills)** Attachment adnate to decurrent; close; colour pale orange-yellow to ochre-orange, dull green when bruised. **Stipe (Stem)** Central; generally up to 70 mm long and 25 mm thick; robust, sometimes tapered towards the base; surface dry, sometimes scrobiculate (with shallow pits or depressions); colour orange to salmon, like pileus or paler, stains green when bruised or with age. **Spore Print** Off-white

Microscopic Features

Basidiospores 7–9 $\times$ 6–7 μm, ellipsoidal, with minute warts. Basidia four-spored, 35–45 $\times$ 7–9 μm, clavate. Clamp connections absent.

Comments

Lactarius deliciosus is a mycorrhizal fungus that has been introduced into Australia to assist in the growth of *Pinus radiata* plantations. It is easily recognised in the field by its funnel-shaped form, orange colour, carrot-coloured latex when it is cut, the green stains where it is bruised, and its close association with pine trees. This is an edible species and it has been documented in Europe as a food source since well before the Roman Empire. It was first named and described by Linnaeus (the father of modern botanical nomenclature) in 1753. The taxonomy of *Lactarius deliciosus* in the northern hemisphere is not yet settled because there is a lot of evidence to suggest that it is a complex of closely related species. Most of the species in this complex have been described only in the last decade or so.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi*. 2nd ed. Ten Speed Press: Berkeley, CA. **p. 68** **[D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 104** **[D CP]**

Hesler LR and Smith AH (1979) *North American Species of Lactarius.* The University of Michigan Press: Ann Arbor. **p. 90** **[D I]** (as *Lactarius deliciosus* var. *deliciosus*)

Læssøe T (1998) *Mushrooms.* Dorling Kindersley: London. **p. 46** **[D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 67** **[CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 148** **[D I]**

Fam. Russulaceae

Lactarius eucalypti

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Lactarius eucalypti

Biology

Mycorrhizal basidiomycete; solitary or in scattered groups on the ground amongst leaf litter, in association with eucalypts.

Fruit-body Description

Pileus (Cap) Diameter to 45 mm or more; when young broadly convex with a depressed centre, margin strongly inrolled, becoming broadly depressed, sometimes with an umbo in the centre; surface smooth, dry, glabrous, not viscid; colour varies from pinkish brown to rust-brown or reddish brown, usually darker in the centre, occasionally concentrically zoned with shades of brown. **Flesh** soft, pale pinkish buff, not bruising, bleeding white milky latex when cut, latex drying white. **Lamellae (Gills)** Attachment subdecurrent; close; colour at first pale cream, then a darker tan, finally with a pinkish tinge. When damaged will ooze a white latex. **Stipe (Stem)** Central; generally up to 35 mm long and 6 mm thick; slender, sometimes tapered towards apex; surface dry, glabrous; colour usually the same as the pileus or paler. **Spore Print** White

Microscopic Features

Basidiospores 8.5–9.5 × 7–8 μm, broadly ellipsoidal to subglobose, with minute warts and ridges. Basidia four-spored, 36–55 × 10–12 μm, cylindrical and slightly ventricose. Clamp connections absent.

Comments

Lactarius eucalypti is common in eucalypt forests and it is identified by its reddish brown pileus and stipe, and lamellae that ooze white latex when damaged.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 134 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 104 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 67 [CP]**

Fam. Russulaceae

Lactarius plumbeus

© Virgil Hubregtse

© Virgil Hubregtse

Fam. Russulaceae

Lactarius plumbeus

Lactarius necator *Lactarius turpis*

Biology

Mycorrhizal basidiomycete; found in association with birch and spruce, either solitary or in small groups.

Fruit-body Description

Pileus (Cap) Diameter up to 150 mm or more; at first convex, becoming centrally depressed at maturity; surface viscid when moist, felted when dry; colour a drab olive-brown or sooty brown, paler towards margin. **Flesh** thick, brittle, crumbly, white, bleeding a white milky latex when cut, latex slowly changes to grey-brown or greenish brown. **Lamellae (Gills)** Attachment adnate to subdecurrent; close; colour at first pale cream to yellowish buff, bruising grey-brown. When damaged will ooze a white latex which slowly turns grey-brown. **Stipe (Stem)** Central; generally up to 70 mm long and 30 mm thick; short and stout; surface viscid, sometimes finely felted; colour similar to or paler than that of pileus, with a greenish tint. **Spore Print** White to cream

Microscopic Features

Basidiospores 7–10 × 6–8 μm, ellipsoidal; reticulate, ridges forming well defined network along spore. Basidia four-spored, 39–58 × 7–11 μm. Clamp connections absent.

Comments

This is an introduced species found in parks and gardens where birch or spruce trees are present. It is readily recognised by its drab colour, covering of soil and mulch particles adhering to is surface, and the production of copious latex when its lamellae are damaged. The purple discoloration of the pileus, when solutions of KOH or ammonia are applied, is also characteristic.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 105 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 54 [D]** (as *Lactarius necator*)

Læssøe T (1998) *Mushrooms.* Dorling Kindersley: London. **p. 47 [D CP]** (as *Lactarius necator*)

McNabb RFR (1971) "The Russulaceae of New Zealand 1. Lactarius DC ex S. F. Gray". *New Zealand Journal of Botany* **Vol. 9, pp. 46–66.** **[D]** (as *Lactarius turpis*)

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 57** **[D CP]** (as *Lactarius turpis*)

Fam. Russulaceae

Lactifluus wirrabara

© Virgil Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Lactifluus wirrabara

Lactarius wirrabara

Biology

Mycorrhizal basidiomycete; solitary or in scattered groups on the ground amongst leaf litter, in association with eucalypts.

Fruit-body Description

Pileus (Cap) Diameter to 114 mm or more; when young broadly convex with a depressed centre, becoming shallowly funnel-shaped with undulating margin; surface dry, velvety, may become smooth with age; colour brown to brownish umber. **Flesh** thick, brittle, white, exuding white milky latex when cut. **Lamellae (Gills)** Attachment decurrent; distant; colour white, becoming pale pinkish with age. **Stipe (Stem)** Central or eccentric; up to 50 mm long and 15 mm thick; robust, equal; surface dry, matt to smooth; colour light brown to dark brown. **Spore Print** White

Microscopic Features

Basidiospores 7–10.5 × 6–9.5 μm, subglobose, with amyloid ornamentation. Basidia four-spored, 65–80 × 8–12 μm, long thin clavate. Clamp connections absent.

Comments

Lactifluus wirrabara is uncommon and is always associated with *Eucalyptus* trees. Its velvety brown pileus, distant whitish decurrent lamellae and brown stipe make this fungus readily identifiable. Phylogenetic analysis carried out by Stubbe *et al.* (2012) shows that this species no longer belongs in the genus *Lactarius*. The specific epithet 'wirrabara' is Aboriginal for 'tree place', referring to its habitat under trees.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 107 [D CP]** (as *Lactarius wirrabara*)

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 58 [D]** (as *Lactarius wirrabara*)

Stubbe D, Le HT, Wang X-H, Nuytinck J, Van de Putte K and Verbeken A (2012) "The Australasian species of *Lactarius* subgenus *Gerardii* (Russulales)". *Fungal Diversity* **Vol. 52, pp. 141–167.**

Fam. Russulaceae

Russula clelandii complex

© Virgil Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Russula clelandii complex

Biology

Mycorrhizal basidiomycete; solitary or gregarious on the ground amongst leaf litter; associated with *Eucalyptus* spp.

Fruit-body Description

Pileus (Cap) Diameter to 100 mm or more; at first button-shaped, expanding to flat-convex with an incurved margin, finally centrally depressed with a plane or decurved margin; at maturity surface sometimes receding or peeling, often translucent-striate at the margin; surface when dry slightly pruinose, or slightly velvety; colour when young a deep vinaceous purple that fades with age. **Lamellae (Gills)** Attachment adnate; close; colour initially white, becoming pale cream with age; sometimes with a pinkish margin (marginate). **Stipe (Stem)** Central; generally up to 65 mm long and 17 mm thick; stout, clavate at first, becoming cylindrical; surface smooth, dry; covered by a purplish pink to pink fibrillose or pruinose layer on a white background, paler towards the base; basal mycelium white. **Spore Print** White

Microscopic Features

Basidiospores 7.5–10 × 6–9 μm, broadly ellipsoidal, ornamented, irregularly warty. Basidia four-spored, 30–49 × 10–15 μm, clavate. Clamp connections absent.

Comments

Russula clelandii is closely associated with *Eucalyptus* spp. and is recognised by its purplish red pileus, pale cream lamellae, and a stipe covered in purplish pink fibrils. It was named by Miller and Hilton (1986) from Western Australian material. *R. clelandii* may be a member of a complex of species, which includes *R. lenkunya*. Separating these two species is difficult: morphologically and microscopically they are very similar, but the description by Miller and Hilton (1986) clearly states that *R clelandii* does not have forked lamellae, whereas Grgurinovic (1997), who described *R. lenkunya* using South Australian material, states that the lamellae of this species are often forked near the stipe. DNA analysis will most likely be required to determine if *R. clelandii* and *R. lenkunya* are actually different species or a single variable species.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 144 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 170** **[D CP]** (as *Russula lenkunya*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 141** **[D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **pp. 69–70** **[D CI]** (as *Russula lenkunya*)

Miller, OK Jr and Hilton RN (1986) "New and Interesting Agarics from Western Australia". *Sydowia* **Vol. 39, pp. 126–137** **[D I]**

Fam. Russulaceae

Russula flocktonae

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Russula flocktonae

Biology

Mycorrhizal basidiomycete; solitary or gregarious on the ground amongst leaf litter; associated with *Eucalyptus* spp.

Fruit-body Description

Pileus (Cap) Diameter to 100 mm or more; at first convex, expanding to flat-convex, finally developing a central depression or becoming funnel-shaped, with a thick margin, not translucent-striate; surface dry, velvety; colour bright orange, fading with age. **Lamellae (Gills)** Attachment adnate to subdecurrent; moderately close to distant; colour initially white, becoming cream, with age turning light brown; occasionally bifurcate near margin. **Stipe (Stem)** Central; generally up to 45 mm long and 20 mm thick; stout, cylindrical; surface smooth, dry; colour pale orange, whitish towards apex; basal mycelium white. **Spore Print** White

Microscopic Features

Basidiospores 7.5–12.5 × 5.5–9 μm, broad ellipsoidal, ornamented, irregularly warty. Basidia four-spored, 50–100 × 8–14 μm, elongate clavate; sterigmata up to 12 μm long. Clamp connections absent.

Comments

Russula flocktonae is readily recognised by its velvety orange pileus that may be centrally depressed, pale orange stipe and white to cream lamellae. With age the lamellae may become brownish. As in all *Russula* species the flesh is crumbly and the stipe will snap like a piece of chalk. This species was named in honour of Miss Margaret L. Flockton, a highly respected botanical artist.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 150 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 169 [D CP]** (as *Russula flocktoniae*)

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 81 [D CI]**

Fam. Russulaceae

Russula iterika

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Russula iterika

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground amongst leaf litter; associated with *Eucalyptus* spp.

Fruit-body Description

Pileus (Cap) Diameter to 60 mm or more; at first convex, expanding to flat-convex with a central depression, not translucent-striate; surface dry, glabrous; colour dingy green, lighter or darker in patches, lighter towards margin, turning light brown on drying. **Lamellae (Gills)** Attachment adnate; moderately close; cream-coloured; bifurcate near stipe. **Stipe (Stem)** Central; generally up to 40 mm long and 16 mm thick; stout, cylindrical; surface smooth, dry; colour pure white; basal mycelium white. **Spore Print** White

Microscopic Features

Basidiospores 6.5–9 × 5–8 μm, short ellipsoidal to subglobose, ornamented, irregularly warty. Basidia four-spored, 46–60 × 6–12 μm, clavate; sterigmata up to 6 μm long. Clamp connections absent.

Comments

Russula iterika is recognised by its glabrous pileus with dingy green pigment, and lamellae that are bifurcate near the stipe. It can easily be mistaken for a similar looking species, *R. viridis*, but the latter does not have bifurcating lamellae. Like all *Russula* species it has crumbly flesh and the stipe will snap like a piece of chalk.

References

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 74** **[D I]**

Fam. Russulaceae

Russula marangania

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Russula marangania

Russula delica sensu Cleland

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground amongst leaf litter in schlerophyll forests; associated with *Eucalyptus* spp.

Fruit-body Description

Pileus (Cap) Diameter to 75 mm; at first button-shaped, expanding to flat-convex with an incurved margin, finally centrally depressed with a plane or decurved margin, glabrous; colour milk white, sometimes with pale rust-brown stains; flesh does not become dark on drying. **Lamellae (Gills)** Attachment adnate to subdecurrent; moderately close, occasionally bifurcate near stipe; colour initially white, becoming pale cream with age. **Stipe (Stem)** Central; short, generally up to 35 mm long and 20 mm thick; surface smooth; colour white with brownish tints; flesh fragile, snaps easily like a stick of chalk. **Spore Print** White

Microscopic Features

Basidiospores 7–10 × 5–7 μm, broadly ellipsoidal to subglobose, ornamented with mainly isolated warts, but some connected. Basidia four-spored, 40–55 × 8–11 μm, cylindro-clavate. Clamp connections absent.

Comments

Russula marangania is closely associated with *Eucalyptus* spp., and is recognised by its whitish colour, often with pale brownish stains. Its flesh is fragile and its pileus, which seldom exceeds 75 mm diameter, becomes centrally depressed with age. This species can be confused with *R. erumpens* which, when mature, is often larger, with an infundibuliform pileus. Mycologist John Burton Cleland collected a form he described in 1935 as *R. delica* from under eucalypts in the Mount Lofty Ranges in South Australia (Cleland 1976); however, this was reclassified as a new species *R. marangania* by Grgurinovic (1997).

References

Cleland JB (1976) *Toadstools and mushrooms and other larger fungi of South Australia Parts I and II 1934–1935.* The Flora and Fauna of South Australia Handbooks Committee: Adelaide. Photolitho reprint. **p. 150** (as *Russula delica*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 142** **[D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **pp. 78–81** **[D CI]**

D=Description; **I**=Illustration; **CI**=Colour Illustration; **P**=Photo; **CP**=Colour Photo

Fam. Russulaceae

Russula neerimea

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Russula neerimea

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground amongst leaf litter; associated with *Eucalyptus* spp.

Fruit-body Description

Pileus (Cap) Diameter to 85 mm or more; at first convex, expanding to flat with a central depression, margin translucent-striate, grooved; surface smooth, viscid when moist; colour uniformly yellow-brown or orange-brown, becoming paler with age. **Lamellae (Gills)** Attachment adnexed to adnate; moderately close; colour pale yellowish cream, becoming dull with age. **Stipe (Stem)** Central; generally up to 60 mm long and 20 mm thick; stout, cylindrical, fragile; surface smooth, dry; colour white; basal mycelium white. **Spore Print** Cream

Microscopic Features

Basidiospores 8.5–12 × 6–8 μm, ellipsoidal to broadly ellipsoidal, ornamented, irregularly warty. Basidia four-spored, 54–72 × 9–12 μm, clavate; sterigmata up to 10 μm long. Clamp connections absent.

Comments

Russula neerimea is recognised by its viscid yellow-brown to yellow-orange pileus, pale cream lamellae, and white stipe. In some early literature it was misidentified as *R. pectinatoides*, which is a northern hemisphere species. It is possible that *R. neerimea* may belong to a complex of closely related species, since there is a large variation in the published microscopic characteristics.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 152 [D CI]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 84 [D I]**

Fam. Russulaceae

Russula persanguinea

© Jurrie Hubregtse

© Paul George

Fam. Russulaceae

Russula persanguinea

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground amongst leaf litter; associated with *Eucalyptus* spp.

Fruit-body Description

Pileus (Cap) Diameter to 70 mm or more; at first convex with an incurved margin, becoming convex, finally expanding to flat-convex with a central depression, with age margin may become striate; surface viscid when moist but soon drying, smooth; colour dark red, blood-red, or brick-red, fading with age. **Lamellae (Gills)** Attachment adnexed to adnate; moderately close; colour white, becoming pale cream when old. **Stipe (Stem)** Central; generally up to 60 mm long and 25 mm thick; stout, cylindrical, fragile; surface smooth, dry; colour pure white; basal mycelium white. **Spore Print** White

Microscopic Features

Basidiospores 8.5–10.5 × 7–9 μm, short ellipsoidal to subglobose, strongly warted, warts often forming a network. Basidia four-spored, 40–50 × 10–14 μm, slender clavate; sterigmata up to 9 μm long. Clamp connections absent.

Comments

Russula persanguinea is very distinctive because of its bright red pileus, white lamellae, and white stipe. It is always found in association with *Eucalyptus* trees. Like all *Russula* species its flesh is crumbly and the stipe will snap like a piece of chalk.

References

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 154 [D CI]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 170 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 70 [D CI]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 178 [D I]**

D=Description; **I**=Illustration; **CI**=Colour Illustration; **P**=Photo; **CP**=Colour Photo

Fam. Russulaceae

Russula purpureoflava

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Russulaceae

Russula purpureoflava

Biology

Mycorrhizal basidiomycete; solitary or in small groups on the ground amongst leaf litter; associated with *Eucalyptus* spp.

Fruit-body Description

Pileus (Cap) Diameter to 55 mm or more; at first convex, finally expanding to flat-convex with a central depression; surface slightly sticky when moist but soon drying, smooth; colour reddish, reddish purple to purplish red, or very dark purplish brown. **Lamellae (Gills)** Attachment adnate; moderately close; colour mustard yellow to buff yellow, not white. **Stipe (Stem)** Central; generally up to 50 mm long and 15 mm thick; cylindrical, fragile; surface a little rough, dry; colour rosy pink, usually grading to whitish or yellowish at the base. **Spore Print** White

Microscopic Features

Basidiospores 7.5–11 × 6–9 μm, short ellipsoidal to subglobose, strongly warted, warts often forming a network. Basidia four-spored, 31–56 × 10–16 μm, clavate; sterigmata up to 9 μm long. Clamp connections absent.

Comments

Russula purpureoflava is recognised by its reddish, purplish, or dark purplish brown pileus, mustard yellow lamellae, and a pinkish stipe. It is always found in association with eucalypts. Like all *Russula* species its flesh is crumbly and the stipe will snap like a piece of chalk.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 170 [D CP]**

Grgurinovic CA (1997) *Larger fungi of South Australia.* Botanical Gardens of Adelaide and State Herbarium and The Flora and Fauna of South Australia Handbooks Committee: Adelaide. **p. 65 [D I]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 68 [CP]**

Fam. Stereaceae

Aleurodiscus sparsus

© Virgil Hubregtse

© Jurrie Hubregtse

Fam. Stereaceae

Aleurodiscus sparsus

Acanthophysium sparsum *Stereum sparsum*

Biology

Saprotrophic basidiomycete; usually forming colonies of white patches on bark or decorticated wood of small dead eucalypt branches, usually on the ground, in wet native forests.

Fruit-body Description

At first consisting of irregular shaped patches 2–10 mm across, coalescing to form effuse areas; margin abrupt; hymenial surface at first finely fibrillose (need hand lens), with age becoming smooth and areolate; colour white. **Context** up to 0.25 mm thick. **Spore Print** Not observed

Microscopic Features

Basidiospores 26.5–33.5 $\times$ 15.5–18.5 μm, (mean 30.0 $\pm$ 2.7 $\times$ 16.8 $\pm$ 1.0 μm, Q=1.79 $\pm$ 0.16 n=30), broadly ellipsoidal, covered with bristle-like spines (aculeae) up to 3 μm long (in Melzer's reagent and congo red), smooth in KOH (aculeae soluble in KOH), with large apiculus, strongly amyloid in Melzer's reagent. Basidia four-spored, 60–110 $\times$ 15–25 μm, cylindrical to clavate, with robust sterigmata up to 20 μm long. Clamp connections absent.

Comments

Aleurodiscus sparsus is an Australian native species that has also been introduced to New Zealand. Many species of *Aleurodiscus* are restricted to one or a few related hosts (Simpson and Grgurinovic 2003) and to date *A. sparsus* is known only from eucalypts. This species can be readily identified using microscopic features as its spores are amongst the largest found in the genus *Aleurodiscus*.

References

Cunningham GH (1963) "The Thelephoraceae of Australia and New Zealand". New Zealand Department of Scientific and Industrial Research. ***Bulletin* 145, pp. 359; [D I]** (as *Acanthophysium sparsum*)

Gates, GM and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd ed. The Tasmanian Field Naturalists Club: Hobart. **p. 198 [D CP]**

Jülich W (1978) "On some Aphyllophorales from Australia". *Persoonia* **Vol. 9(4), pp. 453–472 [D I]**

Simpson JA and Grgurinovic CA (2003) "A new species of *Aleurodiscus* (Stereaceae) from Mt Kosciuszko, Australia". *Australasian Mycologist* **Vol. 22(1), pp. 15–19**

Fam. Stereaceae

Stereum hirsutum

© Virgil Hubregtse

© Virgil Hubregtse

Fam. Stereaceae

Stereum hirsutum

Thelephora hirsuta
Thelophora subzonata
Stereum amoenum
Stereum kalchbrenneri
Stereum ochraceum
Stereum rameale
Stereum complicatum

Biology

Saprotrophic basidiomycete; usually forming dense, coalescing and overlapping tiers of shelf-like fruit-bodies on dead wood, such as fallen branches, logs, tree stumps, and sawn timber.

Fruit-body Description

May be entirely or partly appressed on the substrate, but more commonly bracket-like, up to 50 mm wide, projecting 35 mm, and 1 mm thick; leathery, margin wavy, lobed and pleated. **Upper surface** concentrically zoned yellow, brown, orange, darkest near point of attachment, coarsely or finely hairy (hirsute). **Lower surface** fertile surface, smooth, may have radial wrinkles and bumps, colour ranging from yellowish near the margin to orange and brownish yellow towards the point of attachment. **Spore Print** White

Microscopic Features

Basidiospores 5–7.5 × 2.5–3.5 μm, ellipsoidal, oval, smooth. Basidia four-spored, 20–30 × 5–6 μm, slenderly clavate. Clamp connections absent.

Comments

Stereum hirsutum may vary in size and shape, but the hairiness, the colour of the upper surface, and the colour and smoothness of the lower surface makes this species readily identifiable. *Stereum* spp. are readily differentiated from similar looking *Trametes* spp. by the lower surface being smooth with no pores.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 605 [D P]**

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 338 [D CI]**

Cunningham GH (1956) "Thelephoraceae of New Zealand. Parts IX, × and XI". *Transactions of the Royal Society of New Zealand* **Vol. 84(2), pp. 201–268 [D I]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 283 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 78 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 83 [CP]**

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 316 [D CP]**

Fam. Stereaceae

Stereum illudens

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Stereaceae

Stereum illudens

Stereum archeri *Lloydella illudens*
Stereum pannosum *Xylobolus illudens*
Sterem spiniferum

Biology

Saprotrophic basidiomycete; usually forming dense, coalescing and overlapping tiers of shelf-like fruit-bodies on dead wood, such as fallen branches, logs, tree stumps, and sawn timber.

Fruit-body Description

May be entirely or partly appressed on the substrate, but more commonly bracket-like, up to 30 mm radius, 150 mm wide, and 1 mm thick; leathery, margin wavy, lobed and pleated. **Upper surface** concentrically zoned dark brown, chestnut, and pale brown, darkest near point of attachment, coarsely or finely hairy (hirsute). **Lower surface** fertile surface, smooth, may have radial wrinkles and bumps, colour ranging from plum, dark violaceous, or tinted violet, often with a whitish bloom, margin usually whitish. **Spore Print** White

Microscopic Features

Basidiospores 7–9 × 3.5–4.5 μm, ellipsoidal, oval, smooth. Basidia four-spored, 24–30 × 5–6 μm, slenderly clavate. Clamp connections absent.

Comments

Stereum illudens is recognised by its chestnut-brown zoned hairy upper surface, and dark violaceous lower surface. This cosmopolitan species occurs widely within Australia. "Index Fungorum" has this species recorded as *Xylobolus illudens*. I have not been able to obtain any phylogenetic evidence to support this, so the locally accepted name *Stereum illudens* is used.

References

Cunningham GH (1956) "Thelephoraceae of New Zealand. Parts IX, × and XI". *Transactions of the Royal Society of New Zealand* **Vol. 84(2), pp. 201–268** **[D I]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 284** **[D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 177** **[D CP]**

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 162** **[D I]** (as *Xylobolus illudens*)

Jülich W (1978) "On some Aphyllophorales from Australia". *Persoonia* **Vol. 9(4), pp. 453–472** (as *Xylobolus illudens*)

McCann IR (2003) *Australian fungi illustrated*. Macdown Productions: Vermont, Victoria. **p. 84 [CP]**

McKenzie EHC, Buchanan PK and Johnson PR (1999) "Fungi on pohutukawa and other *Metrosideros* species in New Zealand". *New Zealand Journal of Botany* **Vol. 37(2), pp. 335–354** (as *Xylobolus illudens*)

Fam. Stereaceae

Stereum ostrea

© Virgil Hubregtse

© Virgil Hubregtse

Fam. Stereaceae

Stereum ostrea

Stereum fasciatum *Stereum leichhardtianum*
Stereum concolor *Stereum lobatum*

Biology

Saprotrophic basidiomycete; usually forming dense, overlapping tiers of shelf-like fruit-bodies on dead wood, such as fallen branches, logs, tree stumps, and sawn timber.

Fruit-body Description

Up to 140 mm wide, projecting 100 mm, and 2 mm thick; leathery, fan-shaped, semicircular or bracket-like, narrowly or broadly attached, margin usually even or wavy. **Upper surface** velvety, hairy, hairy tufts towards point of attachment, brightly coloured, concentrically zoned brown, orange, and yellow, darker towards point of attachment, margin usually yellowish. **Lower surface** fertile surface, smooth, may have radial wrinkles and bumps, colour usually even, pale buff, yellow-orange or gold. **Spore Print** White

Microscopic Features

Basidiospores 5–7.5 × 2–3 μm, narrowly ellipsoidal, cylindrical, smooth. Basidia four-spored, 20–25 × 4–5 μm, slenderly clavate. Clamp connections absent.

Comments

Stereum ostrea is a northern hemisphere species, readily recognised by its largish size and bright yellowish to golden colours. It often forms spectacular colonies on dead logs, and it seems to be relatively common in Australia.

To be certain that the Australian species is the same as that from the northern hemisphere, DNA analysis will be required.

References

Cunningham GH (1956) "Thelephoraceae of New Zealand. Parts IX, × and XI". *Transactions of the Royal Society of New Zealand* **Vol. 84(2), pp. 201–268** **[D I]** (as *Stereum lobatum*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 285** **[D CP]**

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* 2nd edn. Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 178** **[D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 79** **[D CP]**

Hood IA (2003) *An introduction to fungi on wood in Queensland.* School of Environmental Sciences and Natural Resources Management, University of New England: Armidale, NSW. **p. 160** **[D I]** (as *Stereum fasciatum*)

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 84** **[CP]**

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 316** **[D CP]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 83** **[D I]**

2.11 Order: Thelephorales

Thelephorales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Agaricomycetes
Order:	Thelephorales

Families
Bankeraceae
Thelephoraceae

Thelephorales contains 2 families, 17 genera and about 340 species ("Catalogue of Life" website http://www.catalogueoflife.org). This is a strongly supported order where all of the species are ectomycorrhizal and have a cosmopolitan distribution. This order is morphologically diverse and contains corticioid (e.g. *Tomentella*), cantharelloid (e.g. *Polyozellus*), clavarioid (e.g. *Thelephora*) and pileate (e.g. *Hydnellum*) forms. The hymenophores of pileate species may be poroid (e.g. *Boletopsis*), toothed (*e.g. Hydnellum, Sarcodon*), smooth to wrinkled or tuberculate (covered with rounded nodules or warty outgrowths) (e.g. *Thelephora*), or lamellate (e.g. *Lenzitopsis*).

Bankeraceae – consists of 6 genera with 124 species. Its type genus is *Bankera*, which contains 5 species. Many species in this family, especially when dried, can be characterised by their fenugreek odour. They have a varied morphology, with fruit-bodies that are pileate and stipitate with hydnoid to spinose hymenophores. One of the more common Australian species is *Phellodon niger*.

Phellodon niger

Thelephoraceae – consists of 11 genera with 214 species. Its type genus is *Thelephora*, which contains 49 species. Many species in this family have trumpet-like fruit-bodies and are also known as "leathery earthfans".

Polyozellus multiplex

Fam. Bankeraceae

Hydnellum sp.

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Bankeraceae

Hydnellum sp.

Biology

Mycorrhizal basidiomycete; solitary to gregarious, sometimes fused together, on the ground amongst leaf litter under *Eucalyptus* spp.

Fruit-body Description

Pileus (Cap) Diameter to 50 mm or more; initially cone-shaped, becoming plane, centrally depressed, fruit-bodies in contact fuse together; surface felty at first, coarse knobs or roughness at the centre, often radially ridged; colour when young whitish, becoming tan then dark brown, lighter towards the margin, margin staying whitish. **Flesh** tough, almost woody. **Spines (Teeth)** Generally up to 3 mm long and 1 mm thick; often decurrent; initially whitish, becoming brownish as spores mature. **Stipe (Stem)** Central or off-centre; generally up to 40 mm long and 10 mm thick; stout, tapering towards the base; surface felty; colour brown to dark brown. **Spore Print** Brown

Microscopic Features

Not observed

Comments

This is not a common fungus and, because of its size and colour, is not readily seen amongst the leaf litter. The fruit-bodies develop slowly and can vary in appearance according to the growing conditions. For descriptions of similar species see the references below. Further work needs to be done.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **pp. 622–627 [D P]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 242 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 74 [CP]**

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 324 [D CP]**

Fam. Bankeraceae

Phellodon niger

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Bankeraceae

Phellodon niger

Biology

Mycorrhizal basidiomycete; solitary, gregarious, or clustered on the ground amongst leaf litter in eucalypt forest and heathland.

Fruit-body Description

Pileus (Cap) Diameter to 50 mm or more; initially cone-shaped, becoming plane and centrally depressed, margin lobed, fruit-bodies in contact fuse together; surface velvety or downy, pitted, undulating, coarse erect scales or roughness at the centre; colour when young blue-black, becoming black, often radially zoned, margin pale grey to white. **Flesh** leathery, black, with fenugreek-like odour, especially when dried. **Spines (Teeth)** Generally up to 3 mm long; decurrent, initially blue-grey, becoming pale grey. **Stipe (Stem)** Central or off-centre; generally up to 50 mm long and 20 mm thick; stout, tapering towards the base; surface felty; colour black. **Spore Print** White

Microscopic Features

Basidiospores 3.5–4.5 × 2.5–3.5 μm, subglobose to globose, spiny. Basidia four-spored, 27–33 × 4–6 μm, slenderly clavate. Clamp connections absent.

Comments

Phellodon niger is a distinctive fungus, recognised by its black pileus and stipe, pale spines, and its fenugreek-like odour. This species is found in Europe, Great Britain, North America, New Zealand, and Australia.

References

Breitenbach J and Krãnzlin F (1986) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 228 [D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 243 [D CP]**

Læssøe T (1998) *Mushrooms.* Dorling Kindersley: London. **p. 236 [D CP]**

Phillips R (2006) *Mushrooms.* Macmillan: London. **p. 326 [D CP]**

2.12 Order: Tremellales

Thelephorales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Agaricomycotina
Class:	Tremellomycetes
Order:	Tremellales

Families
ca. 9; See text

Tremellales contains 9 families, 36 genera and about 482 species ("Catalogue of Life" website http://www.catalogueoflife.org). This order is strongly supported by phylogenetic analysis and the application of DNA sequence analysis for identification of yeast species is instrumental in the restructuring of the order (Scorzetti *et al.* 2002; Kurtzman *et al.* 2015). At the family and genus levels this order is still in flux; there are a number of families with only 1 genus and about 10% of species have not been allocated to a family. Sixty-six per cent of the species in the 9 families in this order are in the Tremellaceae. It is obvious that not enough species in this order have been sequenced. Species in this order have a cosmopolitan distribution and can be found from the tropics to glacial Arctic regions (de Garcia *et al.* 2012). Species in this order are either teleomorphic (sexual stage with spores) or anamorphic, most of the latter being yeasts. Most of the teleomorphic species are parasitic on other fungi.

Carcinomycetaceae – consists of 1 genus, *Syzygospora*, with 16 species. These species are gelatinous yeasts that are parasitic on other fungi, including lichens (Diederich 2003).

Cuniculitremaceae – consists of 3 genera with 18 species. Its type genus is *Cuniculitrema*, which contains 1 species. The *Cuniculitrema* species is teleomorphic while the other 2 genera, *Fellomyces* and *Kockovaella*, are anamorphic and produce gelatinous fruit-bodies.

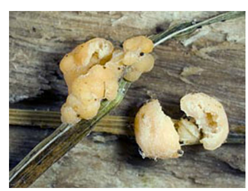
Hyaloriaceae – consists of 3 genera with 10 species. Its type genus is *Hyaloria*, which contains 2 species. Species within this family produce gelatinous or waxy fruit-bodies.

Phragmoxenidiaceae – consists of 2 genera, *Phragmoxenidium* and *Phyllogloea*, with 7 species. Its type genus is *Phragmoxenidium*, which contains 1 species. The species in this family are parasitic on other fungi, and many do not develop distinct fruit-bodies.

Rhynchogastremataceae – consists of 1 genus, *Rhynchogastrema*, with 1 species. Little is known about this family; the only known species, *Rhynchogastrema coronatum*, has been isolated from a soil sample and it is most likely parasitic on other fungi.

Sirobasidiaceae – consists of 2 genera with 11 species. Its type genus is *Sirobasidium*, which contains 8 species. The species in this family are widely distributed, primarily tropical, and typically found on wood. The fruit-bodies are irregular in form, most being globose or composed of flattened globes. It is possible that these species are saprophytic.

Tetragoniomycetaceae – consists of 1 genus, *Tetragoniomyces*, with 1 species, *Tetragoniomyces uliginosus.* This species has brain-like, whitish gelatinous-waxy jelly fruit-bodies, which grow in damp habitats and are parasitic on other fungi.


Tetragoniomyces uliginosus

Tremellaceae – consists of 18 genera with 315 species. Its type genus is *Tremella*, which contains 150 species. This is a cosmopolitan family containing both teleomorphic and anamorphic genera, most of the latter being yeasts. When fruit-bodies are produced they are gelatinous. Like most of the fungi in the Tremellales they are parasitic, predominantly on other fungi, but some species in the genus *Cryptococcus* are parasitic pathogens on humans, other mammals, and insects (Findley *et al.* 2009) .


Tremella mesenterica

Trichosporonaceae – consists of 5 genera with 63 species. Its type genus is *Trichosporon*, which contains 55 species. Most of the species in this family are soil-inhabiting yeasts that do not produce distinctive fruit-bodies.

References

de Garcia V, Zalar P, Silvia Brizzio S, Gunde-Cimerman N and van Broock M (2012) "*Cryptococcus* species (Tremellales) from glacial biomes in the southern (Patagonia) and northern (Svalbard) hemispheres". *FEMS Microbiology Ecology* **Vol. 82, pp. 523–539.**

Diederich P (2003) "New species and new records of American lichenicolous fungi". *Herzogia* **Vol. 16, pp. 41–90**

Findley K, Rodriguez-Carres M, Metin B, Kroiss J, Fonseca Á, Vilgalys R and Heitman J (2009) "Phylogeny and Phenotypic Characterization of Pathogenic *Cryptococcus* Species and Closely Related Saprobic Taxa in the Tremellales". *Eukaryotic Cell* **Vol. 8(3), pp. 353–361**

Kurtzman CP, Mateo RQ, Kolecka A, Theelen B, Robert V and Boekhout T (2015) "Advances in yeast systematics and phylogeny and their use as predictors of biotechnologically important metabolic pathways". *FEMS Yeast Research* **Vol. 15(6), pp. 1–17**

Scorzetti G, Fell JW, Fonseca A and Statzell-Tallman A (2002) "Systematics of basidiomycetous yeasts: a comparison of large subunit D1/D2 and internal transcribed spacer rDNA regions". *FEMS Yeast Research* **Vol. 2, pp. 495–517.**

Fam. Tremellaceae

Tremella foliacea

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Tremellaceae

Tremella foliacea

Tremella frondosa *Tremella vinosa*
Tremella fimbriata *Tremalla crispa*

Biology

Parasitic basidiomycete; parasitic on the mycelium of *Stereum* spp. and Corticiaceae (a large family of crust fungi found on decaying wood); solitary to gregarious clusters on decaying hardwoods and occasionally on pine.

Fruit-body Description

Individual fruit-bodies up to 100 mm or more long, and up to 60 mm high; gelatinous, rubbery, when young irregularly globose to cushion-shaped, becoming a complicated mass of leaf-like folds, lobes, and convolutions; surface smooth, glossy, viscid when moist; colour reddish cinnamon to dark brown, vinaceous-brown, on drying becoming blackish brown. **Spore Print** White

Microscopic Features

Basidiospores 7–10 × 6–9 μm, globose to broadly ellipsoidal, smooth. Basidia (metabasidia), 8–10 μm, globose to broadly ovoid, with 2–4 vertical or oblique septa (i.e. divided up rather like a hot cross bun). Long sterigmata, up to 100 μm or more, protrude from each segment, and spores form at the ends of the sterigmata. Clamp connections present.

Comments

Tremella fimbriata is a jelly fungus recognised by its cinnamon-brown to dark brown colour. This species is widespread but not common.

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 673 [D P]**

Breitenbach J and Krãnzlin F (1986) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 66 [D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 294 [D CP]** (as *Tremella fimbriata*)

Læssøe T (1998) *Mushrooms.* Dorling Kindersley: London. **p. 282 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 92 [CP]** (as *Tremella frondosa*)

Fam. Tremellaceae

Tremella fuciformis

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Tremellaceae

Tremella fuciformis

Biology

Parasitic basidiomycete; parasitic on the mycelium of *Hypoxylon* or *Stereum* spp.; solitary to gregarious clusters on decaying hardwoods.

Fruit-body Description

Individual fruit-bodies up to 160 mm or more long, and up to 60 mm high; gelatinous, rubbery, firm; when young irregularly globose to cushion-shaped, becoming a complicated mass of leaf-like folds, lobes, and convolutions; surface smooth, glossy, not viscid or sticky; colour semi-translucent white to opaque white when fresh, drying pallid creamy yellow. **Spore Print** White

Microscopic Features

Basidiospores 7–10 × 5–6 μm, globose to broadly ellipsoidal, smooth. Basidia (metabasidia), 11–16 × 8–14 μm, globose to broadly ovoid, with 2–4 vertical or oblique septa (i.e. divided up rather like a hot cross bun). Long sterigmata, up to 60 μm or more, protrude from each segment, and spores form at the ends of the sterigmata. Clamp connections present.

Comments

Tremella fuciformis is found on decaying hardwoods that have been infected with *Hypoxylon* or *Stereum* spp., and is readily recognised by its white gelatinous lobes. This species is common in eucalypt and mixed forest.

References

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 295 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 83 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 92 [CP]**

McNabb RFR (1966) "New Zealand Tremellales – II". *New Zealand Journal of Botany* **Vol. 4, pp. 533–545 [D I]**

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 67 [D I]**

Fam. Tremellaceae

Tremella mesenterica

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Tremellaceae

Tremella mesenterica

Tremella lutescens

Biology

Parasitic basidiomycete; parasitic on the mycelium of *Peniophora* spp. (resupinate crust fungus) or *Stereum* spp.; solitary to gregarious clusters on decaying hardwoods.

Fruit-body Description

Individual fruit-bodies up to 100 mm or more long, and up to 50 mm high; gelatinous, rubbery, firm; when young irregularly globose to cushion-shaped, becoming a complicated mass of leaf-like folds, lobes, and convolutions; surface smooth, glossy, not viscid or sticky; colour semi-translucent shades from bright orange to yellow. **Spore Print** White

Microscopic Features

Basidiospores 10–15.5 × 7–12 μm, broadly ellipsoidal, oval, smooth. Basidia (metabasidia), 20–31 × 16–22 μm, globose to broadly ovoid, with 2–4 vertical or oblique septa (i.e. divided up rather like a hot cross bun). Long sterigmata, up to 60 μm or more, protrude from each segment, and spores form at the ends of the sterigmata. Clamp connections present.

Comments

The name *Tremella mesenterica* probably can be applied to a complex of closely related species of jelly fungi with convolutions; morphologically they all look identical, and have a colour range from bright orange to yellow. One such species is *T. aurantia* (see Bougher and Syme 1998).

References

Arora D (1986) *Mushrooms demystified: a comprehensive guide to the fleshy fungi.* 2nd ed. Ten Speed Press: Berkeley, CA. **p. 673 [D P]**

Bougher NL and Syme K (1998) *Fungi of Southern Australia.* University of Western Australia Press: Nedlands. **p. 110 [D CI]**

Breitenbach J and Krãnzlin F (1986) *Fungi of Switzerland* Vol. 2: Non-gilled fungi. Verlag Mykologia: Luzern, Switzerland. **p. 68 [D CP]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 295 [D CP]**

Grey P and Grey E (2005) *Fungi down under: the Fungimap guide to Australian fungi.* Fungimap: South Yarra, Victoria. **p. 84 [D CP]**

Læssøe T (1998) *Mushrooms.* Dorling Kindersley: London. **p. 282 [D CP]**

McCann IR (2003) *Australian fungi illustrated.* Macdown Productions: Vermont, Victoria. **p. 92** **[CP]**

McNabb RFR (1966) “New Zealand Tremellales – II”. *New Zealand Journal of Botany* **Vol. 4, pp. 533–545** **[D I]** (as *Tremella lutescens*)

Young AM (2005) *A field guide to the fungi of Australia.* University of New South Wales Press: Sydney. **p. 68** **[D I]**

CHAPTER 3

PUCCINIOMYCOTINA

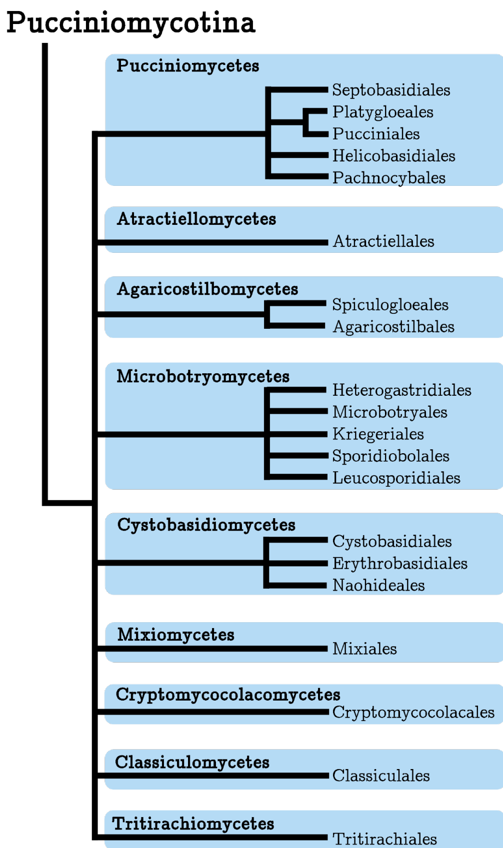


Figure 3.1: Subphylum Pucciniomycotina

Pucciniomycotina is the sister to the Agaricomycotina and Ustilaginomycotina, forming the basal lineage of Basidiomycota. At present Pucciniomycotina consists of approximately 8500 species in 9 classes, 22 orders (2 not assigned), 53 families (7 not assigned) and 321 genera (http://www.speciesfungorum.org/), which is nearly one-third of all described basidiomycetes, or more than 8% of all described species of fungi (Aime *et al.*

2014). These species can be found in diverse habitats, ranging from marine, Artic ice and most terrestrial environments, where the vast majority of species are either pathogens or parasites on plants, fungi or insects. Their life cycles can range from the simple teliosporic yeasts (when a teliospore cell germinates, it gives rise to a four-celled basidium with basidiospores) to the complex five-stage life cycle of of rust fungi, which is regarded as the most complex in Kingdom Fungi (Lutzoni *et al.* 2004). An example of a the complex behaviour of fungi in this subphylum can be illustrated by the parasitic rust fungus *Puccinia monoica* that manipulates its plant host *Boechera stricta* to create elaborate pseudoflowers. These structures are completely novel to the plant's native form (Roy 1993; Roy *et al.* 1998) and act to lure pollinators from co-blooming plant species by offering olfactory incentives and a sugary reward (Cano *et al.* 2013). Visiting pollinators transfer spores between pseudoflowers, thereby completing the sexual reproductive cycle of the fungus. The number of new species and lineages in Pucciniomycotina continue to increase as more species are found. At present the Puccinomycotina is undersampled and it is likely that much more diversity within this subphylum is yet to be discovered.(Aime *et al.* 2014)

References

Aime MC, Toome M, McLaughlin DJ (2014) "Pucciniomycotina". In: *The Mycota VII. Systematics and evolution.* Part A. (McLaughlin DJ, Spatafora JW, eds.). Berlin: Springer: **pp. 271–294.**

Cano LM, Raffaele S, Haugen RH, Saunders DGO, Leonelli L, MacLean D, Hogenhout SA, Kamoun S (2013) "Major transcriptome reprogramming underlies floral mimicry induced by the rust fungus *Puccinia monoica* in *Boechera stricta*". *PloS ONE* **Vol. 8(9), e75293. doi:10.1371/journal.pone.0075293**

Lutzoni F, Kauff F, Cox CJ, McLaughlin D, Celio G, Dentinger B, Padamsee M, Hibbett D, James TY, Baloch E, Grube M, Reeb V, Hofstetter V, Schoch C, Arnold AE, Miadlikowska J, Spatafora J, Johnson D, Hambleton S, Crockett, M, Shoemaker R, Sung GH, Lucking R, Lumbsch T, O'Donnell K, Binder M, Diederich P, Ertz D, Gueidan C, Hansen K, Harris RC, Hosaka K, Kentaro L, Young-Woon L, Matheny B, Nishida H, Pfister D, Rogers J, Rossman A, Schmitt I, Sipman H, Stone J, Sugiyama J, Yahr R and Vilgalys R (2004) "Assembling the Fungal Tree of Life: progress, classification, and evolution of subcellular traits". *American Journal of Botany* **Vol. 91(10), pp. 1446–1480.**

Roy BA (1993) "Floral mimicry by a plant pathogen". *Nature* **Vol. 362, pp. 56–58**

Roy BA, Vogler DR, Bruns TD Szaro (1998) "Cryptic Species in the Puccinia monoica Complex". *Mycologia* **Vol. 90(5), pp. 846–853**

CHAPTER 4

SPECIES DESCRIPTIONS – PUCCINIOMYCOTINA

4.1 Order: Atractiellales

Atractiellales is the only Order in the Class Atractiellomycetes. Atractiellales consists of 5 families of which 4 have assigned names (http://www.speciesfungorum.org/).

Atractogloeaceae – consists of 1 genus (*Atractogloea*) with 1 described species.

Mycogelidiaceae – consists of 1 genus (*Mycogelidium*) with 1 described species.

Phleogenaceae – consists of 8 genera (*Atractiella, Basidiopycnis, Botryochaete, Helicogloea, Hoehnelomyces, Phleogena, Proceropycnis, Saccoblastia*) with 44 described species.

Saccoblastiaceae – consists of 1 genus (*Infundibura*) with 1 described species.

Not assigned – consists of 1 genus (*Hobsonia*) with 3 described species.

Morphologies of species in this Order are varied but most of them are of a gelatinous nature. Some species are parasitic, spread by beetles (Hausner *et al.* 2008) while some other species form mycorrhizae with orchids (Kottke *et al.* 2010).

Atractiellales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Pucciniomycotina
Class:	Atractiellomycetes
Order:	Atractiellales

Families
Atractogloeaceae
Mycogelidiaceae
Phleogenaceae
Saccoblastiaceae

References

Hausner G, Reid J, Eyjólfsdóttir GG, Iranpour M and Loewen PC (2008) "*Basidiopycnides albertensis* gen. et sp. nov., a new anamorphic fungus with phylogenetic affinities in the Atractiellales (Basidiomycota)". *Mycotaxon* **Vol. 103, pp. 279–297.**

Kottke I, Suárez JP, Herrera P, Cruz D, Bauer R, Haug I and Garnica S (2010) "Atractiellomycetes belonging to the 'rust' lineage (Pucciniomycotina) form mycorrhizae with terrestrial and epiphytic neotropical orchids". *Proceedings of the Royal Society B* **Vol. 277, pp. 1289–1298.**

Fam. Phleogenaceae

Helicogloea compressa

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Phleogenaceae

Helicogloea compressa

Dendrodochium compressum *Pleurocolla compressa*
Leucogloea compressa

Biology

Saprotrophic basidiomycete; solitary to gregarious, usually on decorticated decaying wood in moist shaded forest.

Fruit-body Description

The fruit-bodies are asexual (anamorphs), up to 2–3 mm diameter, hemispherical to cushion-like, whitish, firm gelatinous, surrounded by a clear gelatinous layer. Fruit-bodies may form large extended patches on moist decaying decorticated wood. **Spore Print** Not observed

Microscopic Features

Conidia 3–6 × 2–3 μm, subglobose to ellipsoidal, smooth, hyaline. Conidiophores irregularly branched with lateral conidiogenous cells, 13–40 × 1.5–2 μm, which are cylindrical, slightly curved and tapering to the apex.

Comments

Helicogloea compressa is recognised in the field by its whitish, gelatinous hemispherical fruit-bodies. Since there are numerous species of fungi that produce gelatinous fruit-bodies, care must be taken in its identification. In 2004 Kirschner renamed this species from *Pleurocolla compressa* to *Leucogloea compressa*. He observed that the morphology and preliminary DNA analysis had many similarities to the genus *Helicogloea*, but he was not convinced that it belonged to this genus. He coined a new genus *Leucogloea* and put it in there. A larger DNA study (Spirini *et al.* 2018) concluded that the anamorphic fungus *Leucogloea compressa* belonged in the genus *Helicogloea*, which at present has approximately 26 named species.

References

Diehl WW (1933) "Thelebolus lignicola and the genus Pleurocolla (Fungi)". *Journal of the Washington Academy of Sciences* **Vol. 23, pp. 58–61** **[D I]** (as *Pleurocolla compressa*)

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 293** **[D CP]** (misidentified as *Sirobasidium brefeldianum*)

Gates G and Ratkowsky D (2016) *A Field Guide to Tasmanian Fungi.* Tasmanian Field Naturalists Club: Hobart, Tasmania. **p. 173** **[D CP]** (as *Leucogloea compressa*)

Kirschner R (2004) "Sporodochial anamorphs of species of *Helicogloea*.". In: *Frontiers in Basidiomycote Mycology* (Agerer R, Piepenbring M and Blanz P, eds.) Etching: IHW-Verlag: **pp. 165–178** (as *Leucogloea compressa*)

Spirini V, Malysheva V, Trichies G, Savchenko A, Põldmaa K, Nordén J, Miettinen O, and Larsson K-H (2018) "A preliminary overview of the corticioid *Atractiellomycetes* (Pucciniomycotina, Basidiomycetes)". *Fungal Systematics and Evolution* **Vol. 2, pp. 311–340**

4.2 Order: Septobasidiales

Septobasidiales, one of the orders in the class Puncciniomycetes, consists of 1 family (Septobasidiaceae) with 9 genera and a total of 244 named species.

Atractiellales
Taxonomic Classification

Kingdom:	Fungi
Phylum:	Agaricomycota
Subphylum:	Pucciniomycotina
Class:	Pucciniomycetes
Order:	Septobasidiales

Families
Septobasidiaceae

Septobasidiaceae – consists of 9 genera (*Aphelariopsis, Auriculoscypha, Coccidiodictyon, Glenospora , Johncouchia, Mohortia, Ordonia, Septobasidium, Uredinella*) with 244 described species. The majority of species in this family are in the genus *Septobasidium*, which has 225 species (http://www.speciesfungorum.org/).

It is well known that mutualistic (mycorrhizal) and parasitic symbioses between fungi and plants have had significant influence on the development of terrestrial life, but what is less well known is the influence of the symbioses between fungi and insects. Fungal species in the Septobasidiales are the only known large group of fungi in the basidiomycetes that are obligatorily parasitic on insects. The best documented parasitic behaviour is for the genus *Septobasidium*, which sterilises the individuals that are parisitised, but may protect other uninfected individuals living under its thallus (body of the fungus) from predation, thus benefiting the overall population. This complex relationship can be described as both mutualistic and parasitic. It must be noted that not all fungi in the Septobasidiales display this type of symbiosis; some may be wholly parasitic because they do not form substantial protective structures (Henk and Vilgalys 2007).

References

Henk DA, and Vilgalys R (2007) "Molecular phylogeny suggests a single origin of insect symbiosis in the Pucciniomycetes with support from some relationships within the genus *Septobasidium*". *American Journal of Botany* **Vol. 94(9), pp. 1515–1526.**

Fam. Septobasidiaceae

Septobasidium clelandii

© Jurrie Hubregtse

© Jurrie Hubregtse

Fam. Septobasidiaceae

Septobasidium clelandii

Biology

Parasitic basidiomycete; solitary to numerous, parasite of the female coccid bug *Callococcus leptospermi*, the host insect on branches of living *Leptospermum* trees.

Fruit-body Description

Initially the fruit-body emerges from a fissure in a gall (produced by a female gall-forming bug *Callococcus leptospermi*) to form a greyish patch of mycelium. From the centre of this patch, over a period of several weeks, clumps of erect spike-like structures (synnemata) up to 15 mm tall are formed. This occurs when the fungus is in its anamorphic (asexual, conidial) state. The fruit-bodies have a very tough gelatinous consistency, and are sometimes covered with a greyish bloom consisting of conidia. **Spore Print** Not observed

Microscopic Features

Basidiospores 18–20 $\times$ 6–7 μm, cylindrical, slightly curved, smooth, with a truncated hilum (the attachment point on the apiculus). Basidia 29–47 μm, auricularoid, 2–4-celled with transverse septa, with each cell able to produce a sterigma and basidiospore.

Conidia 9–10 $\times$ 2.5 μm, cylindrical, curved and smooth. Conidiophores consist of branched hyphae, becoming unbranched some distance back from their apices. The conidiophore apex becomes slightly narrowed and rounded before producing a conidium, but acute when the conidium has seceded. Clamp connections absent.

Comments

Septobasidium clelandii initially infects a female gall-forming bug *Callococcus leptospermi*. How and when this happens in the bug's life cycle is not known. In order for the female bug to produce young it needs to form a gall on a living *Leptospermum* tree branch (Coles *et al.* 1988). While inside the gall, and as the fungus starts to grow a fruit-body, the body of the parasitised *Callococcus* bug is almost completely filled with haustoria (special hyphae able to absorb food from a living cell) (Coles and Talbot 1977). Amongst the approximate 225 *Septobasidum* species, this behaviour is relatively unique, as a majority of species in this genus form a felty, perennial, lichen-like covering over scale insects. These fungi are superficial on the plant, but parasitise some of the insects which are feeding on it. This fungus-insect symbiosis can be regarded as a unique mixture of altruistic (where some insects are protected from predators by the fungal mat) and parasitic behaviour (Henk and Vilgalys 2007).

References

Coles RB and Talbot PH (1977) "*Septobasidium clelandii* and its conidial state *Harpogrphium corynelioides*". *Kew Bulletin* **Vol. 31(3), pp. 481–488** **[D I]**

Coles RB, Verberne F and Brookes HM (1988) "The immature and adult stages of *Calloccus leptospermi* (Maskell) (Homoptera: Coccoidea: Asterolecaniidae), with observations on life history". *Journal of Australian Entomology* **Vol. 27, pp. 15–25** **[D I]**

Fuhrer B (2009) *A field guide to Australian fungi.* Bloomings Books: Melbourne. **p. 292** **[D CP]**

Henk DA and Vilgalys R (2007) "Molecular phylogeny suggests a single origin of insect symbiosis in the Pucciniomycetes with support from some relationships within the genus *Septobasidium*". *American Journal of Botany* **Vol. 94(9), pp. 1515–1526**

GLOSSARY

As you get more involved with fungi, and in particular when talking with fellow enthusiasts or reading about fungi, the jargon of terms and phrases will eventually become part of your own language. In the meantime, here is a glossary with images to assist with terms that are frequently used by mycologists.

adnate – pertaining to the attachment of the lamellae, tubes, spines, etc. to the stipe of the fungus in which the attachment is perpendicular to the stipe.

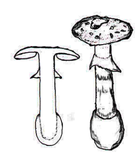
adnexed – pertaining to the attachment of the lamellae, tubes, spines, etc. to the stipe of the fungus in which the fertile tissue curves upwards towards the pileus of the fungus before attaching to the stipe.

aff. – with affinity to, or similar to.

agaric – a term commonly used to describe a fungus that has a pileus (cap), lamellae (gills), and a stipe (stem), i.e., what most people would call a mushroom.

allantoid – sausage-shaped, usually referring to spores.

amanitoid – a mushroom stature type describing a mushroom with a fleshy-fibrous stipe, free or finely adnexed lamellae, an annulus and a volva.



amyloid – a chemical staining reaction in which the tissue, spore wall ornamentation, etc. stains bluish-black in Melzer's reagent (iodine solution), showing the presence of starch.

amygdaliform – having an almond-shape, usually referring to almond-shaped spores.

anamorph – an asexual reproductive form of a fungus, cf. teleomorph.

anastomosing (interveining) – referring to lamellae that have transverse connections resembling veins.

annulus – a ring or collar of tissue around the stipe, usually derived from the partial veil. See *Amanita muscaria*.

appendiculate – usually referring to the hanging veil remnants on the margin of a pileus.

applanate – flattened or becoming flattened.

appressed – scales, fibres or hairs that lie flat against the surface of the pileus or stipe.

areolate – a surface that is split into regular or irregular shaped blocks, revealing the underlying flesh, usually referring to the outer skin of a fungus.

armillarioid – a mushroom stature type describing a mushroom with a fleshy-fibrous stipe, attached lamellae, an annulus, but no volva.

attached – lamellae (gills) fastened to the stipe of a mushroom.

basidiomycete – a fungus that reproduces by producing basidiospores on the basidia. Examples of these fungi types are mushrooms, corals, jellies, puffballs, stinkhorns, brackets, and clubs.

basidium (pl. basidia) – a microscopic club-shaped structure that bears the spores of basidiomycetes.

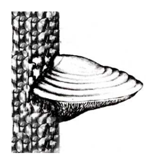
basidiocarp – the fruit-body of a basidiomycete fungus.

bifurcate – dividing into two branches; usually used to describe branching of lamellae.

bolete – a fleshy mushroom-like fungus with tubes and pores on the underside of the pileus. See *Suillus luteus*.

boletoid – resembling a bolete.

bracket – a fungus with a bracket-shaped fruit-body, often produced on trees or dead wood. The fruit-body can be woody, fleshy, tough, or leathery.



broom cell – a cystidium that bears apical appendages, giving it a broom-like appearance.

bulbous – (of stipe) having a swollen base.

caespitose – where a number of fruit-bodies are fused together. See *Flammulina velutipes.*

caulocystidium – a cystidium found on the stipe of a fungal fruit-body.

campanulate – (often of pileus) bell-shaped.

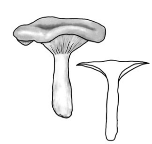
caulocystidium (pl. caulocystidia) – a cystidium on the stipe of a fungus.

cheilocystidium (pl. cheilocystidia) – a cystidium on the edge of a lamella (gill).

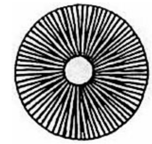
chlamydospores – asexual spores formed by the breaking up of fungal hyphae.

clamp connection – a special structure bridging the septa (cross-walls) of the hyphae of some basidiomycetes. This structure allows nuclei to migrate into new cells after after mitotic division. A clamp connection looks something like the handle on a cup. However, it may be flattened against the wall of the cells or may have a large opening (keyhole clamp).

clavate – club-shaped.



clitocyboid – a mushroom stature type describing a mushroom with a fleshy-fibrous stipe, decurrent lamellae, and no annulus or volva.



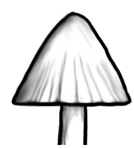
close – usually referring to the spacing of lamellae, which are neither crowded nor well spaced (distant) but arbitrarily in between.

collybioid – a mushroom stature type describing a mushroom with a cartilaginous stipe, attached (but not decurrent) lamellae, a convex to parabolic pileus with an initially inrolled to incurved pileal margin, and no annulus or volva.

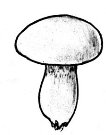
concave – saucer-shaped; often used to describe the shape of disc fungi.

concentric – having rings or zones within each other.

concolorous – two or more objects having the same colour.



conic – cone-shaped (e.g. a pileus that is taller than its width and often pointed).



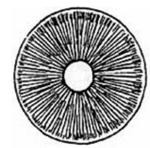
convex – rounded, higher in the middle than at the margin.

coprophilous – growing on dung or droppings.

corticioid – having effused, smooth fruit-body that usually forms on the underside of dead wood, also sometimes called crust fungi.

cortina – cobweb-like partial (inner) veil between pileus margin and stipe of certain agarics. See *Cortinarius* species.

crowded – referring to the spacing of lamellae that are very close together.



cuticle – outermost layer of pileus or stipe.

cylindric – cylinder-shaped, e.g. a stipe that has the same diameter from apex to base.

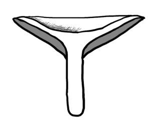
cystidium (pl. cystidia) – a large sterile cell of distinct shape on the pileus, lamellae, or stipe surface.

decurrent – pertaining to the attachment of the lamellae, tubes, spines, etc. that descend down the stipe to some degree. See *Austropaxillus infundibuliformis.*

decurved (incurved) – bent downwards, usually referring to the margin of a pileus.

deliquescence (autodigestion) – lamellae turning into a liquid, liquefying. See *Coprinus comatus.*

depressed – usually with reference to a pileus, with the central part sunken below the level of the margin. Concave.



dextrinoid – a chemical staining reaction in which the tissue, spore wall ornamentation, etc. stains reddish to reddish brown upon exposure to iodine or Melzer's reagent. (See also amyloid).

diploid – of a nucleus, cell, hypha, or a fruit-body having two sets of chromosomes (male and female).

disc – (of pileus) central part of the pileus.

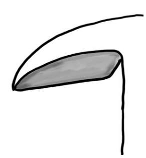
distant – referring to the spacing of lamellae that are wide apart.

dry – pileus or stipe neither viscid nor hygrophanous.

eccentric (excentric) – (of stipe) not attached to the centre of the pileus.

ectomycorrhiza (EM) – mycorrhiza where the fungal hyphae form sheaths around the rootlets of a plant (often of a tree), growing between but not penetrating the cells of the plant rootlets, and providing the plant with water and nutrients while the plant supplies sugars to the fungus.

ellipsoidal – a object that is bilaterally symmetrical,with curved sides and rounded ends, often referring to the shape of spores.



emarginate – sharply adnexed to the stipe, typically describing lamellae attachment.

endomycorrhiza – mycorrhiza in which fungal hyphae penetrate cell walls of host plant.

ephemeral (evanescent) – appearing briefly and then vanishing, e.g. a part of the fungus that is present in the young fruit-body, but disappears when it matures.

equal – usually refers to a stipe having the same diameter throughout its length.

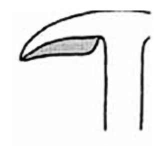
farinaceous – an odour variously described as that of raw potatoes, raw cucumbers, or even of soaps; mealy.

felted – covered with densely matted fibrils or hairs.

fibrillose – covered with hair-like filaments and arranged more or less parallel with one another.

floccose – with a covering of loose cotton-like or or downy scales.

free – referring to lamellae, tubes, spines etc. that are not attached to the stipe.



fruit-body – in macro and micro fungi, the structure that supports the spore-bearing organs.

fusiform – spindle-shaped, tapering at both ends (usually referring to spores).

galerinoid – a mushroom stature type describing a mushroom with a cartilaginous stipe, attached lamellae (which may be decurrent), a variable pileal shape, variable pileal margin, and an annulus but no volva.

gasteroid – basidiocarps that include puffballs, earth-stars, stinkhorns, and false-truffles.

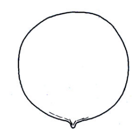
gasteromycetes – macrofungi with a sac-like structure containing spore-bearing tissue (gleba).

germ pore – thin region of spore wall via which spores can germinate.

glabrous – smooth, without any hairs or other ornamentation.

gleba – the spore-bearing tissue inside a sac-like structure.

globose – having a spherical shape (e.g. fungal fruit-bodies or spores).



glutinous – (often describing a pileus surface) covered with a slimy gelatinous layer.

granulose – (often describing a pileus or stipe surface) covered with small granules.

guttule – a small oil-like drop visible (via a microscope) inside a fungal spore.

haploid – of a nucleus, cell, hypha, or a fruit-body having only one set of chromosomes.

hirsute – covered with longish fibres or hairs.

hispid – covered with stiff or bristle-like hairs.

hyaline – clear and without colour; referring to structures such as spores seen under a microscope.

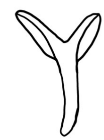
hygrophanous – having the characteristic of changing colour upon drying.

hymenium – the spore-bearing surface of the fruit-body.

hypha (pl. hyphae) – one of the filaments of a fungal mycelium.

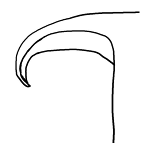
imbricate – overlapping like roof tiles, e.g. the scales on a pileus, or multiple tiers of a bracket-like fungus. See *Coprinus comatus*.

infundibuliform – (of pileus) funnel-shaped. See *Austropaxillus infundibuliformis*.



inamyloid – no change of colour upon application of Melzer's reagent.

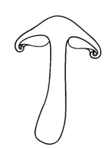
incurved – referring to a pileal margin, pointing down towards the stipe or the lamellae, but not rolled up.



institious – where the stipe is attached to the substrate without fibrils or hyphae being visible.

intervenose – see anastomosing.

involute (inrolled) – referring to a pileal margin, margin rolled inwards.



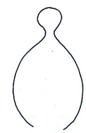
lamellae (sing. lamella) – the technical term used to describe the gills of a mushroom which extend from the pileal margin to the stipe.

lamellulae (sing. lamellula) – short gills that occur between normal gills but do not extend all the way from the pileal margin to the stipe.

lageniform – usually in reference to the shape of cystidia, swollen at the base and narrow at the apex; flask-shaped.

latex – a coloured juice exuding from an injured portion of a fungal fruit-body.

lecythiform – often referring to cystidia, bowling pin-shaped.



lepiotoid – A mushroom stature type describing a mushroom with a fleshy-fibrous stipe, free or finely adnexed lamellae, and an annulus but no volva.

lignicolous – growing on or in wood.

lubricous – slippery; a greasy smoothness.

macrofungi – fungal fruit-bodies that can be seen readily with the naked eye.

margin – with reference to pileus or lamellae, outermost edge of the pileus; edge of lamellae.

marginate – with reference to (a) lamellae, when the lamella edge has a different colour from its face; or (b) stipe base, when there is a distinct rim at the base of a bulbous stipe.

mealy – a surface covered with flour-like particles; smelling like fresh flour.

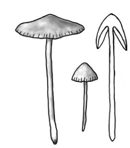
merulioid – a structure type, hymenophore wrinkled with low uneven ridges, like the fruit-body of a *Merulius*.

metuloid – a thick-walled cystidium which may or may not be encrusted at its apex.

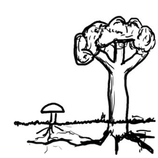
micaceous – a surface covered with mica-like (glistening) particles.

mycelium – the filamentous vegetative (growing and feeding) portion of a fungus.

mycenoid – a mushroom stature type describing a mushroom with a cartilaginous stipe, variably attached (but not decurrent) lamellae, a conic to campanulate pileal shape, an incurved to straight pileal margin, and no annulus or volva.

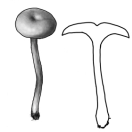


mycorrhizal fungi – fungi that have a symbiotic relationship with a host green plant.



naucorioid – a mushroom stature type describing a mushroom with a fleshy-fibrous stipe, adnexed or emarginate lamellae, and no annulus or volva.

omphalinoid – a mushroom stature type describing a mushroom with a cartilaginous stipe, decurrent lamellae, a convex to plane and sometimes umbilicate pileal shape, a variable pileal margin, and no annulus or volva.



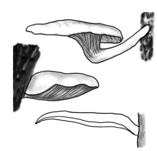
ostiole – a pore or hole through which spores are ejected; for an ascomycete at the apex of the perithecium, or for a basidiomycete the mouth of a puffball or earth-star.

parasitic fungi – fungi that feed on other living organisms. See *Cordyceps gunnii*.

partial veil – (of agarics and boletes) a membrane joining the stipe to the pileus margin during the development of the hymenium; this membrane ruptures to become an annulus or cortina.

pileus – the scientific name for the cap on a macrofungus; it carries the spore-bearing surface.

pleurotoid – a mushroom stature type describing a mushroom with a stipe, eccentrically or laterally attached or absent, a variable lamellae attachment, and no annulus or volva.



plicate-striate – (of pileus) having radial folds or pleats.

pluteotoid – a mushroom stature type describing a mushroom with a fleshy-fibrous stipe, free or finely adnexed lamellae, and no annulus or volva.

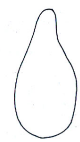
polypore – a wood-inhabiting fungus, often bracket-like, which bears its spores in pores on the hymenium.

pore – (in boletes and polypores) the orifice of a tube through which spores fall.

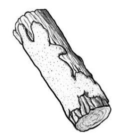
pruinose – covered in a fine powder; powdery.

pulvinate – cushion-like in form.

pyriform – pear-shaped.



resupinate – fruit-body that lies flat on the substrate with its hymenium outermost, often used with reference to crust fungi.



reticulate – (describing a stipe, notably of a bolete) marked with a net-like pattern of ridges or wrinkles.

rhizomorph – easily visible string-like aggregation of hyphae, often seen at the base of a fungal fruit-body.

rimose – (of pileus) cracked or split in a radial manner.

saccate – sac- or bag-like, usually used when describing a loose membranous volva at the base of a stipe.

scabrous – rough surface, covered with with short rigid projections.

sclerotium – a sterile compact mass of hyphae, usually with a hard outer protective layer.

scrobiculate – (of stipe) with shallow depressions or conspicuous spots.

serrate – jagged or saw-like; usually with reference to a lamella or pileus edge.

sessile – a fruit-body without a stipe, so that it sits directly on the substrate.

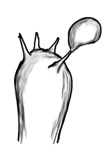
sinuate – (describing lamellae) with a notch near the point of attachment to the stipe.

spatulate – spoon-like in form.

spore – reproductive unit of a fungus.

squamose – (of pileus) having flat scales.

sterigma (pl. sterigmata) – the projection on the basidium on which developing basidiospores are attached (can only be seen under a microscope).



stipe – technical term for the stem of a fungus.

stipitate – having a stipe.

striate – (describing a pileus) with fine lines, grooves or ridges.

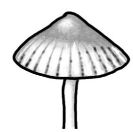
substratum (substrate) – the material to which a fruit-body is attached.

teleomorph – the sexual reproductive stage of the fungus, producing sexual spores.

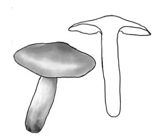
terricolous (terrestrial) – living or growing on soil.

tomentose – covered with long, soft, hairy fibrils, either tangled or matted.

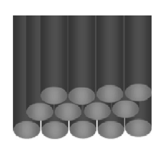
translucent-striate – having the lines of the lamellae visible through the top of the pileus.



tricholomatoid – a mushroom stature type describing a mushroom with a fleshy-fibrous stipe, sinuate or notched lamellae, and no annulus or volva.



tube – the hollow cylinder, on the underside of boletes and polypores, in which spores are produced.

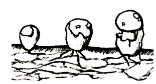


umbilicate – having a deep depression, usually with a small umbo (protrusion) in the centre, e.g. as in a belly button.

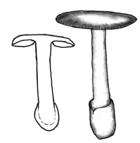
umbo – a broad swelling or bump in the centre of the pileus.

umbonate – a pileus with a distinct swelling or bump (umbo) at the centre.

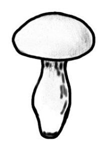
universal veil – (for some agarics) a protective membrane that initially surrounds an entire young agaric fruit-body. Later, when the membrane ruptures, it may leave scales, patches or warts on the pileus surface.



vaginatoid – a mushroom stature type describing a mushroom with a fleshy-fibrous stipe, free or finely adnexed lamellae, and a volva but no annulus.

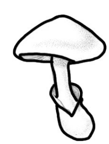


ventricose – swollen or wider in the middle; (of stipe) swollen at or near the middle; (of lamellae) broader midway between stipe and pileal margin.



viscid – slimy or sticky to the touch.

volva – the remains of the universal veil at the base of the stipe in certain fungi.



warts – small pieces of universal veil tissue left on the surface of the pileus.

zonate – pileus or flesh marked with concentrically zoned coloured bands.

SPECIES INDEX