

Preliminary studies in the genus *Entoloma* in Tasmania – II

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Abstract – This paper describes 15 new species of *Entoloma* from forests in Tasmania, Australia, based on 10 years of intensive collecting, description and study of the *Entoloma* mycota. Forest types range from rainforest in high rainfall areas to dry sclerophyll forest in low rainfall areas. This paper is a precursor to a monographic treatment of the Entolomataceae of Tasmania to be published in the next few years.

***Entoloma* / Basidiomycetes / Taxonomy / Tasmania / forests / new species**

Résumé – Dans cet article sont décrites 15 nouvelles espèces d'*Entoloma* des forêts de Tasmanie et d'Australie, résultat de 10 ans de récoltes intensives. Les types forestiers vont des forêts pluvieuses aux forêts sclérophylles. Cet article constitue une publication préliminaire à un traitement monographique des Entomolaceae de Tasmanie, qui sera publié dans les années à venir.

***Entoloma* / Basidiomycetes / Taxonomie / Tasmanie / forêts / nouvelle espèce**

INTRODUCTION

This is the second paper documenting new species of *Entoloma s.l.* in Tasmania, the island state of Australia. A description of the physical characteristics of Tasmania and its vegetation was given in Gates and Noordeloos (2007), which documented 33 new species of *Entoloma* in Tasmania. The present paper adds 15 new species.

A preliminary key to the Tasmanian *Entoloma* species, including the new taxa described in this paper, PDF-s of earlier papers on *Entolomataceae* of Tasmania, and additional information can be found on the *Entoloma* website: <http://www.entoloma.nl/html/tasmania.html>.

Many Tasmanian species find counterparts in the flora of South-east Asia (Horak, 1980, 2008; Noordeloos & Hausknecht, 2007; Manimohan *et al.*, 2006). Although in general, the mycoflora of Tasmania has affinities with that of New

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Zealand, it is remarkable that there are only a limited number of species in common (Horak, 2008). Whether this is due to the absence of native eucalypt forest in New Zealand is well worth investigating, especially since it has been proved that *Entoloma* may be (in part) mycorrhizal (Agerer, 1997; Agerer & Waller, 1993; Kobayashi & Hatano, 2001).

The current infrageneric taxonomy of *Entoloma* (Romagnesi & Gilles, 1979; Noordeloos, 1992, 2005; Largent, 1994) is primarily based on European, North American, and African species. These classifications, which sometimes differ considerably, are based mainly on morphological, and to a lesser extent, chemical characteristics. Although a number of taxa have been described from the Southern Hemisphere in the works by Berkeley (1859), Cleland (1934, 1935), Stevenson (1962), Horak (1973, 1976, 1977, 1980, 1982) and Grgurinovic (1997), no attempt has been made so far to place them into an infrageneric context. Ongoing phylogenetic studies on Entolomataceae, using molecular markers, may, however (Co & Noordeloos, in prep.), have its effect on current classification, and make new arrangements necessary.

MATERIALS AND METHODS

The reader is referred to Gates and Noordeloos (2007) for details of the field work and laboratory methods used. Holotype specimens are deposited in the Tasmanian Herbarium (HO); isotypes are deposited at the National Herbarium of the Netherlands, Leiden (L). Collections cited are deposited at HO or L as designated.

Forest types in Tasmania are determined by the long-term rainfall that an area receives (see the Forest Botany Manuals of the Forest Practices Authority, 2005, for a full description of Tasmanian forest typing). In general, the island of Tasmania is divided into a wet, western half and a dry eastern half, although there are gradations within this broad division. For example, although extensive and diverse areas of rainforest occur in river valleys, alpine and subalpine environments of the west and southwest, the northeastern highlands also contain patches of rainforest. Rainforests vary greatly in their composition, including extremes where stands contain pure *Nothofagus cunninghamii* (Hook.) Oerst. or pure *Atherosperma moschatum* Labill. Other characteristic rainforest species of lowland forests include *Eucryphia lucida* (Labill.) Baill., *Anodopetalum biglandulosum* (Hook.) Hook. and *Anopterus glandulosus* Labill. Their continued existence depends wholly upon the absence of fire, on a time scale of hundreds of years. In a mixed forest, a term used to describe a forest dominated by *Eucalyptus* (i.e., having a ground cover of at least 5%) but with an understorey of rainforest species, more frequent extreme fires (once or twice a century) allow the regeneration of *Eucalyptus* species and the continuation of the eucalypt dominated forest types.

Mixed forests are extensive in the Florentine and Styx valleys of the west and in the Arve and Esperance valleys of the south. Wet sclerophyll denotes forests with a high cover of eucalypts, often of a single species, such as *E. obliqua* L'Hér., *E. regnans* F. Muell., or, at higher altitudes, *E. delegatensis* R.T. Baker, but which lack rainforest understorey species. Wet sclerophyll dominates as humidity increases in high rainfall areas and in more shaded areas and less fire-prone landforms. Dry sclerophyll forests and woodlands occur in less fertile, drier

lowland areas of lesser rainfall, or at exposed sites at higher altitudes. Other localised broad forest types occur in Tasmania, such as swamp forests, which may be dominated by *Acacia melanoxylon* R.Br., up to three species of *Leptospermum* J.R. Forster & G. Forster, or two species of *Melaleuca* L.

In wet sclerophyll and mixed forests, the composition of the understorey species may strongly influence whether *Entoloma* species will be found there or not. Because *Entoloma* are decomposer species, they are often associated with broad-leaved (soft-leaved) species such as *Pomaderris apetala* Labill., *Olearia argophylla* (Labill.) F. Muell. Ex Benth., *Bedfordia salicina* DC and *Zieria arborescens* Sims. In contrast, the narrow-leaved (hard-leaved) understorey species of the genera *Pultenaea* Sm., *Epacris* J.R. Forst. and *Hakea* Schrad & J.C. Wendl. appear to be unfavourable for *Entoloma*.

TAXONOMIC PART

1. *Entoloma perbloxamii* Noordel, D.L.V. Co, G. Gates and Morgado, **sp. nov.**
(Fig. 1, Plate 1.1 & 1.2)

Mycobank 512045

Etymology: Named for its resemblance to *Entoloma bloxamii* (Berk. & Broome) Sacc.

Latin diagnosis: *Pileus* 30-45 mm latus, conico-convexus, umbonatus, haud hygrophanus, haud translucido-striatus, obscure lazulinus, glaber vel fibrillosus centro minute squamulosus. *Lamellae* adnexe sinuatae, confertae, albae demum roseae. *Stipes* 30-70 × 3-8 mm, cylindraceus, lazulinus, innate fibrillosus.

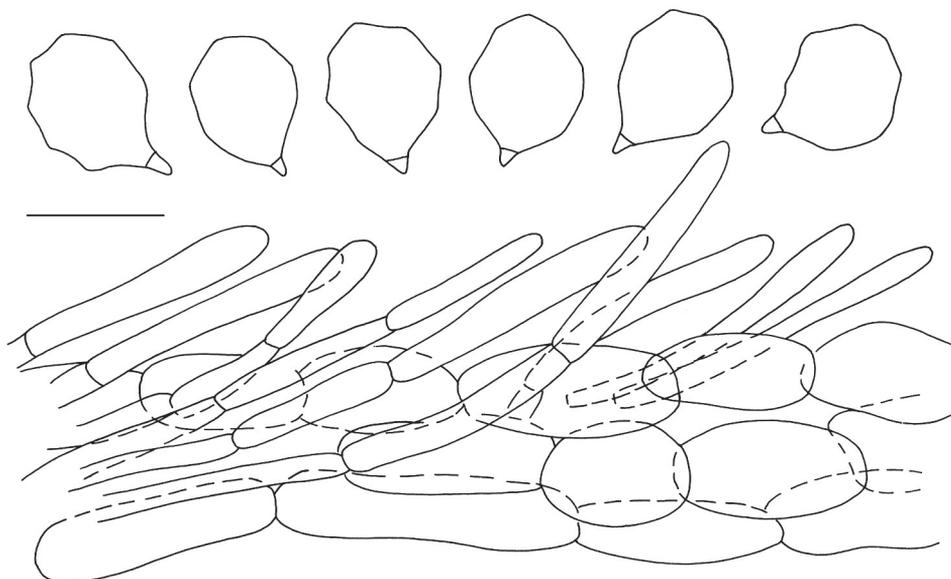


Fig. 1. *Entoloma perbloxamii*. Spores and pileipellis. All figs from holotype. Bar = 10 µm.

Sporae 6.5-9 × 5.5-6.5 µm, isodiametricae. *Acies lamellarum fertilis*. *Cheilocystidia* desunt. *Pileipellis cutis vel trichoderma ex elementis cylindraceutis*, 6-13 µm latis, constituta pigmentis intracellularibus. *Granula lucentia absentia*. *Fibulae abundantes*.

Holotypus: Australia, Tasmania, Macgregors Peak, 42°59'S × 147°57'E, 11 April 2004, M.E. Noordeloos 2004037 (HO; *isotypus* L).

Main characters: tricholomatoid, totally dark blue species with dry, fibrillose to minutely squamulose pileus and very small, many-angled, iso- to subisodiametrical spores.

Pileus 30-45 mm across, conico-convex with umbo, with deflexed margin, not hygrophanous, not translucently striate, deep ultramarine blue, not fading with age, dry, innately radially fibrillose at margin, subtomentose at centre. *Lamellae* rather crowded, L = 40-60, l = 3-5, adnate-emarginate, white then pink with irregularly serrulate, concolorous edge. *Stipe* 30-70 × 3-8 mm, cylindrical with tapering base, ultramarine blue, concolorous with pileus, innately fibrillose all over, with white base. *Context* thin, blue in cortex, white in inner part. *Odour* not distinct. *Taste* not distinct.

Spores 6.5-8(-9) × 5.5-6.5 µm, on average 7.5 × 6.5, Q = 1.02-1.40 (1.15), subisodiametric, 6-8-angled, with thick walls. *Basidia* 34-40 × 8-10 µm, 2-4-spored, with clamp-connections. *Lamellar edge* fertile. *Cystidia* absent. *Hymenophoral trama* regular, made up of cylindrical elements, 64-152 × 11-23 µm. *Pileipellis* two-layered, suprapellis a cutis with transition to a trichoderm, made up of cylindrical elements, 18-47 × 6-13 µm, with blue to brown, intracellular pigment; subpellis well-differentiated from the trama, made up of inflated elements, 40-74 × 11-26 µm, with pale yellow, intracellular pigment. *Pileitrama* regular, made up of cylindrical hyphae, elements 36-96 × 5-18 µm, with diffuse pale yellow, intracellular pigment. *Stipitipellis* a cutis with transitions to a trichoderm, made up of 3-5 µm wide, cylindrical hyphae with patent terminal elements, 22-70 × 3-5 µm with pale blue, intracellular pigment. *Stipititrama* regular, made up of cylindrical elements, 64-152 × 11-23 µm with pale yellow, intracellular pigment. Vascular hyphae present in pilei- and stipititrama. *Brilliant granules* absent. *Clamp-connections* abundant in all tissues.

Habitat: solitary or in small group, terrestrial in mixed forest and wet sclerophyll forest including remnant rainforest.

Collections examined: Australia, Tasmania, Macgregors Peak, 42°59'S × 147°57'E, 11 April 2004, M.E. Noordeloos 2004037 (holotype HO; isotype L); Lake St Clair National Park, 42°04'S × 146°09'E, 19 April 2003, G. Gates E1728 (HO548301).

Notes: The striking characters of *Entoloma perbloxamii* are the dry, fibrillose surface of the pileus and stipe, persistent ultramarine blue color, and the relatively thick-walled spores, as compared with *E. bloxamii* (Berk. & Broome) Sacc. *Entoloma assimilatatum* Corner and *E. Horak* from Papua New Guinea has a somewhat similar pileipellis structure, but a brown pileus, and clampless hyphae. *Entoloma chalybs* E. Horak from Malaysia has similar dark blue basidiocarps, but differs in the structure of the pileipellis, which is an ixocutis of 2-5 µm wide, cylindrical hyphae, and it has a strong, spermatic or farinaceous smell, which make it very similar to *Entoloma bloxamii*.

2. *Entoloma fuligineoviolaceum* G. Gates and Noordel., **sp. nov.** (Fig. 2; Plate 1.3)

Mycobank 512046

Etymology: fuliginous = very dark brown; violaceus = violet, referring to the colour of the pileus.

Latin diagnosis: Pileus 23-30 mm latus, plano-convexus, umbonatus, ad marginem rimosus, haud hygrophanus, haud translucido-striatus, sordide e violaceo brunneus, toto velutinus centro minute squamulosus. Lamellae adnexe sinuatae, moderate confertae, brunneo-violaceae roseotinctae. Stipes 30-35 × 4-6 mm, cylindraceus, coeruleo-violaceus, paulisper fibrillosus vel politus. Sporae 5.5-7.5(-8) × 5.5-6.5(-7) μm, isodiametricae. Acies lamellarum fertilis. Cheilocystidia desunt. Pileipellis cutis vel trichoderma ex elementis cylindraceis, 30-60 × 2-9 μm latis, constituta pigmentis intracellularibus. Granula lucentia absentia. Fibulae abundantes.

Holotypus: Australia, Tasmania, Bruny Island, Mt. Mangana, 43°22'S × 147°17'E, 19 May 2007, G. Gates E2253 (HO548302; *isotypus* L).

Main characters: habit mycenoid, pileus dark brown with distinct violaceous tinge; lamellae violaceous-brown; stipe blue-violaceous; spores small, isodiametric; clamp-connections abundant.

Pileus 23-30 mm across, conico-convex to planoconvex with small umbo, with deflexed then straight, finally rimose margin, not hygrophanous, not translucently striate or at margin only when young, dark brown with distinct dark violaceous hues, velutinous to finely squamulose all over, dry. *Lamellae* moderately crowded, adnexed-sinuate, ventricose, up to 5 mm broad, brownish violet to violet with pink tinge, with entire, concolorous edge. *Stipe* 30-35 × 4-6 mm, cylindrical, up to 10 mm broad at base, blue-violaceous, fibrillose-striate to almost polished, with white basal tomentum. *Context* concolorous in cortex, whitish in inner parts. *Odour* faint, sometimes reminiscent of grass or iodine. *Taste* mild to bitter.

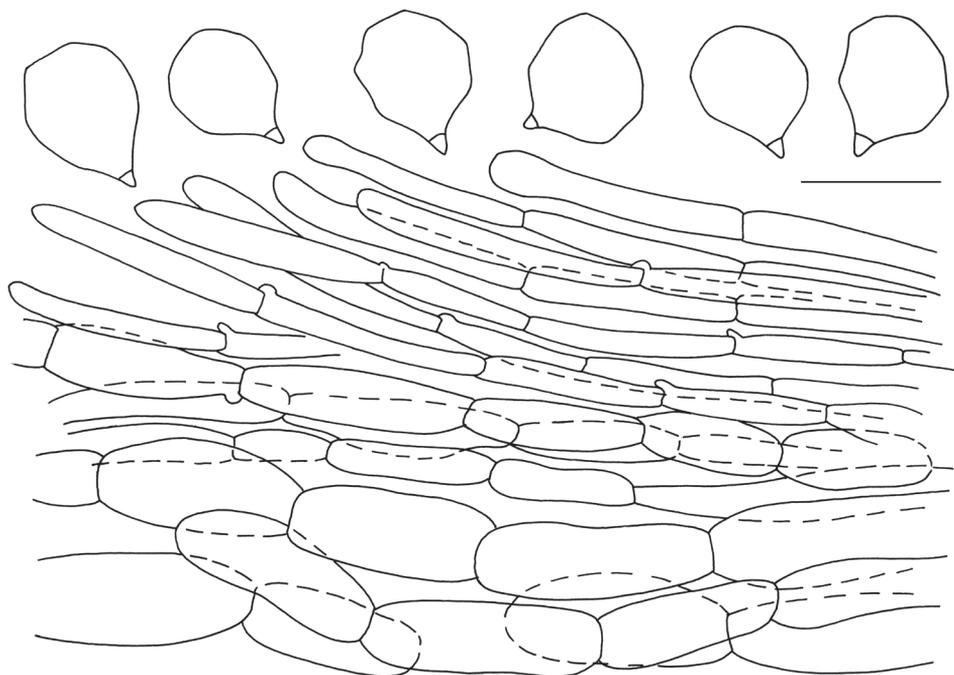


Fig. 2. *Entoloma fulgineoviolaceum*. Spores and pileipellis. All figs from holotype. Bar = 10 μm.

Spores 5.5-7.5(-8) × 5.5-6.5(-7) µm, Q = 1.0-1.2, Q_{av} = 1.05, iso- to subisodiametric, thin-walled with many blunt angles. *Basidia* 23-32 × 5-9 µm, 4-spored, with clamp-connections. *Lamellar edge* fertile. *Cystidia* absent. *Hymenophoral trama* regular, made up of cylindrical to slightly inflated elements, 60-120 × 6-20 µm with pale greyish, intracellular pigment. *Pileipellis* a cutis with transitions to a trichoderm, made up of cylindrical to narrowly clavate terminal elements, 30-60 × 2-9 µm. *Pigment* brownish, intracellular in pileipellis. *Stipitipellis* a cutis of cylindrical, to 4-7 µm wide hyphae with pale bluish, intracellular pigment. *Brilliant granules* absent. *Clamp-connections* abundant in all tissues.

Habitat: in groups, terrestrial in mixed forest with *Nothofagus cunninghamii* (Hook.) Oerst., *Atherosperma moschatum* Labill. and *Eucryphia lucida* (Labill.) Baill.

Collections examined: Australia, Tasmania, Bruny Island, Mt. Mangana, 43°22'S × 147°17'E, 19 May 2007, G. Gates E2253 (holotype HO548302; isotype L); Juee Caves State Reserve, 42°44'S × 146°36'E, 21 April 2007, G. Gates E2251 (HO548303).

Notes: *Entoloma fuligineoviolaceum* belongs to the rather species-rich group of *Entoloma nitidum* and *E. bloxamii*. It resembles *E. haastii* G. Stev. from New Zealand, which has a smoother, not velutinous pileal surface, slightly different colours and slightly larger, 5-7-angled spores. *Entoloma fabulosum* E. Horak from New Zealand is similar, but has a palisade-like pileipellis and brown pileus without distinct blue or violaceous tinge (Horak, 2008).

3. *Entoloma natalis-domini* G. Gates and Noordel., **sp. nov.** (Fig. 3; Plate 1.4)

Mycobank 512047

Etymology: referring to Natalis Domini (Lat.) = in association with the name of the type locality.

Latin diagnosis: *Pileus* 8-27 mm *latus, conico-convexus, acute umbonatus, haud hygrophanus, haud translucido-striatus, obscure brunneus, glabrus. Lamellae adnatae, confertae, griseo-albae, demum roseotinctae, acies lamellarum caesiotinctae. Stipes* 25-37 × 1.2-2 mm, *cylindraceus, coeruleo-griseus, politus. Sporae* 8-10(-10.5) × 6-8 µm, (4-)(5-)(6) *angulatae. Acies lamellarum sterilis. Cheilocystidia* 32-55 × 6-12 µm *contento caesio. Pileipellis cutis vel trichoderma ex elementis cylindraceis, 5-14 µm latis, constituta pigmentis intracellularibus. Granula lucentia abundantia. Fibulae desunt.*

Holotypus: Australia, Tasmania, Styx Valley, Christmas Tree Grove, 42°49'S × 146°38'E, 9 June 2007, G. Gates E2260 (HO548304; *isotypus* L).

Main characters: habit mycenoid with acute pileus, very dark brown; lamellar edge dark blue, fimbriate; stipe grey-blue, polished.

Pileus 8-27 mm across, conico-convex with sharp umbo, with somewhat terraced surface, with straight, entire to crenulate margin, not hygrophanous, slightly translucently striate, very dark brown, velutinous at centre, glabrous at margin. *Lamellae* crowded, adnate with short decurrent tooth, seceding, ventricose, up to 4 mm broad, greyish blue-pink, paler towards the dark blue, fimbriate edge. *Stipe* 25-37 × 1.2-2 mm, slightly broadened towards base, cylindrical, dark blue-grey, polished with pinkish basal mycelium. *Context* white. *Odour* not distinctive. *Taste* not distinctive.

Spores 8-10(-10.5) × 6-8 µm, average 9-9.5 × 7-7.5 µm, Q = 1.2-1.5, Q_{av} = 1.35, heterodiametric, (4-)(5-)(6)-angled in side-view. *Basidia* 17-25 × 7-9 µm, 4-spored, clampless. *Lamellar edge* sterile, of serrulatum type. *Cheilocystidia* 32-55 × 6-12 µm, cylindrical to narrowly clavate, with blue intracellular pigment. *Hymenophoral trama* regular, made up of long, cylindrical elements, 80-150 ×

4-14 μm . *Pileipellis* a cutis with transition to a trichoderm at centre, made up of 9-12(-14) μm wide hyphae, with clavate terminal elements at centre, 11-20 μm wide, with abundant bright blue pigment; subpellis made up of long, cylindrical elements, 5-14 μm wide with brown intracellular pigment. *Pileitrama* regular, as hymenophoral trama. *Brilliant granules* very abundant in all tissues. *Stipitipellis* a cutis of cylindrical hyphae, 5-15 μm wide with blue, intracellular pigment. *Clamp-connections* absent.

Habitat: in small groups, terrestrial in mixed forest dominated by *Eucalyptus regnans* F. Mueller, with the rainforest species *Nothofagus cunninghamii* (Hook.) Oerst. and *Atherosperma moschatum* Labill. abundant.

Collection examined: Australia, Tasmania, Styx Valley, Christmas Tree Grove, 42°49'S \times 146°38'E, 9 June 2007, G. Gates E2260 (holotype HO548304; isotype L).

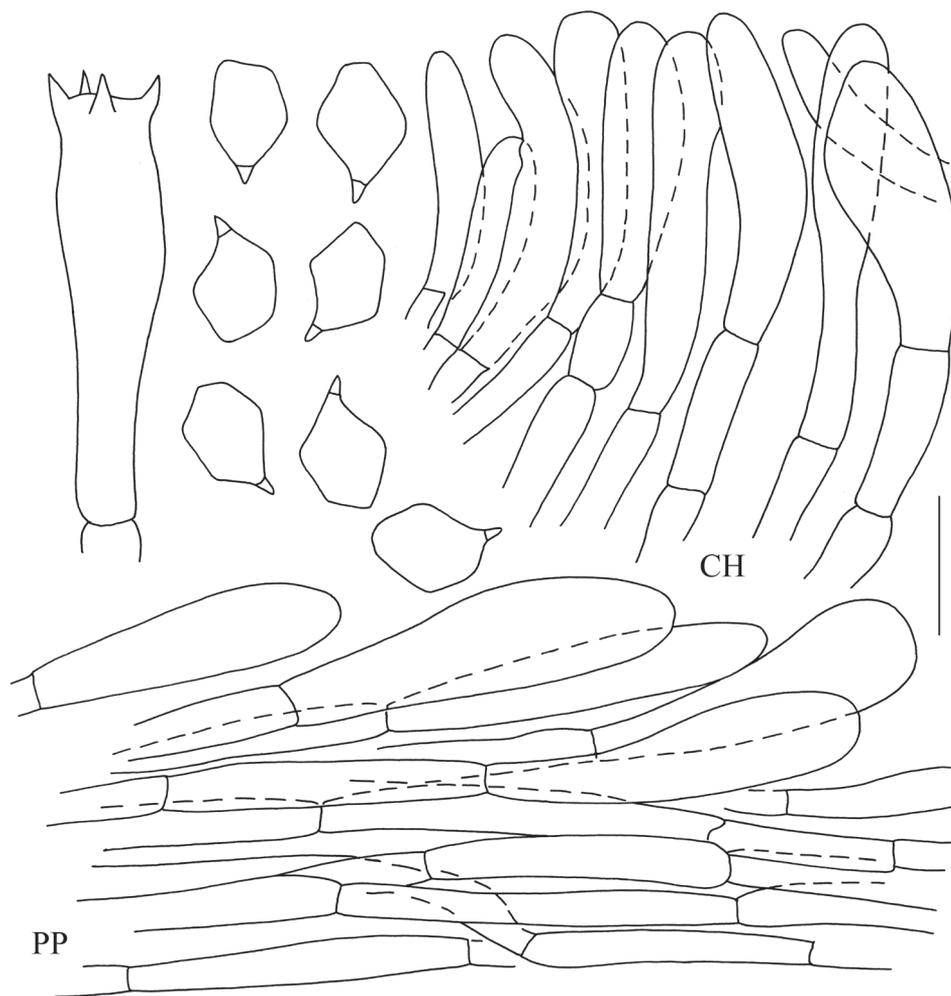


Fig. 3. *Entoloma natalis-domini*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μm .

Notes: The blue-fringed lamellar edge suggests that *Entoloma natalis-domini* is related to the serrulatum group of subgenus *Cyanula*, but its dark brown, conical, papillate pileus and the small (4-)5-angled spores place it in a rather isolated position there. *Entoloma caesiocinctum* (Kühner) Noordel., another species from the serrulatum group with a brown pileus, is a wide-spread species from Europe and North America, but differs by a less dark brown, usually deeply translucently striate, umbilicate pileus, and larger spores (Noordeloos, 2004). *Entoloma sassafras*, described as a new species below, is another dark coloured species with a carmine to violet-black lamellar edge, but it lacks blue tinges in the stipe, and has differently shaped spores. *Entoloma asprelloides* G. Stev. from New Zealand differs not only by a collybioid habit with depressed pileus and lack of blue tinges in the stipe, but also by the larger spores (Horak, 2008). *Entoloma glaucopus* E. Horak, albeit macroscopically different in stature and colour, appears somewhat similar in microscopy, but has slightly larger spores. The European *Entoloma linkii* (Fr.) Noordel. has a collybioid habit, with similar dark brown pileus, but lacks blue tinges in the stipe, and has larger spores.

4. *Entoloma sassafras* G. Gates and Noordel., **sp. nov.** (Fig. 4; Plate 1.5)

Mycobank 512055

Etymology: named after Sassafras, the common name of the tree *Atherosperma moschatum*, with which it is often associated.

Latin diagnosis: Pileus 11-30 mm latus, plano-convexus, centro depressus, haud hygrophanus, haud translucido-striatus, flavo-brunneus regulariter minute squamulosus. Lamellae adnatae, confertae, griseae vel flavo-griseae, demum roseo-tinctae, acies lamellarum violaceotinctae. Stipes 25-45 × 3-4 mm, cylindraceus, obscure griseus, politus sed apicem squamulosus. Sporae 9-10.5 × 7-8 μm, 5-7angulatae. Acies lamellarum sterilis. Cheilocystidia 32-60 × 5-11 μm, contento caesio. Pileipellis cutis vel trichoderma ex elementis fusiformis, 25-80 × 7-25 μm latis, constituta pigmentis intracellularibus. Granula lucentia abundantia. Fibulae desunt.

Holotypus: Australia, Tasmania, Warra LTER Site, Bird Track, 43°06'S, 146°41'E, 5 June 2007, G. Gates E2256 (HO548308; *isotypus* L).

Main characters: habit collybioid; pileus very dark, almost black with neat, regularly arranged squamules; lamellar edge deep carmine to violaceous-black; stipe dark grey, squamulose at apex.

Pileus 11-30 mm across, convex to plano-convex with depressed centre and deflexed to straight, black-rimmed margin, not hygrophanous, not translucently striate, entirely black in youth, then dark yellow-brown, overlaid by radiating, thick, black squamules, which are more concentrated on the black, scaly disc, and regularly spread towards the margin; sometimes a distinct violet hue may be present near the margin. *Lamellae* crowded, adnate-emarginate to adnexed, segmentiform to subventricose, up to 4.5 mm broad, dark grey or yellow-grey, sometimes more yellow near pileus, with sub-entire, deep carmine to violet-black edge. *Stipe* 25-45 × 3-4 mm, cylindrical, dark grey, finely squamulose at apex, glabrous or with some sparse fibrils towards base, with white to pinkish basal tomentum. *Context* greyish. *Odour* not distinct. *Taste* not distinct or somewhat bitter.

Spores 9-10.5 × 7-8 μm, average 9.5 × 7.5 μm, Q = 1.2-1.5, heterodiametric, 5-7-angled in side-view with pronounced angles, thick-walled. *Basidia* 20-37 × 7-11 μm, 4-spored, clampless. *Lamellar edge* sterile with dense clusters of clavate to utriform cheilocystidia, 32-60 × 5-11 μm with granular, blue pigment. *Hymenophoral trama* regular, made up of cylindrical hyphae, 4-20 μm wide.

Pileipellis a trichoderm of cylindrical to fusiform terminal elements, 25-80 × 7-25 µm with brown, clotted-granular intracellular pigment. *Pileitrama* regular, similar to hymenophoral trama. *Brilliant granules* abundant. *Clamp-connections* absent.

Habitat: in small groups on living and dead trunks of *Atherosperma moschatum* Labill. in wet sclerophyll and mixed forests.

Collections examined: Australia, Tasmania, Warra LTER Site, Bird Track, 43°06'S, 146°41'E, 5 June 2007, G. Gates E2256 (holotype HO548308; isotype L); Duckhole Lake Track, 43°22'S, 146°53'E, 15 May 2003, G. Gates E1804 (HO548312); Lake Skinner Track, 42°57'S × 146°44'E, 11 April 1999, G. Gates E368 (HO548311); Warra LTER Site, coupe WR008J, 43°06'S, 146°41'E, 27 April 2004, G. Gates E1976 (HO548305); Mt Field National Park, 42°41'S, 146°42'E,

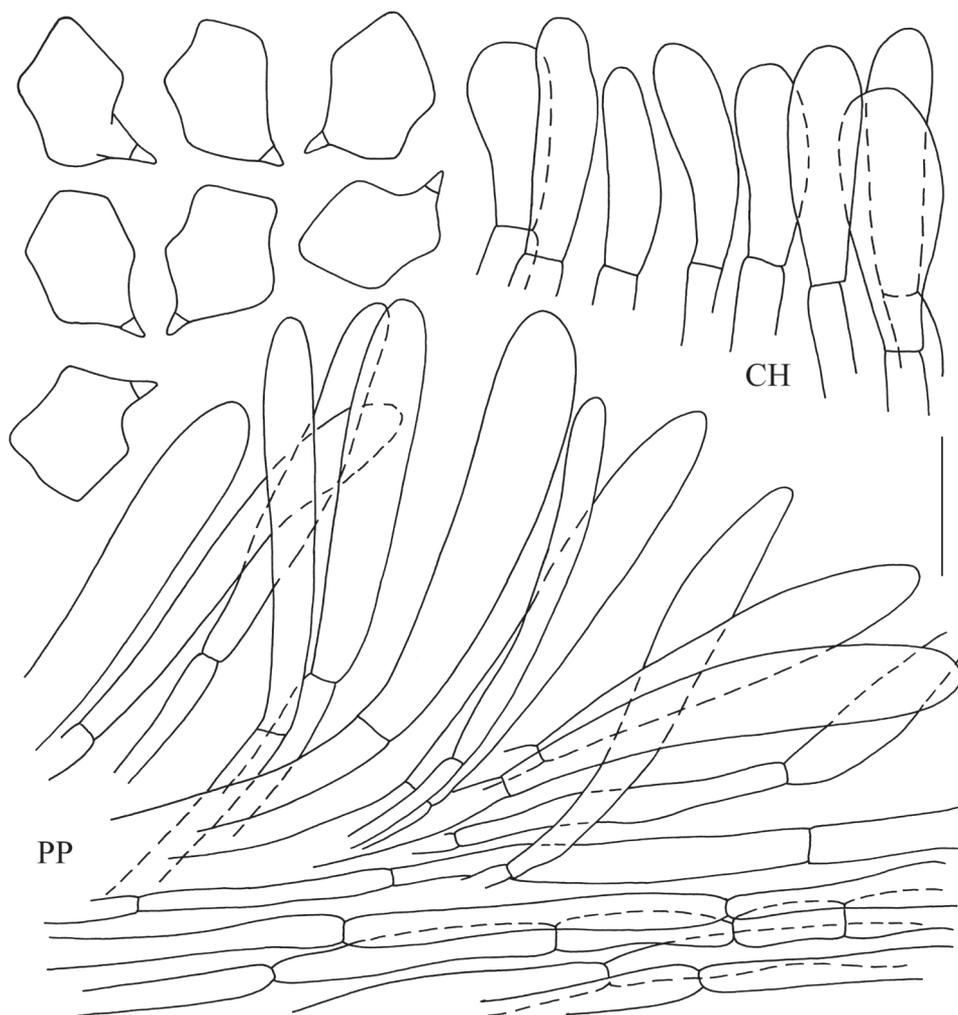


Fig. 4. *Entoloma sassafra*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 µm.

29 June 1999, G. Gates E639 (HO548309); Lake St Clair National Park, 42°04'S × 146°09'E, 20 April 2002, G. Gates E1481 (HO548310); Mt Field National Park, Lyre Bird Walk, 42°41'S × 146°40'E, 1 April 1999, G. Gates E322 (HO548307); same location, 2 June 2001, G. Gates E1208 (HO548306).

Notes: *Entoloma sassafras* is a striking species with its very dark, densely squamulose pileus, violet-blue lamellar edge and dark grey stipe. *Entoloma atrelum* E. Horak from New Zealand is similar, but differs by having a blue pileus, blue lamellae edge, and lageniform cheilocystidia. *Entoloma melanocephalum* G. Stev. from New Zealand has more predominantly blue-green colours in the pileus, lamellae and stipe, a blue coloured lamellar edge, and larger spores.

5. *Entoloma saponicum* G. Gates and Noordel., **sp. nov.** (Fig. 5; Plate 2.1 & 2.2)

MycoBank 512056

Etymology: sapo = soap, the Latin name saponicum reflecting its soapy, hot burning taste.

Latin diagnosis: Pileus 20-40 mm latus, convexus, centro depressus, haud hygrophanus, haud translucido-striatus, atro-brunneus vel griseus, fibrillosus, centro minute squamulosus. Lamellae adnatae, confertae, sordide brunneo-griseae, demum roseotinctae, acies lamellarum brunneotinctae. Stipes 30-60 × 2-6 mm, cylindraceus, griseo-brunneus, politus. Sporae 6-10 × 5-7 µm, 5-6angulatae. Acies lamellarum sterilis. Cheilocystidia 30-60 × 4-12 µm contento brunneo. Pileipellis cutis vel trichoderma ex elementis inflatis, usque ad 20 µm latis, constituta pigmentis intracellularibus. Granula lucentia abundantia. Fibulae desunt.

Holotypus: Australia, Tasmania, Clarks Cliffs, 43°06'S × 147°47'E, 29 Dec. 2001, G. Gates E1380 (HO548313; *isotypus* L).

Main characters: brown or greyish fruit bodies, depressed, smooth pileus except for minutely squamulose centre, and brown lamellar edge.

Pileus 20-40 mm across, convex with pronounced central depression, with involute to deflexed margin, not truly hygrophanous, not translucently striate except in old weathered specimens, fruit bodies grading from very dark blackish brown to grey, minutely squamulose at centre, elsewhere glabrous, innately radially fibrillose, dry. *Lamellae* close, adnate, segmentiform, up to 6 mm broad, brown or grey-brown with pink tinge, edge blackish brown, more or less entire. *Stipe* 30-60 × 2-6 mm, cylindrical or compressed with groove, brittle, grey-brown, usually paler than pileus, smooth, glabrous, polished or with scattered fibrils. *Context* thin, colorous. *Odour* none. *Taste* often soapy and burning.

Spores 6-10 × 5-7 µm, Q = 1.15-1.65(-2), 5-6-angled in side-view. *Basidia* 30-40 × 9-10 µm, 4-spored, clampless. *Lamellar edge* sterile. *Cheilocystidia* 30-60 × 4-12 µm, narrowly to broadly clavate, fusiform or lageniform with rounded, rarely capitate apex, with brown, intracellular pigment. *Hymenophoral trama* regular, made up of 4-20 µm wide, cylindrical hyphae. *Pileipellis* a cutis with transitions to a trichoderm at centre, consisting of cylindrical hyphae up to 12 µm wide with inflated terminal elements, 20-70 × 4-18 µm. *Pigment* abundant, grey-brown, intracellular in pileipellis. *Pileitrama* regular, made up of inflated hyphae to 20 µm wide. *Brilliant granules* abundant. *Clamp-connections* absent.

Habitat: terrestrial in small groups in forest litter in wet sclerophyll forest and mixed forest, also found abundantly in a marsupial pasture, surrounded by wet sclerophyll forest containing, for example, *Pomaderris apetala* Labill. and *Gahnia grandis* (Labill.) S.T. Blake.

Collections examined. Australia, Tasmania, Clarks Cliffs, 43°06'S × 147°47'E, 29 Dec. 2001, G. Gates E1380 (holotype HO548313; isotype L); same location, 13 March 2004, G. Gates E1947 (HO548314); Mt. Wellington, Circle

Track, 42°55'S × 147°15'E, 25 March 1999, G. Gates E278 (HO548315); Junee Caves State Reserve, 42°44'S × 146°36'E, 28 March 2009, M.E. Noordeloos 2009065 & 66 (L).

Notes: The colour of the fruit bodies may vary from moderately dark brown to very dark grey-brown. Variants with a non pigmented lamellar edge also occur. *Entoloma saponicum* belongs therefore to a rather large group of similar

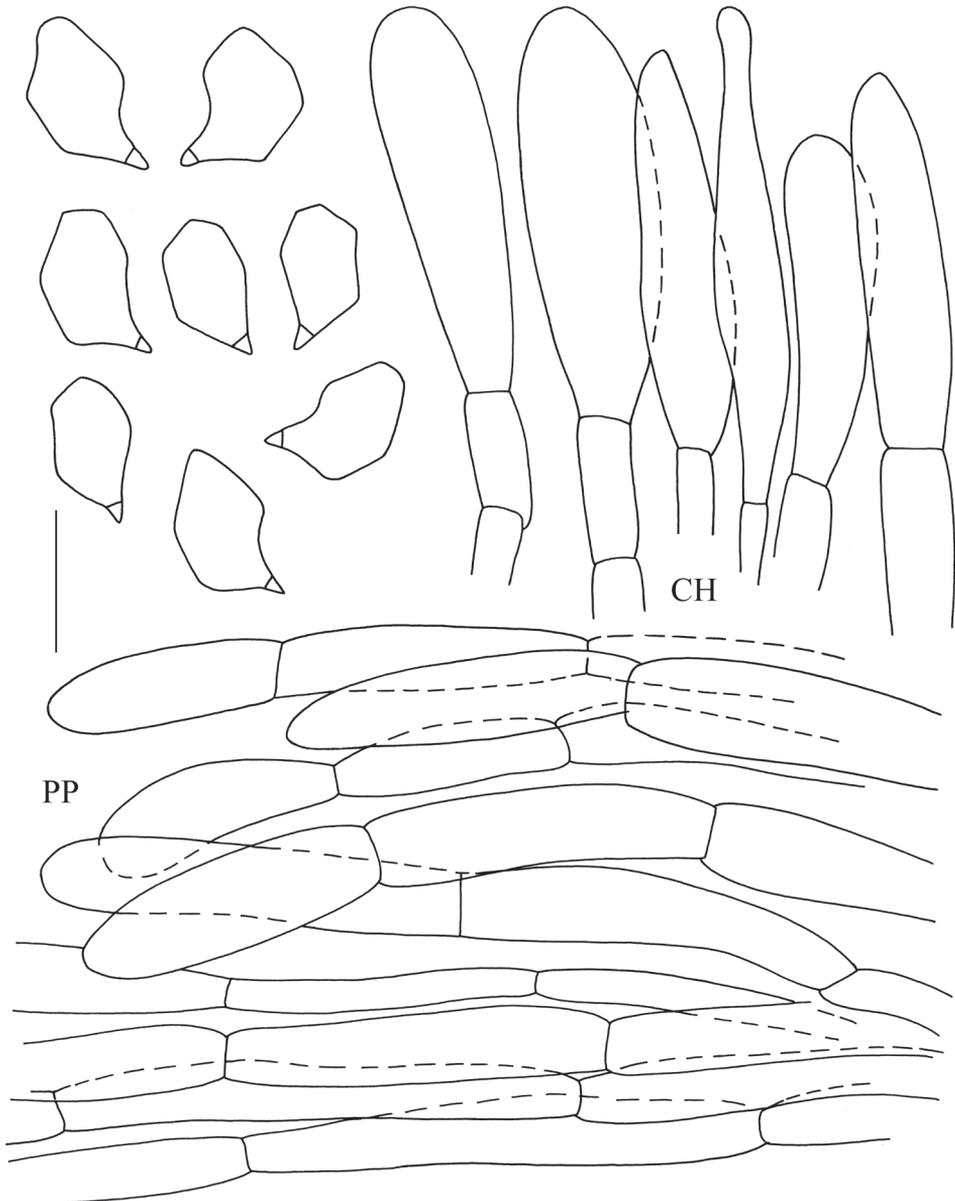


Fig. 5. *Entoloma saponicum*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μ m.

species, which are not easy to distinguish. The Australian *Entoloma fuscum* (Cleland) E. Horak differs particularly by having a fertile lamellar edge (Grgurinovic 1997; Horak 2008). *Entoloma phaeomarginatum* E. Horak from New Zealand differs by the more distinctly squamulose pileus, fibrillose stipe, and *Entoloma asprelloides* G. Stev. has a blue lamellar edge; in addition both species have much larger spores (Horak, 2008). *Entoloma persimile* E. Horak differs by a paler, strongly hygrophanous, distinctly translucently striate pileus, with squamulose centre. *Entoloma inventum* E. Horak differs particularly in having a strongly hygrophanous, deeply translucently striate pileus with squamulose centre, and a strong rancid-farinaceous smell and taste. *Entoloma turci* (Bres.) M.M. Moser may represent a Northern Hemisphere counterpart of our species, with similar dark brown colours, differing by having an entirely tomentose pileus, and reddish bruising on the base of the stem with age, and larger spores. The record of *Entoloma turci* from Papua New Guinea by Horak (1980: 226-227) appears to be a misidentification since it describes a species with a fertile lamellar edge. *Entoloma spermatiolens* E. Horak from Papua New Guinea differs in smell, a more pronouncedly squamulose pileus, and larger, differently shaped spores.

6. *Entoloma asprelloopsis* G. Gates and Noordel., **sp. nov.** (Fig. 6; Plate 2.3 & 2.4)

Mycobank 512057

Etymology: *opsis* = similar, referring to the similarity with *E. asprellum* and *E. asprelloides*.

Latin diagnosis: Pileus 21-25 mm latus, hemisphaericus vel convexus, centro depressus, haud hygrophanus, haud translucido-striatus, brunneus vel obscure brunneus, fibrillosus, centro minute squamulosus. Lamellae adnatae, moderate distantes, sordide coeruleo-griseae, demum roseo-tinctae. Stipes 40-60 × 1-3 mm, cylindraceus, coeruleo-griseus, politus. Sporae 9-12 × 6-8 μm, 5-6-angulatae. Acies lamellarum sterilis. Cheilocystidia 28-45 × 8-15 μm contento brunneo. Pileipellis cutis vel trichoderma ex elementis inflatis, usque ad 19 μm latis, constituta pigmentis intracellularibus. Granula lucentia abundantia. Fibulae desunt.

Holotypus: Australia, Tasmania, North West Bay River, 42°57'S × 147°12'E, 18 May 2004, G. Gates E2004 (HO548318; *isotypus* L).

Main characters: pileus medium to dark brown, squamulose centre, striate margin; lamellae with brown margin; stipe blue to blue grey, polished.

Pileus 12-25 mm across, hemispherical to convex with depressed centre, expanding to plano-convex or appanate, with deflexed margin in youth, not distinctly hygrophanous, not distinctly translucently striate, medium to dark brown, darker at centre, minutely squamulose at centre, fibrillose at margin. *Lamellae* moderately distant, adnate, seceding, up to 4 mm broad, (sub)ventricose, sordid blue-grey, tinged pink, edge brown. *Stipe* 40-60 × 1-3 mm, cylindrical, slender, blue-grey, glabrous, polished, with white basal tomentum. *Odour* somewhat spermatoc. *Taste* saliva inducing.

Spores 9-12 × 6-8 μm, Q = 1.2-1.5, Q_{av} = 1.35, heterodiametric, 5-6-angled in side-view. *Basidia* 25-35 × 9-11 μm, 4-spored, clampless. *Lamellar edge* sterile with dense clusters of cylindrico-clavate cheilocystidia, 28-45 × 8-15 μm with brown, intracellular pigment. *Hymenophoral trama* regular, made up of inflated cylindrical elements, 5-18 μm wide with brown intracellular pigment. *Pileipellis* a cutis of radially arranged, cylindrical to inflated hyphae, 6-12 μm wide with scattered trichodermal tufts of clavate terminal elements, 20-70 × 8-19 μm. *Pigment* brown, intracellular in pileipellis and upper pileitrama. *Brilliant granules* abundant. *Vascular hyphae* present. *Stipitipellis* a cutis of cylindrical hyphae, 7-13 μm wide with pale blue intracellular pigment. *Clamp-connections* absent.

Habitat: terrestrial in small groups in forest litter in wet sclerophyll forest with abundant broad-leaved species such as *Bedfordia salicina* DC and *Pomaderris apetala* Labill.

Collections examined: Australia, Tasmania, North West Bay River, 42°57'S × 147°12'E, 18 May 2004, G. Gates E2004 (holotype HO548318; isotype L); Mt. Wellington, Myrtle Gully, 42°54'S × 147°15'E, 12 Sept. 2002, G. Gates E1635 (HO548316); Arve River Streamside Reserve, 43°10'S × 146°48'E, 20 Jan. 2004, G. Gates E1920 (HO548317).

Notes: *Entoloma asprelloides* G. Stev. from New Zealand differs by having a more or less equally coloured dark brown to fuliginous pileus and stipe, a blue lamellar edge, and larger spores, 11-13 × 7-9 μm (Horak, 2008). It resembles the small-spored form of *Entoloma poliopus* (Romagn.) Noordel. from Europe (Noordeloos, 2004), which, however, never has blue tinges in the lamellae. *Leptonia gracilipes* Peck from North America is also similar, differs mainly by the concolorous lamellar edge (Largent, 1977; 1994).

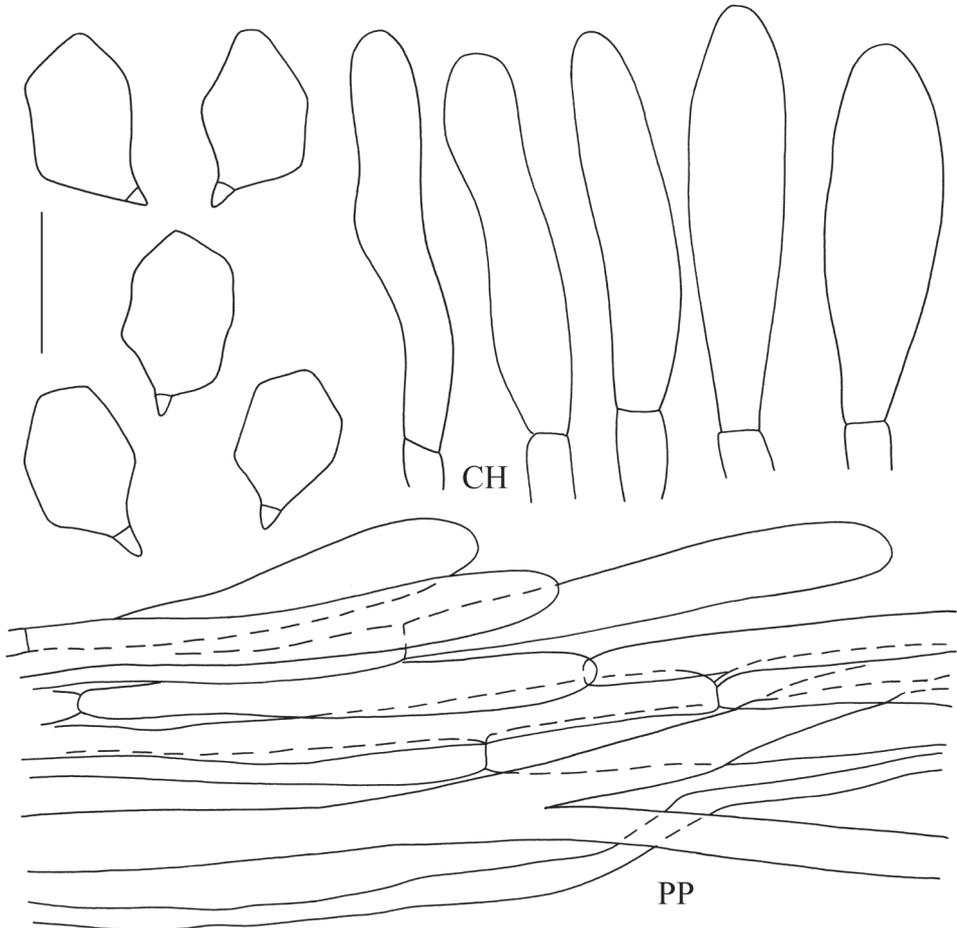


Fig. 6. *Entoloma asprelloides*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μm.

7. *Entoloma totalbum* G. Gates and Noordel., **sp. nov.**

(Fig. 7)

Mycobank 512058

Etymology: totus (Lat.) = total, albus (Lat.) = white, referring to the totally white basidiocarps.

Latin diagnosis: Pileus 11-34 mm latus, convexus, umbilicatus, haud hygrophanus, haud translucido-striatus, albus demum leviter roseotinctus, glaber. Lamellae adnatae, confertae, albae demum roseae. Stipes 27-40 × 2-5 mm, cylindraceus, albus, glaber sed non politus. Sporae 8-11 × 6-8 μm, polyangulatae vel nodulosae. Acies lamellarum steriles. Cheilocystidia 27-75 × 4-11 μm, lageniformia. Pileipellis cutis ex elementis cylindraceis vel leviter inflatis, 10-15 μm latis, constituta pigmentis nullis. Granula lucentia absentia. Fibulae abundantes.

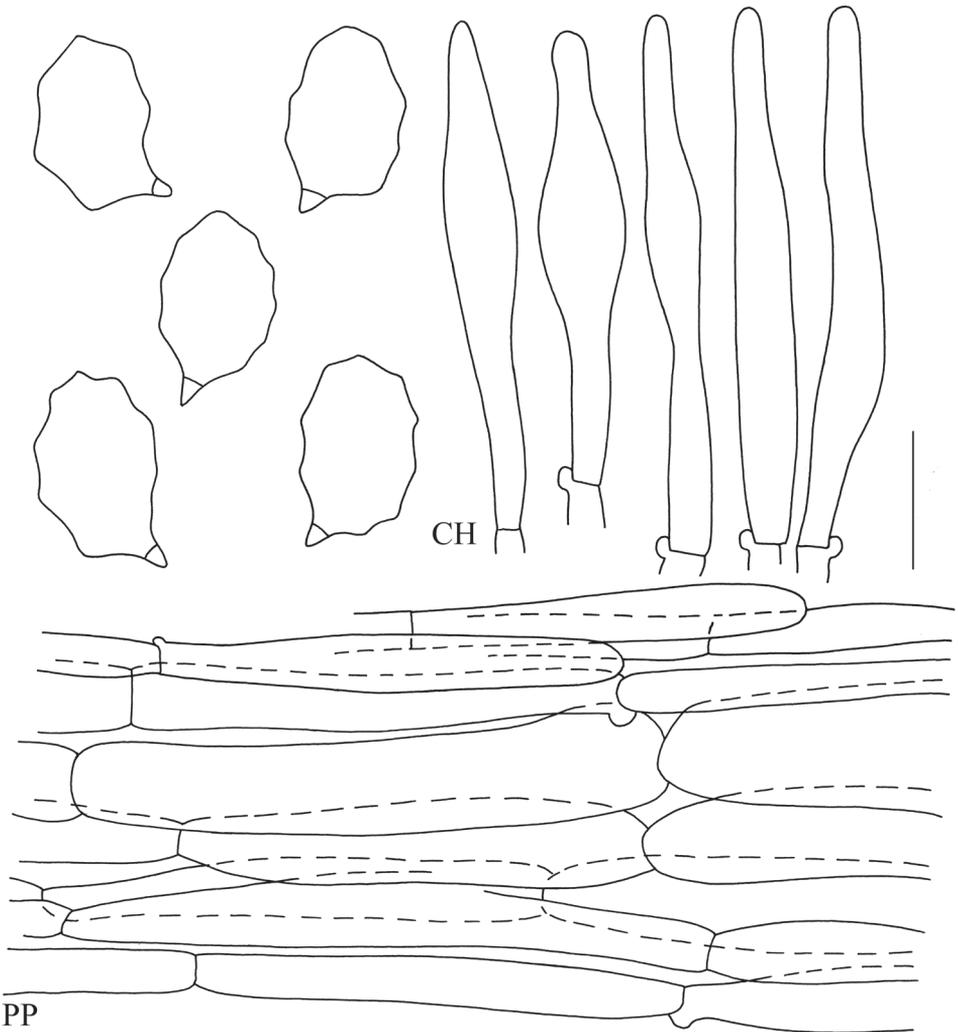


Fig. 7. *Entoloma totalbum*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μm.

Holotypus: Australia, Tasmania, University of Tasmania, gully nr. Hytten Hall, 42°54'S × 147°19'E, 15 May 2006, G. Gates E2239 (HO548319; *isotypus* L).

Main characters: totally white, collybioid species with large, nodulose spores and long, protruding cheilocystidia.

Pileus 11-34 mm across, convex, expanding with age, deeply umbilicate, with straight, entire margin, not hygrophanous, not translucently striate, white becoming pink tinged, glabrous, dry, slightly aeriferous. *Lamellae* crowded, moderately thick, adnate with decurrent tooth, segmentiform to subarcuate, up to 4-5 mm broad, white then pink, with serrulate edge. *Stipe* 27-40 × 2-5 mm, equal, cylindrical, white, slightly yellowing at base, apex pruinose, downwardly glabrous but not polished, fistulose. *Odour* fruity then slightly farinaceous when cut. *Taste* not known.

Spores 8-11 × 6-8 μm, Q = 1.2-1.7, Q_{av} = 1.45, irregularly nodulose-angled, with 7-9 blunt angles in outline. *Basidia* 4-spored, with clamp-connections. *Lamellar edge* heterogeneous with abundant, large, protruding cheilocystidia, 27-75 × 4-11 μm, narrowly to broadly lageniform. *Pileipellis* a differentiated cutis of cylindrical hyphae, 10-15 μm wide. *Clamp-connections* abundant.

Habitat: terrestrial in small groups in forest litter in wet gully within a shrubby dry sclerophyll forest community with, for example, *Pomadouris apetala* Labill., *Dodonaea viscosa* Jacq., *Coprosma quadrifida* B.L. Rob., and *Bedfordia salicina* DC.

Collection examined: Australia, Tasmania, University of Tasmania, gully nr. Hytten Hall, 42°54'S × 147°19'E, 15 May 2006, G. Gates E2239 (holotype, HO548319; *isotypus* L).

Notes: At first sight *Entoloma totalbum* is reminiscent of *E. sericellum* (Fr.) P. Kumm., a common species from the Northern Temperate Zone of the Northern Hemisphere (Noordeloos, 2004), which has also been recorded from New Zealand (Horak, 2008). However, that species often has a distinct yellow tinge in the pileus and stipe, and differently shaped spores. *Entoloma albidosimulans* G. Gates and Noordel., previously described from Tasmania (Gates & Noordeloos, 2007) has a completely sterile lamellae edge, regularly shaped spores with 6-7 angles, and clamp connections are lacking or very scarce. *Entoloma peralbidum* E. Horak from New Zealand differs by the shape of the spores and presence of incrusting pigment in the hyphae of the pileipellis. *Entoloma niveum* G. Stev. from New Zealand has differently shaped, larger spores, less abundant clamp-connections, and strangulated cheilocystidia. The macroscopically similar white species from Australasia in Horak (1980) lack the above combination of characters. Manimohan *et al.* (1995, 2006) described a number of white species from Kerala state, India, which differ consistently from *Entoloma totalbum*, particularly with regard to the pink tinge in the mature pileus and size and shape of the spores.

8. *Entoloma violascens* G. Gates and Noordel., **sp. nov.** (Fig. 8; Plate 2.5)

Mycobank 512059

Etymology: violascens = turning violaceous, referring to the colour of the basidiocarps.

Latin diagnosis: *Pileus* 6-21 mm latus, conicus vel convexus, haud hygrophanus, haud translucido-striatus, violaceo-brunneus, minute squamulosus. *Lamellae* adnexae, moderate distantes, sordide albae demum roseae. *Stipes* 15-55 × 1-2 mm, cylindraceus, violaceus, politus. *Sporae* 8-12 × 7-9.5 μm, 5-6angulatae. *Acies lamellarum* fertilis. *Cheilocystidia* absentes. *Pileipellis* cutis vel trichoderma ex elementis inflatis, usque ad 16 μm latis, constituta pigmentis intracellularibus. *Granula* lucentia absentia. *Fibulae* presentes.

Holotypus: Australia, Tasmania, Mt. Wellington, Fern Glade, 42°55'S × 147°15'E, 5 May 2001, G. Gates E1166 (HO548320; *isotypus* L).

Main characters: habit mycenoid, pileus and stipe with distinct violaceous tinges; cheilocystidia absent; clamp-connections present.

Pileus 6-21 mm across, conical to convex, not hygrophanous, not translucently striate, moderately dark to fairly dark violet brown (9-10D3), finely squamulose all over. *Lamellae* moderately distant, adnexed to (almost) free, ventricose, up to 4 mm broad, sordid white to flesh pink (6A2) with entire, concolorous edge. *Stipe* 15-55 × 1-2 mm, cylindrical, slender, pliant, deep violet (18A4) becoming violet-grey in older specimens, dry, glabrous, polished, with white mycelium at base. *Odour* not distinct. *Taste* not distinct.

Spores 8-12 × 7-9.5 μm, Q = (1.1-)1.2-1.5, Q_{av} = 1.35, heterodiametric, irregularly 5-6-angled, sometimes more or less nodulose. *Basidia* 40-60 ×

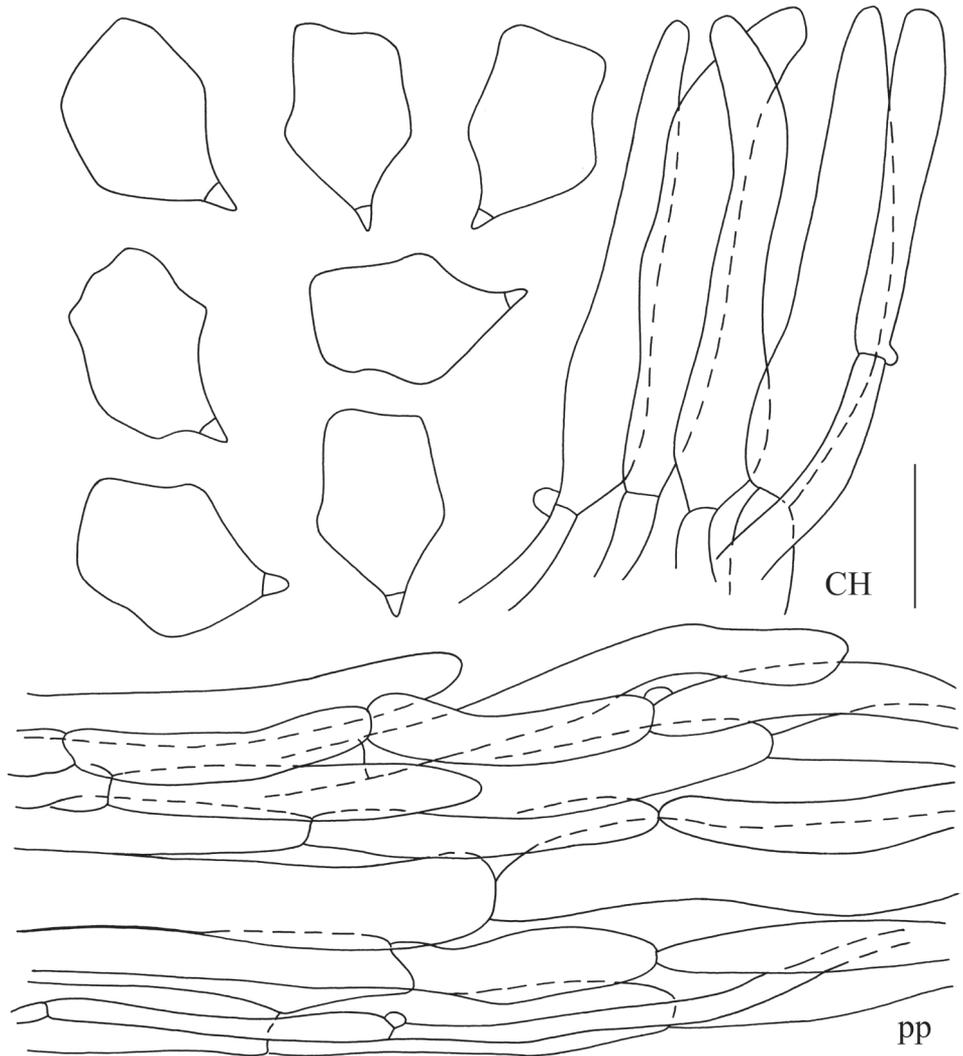


Fig. 8. *Entoloma violascens*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μm.

10-16 μm , 4-spored, with clamp-connections. *Lamellar edge* fertile. *Cystidia* absent. *Hymenophoral trama* regular, made up of cylindrical, 6-15 μm wide hyphae. *Pileipellis* a cutis with transition to a trichoderm of inflated elements, 10-16 μm wide, gradually passing into the pileitrama of similar, cylindrical to slightly inflated hyphae. *Pigment* golden brown, intracellular in pileipellis and upper pileitrama. *Brilliant granules* absent. *Clamp-connections* present.

Habitat: terrestrial in small groups in forest litter in wet sclerophyll forest.

Collections examined: Australia, Tasmania, Mt. Wellington, Fern Glade, 42°55'S \times 147°15'E, 5 May 2001, G. Gates E1166 (holotype, HO548320; isotype L); Mt. Wellington, Myrtle Forest, 42°52'S \times 147°09'E, 14 April 2003, G. Gates E1704 (HO548321).

Notes: *Entoloma violascens* belongs to subgenus *Leptonia*, section *Leptonia* on account of its trichodermal pileipellis structure and with clamp-connections hyphae (Noordeloos, 2004). *Entoloma panniculus* (Berk.) Sacc. differs by the overall blue colour. *Entoloma peraffine* E. Horak from New Zealand is superficially similar, but differs strikingly by the blue-amethyst tinge in the lamellae, smaller, less angular spores, and the absence of clamp-connections. *Entoloma scabripes* E. Horak, also from New Zealand, has persistent blue colours, and a scabrous stipe, resembling the Tasmanian *E. panniculus* (Berk.) Sacc. *Entoloma gentile* E. Horak from Papua New Guinea has purplish tinges in the pileus and stipe, but a fibrillose surface of both pileus and stipe. *Entoloma perfidum* E. Horak, also from Papua New Guinea, has more bluish tinges and larger elements in the pileipellis.

9. *Entoloma transmutans* G. Gates and Noordel., **sp. nov.** (Fig. 9; Plate 2.6 & 2.7)

Mycobank 512060

Etymology: transmutans = changing, referring to the colour changes in the developing pileus.

Latin diagnosis: *Pileus* 4-20 mm *latus, convexus vel plano-convexus, haud hygrophanus, haud translucido-striatus, obscure atro-coeruleus vel coeruleo-griseus, minute squamulosus, versus marginem virgatus. Lamellae adnatae, distantes, griseo-roseae, acies lamellarum brunneo-tinctae. Stipes* 7-20 \times 1-2 mm, *cylindraceus, violaceus, politus. Sporae* 8-10 \times 6-9 μm , *6-8angulatae. Acies lamellarum sterilis. Cheilocystidia* 20-42 \times 9-25 μm , *cylindracea vel clavata. Pileipellis cutis vel trichoderma ex elementis inflatis, 6-25 μm latis, constituta pigmentis intracellularibus. Granula lucentia abundantia. Fibulae absentes.*

Holotypus: Australia, Tasmania, Mt. Field National Park, Lyre Bird Walk, 42°41'S \times 146°43'E, 1 April 1999, G. Gates E331 (HO548322, *isotypus* L).

Main characters: small, collybioid species with dark blue-grey pileus at first, showing delicate pinkish purple tinges between the dark fibrils and squamules when mature.

Pileus 4-20 mm across, convex then plano-convex with blunt to umbilicate centre, not hygrophanous, not translucently striate, dark blue-grey at first, then minutely greyish or blackish blue (11D-E4-5), squamulose at centre and radially fibrillose-virgate towards margin, showing delicate pinkish-purple background between the squamules and fibrils. *Lamellae* moderately distant, L = ca. 40, l = 3-5, adnate-emarginate, up to 4.5 mm broad, blue-grey at first then greyish pink with fimbriate, pale pinkish brown edge. *Stipe* 7-20 \times 1-2 mm, cylindrical, bluish at first then purplish pink, concolorous with background of pileus, shiny, innately fibrillose. *Odour* spermatic. *Taste* saliva inducing.

Spores 8-10 \times 6-9 μm , Q = 1.2-1.5, shortly heterodiametric with 6-8 angles. *Basidia* 28-35 \times 9-12 μm , 4-spored, clampless. *Lamellar edge* completely sterile with broadly clavate, vesiculose or sphaeropedunculate

cheilocystidia, $20\text{-}42 \times 9\text{-}25 \mu\text{m}$ with pale brownish intracellular pigment. *Hymenophoral trama* regular, made up of inflated hyphae to $20 \mu\text{m}$ wide. *Brilliant granules* abundant. *Pileipellis* a cutis of $7\text{-}12 \mu\text{m}$ wide hyphae, with transitions to a trichoderm, made up of clavate terminal elements, $24\text{-}90 \times 6\text{-}25 \mu\text{m}$; subpellis filamentous, made up of narrow, cylindrical hyphae, $5\text{-}12 \mu\text{m}$ wide. *Pigment* abundant, brown in suprapellis, greyish-blue in subpellis. *Pileitrama* regular, made up of inflated elements to $25 \mu\text{m}$ wide. *Stipitipellis* a cutis of cylindrical hyphae, $6\text{-}12 \mu\text{m}$ wide. *Caulocystidia* present at apex of stipe, $30\text{-}70 \times 5\text{-}10 \mu\text{m}$, cylindrical or strangulate, sometimes subcapitate. *Clamp-connections* absent.

Habitat: distributed widely in forest litter of wet and dry sclerophyll forest and in mixed forest.

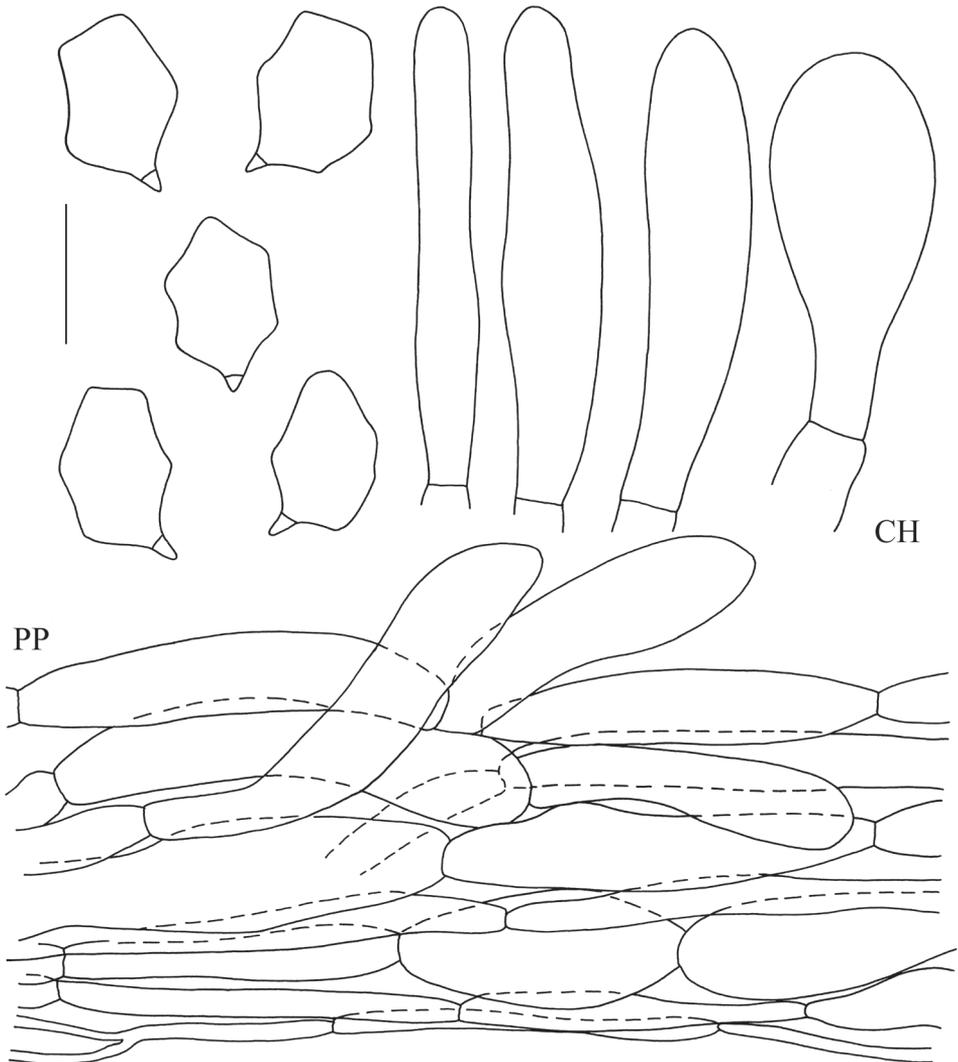


Fig. 9. *Entoloma transmutans*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = $10 \mu\text{m}$.

Collections examined: Australia, Tasmania, Growling Swallet, 42°41'S × 146°30'E, 22 April 2004, M.E. Noordeloos 200407; Mt. Wellington, Circle Track, 42°55'S × 147°15'E, 30 Nov. 1999, G. Gates E771 (HO548323); Chauncy Vale, 42°37'S × 147°16'E, 28 June 2003, G. Gates E1891 (HO548324); Mt. Field National Park, Lyre Bird Walk, 42°41'S × 146°43'E, 1 April 1999, G. Gates E331 (holotype HO548322; isotype L).

Notes: *Entoloma transmutans* is a remarkable little species in subgenus *Cyanula* with the delicate purple-pink background colour of the pileus and stipe and pinkish brown lamellar edge. It finds its place in stirps *Corvinum* (Noordeloos, 1992, 2004), but differs from all species in that group in colour. *Entoloma melanocephalum* G. Stev. and *E. asprelloides* G. Stev., both from New Zealand, differ in colour, spore size and spore shape.

10. *Entoloma melanophthalmum* G. Gates and Noordel., **sp. nov.** (Fig. 10; Plate 3.1)

Mycobank 512061

Etymology: melanos = black, phtalmus = eye, referring to the black “eye” at centre of pileus.

Latin diagnosis: Pileus 13-30 mm latus, convexus vel plano-convexus, umbilicatus, haud hygrophanus, haud translucido-striatus, obscure brunneus vel atro-brunneus, versus marginem violaceus, tomentosus, centro minute squamulosus. Lamellae adnatae, distantes, pallidae demum roseae. Stipes 30-45 × 2-5 mm, cylindraceus, coeruleo-griseus, politus. Sporae 10-15(-17) × 8-11 μm, 5-7angulatae. Acies lamellarum steriles. Cheilocystidia 24-60 × 6-15 μm, clavata. Pileipellis cutis vel trichoderma ex elementis inflatis, usque ad 20 μm latis, constituta pigmentis intracellularibus. Granula lucentia abundantia. Fibulae absentes.

Holotypus: Australia, Tasmania, Mt Field National Park, 42°41'S × 146°43'E, 31 May 2003, G. Gates E1842 (HO548326; isotypus L).

Main characters: pileus rather variable shade of brown with distinct darker “eye”, with distinct lilac violaceous hue at least at margin, sometimes over whole pileus; stipe deep grey-blue, polished; large heterodiametric spores; cheilocystidia present.

Pileus 13-30 mm across, convex with central depression, expanding with age, not hygrophanus, entirely dark greyish black, velutinous when young, while expanding retaining the dark colour at centre as a distinctly marked velutinous or squamulose disc, the rest yellowish or golden brown (5D6), with a subtle but distinct lilac-violet hue in the marginal zone, radially fibrillose-squamulose or translucently striate. *Lamellae* moderately distant, adnate, segmentiform, up to 5 mm broad, pallid then flesh-coloured pink with entire, concolorous edge. *Stipe* 30-45 × 2-5 mm, cylindrical, grey-blue, glabrous, polished, with white basal tomentum. *Odour* slightly of iodine or spermiatic. *Taste* none.

Spores 10-15(-17) × 8-11 μm, Q = 1.25-1.9, Qav = 1.5, heterodiametric, 5-7-angled in side-view. *Basidia* 22-40 × 8-12 μm, 4-spored. *Lamellar edge* sterile. *Cheilocystidia* 24-60 × 6-15 μm, narrowly to broadly clavate. *Pileipellis* a cutis with transition to a trichoderm, with inflated terminal elements up to 20 μm wide. *Pigment* brown, intracellular. *Pileitrama* regular, made up of inflated elements to 22 μm wide, mixed with narrow, cylindrical hyphae, 4-11 μm wide. *Brilliant granules* abundant in pileitrama. *Stipitipellis* a cutis of narrow, cylindrical, 4-14 μm wide hyphae. *Caulocystidia* absent. *Clamp-connections* absent.

Habitat: terrestrial in small groups in forest litter in wet sclerophyll forest.

Collections examined: Australia, Tasmania, Tasman Peninsula, Canoe Bay, 43°09'S × 147°57'E, 22 May 2004, G. Gates E2011 (HO548325); Mt Field National Park, 42°41'S × 146°43'E, 31 May 2003, G. Gates E1842 (holotype HO548326; isotype L).

Notes: *Entoloma melanophthalmum* is distinctive because of the violaceous margin to the brownish pileus contrasting with the grey-blue stipe, and the persistent dark spot at the centre of the pileus. No species known from New Zealand (Horak, 2008) approaches the present species. It can be classified among the species of stirps *Poliopus* (Noordeloos, 1992), but differs from all known species by its colours.

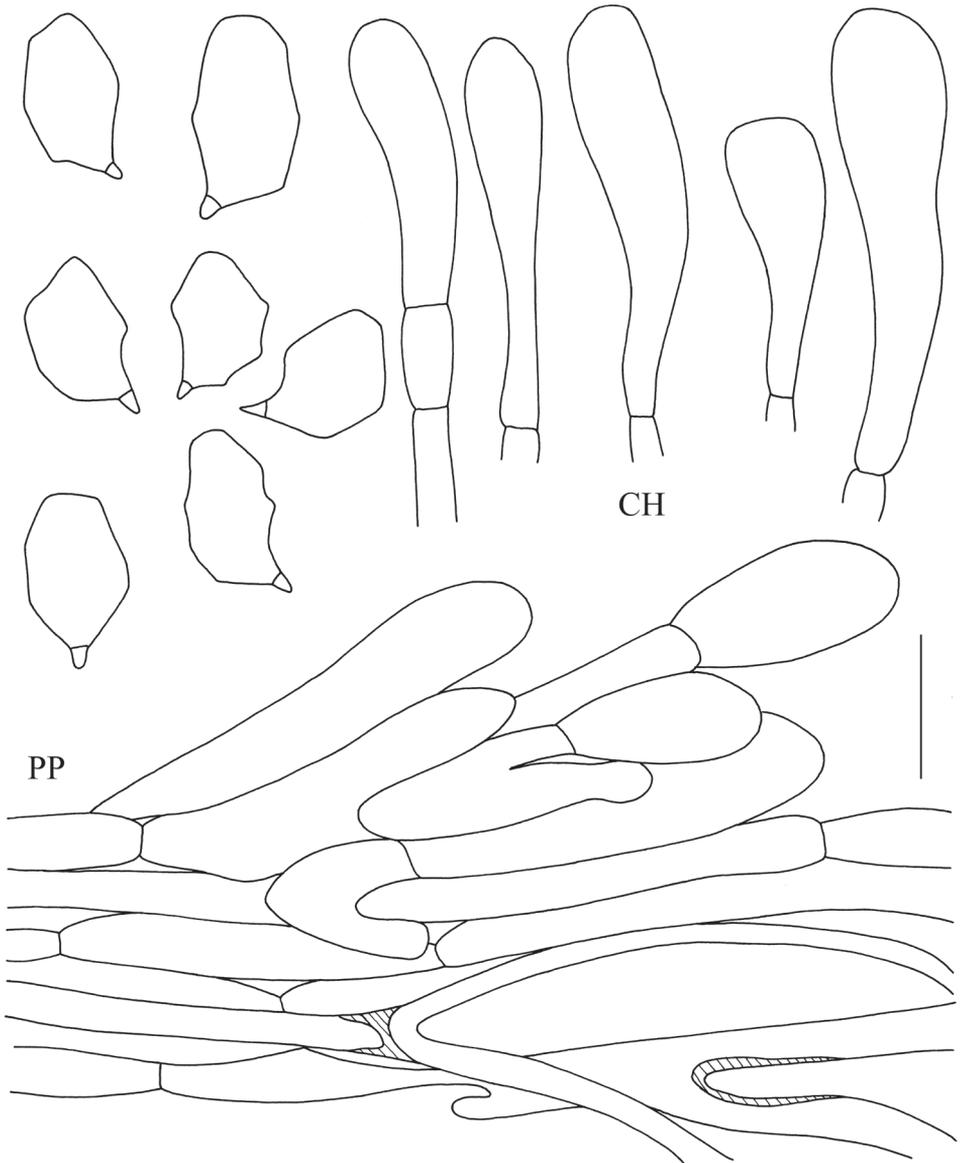


Fig. 10. *Entoloma melanophthalmum*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μ m.

11. *Entoloma tenuicystidium* G. Gates and Noordel., **sp. nov.** (Fig. 11, Plate 3.2)

Mycobank 512062

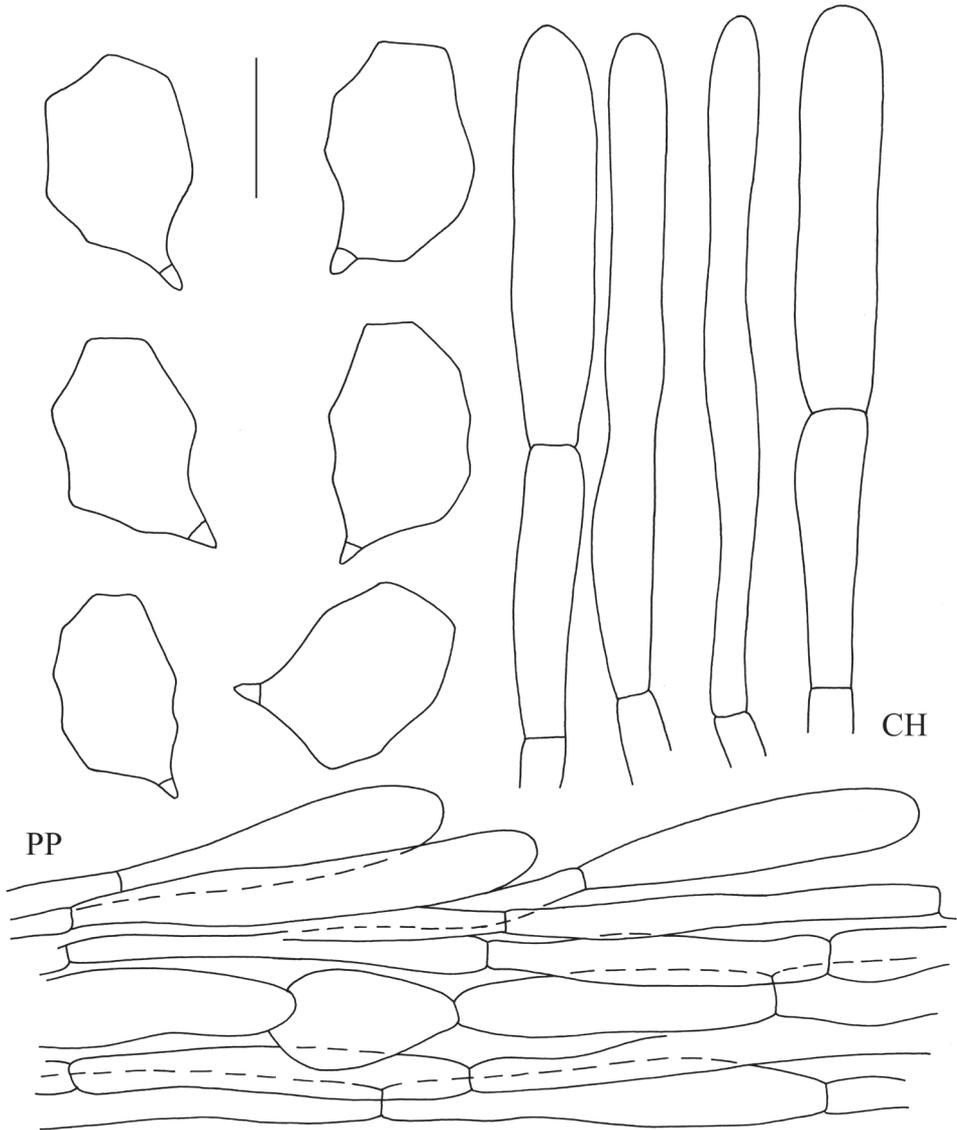
Etymology: *tenuis* = thin, referring to the slender cheilocystidia.*Latin diagnosis*: *Pileus* 9-14 mm *latus*, *plano-convexus*, *umbilicatus*, *hygrophanus*, *translucido-striatus*, *pallide brunneus vel brunneus*, *fibrillosus*, *centro minute squamulosus*. *Lamellae adnatae*, *moderate distantes*, *pallide brunneo-roseae*. *Stipes* 35-46 × 1-2.5 mm, *cylindraceus*, *coeruleo-griseus*, *politus*. *Sporae* 10-15 × 8-10 μm, 6-7*angulatae*. *Acies lamellarum steriles*. *Cheilocystidia* 40-110 ×

Fig. 11. *Entoloma tenuicystidium*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μm.

5-9 μm , filiformia vel anguste clavata. Pileipellis cutis vel trichoderma ex elementis inflatis, usque ad 10 μm latis, constituta pigmentis intracellulibus. Granula lucentia absentia. Fibulae absentes.

Holotypus: Australia, Tasmania, Warra LTER Site, at roadside, 43°06'S \times 146°41'E, 26 April 2005, G. Gates E2140 (HO548329; *isotypus* L).

Main characters: small collybioid species with pale brown pileus with darker centre, long slender cheilocystidia, and large spores.

Pileus 9-14 mm across, plano-convex with slight central depression, becoming applanate, pale brown with darker grey-brown central disc, hygrophanous, deeply translucently striate, becoming sulcate along the backs of the lamellae, velutinous on disc, glabrous elsewhere. *Lamellae* moderately crowded, moderately thick, adnate, seceding, ventricose, up to 3 mm broad, flesh pink with faint brown edge. *Stipe* 35-46 \times 1-2.5 mm, cylindrical, fragile, hyaline, white or pale brown, glabrous, polished, with white basal mycelium. *Odour* not distinct. *Taste* not distinct.

Spores 10-15 \times 8-10 μm , heterodiametric, 6-7-angled in side-view with pronounced angles. *Basidia* 24-30 \times 11-13 μm , 4-spored, clampless. *Lamellar edge* sterile. *Cheilocystidia* 40-110 \times 5-9 μm , cylindrical-filiform to slenderly clavate, with brown, intracellular pigment. *Hymenophoral trama* regular, made up of cylindrical hyphae up to 10 μm wide. *Pileipellis* a cutis of long narrow hyphae, up to 6 μm wide with scattered trichodermal tufts of narrowly clavate terminal elements to 10 μm wide. *Pileitrama* regular, made up of cylindrical hyphae to 20 μm wide. *Pigment* golden brown, intracellular in pileipellis. *Stipitipellis* a cutis of narrow hyphae to 8 μm wide. *Clamp-connections* absent.

Habitat: terrestrial in groups in somewhat disturbed habitats, like roadsides and marsupial pasture, surrounded by wet sclerophyll forest containing, for example, *Pomaderris apetala* Labill. and *Gahnia grandis* (Labill.) S.T. Blake.

Collections examined: Australia, Tasmania, Junee Caves State Reserve, 42°44'S \times 146°36'E, 22 March 2001, G. Gates E1033 (HO548330); Warra LTER Site, at roadside, 43°06'S \times 146°41'E, 15 April 2004, G. Gates E1969 (HO548331), M.E. Noordeloos 200490; same location, 27 April 2004, G. Gates E1974 (HO548327); same location, 26 April 2005, G. Gates E2140 (holotype HO548329; isotype L).

Notes: *Entoloma tenuicystidium* keys out in the rather variable group of *Entoloma longistriatum* (Peck) Noordel. but is distinct because of the pale colour, and brown-edged lamellae with abundant, very long and slender cheilocystidia. It is not unlike *Entoloma mutabilipes* Noordel. and Liiv from Europe, which, however, has stronger colours, and blue tinges in the stipe, as well as smaller spores and cheilocystidia. *Entoloma gnophodes* (Berk. and Broome) E. Horak, a poorly understood species from Sri Lanka, is somewhat similar in habit and colour, but has differently shaped spores and broader cheilocystidia (up to 20 μm). No species described by Horak (2008) from New Zealand approach this species, except for *E. corneum* E. Horak and *E. perplexum* E. Horak, both of which, however, have a hymenidermal pileipellis and more or less capitate cheilocystidia.

12. *Entoloma griseosquamulosum* G. Gates and Noordel., **sp. nov.** (Fig. 12; Plate 3.3)

MycoBank 512063

Etymology: griseus = grey, squamulosus = squamulose, referring to the grey, squamulose surface of the pileus.

Latin diagnosis: *Pileus* 10-15 mm latus, convexus demum plano-convexus, umbilicatus, haud hygrophanus, haud translucido-striatus, obscure griseo-brunneus vel ater, fibrillosus, centro minute squamulosus. *Lamellae* adnatae, confertae, pallide griseo-roseae. *Stipes* 20-35 \times 1.5-2 mm, cylindraceus, griseo-violaceus,

politus. Spores $9\text{--}12 \times 7\text{--}9 \mu\text{m}$, 5-7-angulatae. Acies lamellarum sterilis. Cheilocystidia $45\text{--}60 \times 10\text{--}16 \mu\text{m}$, clavata. Pileipellis cutis vel trichoderma ex elementis inflatis, usque ad $15 \mu\text{m}$ latis, constituta pigmentis intracellularibus. Granula lucentia abundantia. Fibulae absentes.

Holotypus: Australia, Tasmania, Myrtle Bank, Skemps, Fern Gully, $41^{\circ}18'S \times 147^{\circ}22'E$, 20 March 2004, G. Gates E1956 (HO548336, *isotypus* L).

Main characters: small collybioid species with grey, squamulose cap and grey-violet stipe.

Pileus 10-15 mm across, convex, expanding to plano-convex, umbilicate, with deflexed margin, not hygrophanous, translucently striate at margin or not, dark grey to grey-black (2E1), squamulose in central part, fibrillose on margin, dry. *Lamellae* crowded, adnate, segmentiform, up to 3 mm broad, pallid grey then with pink tinge, with entire, concolorous edge. *Stipe* $20\text{--}32 \times 1.5\text{--}2$ mm, cylindrical, slender, grey-violet, glabrous, with white basal tomentum. *Odour* spermatic. *Taste* saliva inducing.

Spores $9\text{--}12 \times 7\text{--}9 \mu\text{m}$, $Q = 1.25\text{--}1.9$, $Q_{av} = 1.55$, heterodiametric, 5-7-angled. *Basidia* 4-spored, with clamp-connections. *Lamellar edge* sterile. *Cheilocystidia*

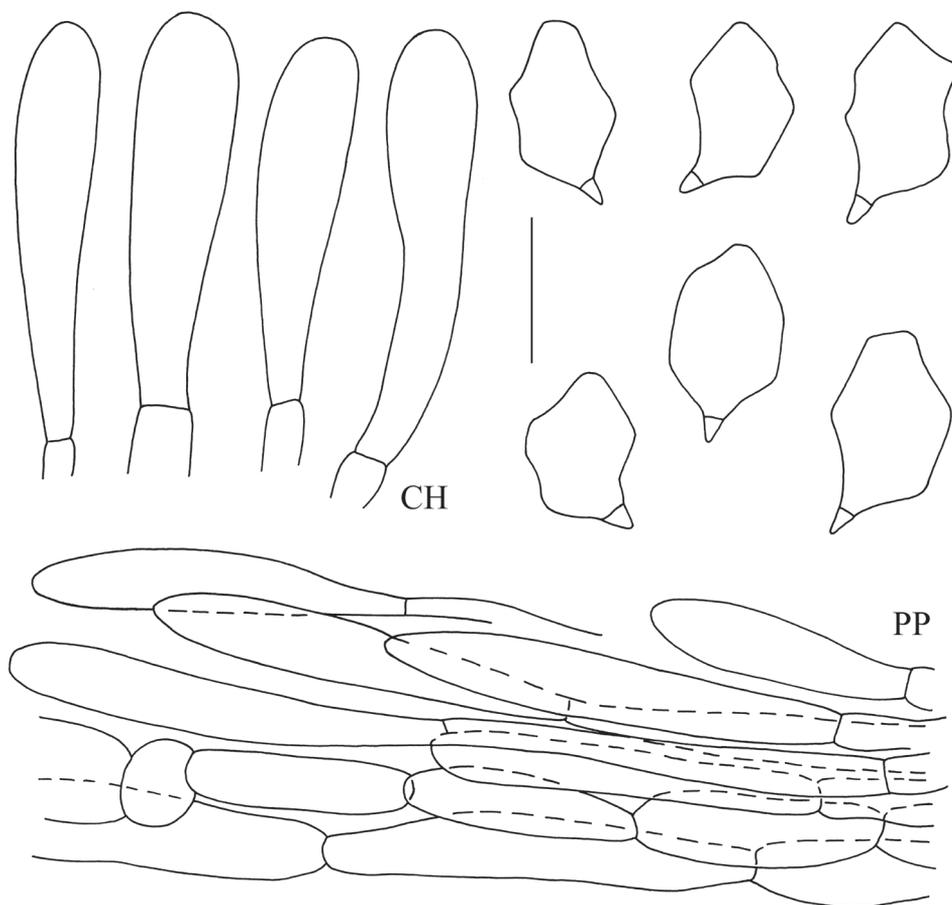


Fig. 12. *Entoloma griseosquamulosum*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = $10 \mu\text{m}$.

45-60 × 10-16 µm, clavate. *Pileipellis* a cutis with transitions to a trichoderm at centre, made up of cylindrical hyphae 8-10 µm wide, with clavate terminal elements to 15 µm wide. *Pigment* of pileipellis violet-brown, intracellular clumps. *Pileitrama* regular, made up of cylindrical to inflated hyphae to 20 µm wide, with clumps of violet-brown, intracellular pigment. *Brilliant granules* abundant. *Stipitipellis* a cutis of narrow, cylindrical hyphae 4-12 µm wide. *Clamp-connections* absent.

Habitat: terrestrial, in small groups in forest litter of wet sclerophyll forest.

Collections examined: Australia, Tasmania, Warra LTER Site, 43°06'S × 146°41'E, 16 March 2004, G. Gates E1953 (HO548335); same location, 15 April 2004, G. Gates E1968 (HO548333); Myrtle Bank, Skemps, Fern Gully, 41°18'S × 147°22'E, 20 March 2004, G. Gates E1956 (holotype HO548336; isotype L); Wielangta Forest Reserve, 42°42'S × 147°51'E, 29 April 1999, G. Gates E456 (HO548337); Mt. Field National Park, Lady Barron Falls, 42°41'S × 146°42'E, 9 May 2002, G. Gates E1507 (HO548334); Mt. Field National Park, Tall Trees walk, 42°41'S × 146°42'E, 4 Dec. 2001, G. Gates E1366 (HO548332).

Notes: *Entoloma griseosquamulosum* can be placed in subgenus *Cyanula*, stirps *Asprellum* (Noordeloos, 1992) on account of the grey pileus and grey-violet, polished stipe. It keys out near *Entoloma poliopus* (Romagn.) Noordel. (Noordeloos, 2004), which differs, however, by the brown, often distinctly translucently striate pileus and blue tinges in the stipe. No species described by Horak (2008) from New Zealand matches *E. griseosquamulosum*.

13. *Entoloma psilocyboides* G. Gates and Noordel., **sp. nov.** (Fig. 13; Plate 3.4)

Mycobank 512064

Etymology: reminiscent of *Psilocybe montana* (Pers.) P. Kumm.

Latin diagnosis. *Pileus* 7-21 mm *latus*, *conicus demum convexus*, *umbonatus*, *hygrophanus*, *translucido-striatus*, *obscurus brunneus vel griseo-brunneus*, *pallescens*, *glabrus*. *Lamellae adnatae*, *moderate distantes*, *pallide brunneo-roseae*. *Stipes* 23-46 × 1-2 mm, *cylindraceus*, *griseo-brunneus*, *leviter pruinosis*. *Sporae* 8-10 × 6-8 µm, *5-6angulatae*. *Acies lamellarum heterogeneae* (*cheilocystidia et basidia adsunt*). *Cheilocystidia* 30-65 × 5-15 µm, *clavata*. *Pileipellis ex hyphis usque ad 5 µm latis cutem formantibus constituta pigmentis intracellularibus*. *Granula lucentia abundantia*. *Fibulae absentes*.

Holotypus: Australia, Tasmania, Growling Swallet, 42°41'S, 146°30'E, May 2001, G. Gates E1145 (HO548338; *isotypus* L).

Main characters: small mycenoid species with distinct small umbo, dark brown lamellae, large cheilocystidia, intracellular pigment and simple, 5-6-angled spores.

Pileus 7-21 mm across, conical, expanding to convex with small, acute umbo, with straight margin, hygrophanous, deeply translucently striate, rather dark brown to grey-brown, pallescent on drying to grey-brown, glabrous, dry, sometimes becoming slightly rimose with age. *Lamellae* moderately crowded, adnate, seceding so as to appear adnexed, subventricose, up to 4 mm broad, pale to dark brown with concolorous edge. *Stipe* 23-46 × 1-2 mm, cylindrical, slender, stuffed, dark greyish brown, finely pruinose under lens. *Odour* somewhat spicy or fruity. *Taste* like fresh grass.

Spores 8-10 × 6-8 µm, $Q = (1.1-1.35-1.6)$, $Q_{av} = 1.45$, regularly 5-6-angled in side-view. *Basidia* 34-44 × 9-12 µm, 4-spored, with clamp-connections. *Lamellar edge* heterogeneous. *Cheilocystidia* 30-65 × 5-15 µm, cylindrical, lageniform or subcapitate, protruding from hymenium. *Pileipellis* a cutis of narrow, very regularly cylindrical hyphae, ca. 5 µm wide. *Pigment* brown, intracellular and minutely incrusting in pileipellis. *Pileitrama* regular, made up of inflated, relatively short elements. *Clamp-connections* observed in pileipellis and hymenium.

Habitat: terrestrial in small groups in forest litter in wet sclerophyll forest and mixed forest with *Nothofagus cunninghamii* (Hook.) Oerst. and *Atherosperma moschatum* Labill.

Collection examined: Australia, Tasmania, Growling Swallet, 42°41'S, 146°30'E, 22 April 2004, G. Gates E1973 (HO548340); same location, 1 May 2001, G. Gates E1145 (holotype HO548338; isotype L); same location, 11 April 2002, G. Gates E1477 (HO548339); same location, 19 May 1999, G. Gates E520 (HO548341); Kermadie Falls, Lower Track, 43°12'S × 146°52'E, 8 June 2002, G. Gates E1562 (HO548342).

Notes: *Entoloma psilocyboides* appears in a dark or pale form, but always with distinct brown tinges in the lamellae. Microscopically, the large, protruding cheilocystidia and relatively small, simple spores are distinctive. The dark colours,

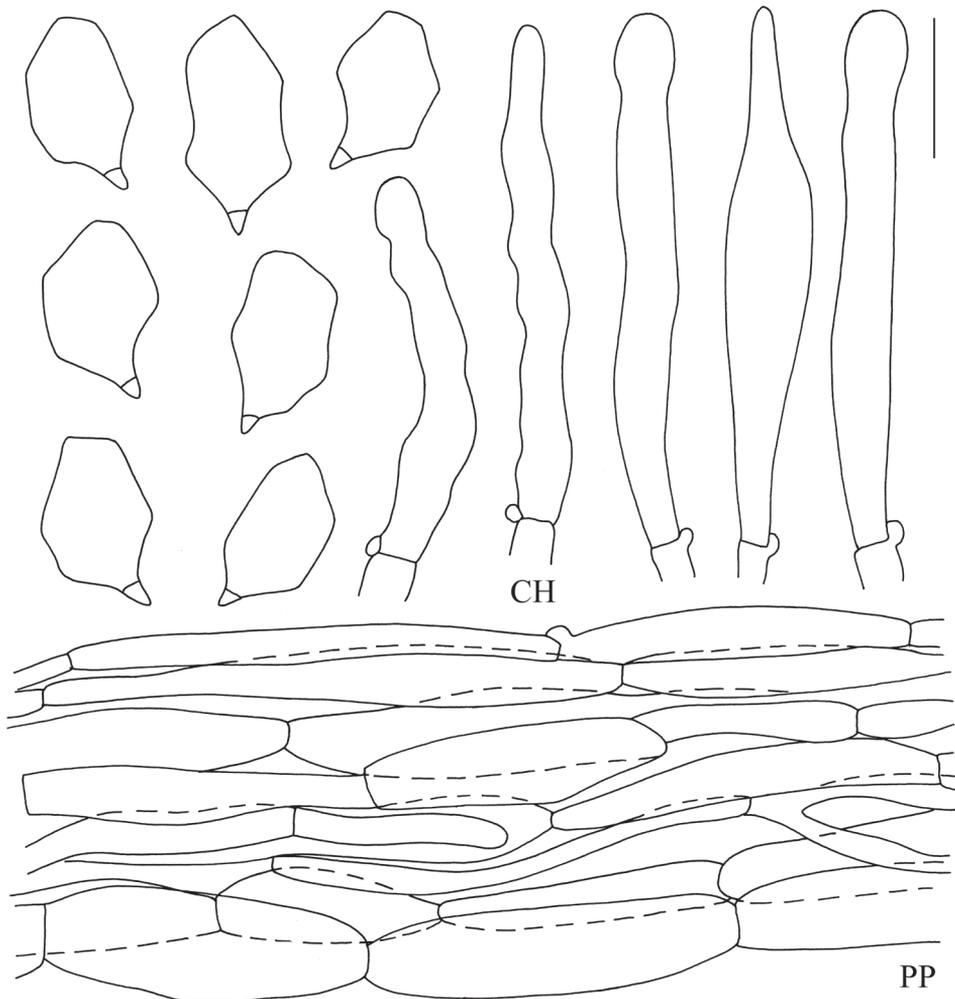


Fig. 13. *Entoloma psilocyboides*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μ m.

presence of cheilocystidia, and the relatively short elements of the pileitrama suggest affinity with *Entoloma kerocarpus* Hauskn. and Noordel. from Europe and *E. obscureotenax* G. Gates and Noordel. from Tasmania. The former is somewhat similar but differs by the size and shape of the spores, shape of cheilocystidia and presence of strongly incrusting hyphae in all parts of the fruit body. The latter differs by the much larger spores, shape of cheilocystidia, and predominant strongly incrusting pigment. *Entoloma atroenigmaticum* Noordel. and Hauskn. from Europe lacks cheilocystidia. No nolaneoid species in Horak (1980) fits our species. *Entoloma elegantissimum* E. Horak from New Zealand is a paler species with smaller spores and lacking cheilocystidia. *Entoloma confusum* E. Horak from New Zealand has smaller spores, a rancid odour, and lacks cheilocystidia.

14. *Entoloma strigosum* G. Gates and Noordel., **sp. nov.** (Fig. 14; Plate 3.5)

MycoBank 512065

Etymology: strigosum = hairy, referring to the strigose tufts on the pileal surface.

Latin diagnosis: Pileus 8-20 mm latus, hemisphaericus vel convexus, haud hygrophanus, haud translucido-striatus, obscure brunneus, strigosus. Lamellae adnatae, distantes, obscure brunneus. Stipes 10-15 × 1-2 mm, cylindraceus, brunneus, fibrillosus. Sporae 10-12 × (6-)7-8 µm, angulate nodulosae. Acies lamellarum fertiles. Cheilocystidia desunt. Pileipellis ex hyphis usque ad 5 µm latis, cutem formantibus constituta cum fasciculis erectis ex elementis terminalibus fusiformibus, 90-150 × 10-17 µm, pigmentis intracellularibus. Granula lucentia absentia. Fibulae presentes.

Holotypus: Australia, Tasmania, Duckhole Lake Track, 43°22'S × 146°53'E, 20 April 2004, E1972 (HO548343; *isotypus* L).

Main characters: tiny mycenoid species with strigose pileus, fibrous stipe, intracellular pigment and with clamp-connections hyphae.

Pileus 8-20 mm across, convex-hemispherical, with incurved margin, not hygrophanous, not translucently striate, very dark brown (7F8), entirely covered with minute strigose tufts. *Lamellae* distant, adnate, thick, up to 2.5 mm broad, dark brown with entire margin. *Stipe* 10-15 × 1.5-2 mm, tapering downwards, cylindrical, dark brown, fibrous. *Odour* none. *Taste* unknown.

Spores 10-12 × (6-)7-8 µm, Q = 1.3-1.4(-1.7), irregularly angled-nodulose. *Basidia* 38-49 × 11-14 µm, broadly clavate, 4-spored, with clamp-connections. *Lamellar edge* fertile. *Cheilocystidia* absent. *Hymenophoral trama* consisting of cylindrical hyphae to 9 µm wide, with pale brown, intracellular pigment. *Pileipellis* a cutis of repent hyphae with trichodermal fascicles of fusiform terminal elements, 90-150 × 10-17 µm, with abundant, brown, intracellular pigment. *Pileitrama* regular, made up of cylindrical hyphae, ca. 10 µm wide. *Caulocystidia* narrowly cylindrical to fusiform, ca. 50 × 5 µm with intracellular pigment. *Clamp-connections* observed in hymenium and hymenophoral trama.

Habitat: terrestrial in small groups in forest litter in wet sclerophyll forest and mixed forest, the latter with a wide range of rainforest species including *Nothofagus cunninghamii* (Hook.) Oerst. (at Duckhole Lake) and *Atherosperma moschatum* Labill. (at Wielangta).

Collections examined: Australia, Tasmania, Wielangta Forest Reserve, 42°42'S × 147°51'E, 23 Feb. 1999, G. Gates E126 (HO548345); Duckhole Lake Track, 43°22'S × 146°53'E, 20 April 2004, E1972 (holotype HO548343; *isotype* L); same location, 15 May 2003, E1811 (HO548344).

Notes: In the field, *Entoloma strigosum* may be taken for a *Pouzarella* species, but the lack of incrusting pigment and the presence of clamp-connections

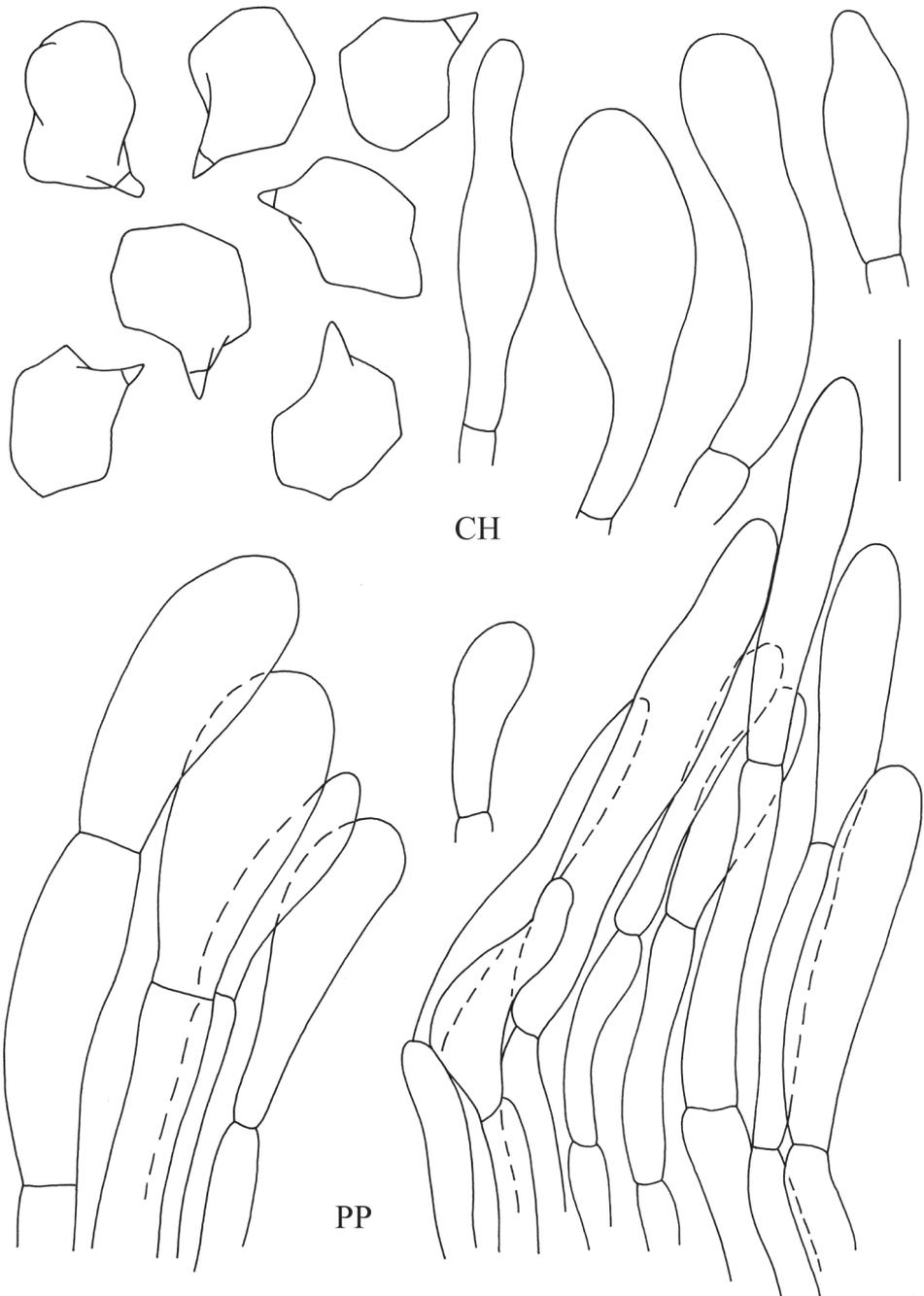


Fig. 14. *Entoloma strigosum*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μ m.

suggest inclusion in subgenus *Inocephalus*. *Entoloma densisquamosum* E. Horak from Papua New Guinea is similar in having brown densely squamulose-strigose pileus and dark lamellae, but differs by having much simpler, smaller spores, and the lack of clamp-connections. This is also the case in *E. villosulum* Corner and E. Horak from Malaysia, which in addition has paler lamellae.

15. *Entoloma cystidiosum* G. Gates and Noordel., **sp. nov.** (Fig. 15; Plate 3.6)

Mycobank 512066

Etymology: cystidiosum = provided with cystidia, referring to the abundant cheilocystidia.

Latin diagnosis: Pileus 20-40 mm latus, conico-convexus, demum plano-convexus, leviter umbilicatus vel umbonatus, paulisper hygrophanus, leviter translucido-striatus, brunneus, fibrillosus, centro minute squamulosus. Lamellae adnatae, moderate distantes, roseobrunneae. Stipes 20-40 × 2-5 mm, cylindraceutus, pallide cremeus vel brunneus, politus. Sporae (9-)10-12 × (7-)8-10 μm, 5-7angulatae. Acies lamellarum heterogeneae (cheilocystidia et basidia adsunt). Cheilocystidia 40-90 × 8-15 μm, clavata vel utriformia. Pileipellis cutis ex hyphis cylindraceutis, 8-15 μm latis, constituta pigmentis intracellularibus vel minute incrustatis. Granula lucentia absentia. Fibulae presentes.

Holotypus: Australia, Tasmania, Wielangta Forest Reserve, 42°42'S × 147°51'E, 14 July 1998, G. Gates and A. Mills E14 (HO548347; *isotypus* L).

Main characters: pileus variably shaped, umbonate or umbilicate, brown, more or less glabrous; stipe pale brown, glabrous; spores irregularly shaped, sometimes almost quadrate, or irregularly 5-7-angled; large lageniform cystidia abundant on gill edge.

Pileus 20-40 mm across, conico-convex, convex or plano-convex, usually flat or slightly umbilicate, or umbonate, with deflexed then straight margin, brown, slightly translucently striate, but not truly hygrophanous, radially fibrillose, at centre sometimes minutely squamulose. *Lamellae* moderately distant, adnate with pronounced decurrent tooth, up to 3 mm broad, brown with pink tinge, with entire, concolorous edge. *Stipe* 20-40 × 2-5 mm, cylindrical, sometimes slightly broadened at base, pallid brown-beige, paler than pileus, polished. *Odour* not distinct. *Taste* not distinct.

Spores (9-)10-12 × (7-)8-10 μm, iso- to heterodiametric, usually irregularly 5-7-angled, but some 4-angled, pseudocuboid spores are found. *Basidia* 30-38 × 10-12 μm, 4-spored, clampless. *Lamellar edge* heterogeneous. *Cheilocystidia* 40-90 × 8-15 μm, fairly abundant, variably shaped from clavate to utriform, lageniform or sphaeropedunculate with rounded, frequently subcapitate apex. *Pileipellis* a differentiated cutis of cylindrical to inflated hyphae 8-15 μm wide, with olivaceous-brown intracellular pigment and in addition also sometimes fine incrustations. *Pileitrama* regular, made up of medium-sized, inflated elements. *Clamp-connections* absent.

Habitat: terrestrial in small groups in forest litter in wet sclerophyll forest with *Olearia argophylla* F. Mueller, and *Pomaderris apetala* Labill.

Collections examined: Australia, Tasmania, Wielangta Forest Reserve, 42°42'S × 147°51'E, 14 July 1998, G. Gates and A. Mills E14 (holotype HO548347; isotype L); North West Bay River, 42°57'S × 147°12'E, 18 May 2004, G. Gates E2007 (HO548346).

Notes: *Entoloma cystidiosum* comes very close to *E. deprensum* E. Horak from New Zealand, from which it mainly differs by the larger fruit bodies of the former, with paler, yellow-brown colours, predominantly intracellular pigment in

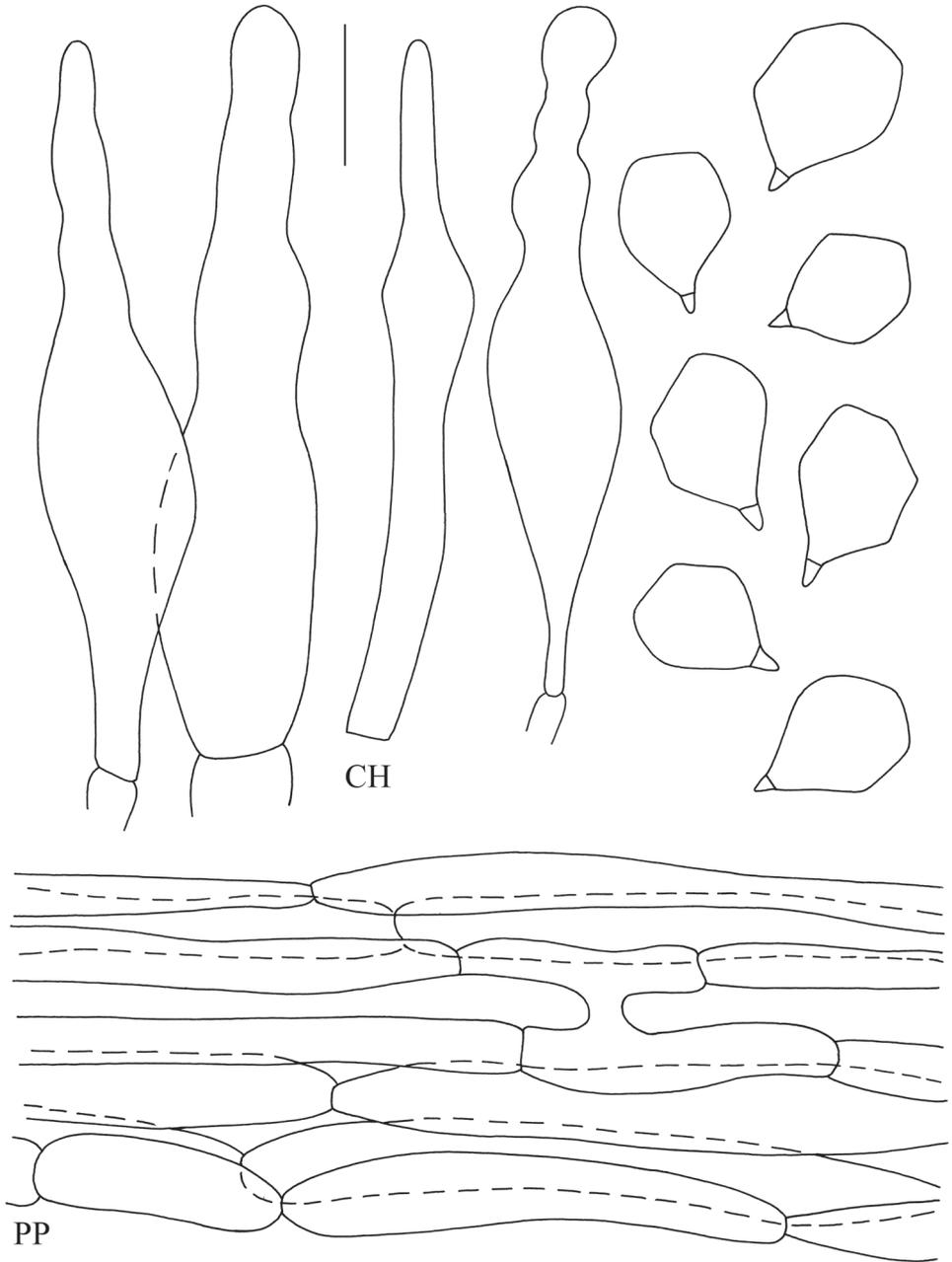


Fig. 15. *Entoloma cystidiosum*. Spores, cheilocystidia, and pileipellis. All figs from holotype. Bar = 10 μ m.

the pileipellis, and larger spores. *Entoloma farinolens* E. Horak from New Zealand is a with clamp-connections species with strongly incrusting hyphae in the pileipellis. *Entoloma indutoides* (P.D. Orton) Noordel. from Europe has a similar microscopy, but differs in colour, with clamp-connections hyphae, lack of incrusting pigment, and presence of pleurocystidia. Therefore *E. cystidiosum* is best classified in section *Griseorubida* Noordel. (Noordeloos, 2004).

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Plate. 1. *Entoloma perbloxamii*, holotype (photo Noordeloos, 2. GG E1728, photo Gates); 3. *Entoloma fuligineoviolaceum*. MEN 2009071 (photo Noordeloos). 4. *Entoloma natalis-domini*, holotype (photo Gates). 5. *Entoloma sassafras*, holotype (photo Pilkington).



Plate 2. 6, 7. *Entoloma saponicum* (6: MEN 2009065, photo Noordeloos; 7: holotype, photo Gates); 8, 9 *Entoloma asprellopsi*. (7: MEN 2009072, photo Noordeloos; 8: holotype); 10. *Entoloma violascens*, holotype, photo Gates. 11, 12. *Entoloma transmutans* (MEN 2009024; MEN2009081, photo Noordeloos).



Plate 3. 1. *Entoloma melanophialmum*. MEN 2009037 (photo Noordeloos). 2. *Entoloma tenuicystidiatum*. MEN 2004090 (photo Noordeloos); 3. *Entoloma griseosquamulosum*, holotype (photo Gates); 4. *Entoloma psilocyboides* (holotype, photo Gates); 5. *Entoloma strigosum*, holotype (photo Gates); 6. *Entoloma cystidiosum*, holotype (photo Pilkington)

In manuscript add to collections examined:

Entoloma fulgineoviolaceum: Junee Caves State Reserve, 42°44'S × 146°36'E, 28 March 2009, M.E. Noordeloos 2009071

Entoloma asprellopsis: Junee Caves State Reserve, 42°44'S × 146°36'E, 28 March 2009, M.E. Noordeloos 2009072

Entoloma transmutans: Styx Valley, Christmas Tree Grove, 42°49'S × 146°38'E, 19 March 2009, M.E. Noordeloos 2009024; Growling Swallet, 42°41'S, 146°30'E, 28 March 2009, M.E. Noordeloos 2009081