

## Mycological Notes 38

### Residual Tricholomatineae

Jerry Cooper, June 18<sup>th</sup> 2018

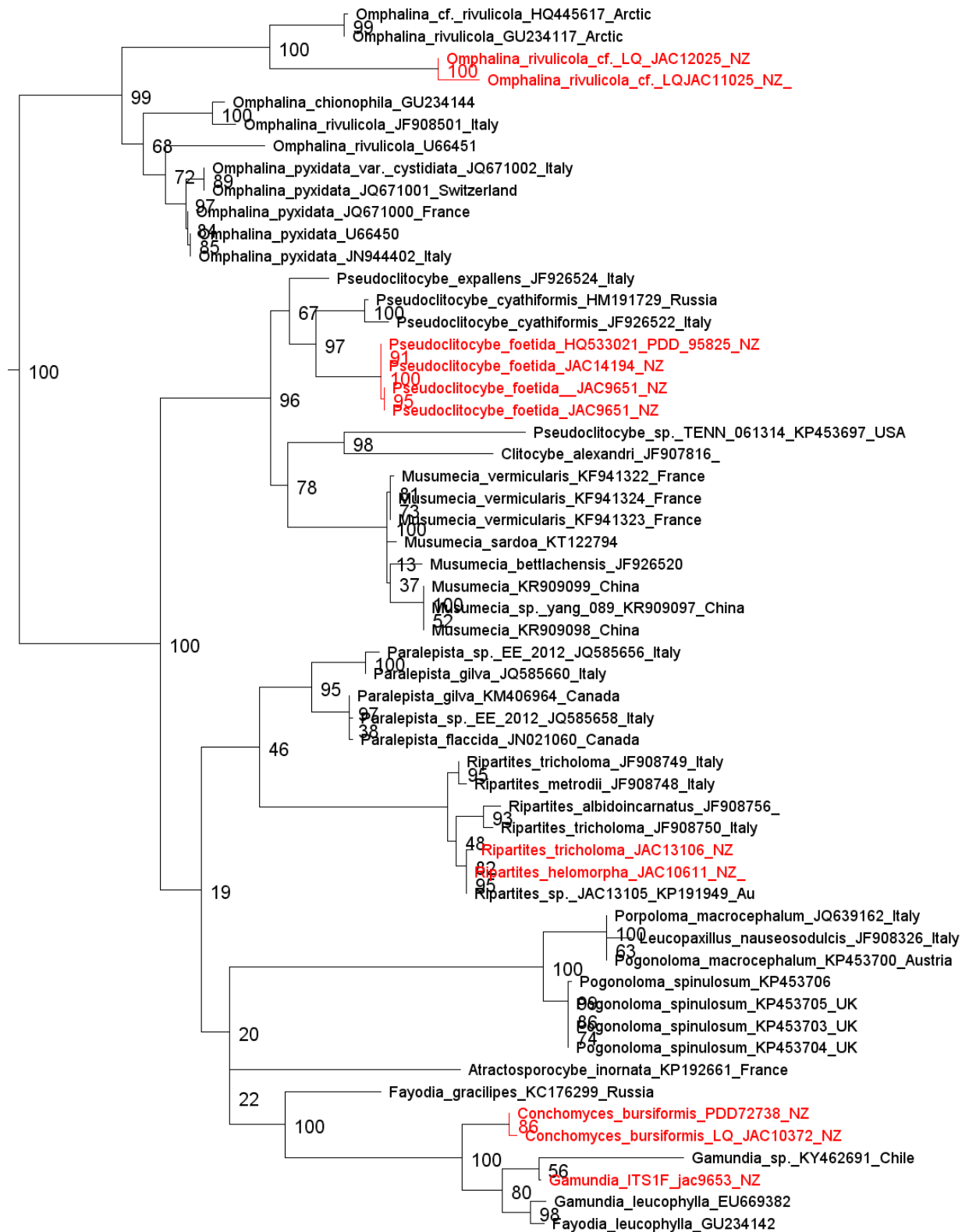
My recent 'Mycological Notes' on various families of New Zealand agarics are preliminary treatments intended as an outline of described/undescribed species. Hopefully they will eventually be followed by more complete and formal treatments, including the description of the new species. That process will take some time. They are based on preliminary notes on recent collections, sequence data and phylogenetic analysis in the context of what we already know about mushrooms in New Zealand, which is quite limited. These notes have an audience in mind. They are semi-technical, in the sense that a user is expected to have some existing knowledge, access to a microscope, stains, and some literature. I realise that approach excludes most potential end-users who just want to identify observations/collections, and for whom such notes provide little more than a few named photos. However, the notes and the subsequent detailed technical publications, are a necessary pre-requisite in a longer process. We need many collections to be accurately named (and probably sequenced) by the few with the necessary technical skills. A range of collections is necessary to establish the morphological, ecological and geographical boundaries of a species. However, for mushrooms, getting the right collections means the skilled people need to be in the right place and at the right time. There's more chance of winning lotto. Too often in the past (and even currently) new species are described based on one or two collections, which may prove to be atypical, and/or without sequence data to 'pin them down', or without sufficient morphological characterisation to separate them from superficially similar species. The practice is a consequence of taxonomists being unable to collect, or examine a representative range of material. Many of these 'species' are then either never seen again or cause significant confusion for years before their identity is commonly established. In my opinion the practice should be strongly discouraged. Only now, through the partnership of professionals and the growing ranks of social-media enabled Citizen Scientists, as exemplified by the work introduced here, can we really enhance our knowledge through much greater access to representative material. The goal is a more complete characterisation allowing species to be identified by anybody in-the-field, and with user-friendly identification keys. Although I must add that in New Zealand that may not be possible for some groups which are a consequence of recent radiations including multiple similar (cryptic) species. So, remember, these kinds of notes are just the first step in a long process.

This document covers various species within the suborder Tricholomatineae, some unplaced at family level, together with some similar species in other families. Most of the species presented here are rarely encountered. Some species are undescribed, and some described decades ago and not observed recently. Many of the species remain poorly studied, globally, and their relationships to other genera is unclear (e.g. *Gamundia* and *Pseudobaeospora*), and even the addition of basic sequence/phylogenetic data has not yet clarified the situation. I have also taken the opportunity to include some relatively poorly known genera in the family Tricholomataceae and Hygrophoraceae. Myself and Pat Leonard have done quite a bit of work on the genus *Tricholoma* in New Zealand which will eventually see the light of day. We have many undescribed species in that genus. Here I want to include the remaining genera in the Tricholomataceae: *Porpoloma*, *Dermoloma* and *Leucopaxillus*. This is the modern sense of the Tricholomataceae in New Zealand, with relatively few genera. In the past it was used as a catch-all for genera now widely dispersed in other families.

## Fayodiaceae/Pseudoclitocybaceae

The family Fayodiaceae is based on the genus *Fayodia* with type species *F. bisphaerigera* which is yet to be sequenced. It has an unusual spore morphology and it might not be related to some other species currently placed in the genus. My adoption of this family name stems from a brief article in *Field Mycology* by Alick Henrici (Henrici, 2012) where he reasonably proposed the following genera in the family: *Fayodia*, *Myxomphalia*, *Gamundia*, *Conchomyces*, *Infundibulicybe*, *Pseudoclitocybe*, *Callistosporium*, *Leucocortinarius*. This use of the family name Fayodiaceae (here within the suborder Tricholomatineae) was based on very limited phylogenetic data, which includes some species of *Fayodia* but not the type. It may not be appropriate, certainly not for all these genera. A recent paper (Alvarado & ..., 2018) introduces a new family name Pseudoclitocybaceae for some genera (*Pogonoloma*, *Pseudoclitocybe*, *Musimecia*), but excludes others in a broader grouping (with poor internal node support in my ITS tree). In addition to Henrici's original genera the broader grouping suggested by current sequence data also possibly includes *Omphalina pyxidata*, which is the type species of *Omphalina* and *Ripartites tricholoma*, the type species of *Ripartites*. A robust phylogenetic backbone and the appropriate family names and all genera within this group remain an issue. Certainly not all Henrici's original postulated placements are currently accepted. The position of *Leucocortinarius* remains uncertain. *Callistosporium* is now accepted in the Biannulariaceae (=Catathelasmataceae) (Sanchez-Garcia & ..., 2016), along with *Catathelasma* and *Pleurocollybia*.

ITS ML Tree



*Omphalina rivulicola* cf.

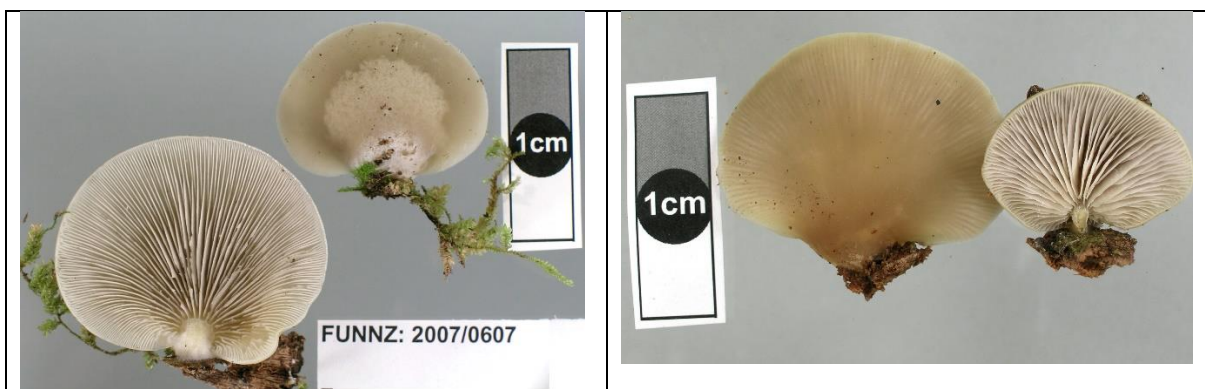
It interesting to note the circumpolar relationship indicated in the tree. A similar pattern exists for some *Lichenomphalia* species, a rather similar genus but easily distinguished by presence of algal cells and lack of clamps on the hyphae. Both genera are predominantly alpine in New Zealand.

Collection: 4-spored, including apiculus, length=6.2–7.7 $\mu$ m ( $\mu$ =6.7,  $\sigma$ =0.4), width=4.2–5.0 $\mu$ m ( $\mu$ =4.7,  $\sigma$ =0.2), Q=1.3–1.6 $\mu$ m ( $\mu$ =1.4,  $\sigma$ =0.1), n=13. Pileipellis a glassy-walled clamped cutis.



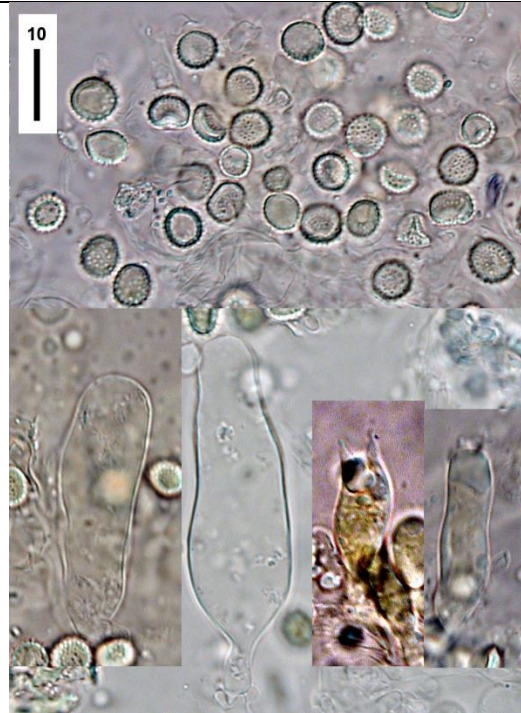
*Conchomyces bursiformis*

This species has a distribution that covers Australasia, Pacific and South America. It has a distinct pale greyish green hue to both cap and gills. The spores are hyaline, globose, warted and 7 $\mu$ m in diam.



*Conchomyces bursiformis* JAC10372= PDD 87460

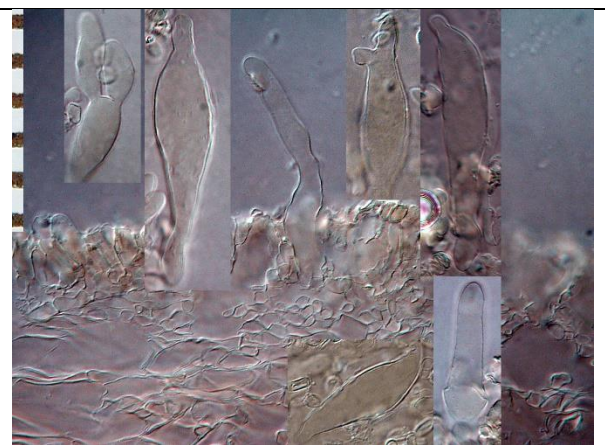
*Conchomyces bursiformis* JAC 9944= PDD 87047

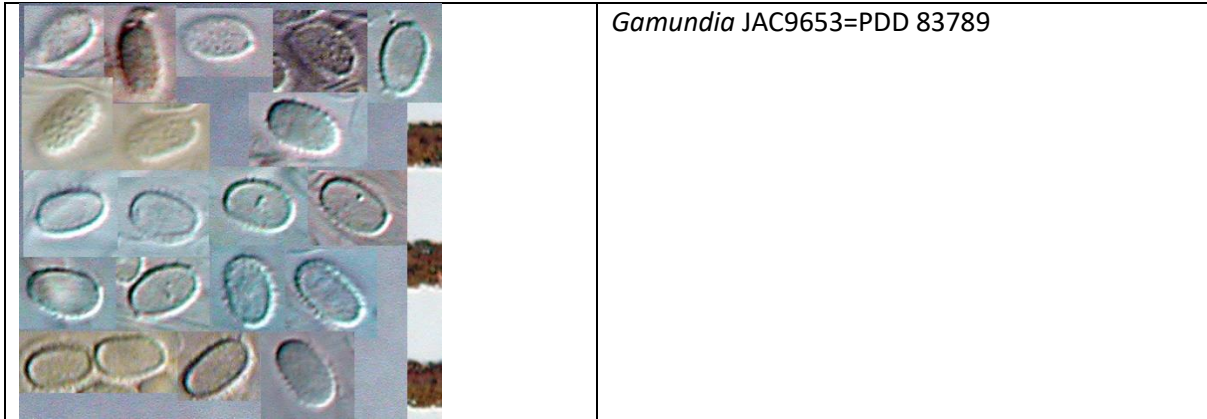


*Conchomyces bursiformis* JAC 9944= PDD 87047 Spore, cystidia, basidia

*Gamundia* sp. JAC9653

A sequence of this collection is close to those labelled *G. leucophylla*, a species also placed in *Fayodia* and sometimes synonymised with *Gamundia striatula* (Antonin & Noordeloos, 2004). It seems wise to leave the NZ taxon in *Gamundia* until the relationship between the type species of *Gamundia* and *Fayodia* is better understood.





*Pseudoclitocybe foetida*

Greta Stevenson incorrectly (although reasonably) placed this in *Cantharellula*, which is now considered in the hygrophoroid clade. *Cantharellula foetida* was described with amyloid spores and unclamped hyphae, observations confirmed by re-examination of the type specimen. The spores are 7.2–8.6 $\mu\text{m}$  ( $\mu=7.9$ ,  $\sigma=0.6$ ), width=4.2–5.5 $\mu\text{m}$  ( $\mu=4.8$ ,  $\sigma=0.5$ ), Q=1.5–2.0 $\mu\text{m}$  ( $\mu=1.7$ ,  $\sigma=0.2$ ), n=5. Egon Horak reported inamyloid spores and incorrectly recombined the species into *Omphalina*.





*Pseudoclitocybe foetida* JAC11419= PDD 95825



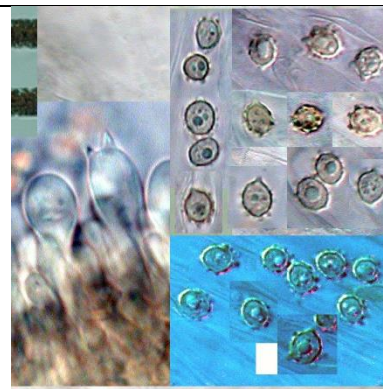
*Pseudoclitocybe foetida* JAC 14194= PDD 106355

### *Ripartites tricholoma*

A probable introduction into New Zealand found in modified habitats and with pale brown spiny spores. Also known from Tasmania.

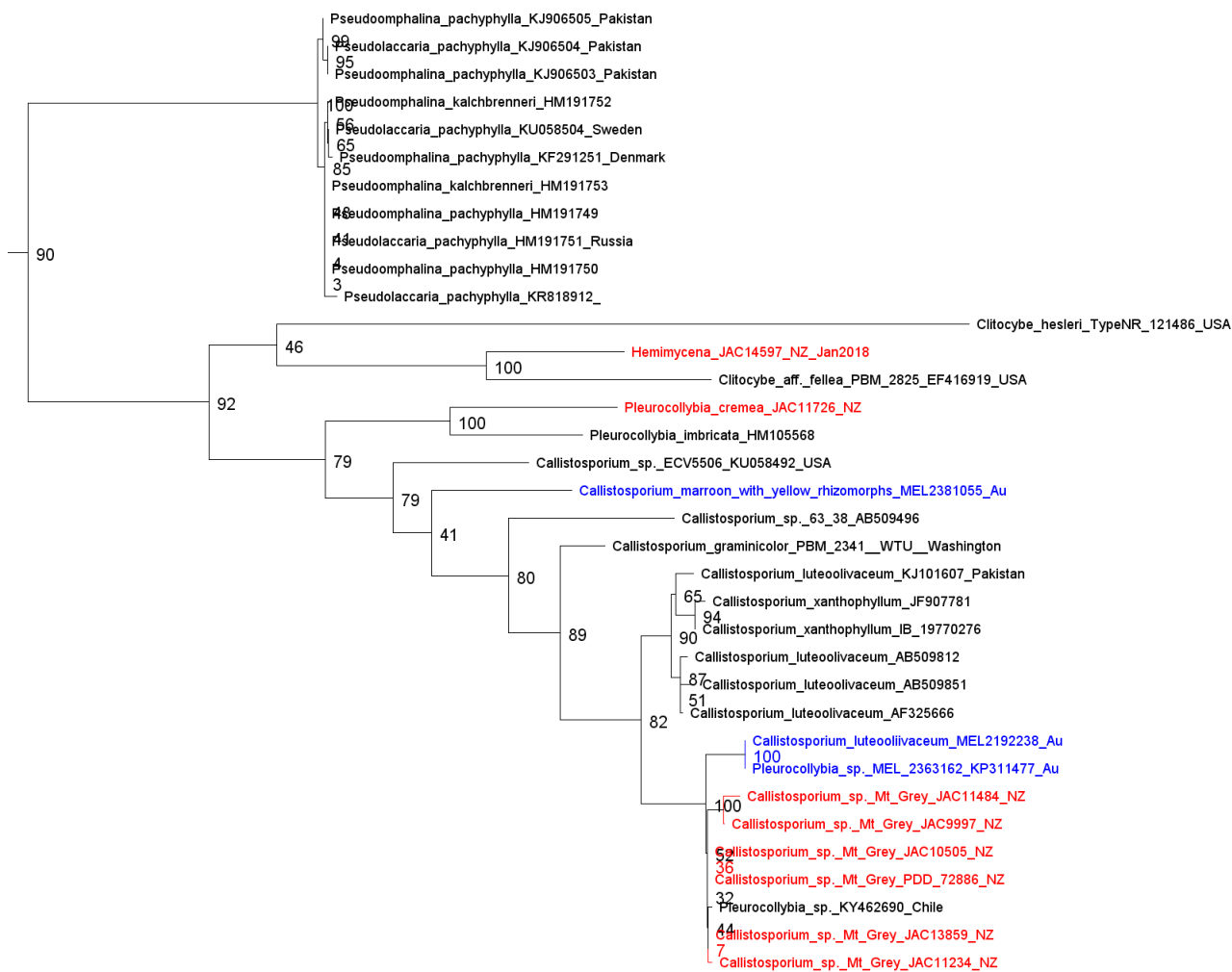


*Ripartites tricholoma* JAC 10611= PDD 95216



### Biannulariaceae

This family was only recently resurrected (Sanchez-Garcia & ..., 2016) for *Catathelasma*, *Pleurocollybia*, *Callistosporium*, *Macrocybe* and *Pseudolaccaria*. Of these genera we only have representatives in *Callistosporium* and *Pleurocollybia* – at the present time.



### *Pleurocollybia cremea*

The type species of *Pleurocollybia* is *Pleurocollybia praemultifolia* and a recent sequence confirms its relationship to *P. cremea* (although it should be noted the generic type collection was from Florida and the sequenced material from Africa!). The genus is related to *Callistosporium*, as postulated by Singer (Singer R. , 1947). *Pleurocollybia*, as the name suggests, was erected for *Collybia* (*Gymnopus*)-like species with eccentric stems. *Pleurocollybia* now includes species with central, or only slightly eccentric stems, as is the case with *P. cremea*. The NZ species was originally described by Stevenson as *Lentinellus cremeus* (Stevenson, 1964), as one of her more random generic assignments (although the gills do have a lacerate edge). Egon Horak (Horak, 1971) proposed *Pleurocollybia* as an appropriate genus (although he suggested it has weakly amyloid spores) around the same time that Miller proposed *Omphalina* (Miller & Stewart, 1971). My re-examination of the type, held at Kew, shows the spores are inamyloid, larger than described, and critically, the hyphae do not possess clamp connections which is one of the key features separating *Pleurocollybia* from similar genera (an important character not noted for the type collection in the descriptions by Stevenson, Horak or Miller).

It can be difficult, on macro-morphological characters alone, to separate several similar New Zealand white spored agarics, with central-eccentric stems, growing on wood. Micro-details are necessary to be certain.

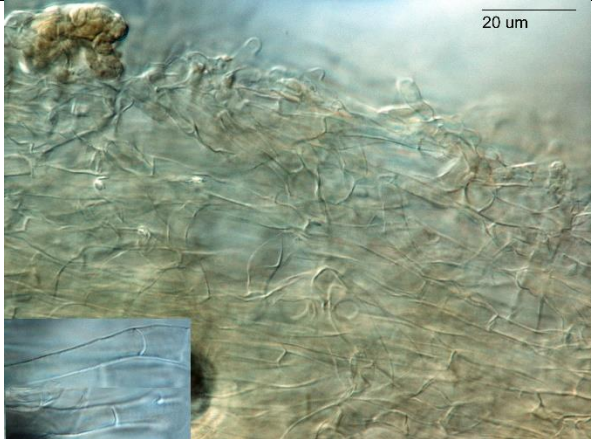
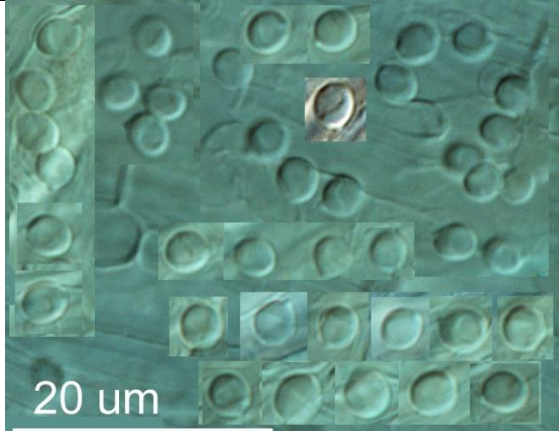


1	Pileipellis with distinct cystidia or vesicles but otherwise of unornamented hyphae. Without noticeable basal rhizoids. Usually on litter/soil. Stipes usually central.	2
1'	Pileipellis without distinct cystidia, sometimes with ornamented (bumpy) hyphae. With basal rhizoids. On rotting wood or tree fern stems. Stipes central to slightly eccentric. See also several NZ <i>Clitocybe</i> spp. Usually on litter.	3
2	Pileal cystidia fusiform	<i>Lactocollybia</i> sp. 'Waitangi'
2'	Pileipellis with globose vesicles	<i>Singerocybe clitocyboides</i>
3	Hyphae unclamped, spores 3-5µm, subglobose	<i>Pleurocollybia cremea</i>
3'	Hyphae clamped	4
4	Pileipellis hyphae smooth. Spores subglobose 3-4µm	<i>Ossicaulis</i> sp. 'Prices Valley',
4'	Pileipellis hyphae bumpy. Spores ellipsoid 3-5 x 2-4µm, Q=1.3	<i>Rhizocybe albida</i>

In New Zealand we have an undescribed pleurotoid *Rhizocybe* species tagged *R.* sp. 'Pureora' with fruitbodies bearing a striking resemblance to some illustrations of named *Pleurocollybia* species overseas. I strongly suspect that when these species are sequenced they too will be found to be related to *Rhizocybe* in the Lyophyllaceae, and not *Pleurocollybia* sensu stricto.


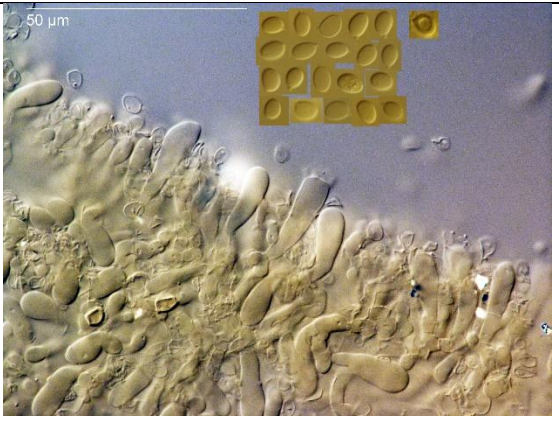
JAC11726: Stem with rhizoids. Cap no reaction with NH<sub>4</sub>OH or KOH. Lamellae decurrent. With lamellulae, some lacerate. Cap filamentous, not gelatinised, without ornamentation, glassy-walled, unclamped. Spores subglobose, inamyloid (or weakly so), 4-spored, without cystidia. Spores length=3.1–3.9µm ( $\mu=3.4$ ,  $\sigma=0.19$ ), width=2.7–3.4µm ( $\mu=3.0$ ,  $\sigma=0.17$ ), Q=1.0–1.2µm ( $\mu=1.12$ ,  $\sigma=0.07$ ), n=20, excluding apiculus.



JAC 11726 = PDD 96134	
	
Pileipellis squash	spores



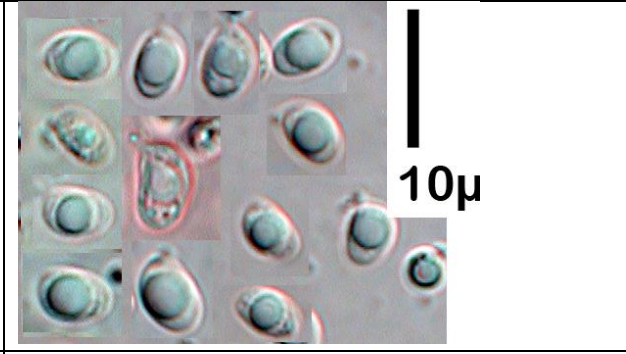

*Pleurocollybia* cf. sp. JAC14597

The relationship of this species with *Pleurocollybia* was entirely unexpected. It is centrally stipitate and has the appearance of a *Hemimycena* (and in the tree as *Hemimycena*). It has been collected just once, recently, and not yet adequately documented. It dries yellowish, like *Pleurocollybia cremea* and hyphae are unclamped, unlike most *Hemimycena*. It also has occasional thick-walled spores, also unlike *Hemimycena*. Cystidia not observed, and pileipellis a broad cutis.

	
JAC 14597 (PDD 106477)	

*Callistosporium* sp. 'Mt Grey (PDD95689)'

Species of *Callistosporium* are characterised by so-called necro-pigments in the spores, which are inamyloid. That is, pigmented material (yellow/brown/purple) within the spores that appears only after drying. In the New Zealand species of *Callistosporium* that character is often lacking, or weakly greenish, but like several other species in the genus fruitbodies show a strong red/violet discolouration of the cap when treated with KOH. Note the similar *Heimiomyces nevoletipes* shows the same reaction but has strongly amyloid spores. Some species of *Pseudobaeospora* can also be similar, microscopically, and reacting with KOH. From a phylogenetic perspective our species is close to the northern hemisphere *C. luteo-olivaceum*, but clearly distinct. A closely related and unnamed species is present in Australia. It seems the New Zealand species is also present in Chile. In New Zealand the species is common in both natural and modified habitats.

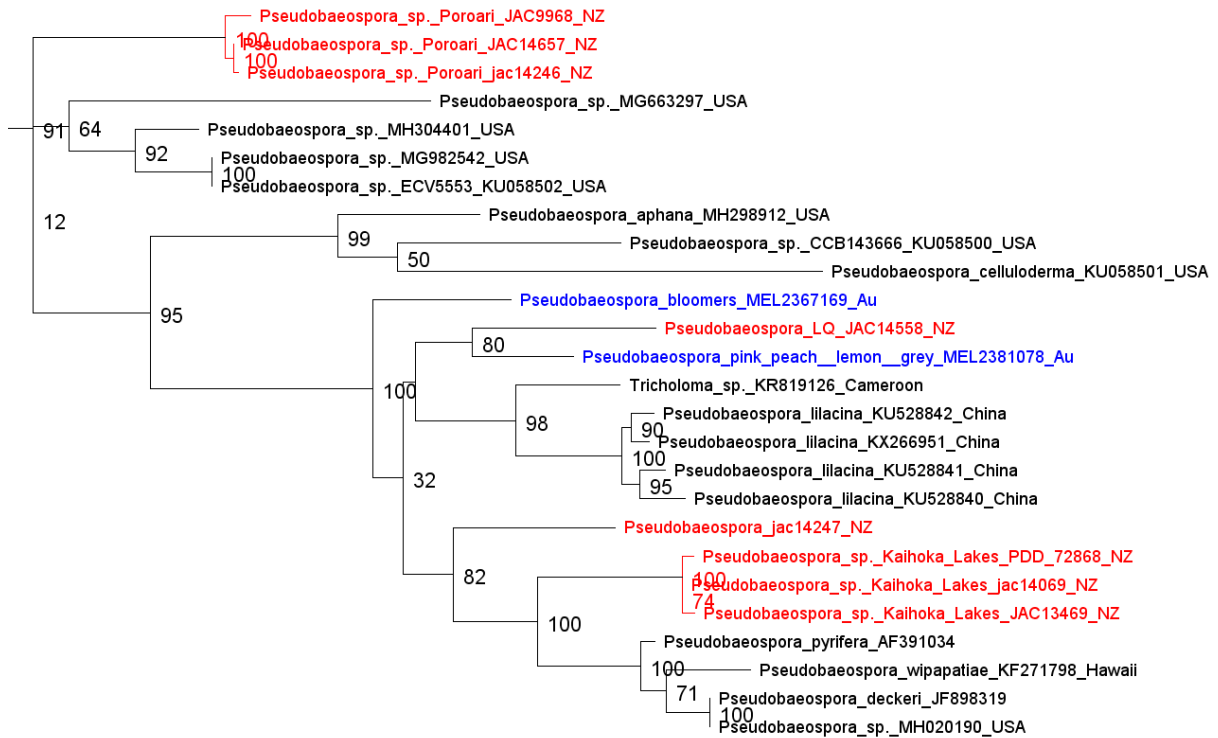
	
<p>JAC9997(PDD 87097)</p>	<p>JAC10505(PDD 87756)</p>
	
<p>JAC11234(PDD 95689)</p>	<p>JAC11234(PDD 95689)</p>
	
<p>JAC 11484(PDD 95883)</p>	

## Incertae sedis

Some genera with NZ representatives currently unplaced within the suborder.

### *Pseudobaeospora*

*Pseudobaeospora* species often go unidentified, and it's a possibility to consider when all the obvious options have been tried and rejected. However, once a few have been seen they can be recognised again. Microscopically the spores usually have a partial dextrinoid reaction, like *Rhodocollybia*, and pigmented thick-walled sclerobasidia are usually present, although not in great numbers. As mentioned above *Pseudobaeospora* remains unplaced at family level within the suborder.



1	Cap with green shades in KOH	3
1'	Cap without green shades in KOH	2
2	Cap with deepening red shades in KOH	<i>Pseudobaeospora</i> sp. 'Kaihoka Lakes
2	Cap not changing in KOH	4
3	Spores > 4 long, Q=1.5	<i>Pseudobaeospora</i> sp. JAC14558
3	Spores < 4 long, Q=1.2	<i>Pseudobaeospora aciculifera</i> ?
4	Cap yellow/tan, an ixocutis	<i>Pseudobaeospora</i> sp. 'Pororiari (PDD 87071)
4	Cap/gills with olivaceous hues. Cap a cutis?	<i>Pseudobaeospora</i> ? sp. JAC4803

### *Pseudobaeospora* sp. 'Pororiari (PDD 87071)'

It's not entirely clear from phylogenetic data if this is congeneric with *Pseudobaeospora*.

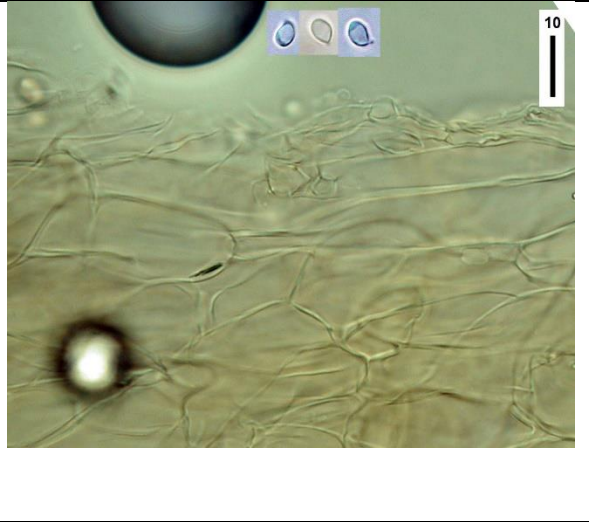
On litter. Caps 1-1.5cm, creamy-yellow, sometimes tan towards the centre and sometimes with an umbo. No change with KOH/NH<sub>4</sub>OH. Stem yellow at apex becoming tan to pink-tan lower. With rhizoids at the stem base. Strong earthy odour. Spores hyaline, inamyloid, some (on cap) dextrinoid, length=3.8–5.0µm ( $\mu=4.3$ ,  $\sigma=0.30$ ), width=2.5–3.7µm ( $\mu=3.2$ ,  $\sigma=0.32$ ), Q=1.1–1.8µm ( $\mu=1.35$ ,  $\sigma=0.16$ ), n=23. Cheilocystidia presence variable. Pileipellis an unclamped (requires confirmation) ixocutis. Trama regular.

<https://inaturalist.nz/observations/3787891>

<https://inaturalist.nz/observations/6999903>



JAC 9968= PDD 87071



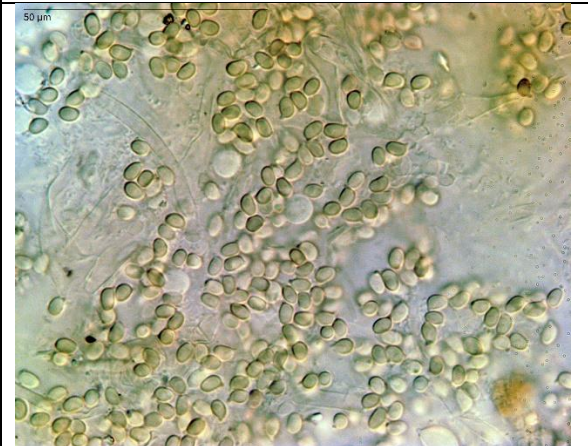
JAC 9968= PDD 87071



JAC 14246= PDD 106395 (© W. Daley)





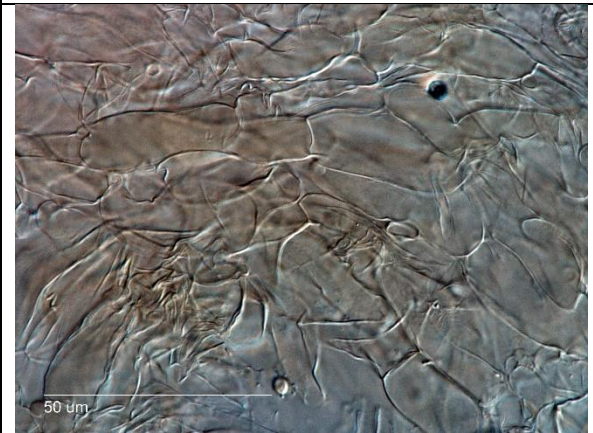
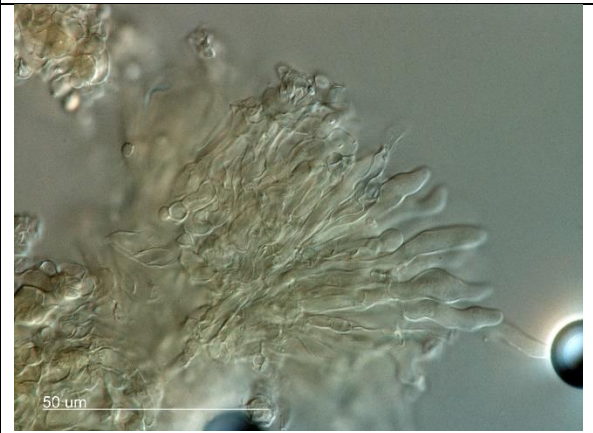
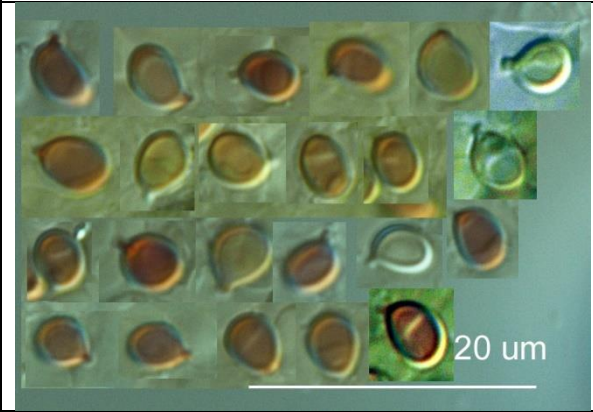
JAC 14246= PDD 106395 (© W. Daley)



JAC 14246= PDD 106395



JAC 14657= PDD 106535 (© G. Smith)

	
<p>JAC 14657= PDD 106535 (© G. Smith)</p>	<p>JAC 14657= PDD 106535 (© G. Smith)</p>
 <p>50 um</p>	 <p>50 um</p>
<p>PP. JAC 14657= PDD 106535</p>	<p>CH. JAC 14657= PDD 106535</p>
 <p>20 um</p>	
<p>Spores (mezers) JAC 14657= PDD 106535</p>	

*Pseudobaeospora aciculifera?* (JAC14247)

The micro-morphology of this is quite different to *P. sp. 'Kaihoka'* but spore size and absence of pleurocystidia don't quite fit the published description of *P. aciculifera*. A sequence of the type is urgently required.

JAC14247: [WMD] Small fungi with a powdery pink cap and stipe and deep pink gills. The cap is conical in shape and observed growing 1.5 to 2 cm in diameter and up to 4 cm in height. The gills appear to be attached but pulling away from the stipe. Growing on the forest floor amongst litter in remnant mature coastal broadleaf forest. [JAC] Cap green in KOH, and pileipellis a grey color in KOH, without the coloured pigment of *P. sp. 'kaihoka'*. Terminal elements broad. Cheilocystidia cylindrical,

uneven, little encrusting pigment. Pleurocystidia, if present, unconvincing but perhaps elongate and thin. Spores some refractive and greenish hue in KOH (unlike *P. sp.* 'kaihoka'). Spores, excluding apiculus length=3.0–3.6 $\mu$ m ( $\mu$ =3.3,  $\sigma$ =0.22), width=2.7–3.3 $\mu$ m ( $\mu$ =2.9,  $\sigma$ =0.20), Q=1.0–1.3 $\mu$ m ( $\mu$ =1.13,  $\sigma$ =0.09), n=20.

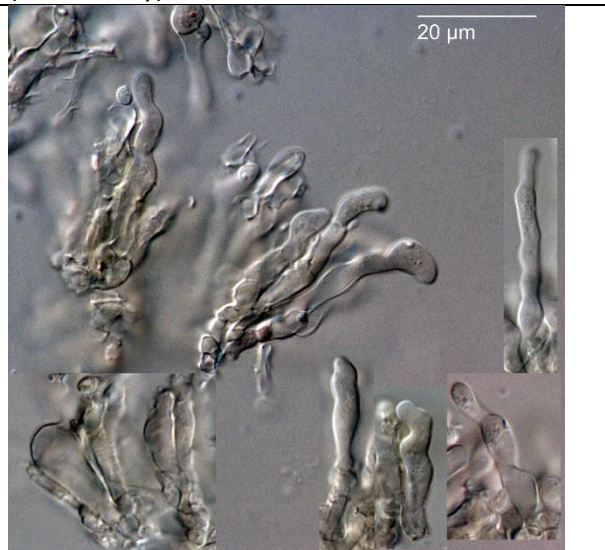
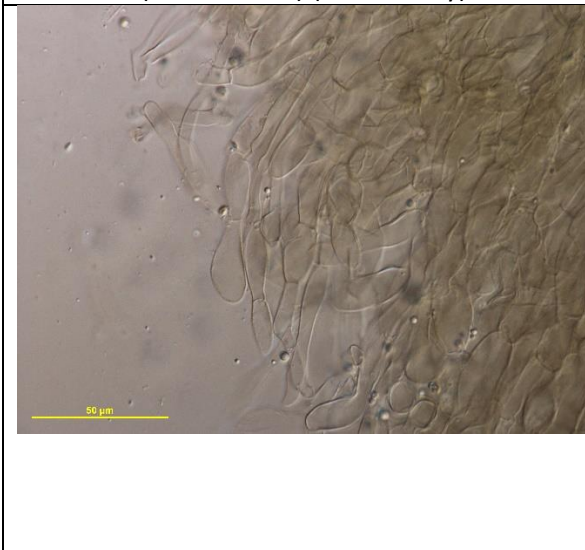
<https://inaturalist.nz/observations/3647416>

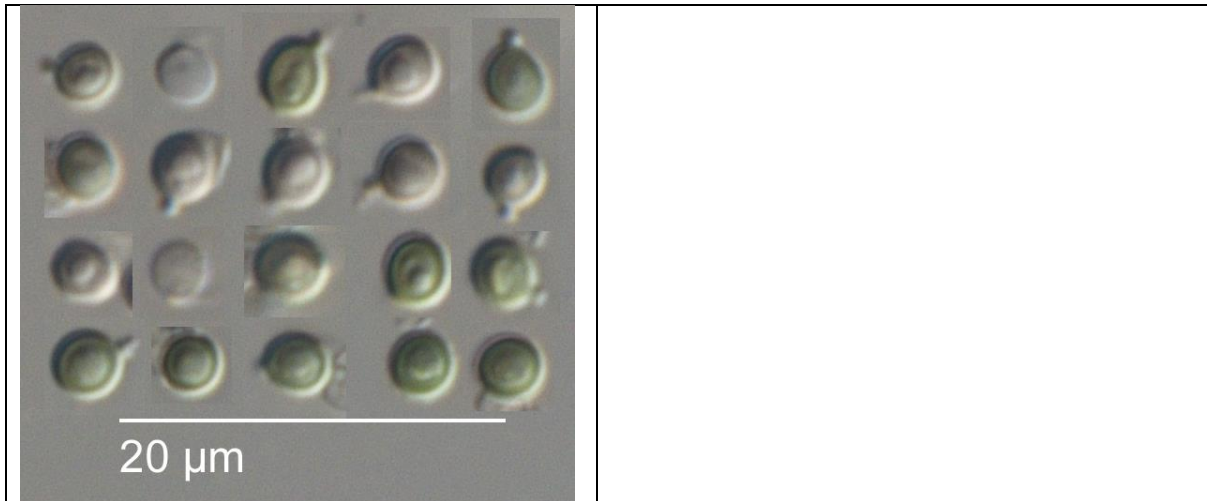


JAC14247 (PDD 106396) (© W. Daley)



(© W. Daley)





*Pseudobaeospora* sp. 'Kaihoka Lakes (PDD 105720)'

JAC14069 (PDD106240): [WMD] Scattered group of small mushrooms, up to 2 cm in diameter and 3 cm in height, with a dusty layer of yellow-mustard over a terracotta-pink cap. The gill attachment is sinuate and the gills are a terracotta-pink colour. The margin of the cap is inrolled when young. The stipe also has a dusty yellow-mustard layer over a pinkish-terracotta colour with tomentose matted fibres around the base of the stipe. If cut - the cut surface of the cap and stipe are a dark pink-red. Growing on soil amongst surface debris and rootlets. Remnant mature coastal broadleaf forest. [JAC] Occasional pigmented sclerobasidia. No pleurocystidia. 4-spored, clamped. Some spores present which are thick-walled and weakly dextrinoid. Excluding apiculus length=2.6–3.8 $\mu$ m ( $\mu$ =3.3,  $\sigma$ =0.27), width=2.3–3.3 $\mu$ m ( $\mu$ =2.8,  $\sigma$ =0.24), Q=1.0–1.4 $\mu$ m ( $\mu$ =1.18,  $\sigma$ =0.12), n=20 (spores perhaps immature and from gill squash). Otherwise no tissue amyloid/dextrinoid. Pileipellis clamped, with a trichoderm of cylindrical terminal cells, often with internal pigment brown in KOH, and extracellular pigment lumps golden/brown in KOH. PP discolouring purple in KOH. Caulocystidia like pileipellis. Cheilocystidia lageniform, occasionally subglobose, some with internal amorphous pale pigment, extra-cellular pigment present.

<https://inaturalist.nz/observations/2986414>

See also

[http://mushroomobserver.org/observer/show\\_observation/20850](http://mushroomobserver.org/observer/show_observation/20850)

[http://mushroomobserver.org/observer/show\\_observation/22113](http://mushroomobserver.org/observer/show_observation/22113)

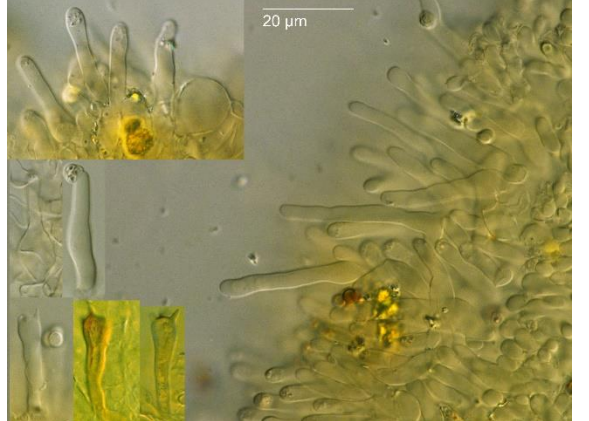
JAC13469 (PDD 105720): When fresh has yellow stem base and what looks like yellow caulocystidia. 4-spored. Pileipellis of broad chains with slightly swollen ovoid encrusted terminal cells (KOH), clamped. Cheilocystidia cylindrical and encrusted, some with brown/purple insoluble pigment (Melzers/KOH). No tissue amyloid or dextrinoid. Has occasional (not dominant) thick walled basidia which are brown in Melzers and purple in KOH and water. No pleurocystidia. Spores thin-walled, collapsing, excluding apiculus length=3.5–4.6 $\mu$ m ( $\mu$ =4.1,  $\sigma$ =0.28), width=2.8–3.6 $\mu$ m ( $\mu$ =3.2,  $\sigma$ =0.25), Q=1.1–1.6 $\mu$ m ( $\mu$ =1.29,  $\sigma$ =0.14), n=20. Same as ZT9386, NZ-120 and ZT1118.





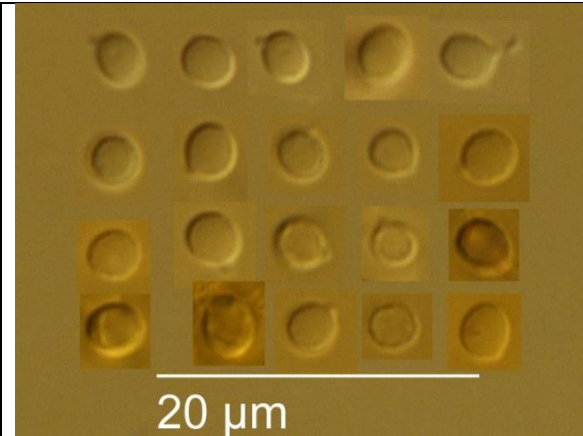
JAC14069 (PDD106240) (© W. Daley)

Caulocystidia (KOH)



Pileipellis section (KOH)

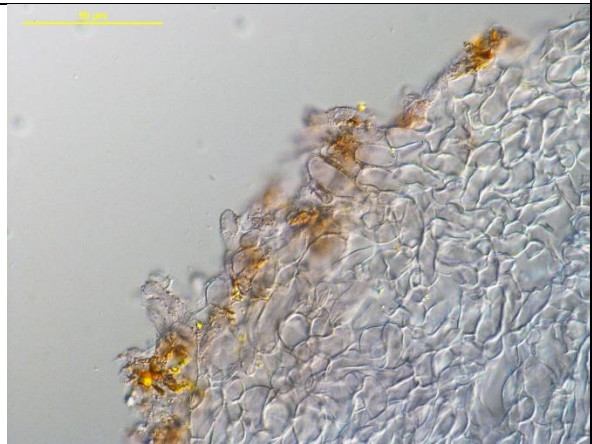
Cheilocystidia and sclerified basidia (Melzers)



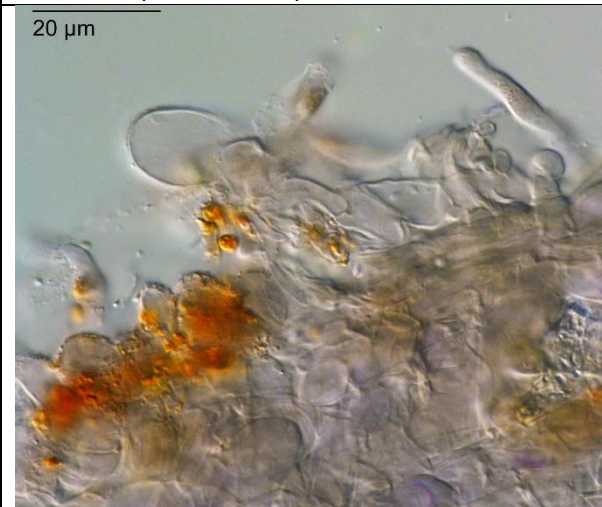
Spores (melzers)



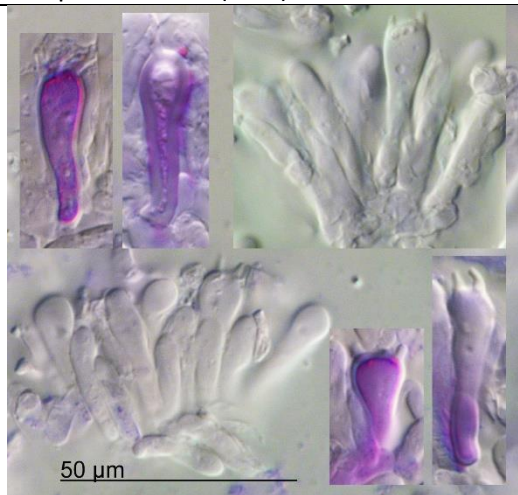
JAC13469 (PDD 105720)



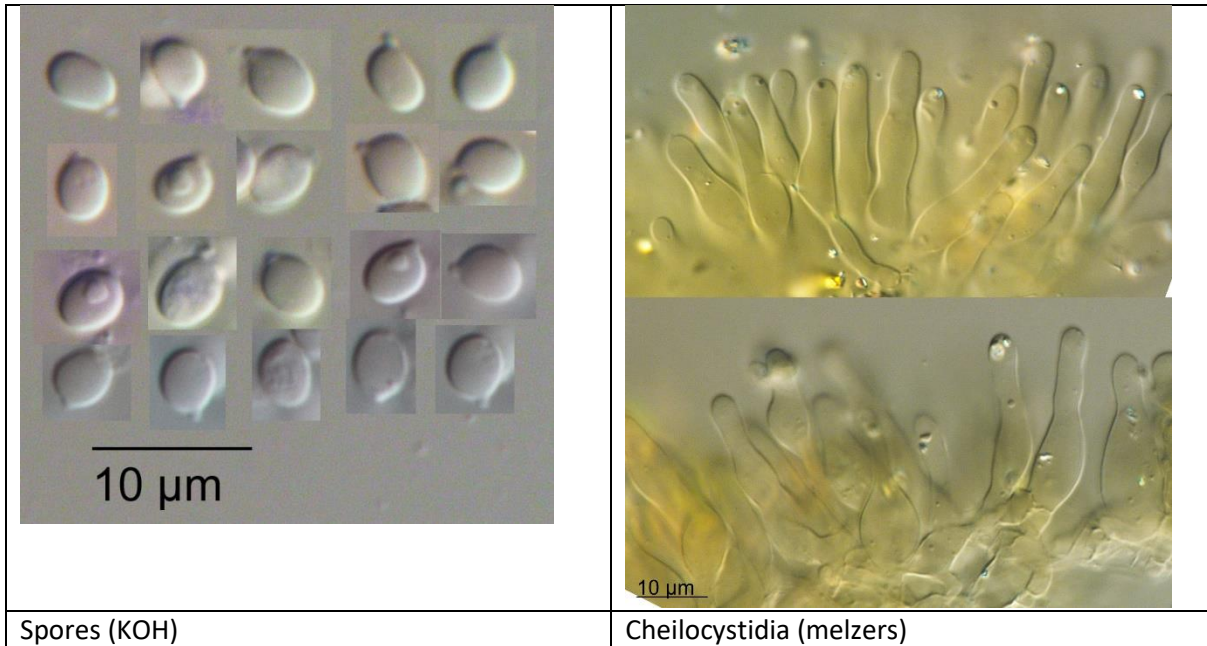
Pileipellis section (KOH)



Pileipellis section (KOH)



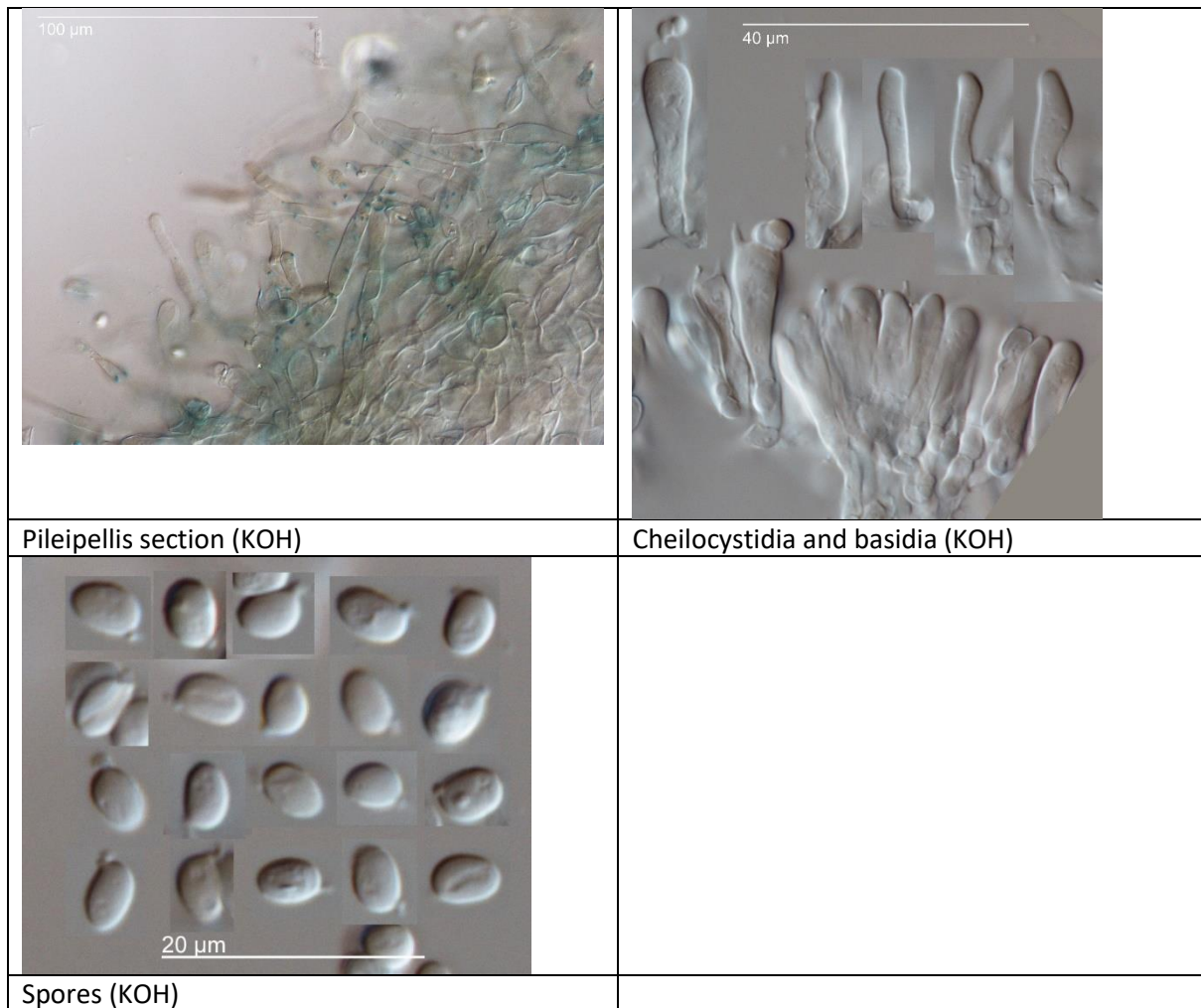
Sclerified basidia (KOH)



*Pseudobaeospora* sp. JAC14558

JAC14558: Fruitbodies pinkish grey, cap green in KOH. Pileipellis a loose trichoderm of elongated cells. Terminal elements with granular content green in KOH. Extracellular pigment absent. Clamped. Cheilocystidia not clear, a few thinner and irregular elements. Pleurocystidia absent, or basidioid. Spores refractive, some with greenish hue in KOH. Excluding apiculus length=4.2–5.7 $\mu$ m ( $\mu$ =5.0,  $\sigma$ =0.33), width=3.1–3.8 $\mu$ m ( $\mu$ =3.4,  $\sigma$ =0.22), Q=1.3–1.7 $\mu$ m ( $\mu$ =1.49,  $\sigma$ =0.13), n=20



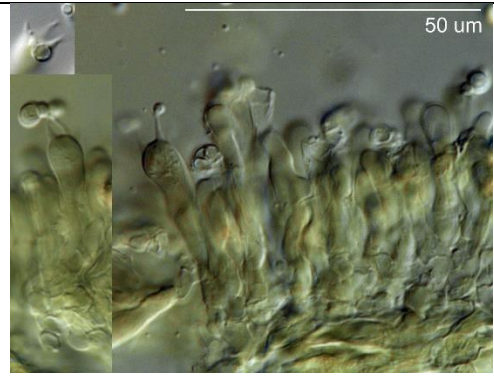


*Pseudobaeospora* sp. 'pink/peach/lemon/grey' (Australia)

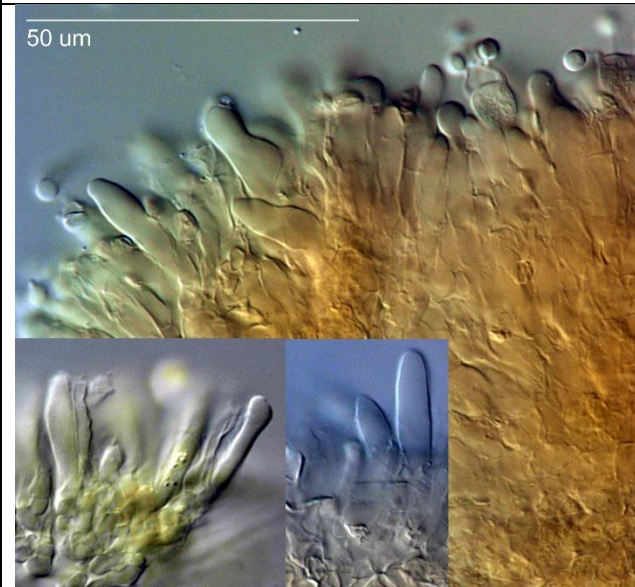
MEL2381078: [Gates] (Gates & Ratkowsky, 2016) The small fruitbodies of this species are variable in colour with pale lemon, peach, pink and grey forms recorded. The dry felty cap (ca. 1.5 cm diam. in the largest specimens) and slender fleshy stipe (ca. 4 cm long, 2-3 mm wide) are the same colour and the gills just a shade lighter. A distinctive feature is the mass of stiff, bristly hairs at the base of the stipe. [JAC] Collection is pink phase of *P.* 'pink, peach, lemon, grey'. Has pink basal tomentum. Dried material not changing in KOH. Surface minutely fibrillose. Microscopically some spores appearing red in KOH and those becoming dextrinoid in Melzers, and appearing thick walled. Pileipellis an inflated clamped hymeniderm with inflated elongate cells. 4-spored. Cystidia not obviously distinguished but perhaps present as two types. Large basidiolar/irregular cystidia and thin paraphyses-like cystidia, both probably pleurocystidia as well as cheilocystidia (but some at least may just represent different maturation states of basidia). Spores perhaps minutely ornamented. Excluding apiculus length=3.6–4.6 $\mu$ m ( $\mu$ =4.1,  $\sigma$ =0.22), width=2.9–3.7 $\mu$ m ( $\mu$ =3.3,  $\sigma$ =0.23), Q=1.1–1.4 $\mu$ m ( $\mu$ =1.26,  $\sigma$ =0.09), n=20. MEL2367169 as *Pseudobaeospora* 'bloomers' is macroscopically/microscopically identical but phylogenetically a different species.



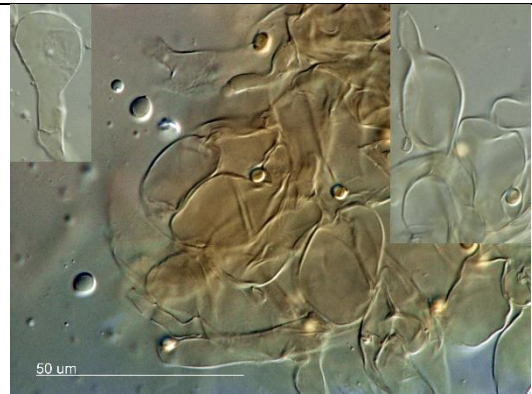
© Gen Gates/Mike Pilkington.



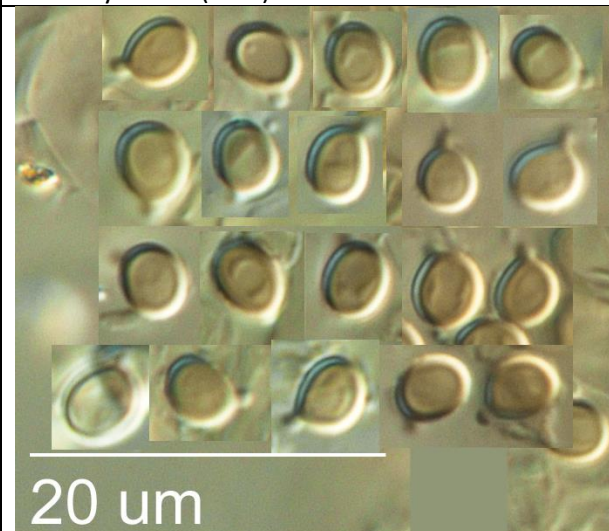
MEL2381078. basidia



Cheilocystidia? (KOH)



Pileipellis elements (KOH)



20 um

*Pseudobaeospora?* sp. JAC14803

JAC14803: [GS] Small mushrooms growing on the ground in broadleaf-podocarp forest. Caps to 10 mm across, khaki coloured, becoming more yellowish near the margins with age, and with a pronounced umbo. Gills yellowish, tinged green, free of stem. Stems khaki coloured, pruinose. [JAC] 4-spored, spores hyaline, inamyloid/non-dextrinoid, excluding apiculus length=3.2–3.8 $\mu$ m ( $\mu$ =3.5,  $\sigma$ =0.19), width=1.8–2.6 $\mu$ m ( $\mu$ =2.3,  $\sigma$ =0.20), Q=1.2–2.0 $\mu$ m ( $\mu$ =1.53,  $\sigma$ =0.16), n=20, hymenial cystidia clavate, with occasional lanceolate beaks and present as both cheilocystidia (mainly) and pleurocystidia (few). Cap not changing in KOH. Pileipellis an unclamped cutis (a few clamped?) with a few erect thin trichodermal hyphae with brown plasmatic content.

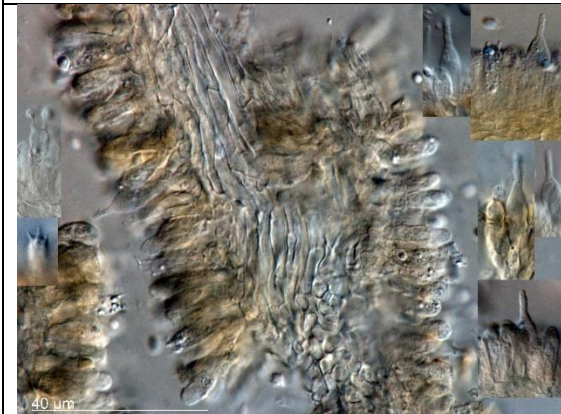
<https://inaturalist.nz/observations/10062256>



JAC 14803 (© G. Smith)



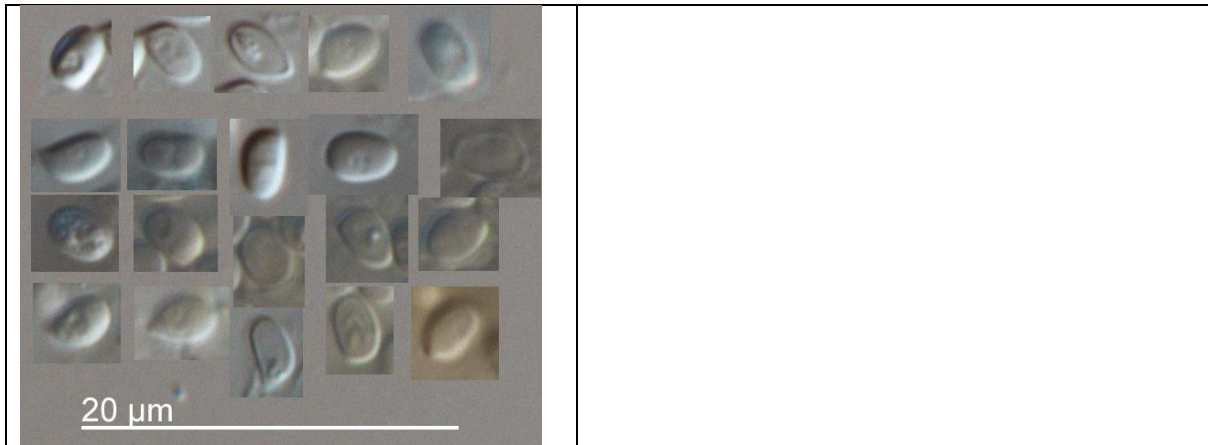
JAC 14803 (© G. Smith)



Hymenium and cytsidia



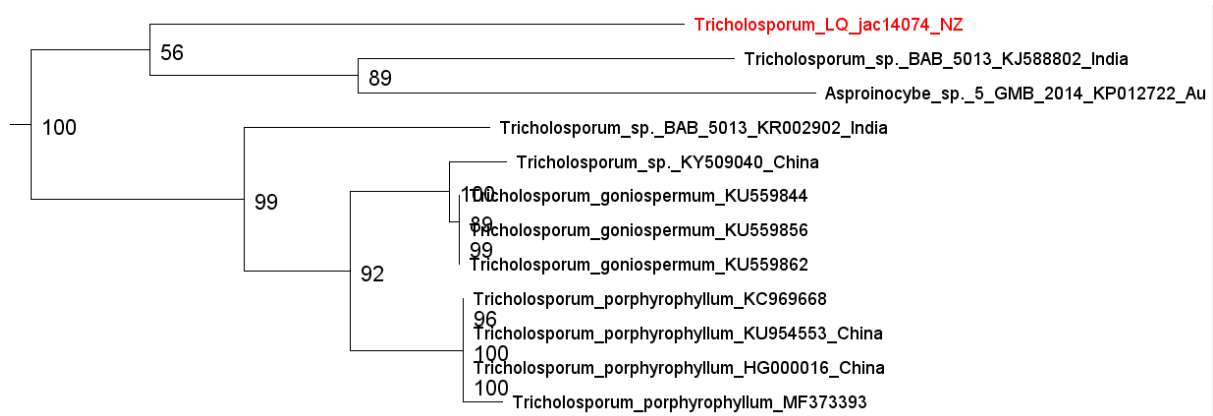
Pileipellis terminal hyphae (KOH)



*Asproincybe* sp. JAC 14074

This striking species, which is a dead-ringer for *Lepista nuda*, is known from one site in Auckland frequented by Wanda Daley. It is only when you look at the spores that you realise this is very different to *Lepista* indeed. The spores are distinctly tuberculate and hyaline. The genera *Asproincybe* and *Tricholosporum* are closely related. *Tricholosporum* is described with cruciform/nodulose spores and *Asproincybe* with tuberculate spores, but otherwise rather similar with violaceous colours and a mainly tropical distribution. I originally placed this collection in *Tricholosporum*, but spore morphology and the phylogeny does suggest two possible genera and a closer affinity with *Asproincybe*. If they are considered as a single genus then *Asproincybe* takes priority. In the tree below it is labelled *Tricholosporum*. Phylogenetically these genera remain unplaced at family-level but seem to be basal to the Tricholomataceae.

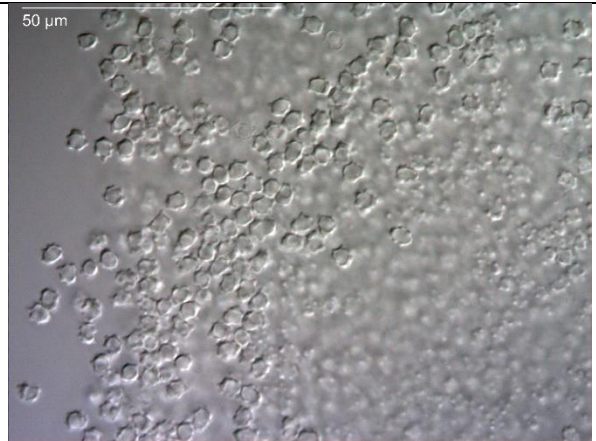
JAC14074: [WMD] Mushroom with a dry creamy-tan cap with purple hints and purple gills. Cap lightly fibrous, 3.5 cm in diameter and 3 cm in height. Gills attached with a slight decurrent tooth. Stipe pale purple near apex and tan towards base. On soil in remnant mature coastal broadleaf forest.



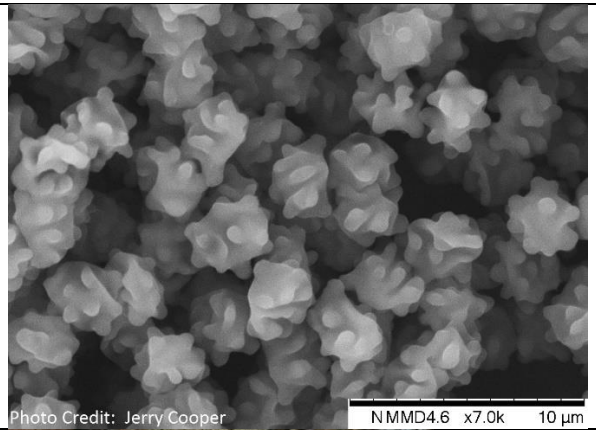
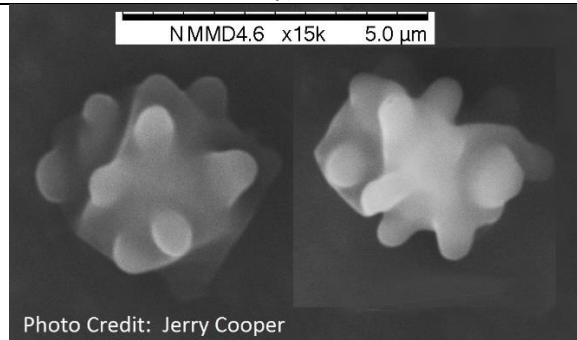
<https://inaturalist.nz/observations/2932016>



JAC 14074 (© W. Daley)



JAC 14074



JAC14662(PDD 106540) (© W. Daley)



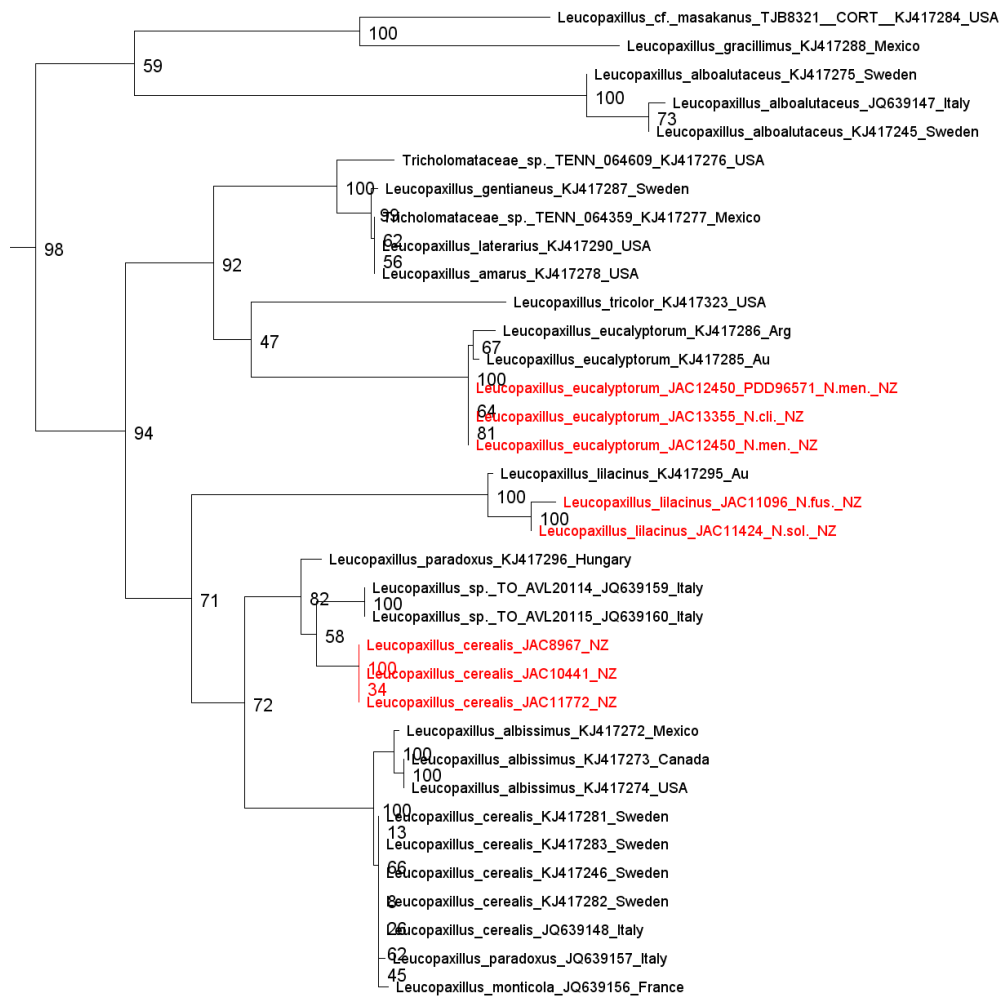
JAC14662(PDD 106540) (© W. Daley)

## Tricholomataceae

The following genera and species reside within the modern concept of the family Tricholomataceae.

*Leucopaxillus*





### *Leucopaxillus cerealis/paradoxus sensu NZ*

It is difficult to decide on the correct name for this white *Leucopaxillus* which is obviously introduced into our pine plantations from somewhere else. It is part of a species complex and I considered many potential names like *L. albissimus* (1873, USA), *L. paradoxus* (1896 France), *L. cerealis* (1829 Germany), *L. cutefractus* (1983 Netherlands), *L. piceina* (1904 USA), *L. monticola* (USA 1947). Discussions in the literature about the synonymy/non-synonymy, morphological differences and geographical distribution of these species are less than convincing. However, it is clear from sequence data there are several taxa involved. I don't think much more can be said until the North American taxa are sorted out, and that is the most likely origin of our species.

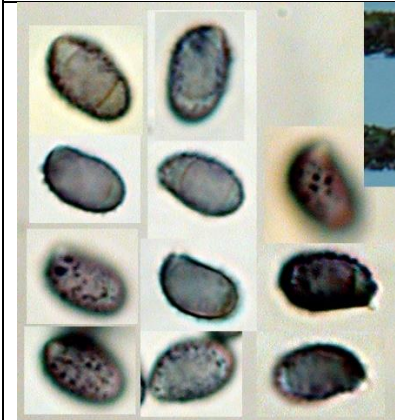
Microscopically *Leucopaxillus* is easily recognised by the amyloid warted spores which are 8.5 x 5µm in this species.



JAC 8967 = PDD 80234



JAC 10441= PDD 87707



JAC 10441= PDD 87707



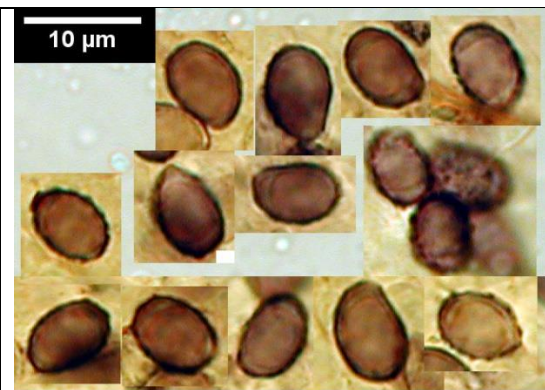
JAC11772= PDD 96174

*Leucopaxillus lilacinus*

This lilac coloured species was described from Australia, and the New Zealand species is phylogenetically closely related (and not worthy of a different species name). It is infrequent in our beech forests.



JAC 11096 = PDD 95547



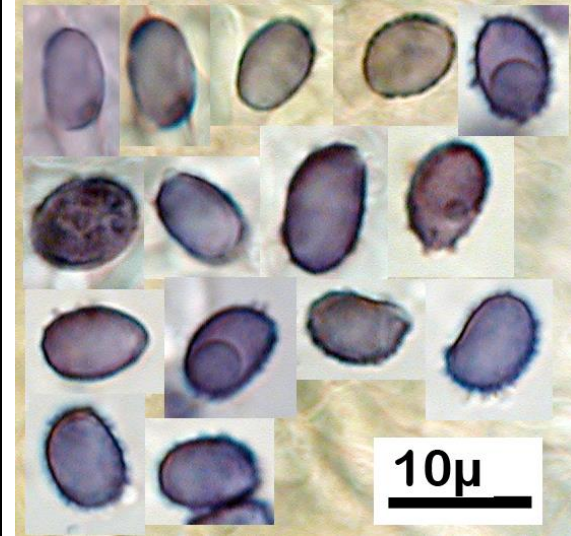
JAC 11096 = PDD 95547



JAC11424 = PDD 95838 (© N. Siegel)



JAC11424 = PDD 95838



*Leucopaxillus eucalyptorum*

Like *L. lilacinus* this species was also first described from Australia, and is relatively common in our beech forests. It produces large amounts of mycelium binding the litter layer.



JAC 13355 = PDD 105608

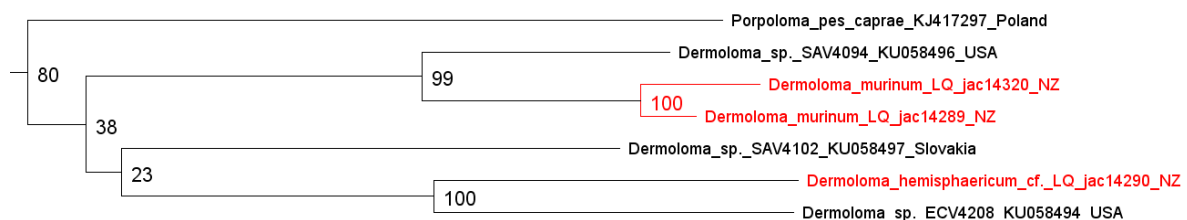


JAC 13355 = PDD 105608

## *Dermoloma*

In Greta Stevenson's ground-breaking 1960s papers in Kew Bulletin she introduced many New Zealand taxa, albeit often in incorrect genera, even for the knowledge of the time. Amongst those were *Tricholoma hemisphaericum* and *Tricholoma murinum* (and *Tricholoma amyloideum* covered later) (Stevenson, 1964). In Egon Horak's subsequent review of New Zealand agarics (Horak, 1971) he moved them to *Dermoloma*, and there they remained, without any additional collections or information until recently.

The genus *Dermoloma* is based on *Dermoloma cuneifolium*. It is characterised by a hymeniform pileipellis and amyloid smooth white spores. It is a typical member of the European waxcap grassland community. Surprisingly no material of *D. cuneifolium* has been sequenced to date, and so we do not know where it sits. We know *Dermoloma inconspicuum* sits within the Agaricaceae, whereas other sequenced species sit within the Tricholomataceae (sensu stricto). Depending on where *D. cuneifolium* pops up in a phylogeny we may need a different genus. Our species are related to *Pseudoporpoloma*, recently erected for *Porpoloma pes-caprae* (Vizzini & ..., 2016). It is surprising, and disappointing, that the authors of *Pseudoporpoloma* did not investigate the true position of *Dermoloma*, or even discuss it.



The two New Zealand species are superficially similar but easily separated because *D. murinum* has strongly amyloid broadly ellipsoid spores, whereas *D. hemisphaericum* has weakly (or fleetingly) amyloid elongate spores. We also have similar looking species, with a hymeniform pileipellis in *Hodophilus* (later in this paper) but the spores are totally inamyloid.

## *Dermoloma hemisphaericum*

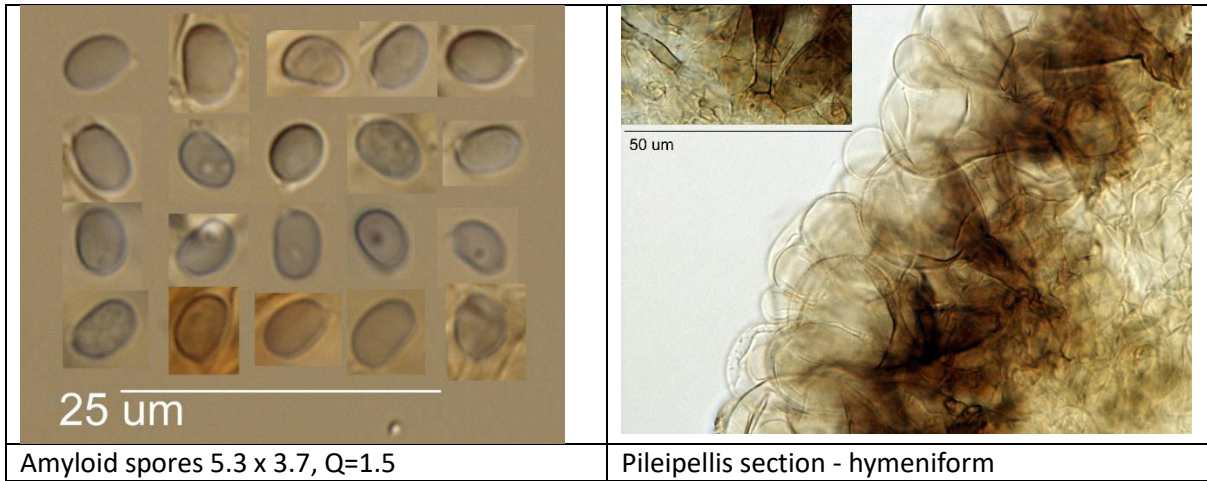
Cap 1.5-3cm diam. The fact this was described with a hemispherical cap is incidental and just a feature of development.



JAC 14290 (© W. Daley)



JAC 14290 (© W. Daley)



*Dermoloma murinum*

This was described with inamyloid spores but re-examination of the type at Kew shows the spores are weakly amyloid, the reaction quickly fading. They are significantly longer in *D. murinum* than *D. hemisphaericum*. Collections with a hymeniform pileipellis and inamyloid spores should also be compared with *Hodophilus* later in this paper.

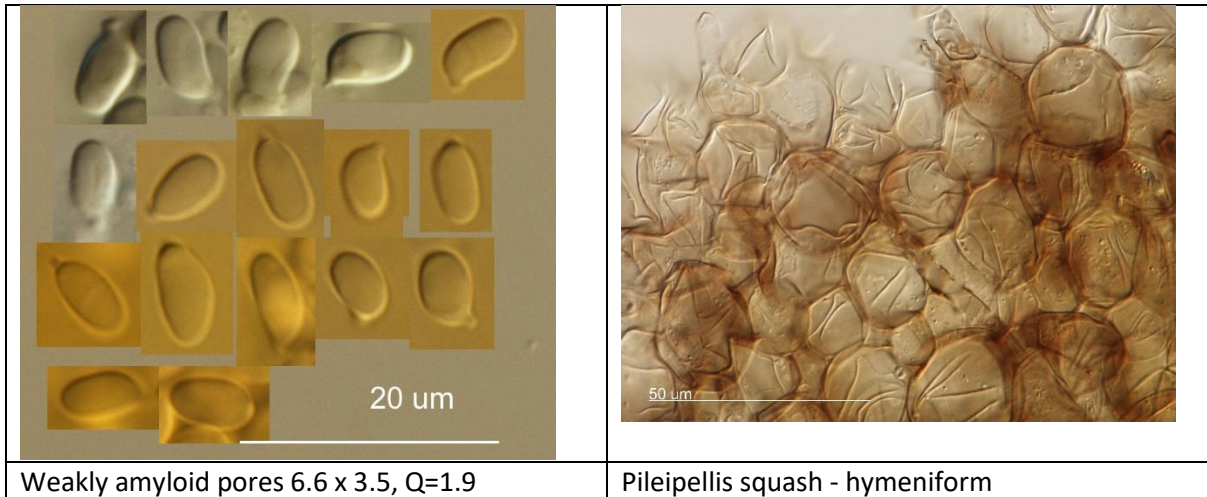
<https://inaturalist.nz/observations/4492665>

[WMD] These mushrooms have a dark grey-brown cap which is lighter around the margin. The gills are creamy-pale grey when young becoming cream when older with a sinuate attachment to the stipe. The stipe is light grey and fibrous in appearance and 4-5 mm in diameter. The caps were observed growing from 1.5 to 3.2 cm in diameter and 1.5 to 3.2 cm in height.



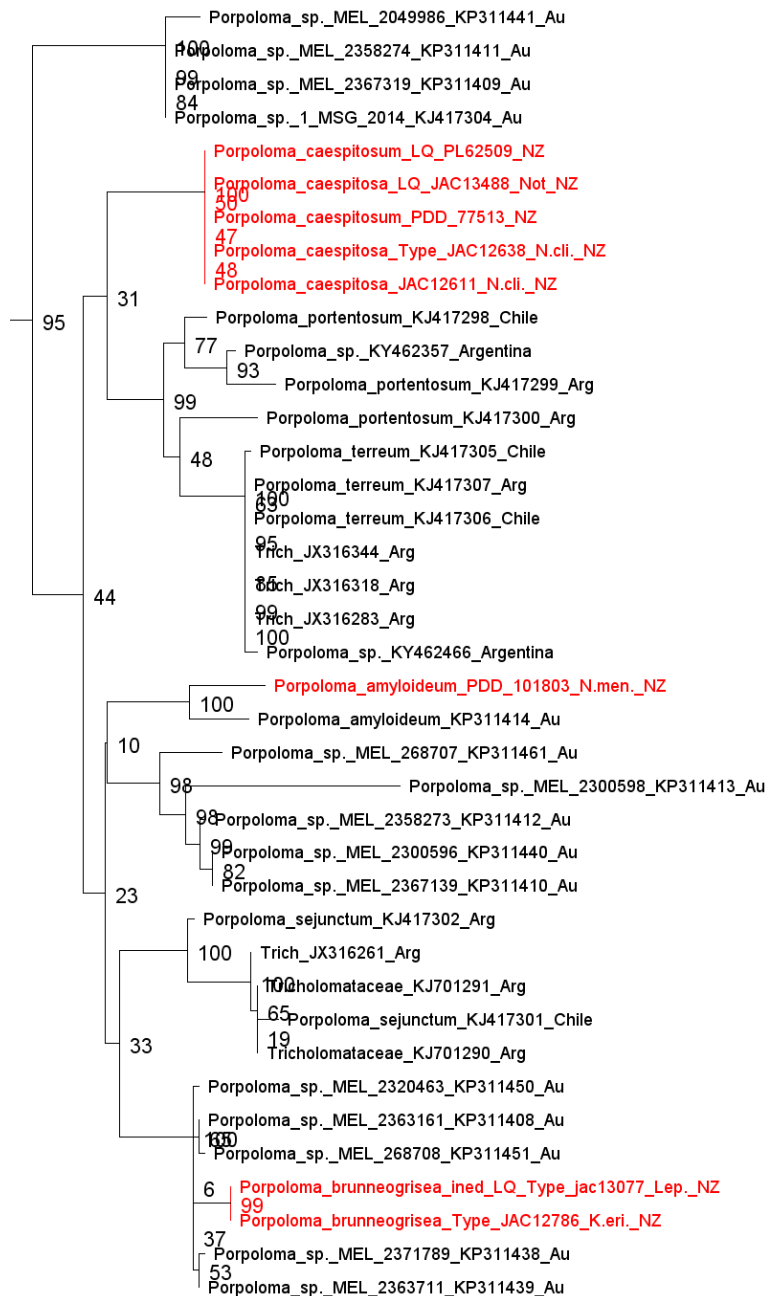
JAC14289 (© W. Daley)

JAC14289 (© W. Daley)




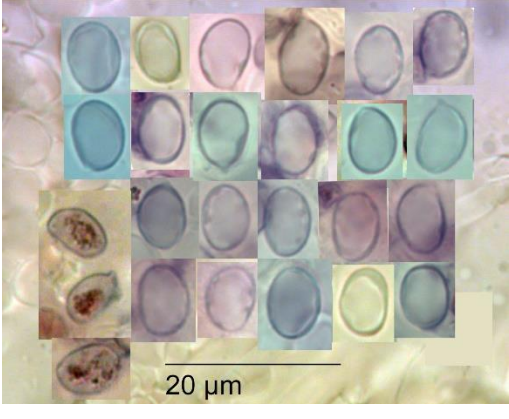
### *Porpoloma*

The genus *Porpoloma* was erected by Singer (Singer R. , 1952) based on *P. sejunctum*, a species associated with *Nothofagus* in South America. The name was then picked up by European mycologists for some grassland species, none of which are related to the South American type and most recently moved into new genera such as *Corneriella*, *Porpolomopsis*, *Pseudotricholoma*, *Pogonoloma* and *Pseudoporpoloma*. In New Zealand (and Australia) we have the real thing.




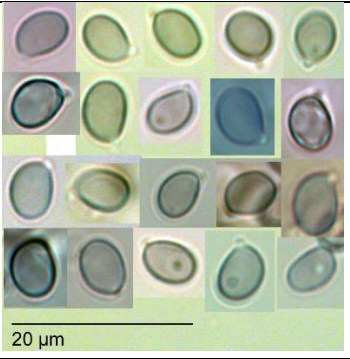

### *Porpoloma amyloideum*

This species was originally placed in *Tricholoma* by Stevenson (Stevenson, 1964) but moved to *Porpoloma* by Egon Horak (Horak, 1971). It is *Tricholoma*-like, and very like one of our undescribed *Tricholoma* species, except it has amyloid spores. It always has yellow colours and usually a sheathing ring on the lower part of the stem. Presumably it is ectomyorrhizal with beech.

	
<p>JAC 13076 = PDD 101803 (© P. Leonard)</p>	<p>Amyloid spores 7.8 x 5.4um</p>

*Porpoloma caespitosa* nom. prov. (Leonard & Cooper)

This species, again looking like a *Tricholoma*, is associated (ectomycorrhizal) with southern beech. It has a smoky brown/grey minutely fibrillose, dry cap and grows in clusters. There is one similar undescribed species of *Tricholoma* which does not possess amyloid spores. *Lyophyllum* species in similar habitats and with similar colours always have a waxy feel to the cap surface.

	
<p>JAC 12611= PDD 96731 (© N. Siegel)</p>	<p>JAC 12611= PDD 96731 Spores 6 x 4.5um</p>
	
<p>JAC 13488= PDD 10573</p>	

*Porpoloma brunneogrisea* nom. prov.

This species is strictly associated with tea-tree and has large spores, but otherwise like *P. caespitosa*.





JAC 12786 = PDD 96890



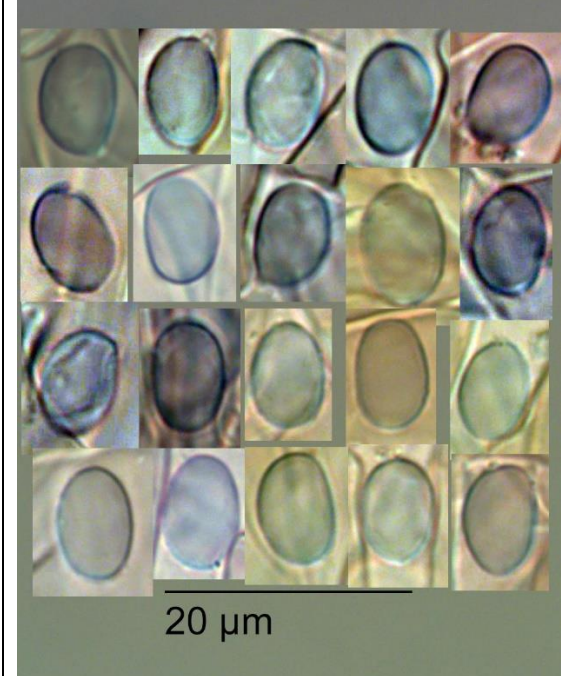
JAC 12786 = PDD 96890



JAC 13077 = CSAK354 = PDD 97169 (© Clive Shirley)



JAC 13077 *Pileipellis*



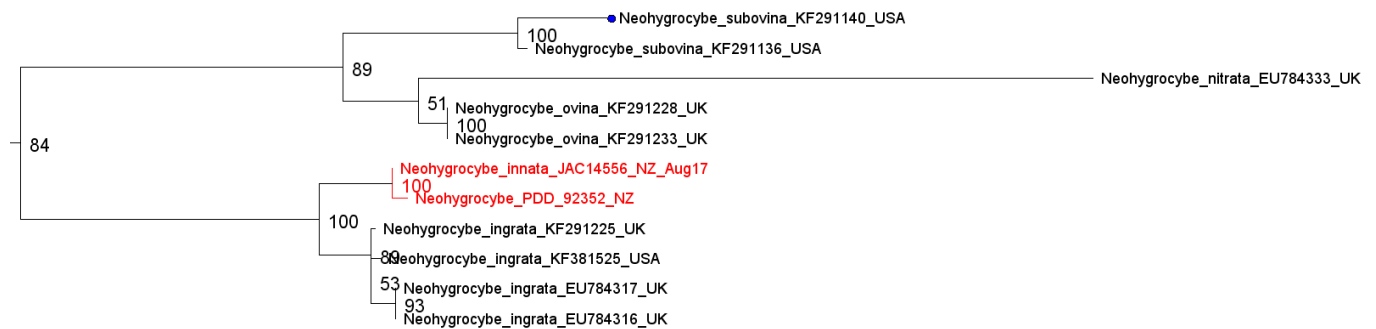
JAC 13077 Spores 9 x 6µm

## Some residual genera in Hygrophoraceae and Clavariaceae

I have included the genera *Neohygrocybe*, *Aeruginsopora* and *Hodophilus* because the New Zealand species are superficially like some of the species treated above.

### *Neohygrocybe innata* - Hygrophoraceae

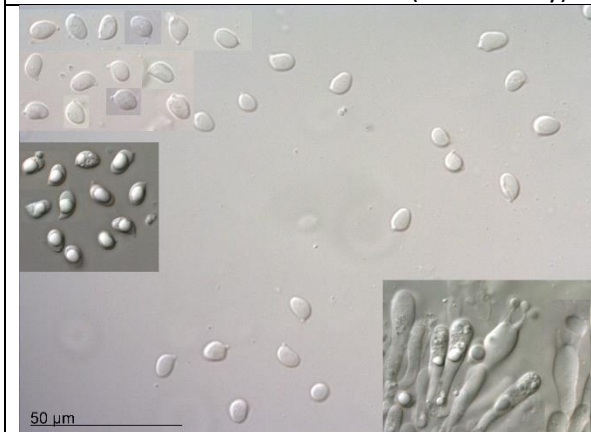
The genus *Neohygrocybe* lies within the family Hygrophoraceae although the species don't look typically wax-cap like, except often the gills. They have fibrous caps, non-hymeniform pileipellis, inamyloid spores and the flesh and whole fruitbody discolours red/brown on handling, and they dry dark. Egon Horak (Horak, 1973) named two New Zealand species in this genus; *N. innata* with characters typical of the genus, and *N. squarrosa* with flesh unchanging, and cystidia, not typical of the genus. Both species were based on single collections and not seen again. Collections have been made recently with similarities to both these species but with identical sequences - one discolouring on handling and the other not. I have chosen to recognise this species under the name *N. innata*. It is possible that *N. innata* and *N. squarrosa* represent two forms of the same species, but more data are required.





JAC13269=CSAK325=PDD 92352 (© C. Shirley)



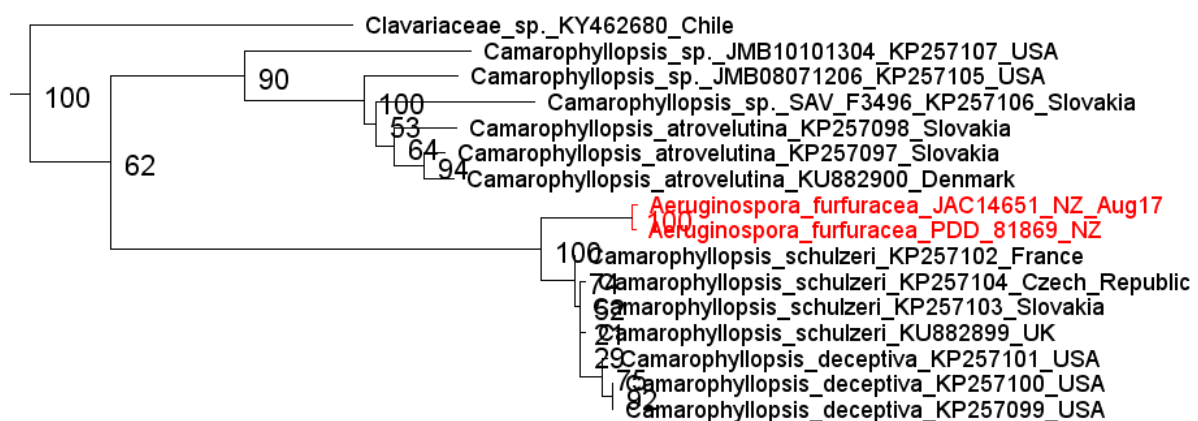
JAC13269=CSAK325=PDD 92352 (© C. Shirley)



JAC13269=CSAK325=PDD 92352. Spores 8.2 x 5.5	JAC 14556 = PDD 106437
	
PDD 27076 – Holotype of <i>N. innata</i>	PDD 27077 – Holotype of <i>N. squarrosa</i>

### *Aeruginospora furfuracea* - Hygrophoraceae

*Aeruginospora* was erected for a species from Java described with spores having a blue/green pigment fading with time and unclamped hyphae but otherwise rather featureless microscopically. The genus has been subsequently adopted for some hygrophoroid species one of which is from New Zealand, *Aeruginospora furfuracea*. The hyphae in this species are clampless and it does not possess pigmented spores, but they were described as “dextrinoid to faintly amyloid”. The pileipellis is not hymeniform. A phylogenetic analysis of collections fitting this description indicates the species belongs in *Camarophylloopsis* sensu stricto where it is closely related to the type species *C. schulzeri*. All available collections (not many) I have examined show an unusual reaction with Melzers. All the tissue, including the small spores, show intra- and extra-cellular material a distinct orange reaction which I would not call dextrinoid. It is however quite characteristic. Our species needs a recombination in *Camarophylloopsis*, which may not be true of other species placed in the genus.



<https://inaturalist.nz/observations/6878137>

JAC14651: [GS] Growing on a mossy bank beside a track in broadleaf-podocarp forest. Cap 20 mm across, grey with a rough surface, whitish at the margin. Stem and gills white. [JAC] Pileipellis an unclamped ixocutis (unlike the type description, but consistent with a re-examination of the type). Pileipellis with orange(dextrinoid?) amorphous extra-cellular material in Melzers, hyaline in KOH. Basidia with orange(dextrinoid?) crystalline material in Melzers, hyaline in KOH.



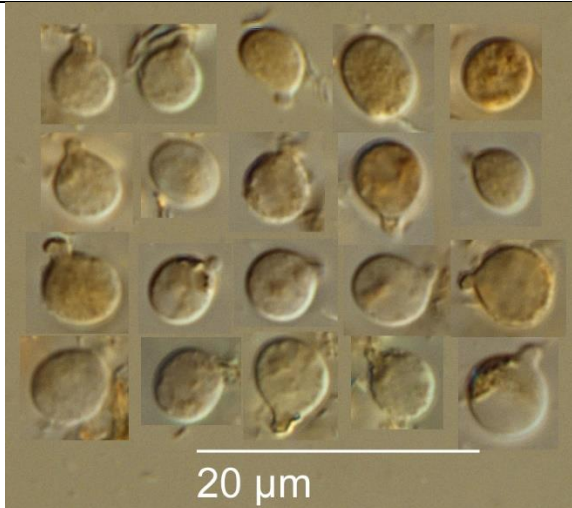
JAC14651 = PDD 106530 (© G. Smith)



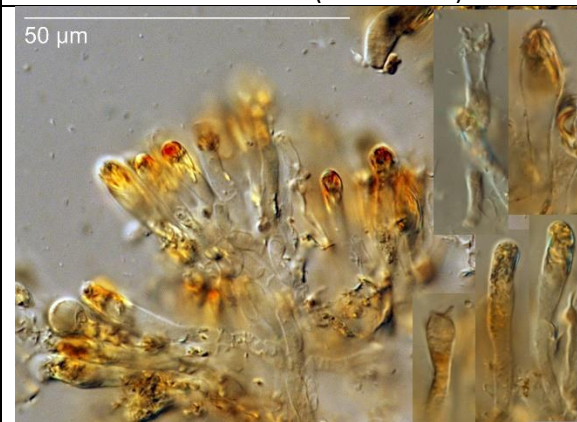
JAC14651 = PDD 106530 (© G. Smith)



JAC14651 = PDD 106530 (© G. Smith)



Spores 5.2 x 4.6µm



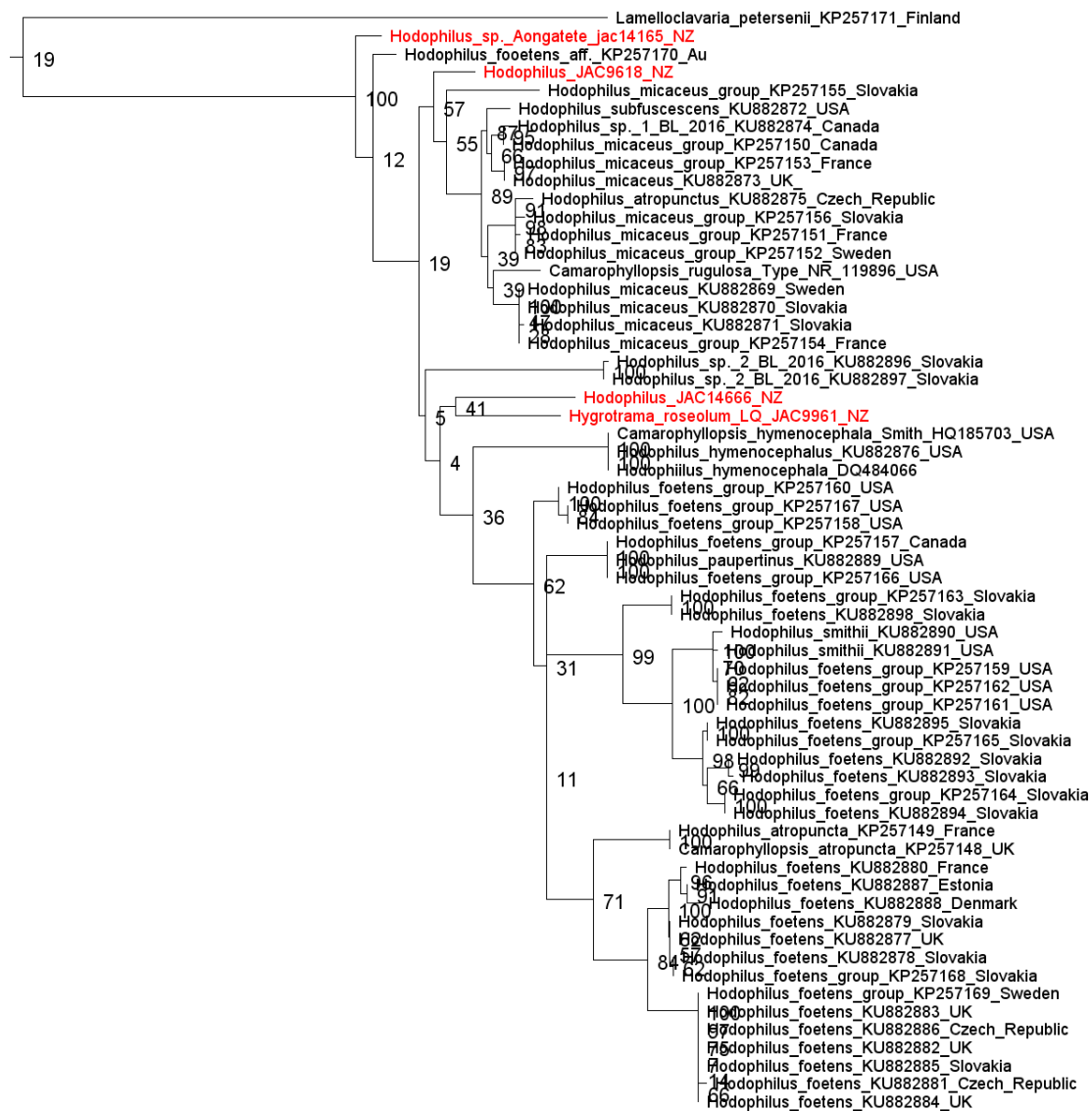
Basidia (Melzers)



ZT69/137 – Isotype of *Aeruginospora furfuracea*

## *Hodophilus* (syn. *Hygrotrama*) – Clavariaceae

*Hodophilus* is a recently resurrected genus separated from the wax-cap genus *Camarophylloopsis* (Birkebak & ..., 2016). *Hygrotrama* is a similar genus now treated as a synonym of *Hodophilus*. Somewhat surprisingly the sequence data for *Hodophilus* demonstrate the most closely related species are in the club-fungus genus *Clavaria*. *Hodophilus* has a hymeniform pileipellis, and of course inamyloid spores, which separates it from the superficially similar NZ species of *Dermoloma*. Many of the species often have a characteristic odour of naphtha (moth-balls).



## *Hygrotrama* (*Camarophylloopsis*) *roseolum*

A white species with pinkish hues on the cap and stem. This species needs a re-combination in *Hodophilus*, although support in the presented ITS tree is low. It has the characteristic odour of naphtha which was not noted by Stevenson (Stevenson, 1964) when she originally described it (in *Omphalina*).



JAC 9961= PDD 87064

JAC 9961= PDD 87064



Hymeniform pileipellis

*Hodophilus* sp. JAC9618

Naptha odour not noted for this collection. Unclamped hyphae, hymeniform pileipellis and spores often with pale brown pigment in KOH it is possible this species is also in Tasmania under the informal name *Camarphylopsis* 'brown' (Gates & Ratkowsky, 2016).



JAC 9618= 9618



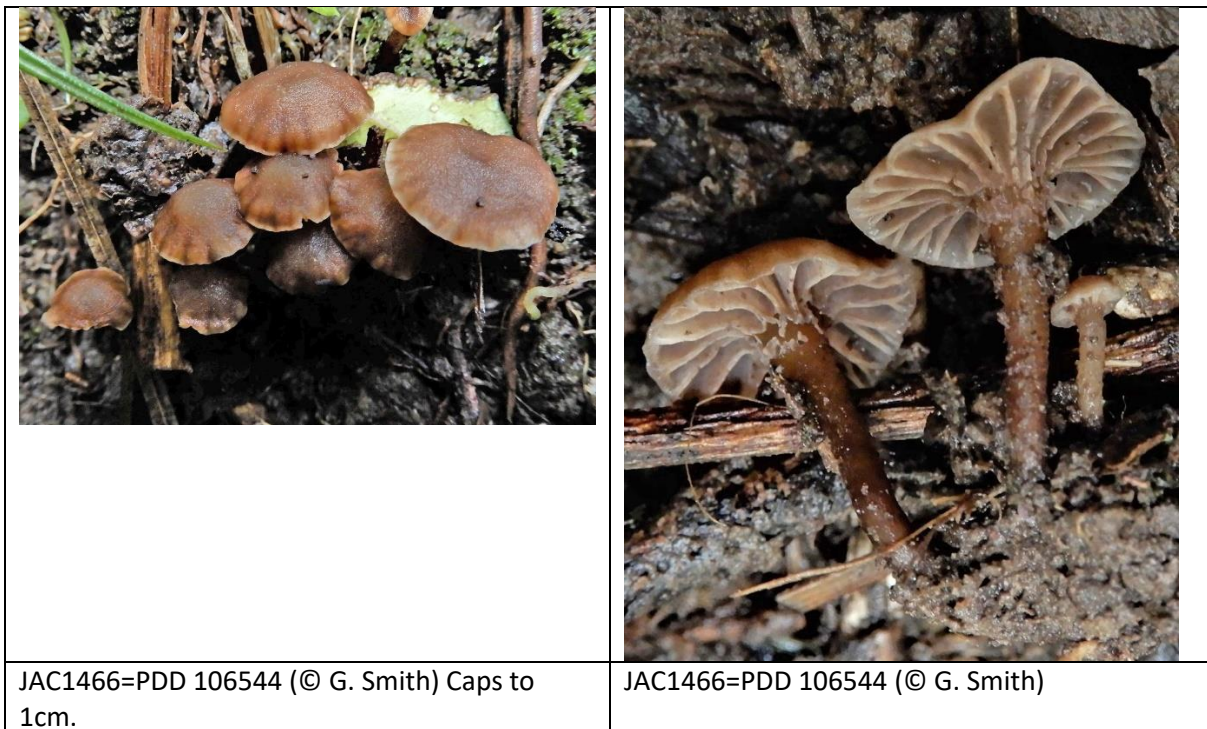
JAC 9618= 9618

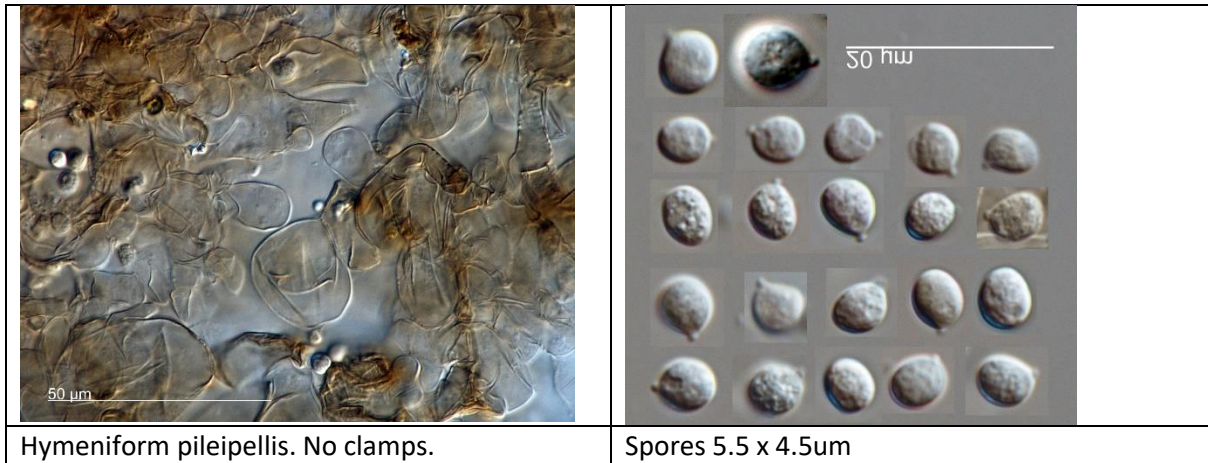


*Hodophilus* sp. JAC14666

This species (and *H.* sp. 'Aongatete ') both have strongly crenulate margins when young and require critical comparison with the Australian *Camarophylloopsis darwinensis* (Gates & Ratkowsky, 2016). That was described with pinkish hues.

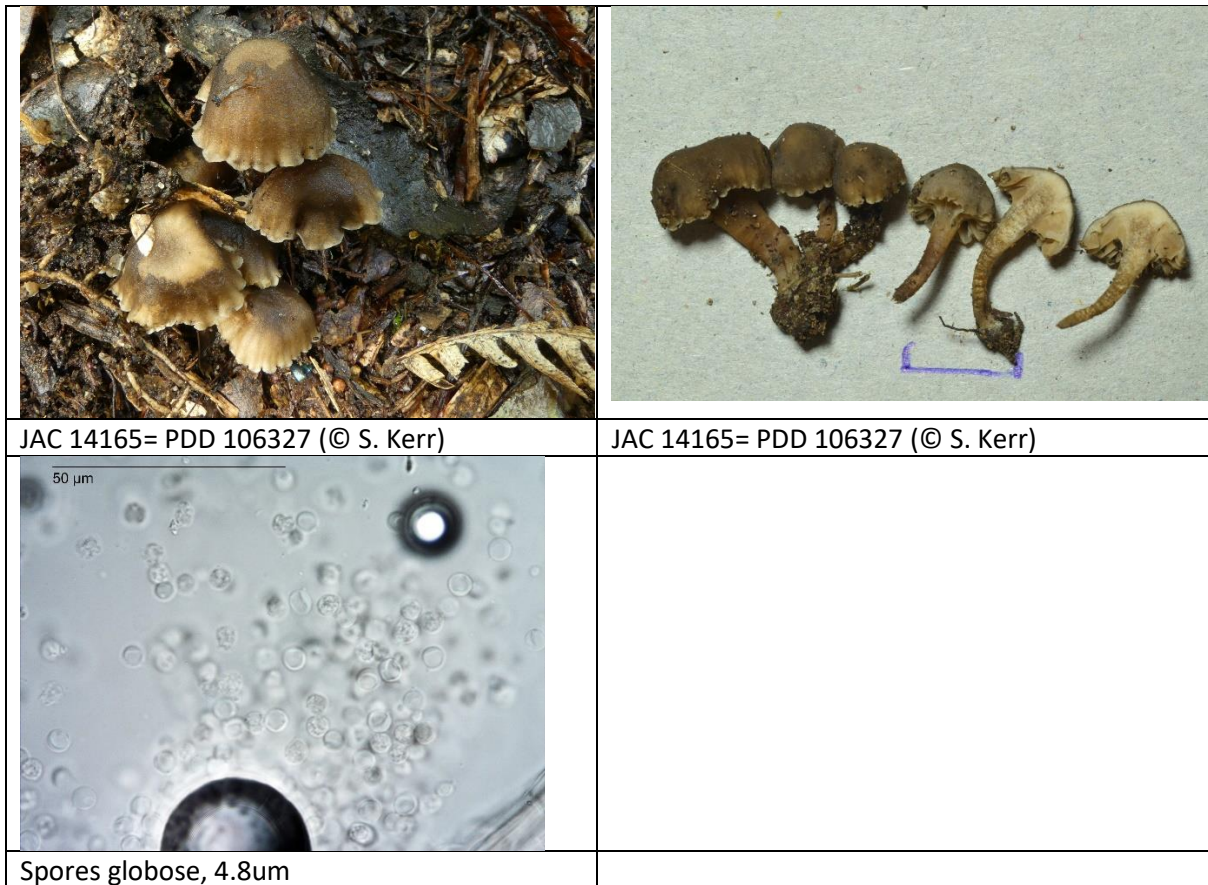
<https://inaturalist.nz/observations/7019435>





*Hodophilus* sp. 'Aongatete (PDD 106327)'  
 With the naptha odour, otherwise like JAC14666

<https://inaturalist.nz/observations/3573458>



Key to NZ genera of similar grey/brown, fibrous capped, waxy-gilled agarics

1	Pileipellis hymeniform	2
1'	Pileipellis not hymeniform (a cutis or trichoderm)	3
2	Spores amyloid (sometimes weakly or fleetingly). Clamp connections present. Without odour.	<i>Dermoloma</i>



2	Spores inamyloid. Clamp connections absent. Often with odour of naphtha.	<i>Hodophilus</i> (inc. <i>Hygrotrama</i> )
3	Spores amyloid. Clamp connections present.	<i>Porpoloma</i>
3	Spores inamyloid	4
4	Fruitbodies often bruising red/brown and drying dark. Tissue/spores not orange in Melzers. Clamp connections present (or rare).	<i>Neohygrocybe</i>
4	Fruitbodies not bruising red/brown and not drying dark. Tissue and at least some spores orange in Melzers. Clamp connections absent. If clamp connections present see <i>Cuphophyllus</i> or even the duller <i>Hygrocybe</i>	<i>Aeruginospora</i> ( <i>Camorphyllopsis</i> ) <i>furfurcea</i>

## Acknowledgements

I have become aware of many of the species because of the recent exponential growth of Citizen Scientists using the iNaturalist <sup>1</sup>website/app. As usual the annual FUNNZ <sup>2</sup>Foray provides useful collections. I am especially grateful to Wanda Daley [WMD in the text], Grey Smith [GS in the text], Clive Shirley and Shirley Kerr for their observations, photographs & specimens (deposited in the PDD national collection). Also thanks to Gen Gates (Tasmania), Teresa Lebel (the Royal Botanic Garden Melbourne, MEL), and the Royal Botanic Gardens Kew, K(M), for access to their collections. None of the work would be possible without the support and facilities of Manaaki Whenua – Landcare Research, and especially Duckchul Park and his sequencing skills.

## References

- Alvarado, P., & ... (2018). Pseudoclitocybaceae fam. nov. (Agaricales, Tricholomatineae), a new arrangement at family, genus and species level. *Fungal Diversity*, 90, 109-133.
- Antonin, V., & Noordeloos, M. (2004). *A monograph of the genera HEMIMYCENA, DELICATULA, FAYODIA, GAMUNDIA, MYXOMPHALIA, RESINOMYCENA, RICKENELLA, and XEROMPHALINA in Europe.*
- Birkebak, J., & ... (2016). Multilocus phylogenetic reconstruction of the Clavariaceae (Agaricales) reveals polyphyly of agaricoid members. *Mycologia*, 108, 860-868.
- Gates, G., & Ratkowsky, D. (2016). *A Field Guide to Tasmanian Fungi.*
- Henrici, A. (2012). Notes & Records. *Field Mycology*, 13(3), pp. 105-108.
- Horak, E. (1971). A Contribution towards the Revision of the Agaricales (Fungi) from New Zealand. *New Zealand Journal of Botany*, 9, 403-462.
- Horak, E. (1973). Fungi Agaricini Novaezelandiae I-V. *Beihefte zur Nova Hedwigia*, 43, 1-200.
- Miller, O., & Stewart, L. (1971). The Genus *Lentinellus*. *Mycologia*, 63, 333-369.
- Sanchez-Garcia, M., & ... (2016). Guyanagarika, a new ectomycorrhizal genus of Agaricales from the Neotropics. *Fungal Biology*, 120, 1540-1553.
- Singer, R. (1947). New Genera of Fungi. III. *Mycologia*, 77-89.

<sup>1</sup> <https://inaturalist.nz/home>

<sup>2</sup> <https://www.funnz.org.nz/forays>

- Singer, R. (1952). The Agarics of the Argentine Sector of Tierra del Fuego and limitrophous Regions of the Magallanes Area. *Sydowia*, 6, 165-226.
- Stevenson, G. (1964). The Agaricales of New Zealand : V. *Kew Bulletin*, 19, 1-59.
- Vizzini, A., & ... (2016). Pseudoporpoloma, a new genus for *Agaricus pes-caprae* (Agaricales, Tricholomataceae). *Phytotaxa*, 243(3), 271-280.