

## Mycological Notes - 32

### Notes on the Porotheleaceae of New Zealand

Jerry Cooper, November 29<sup>th</sup> 2016

Recently I've been adding trial keys to my journal on Naturewatch (<http://naturewatch.org.nz/journal/cooperj>) rather than writing 'Mycological Notes'. In the case of the Porotheleaceae I am discussing mainly undescribed (or at least unidentified) species in a poorly defined family with some poorly delineated genera, and it needs more than a Naturewatch Journal entry.

These are working notes and, as usual, were written primarily for my own use. Most of the species included in this note have sequence data that clearly aligns them with the family. Morphological examination and literature searches have been superficial. The collections require much better characterisation of micro-features and comparison with existing published treatments of the respective genera.

In their 2002 paper Moncalvo et al identified a well-supported clade they designated /hydropoid containing some species of *Hydropus*, *Gerronema*, *Megacollybia*, *Clitocybula* and *Porotheleum*. The family name Porotheleaceae is available for the group (Trogiaceae is invalid - IndexFungorum). For a while there seemed the possibility that sequenced material of *P. fimbriatum* (generic type) may have been misidentified and consequently Porotheleaceae not appropriate, but I believe the position of *Porotheleum* is correct. The family is placed within the sub-order Marasmiineae.

The family consists of a heterogeneous assembly of fungi with both agaricoid and reduced morphology (e.g. *Porotheleum*) and more recently other genera have been placed in the family (Matheny et al, 2006), including *Atheniella* (a segregate from *Mycena*) and the reduced *Henningsomyces*. Other genera have also been included such as *Phloeomana* (also separated from *Mycena*), the reduced *Rectipilus*, and agaricoid *Mycopan* (Wikipedia, Nov. 2016). The *Atheniella* group is represented in NZ by *A. adonis* and several congeneric undescribed white *Hemimycena*-like indigenous species. In ITS/LSU analyses this group is not included in the core hydropoid clade and further analysis is required. I have not included these *Atheniella* species here. The placement of *Mycopan* in the Porotheleaceae (Wikipedia) is probably based on a number of sequences labelled *Hydropus scabripes* (some as cf.) which may be incorrectly identified. NZ has an undescribed *Mycena* like species in this 'Mycopan' group (*Mycena* sp. '*Rangiwahia* (PDD 106087)'). The real *Mycopan* is probably represented by GenBank AF042635 which places the genus close to *Baeospora* and congeneric with our own *Pleurella ardesiaca* (which would provide an earlier generic name), and it sits within the Cyphellaceae, closely related to the Porotheleaceae (Dentinger et al, 2016). *Calyptella capula* may also belong in the Porotheleaceae according to a number of poorly supported published phylogenies.

*Delicatula* (type *D. integrella*) has been associated with the Porotheleaceae and used for NZ collections. Horak's *Delicatula dorothea* (based on Stevenson's *Resupinatus dorothea*) was accepted

by Segedin as a synonym of *Campanella tristis*, which re-examination of the type confirms. *Campanella* is not within the Porotheleaceae.

*Phloeomana speirea* may be present in NZ as an introduction, but requires sequence-based confirmation.

The genus name *Gerronema* has previously been used in a broad sense, but Scott Redhead (1986) narrowed the concept to species with a sarcodimitic construction. Unfortunately the type of the genus, *G. melanomphax*, is not yet sequenced and so we can't be certain it sits within the Porotheleaceae, but it seems likely.

Horak (1971) speculated that Stevenson's *Omphalina wellingtonensis* is a *Gerronema* (in a broad sense), but sequences of material matching Stevenson's concept are related to *Mycena acicula*, not related to *Gerronema*. Phylogenies indicate *M. acicula*, *Hemimycena lactea* (the generic type) & *Mycenella* spp are related but not congeneric with *Mycena* or even within the Mycenaceae but their familial placement remains unclear. They do sit within the Marasmiaceae and potentially may turn out to be within the Porotheleaceae when better data becomes available.

The genus name *Trogia* has frequently been applied to agaricoid fungi with the form similar to *Gerronema*. I am avoiding the use of this name, which was highlighted by Corner (1966). Corner's concept of *Trogia* was very broad (1966, 1991). However, my principle reason for ignoring *Trogia* is the issue of true identity of the type species (as either as *T. (h)aplorutis* or *montagnei*) and whether it sits within Porotheleaceae or not. Apparently Corner did not find/examine any generic type material and as far as I'm aware nobody has done so since Corner's treatments.

Corner's views, his taxonomic and nomenclatural practices, especially applied to the 'Cantharelloid fungi' (1966), were controversial and provoked considerable debate at the time (e.g. Reid, Dennis, Smith 1967). Corner's broad concept of *Trogia*, based on the presence of sarcodimitic tissue, brought together seemingly disparate groups like *Inflatostereum*, *Mycenella*, *Mycena* sect. *acicula* and *Hemimycena*. Smith believed this could not be justified on morphological grounds, arguing that relationships based on single micro-characters, like the presence of sarcodimitic tissue, provides no advantage over assembles based on other, perhaps more visible features. With today's knowledge of evolutionary relationships based on sequence data it is clear that Corner was much closer to the truth than many of his contemporaries accepted. As pointed out by Redhead (1987) the decision to lump them all into a single genus *Trogia* was the principle unfortunate decision. Redhead's 1987 review of agarics with sarcodimitic tissue shows the majority sit within what we now recognise based on sequence data, as the Physalcriaceae and Porotheleaceae (probably). With hindsight Corner's methods and contributions on tropical fungi (and the response of his contemporaries) must be viewed in the context of his unusual and fascinating war-time working environment (Corner, 2013).

A number of undescribed species of *Gerronema/Hydropus* have been collected in the Cook Islands (by Peter Johnston) which are related to those presented here. There are also a few records of this group of species from Australia (May et al, 2004), although all require critical re-examination and confirmation. Cleland's *Cantharellus granulatus* is probably a *Gerronema*. Fuhrer (2005) has a photograph of *Trogia straminea* in his guide book which is possibly the same as *Gerronema* sp. '*Pororari*' but it is not Corner's species.

Horak introduced the genus *Clavomphalia* for *C. yunnanensis* from China and has indicated the genus is represented in New Zealand (Horak, 2004), although no material is deposited in the national collection and no further species have been described. Horak noted a similarity between *Clavomphalia* and several species of *Trogia* sensu Corner, and so I am assuming it also sits within the Porotheleaceae, and sequenced collections are needed to clarify its position.

Stevenson's *Fayodia grisella* does seem to be a good species of *Clitocybula*, as recombined by Horak, although no material exactly matching the type has been found recently.

Stevenson's *Cantharellula fistulosa* was recombined as *Pseudoarmillariella fistulosa* by Horak. Both genera are now considered within the Hygrophoroid clade (Lodge et al, 2014) but *C. fistulosa* is probably more closely related to *Clitocybula/Hydropus* and is treated here in a key to NZ members of that genus. On the other hand Stevenson's *Cantharellula foetida* is morphologically and phylogenetically a *Pseudoclitocybe* and not within the Porotheleaceae.

*Hydropus* species usually have large cells (vesicles) in the cap or trama with brownish sap (and sometimes described with lactifers). Similar cells occur frequently in *Gerronema* and *Clitocybula*. Some species produce a clear fluid when fresh and cut. The concept of *Hydropus* adopted here is restricted to Singer's *Hydropus* section *Hydropus* subsection *marginelli* (with amyloid spores) and section *mycenoides* (with inamyloid spores) (Singer 1982). These groups seem separate in phylogenies.

Distinction of *Clitocybula* and *Hydropus* appears problematic. In several texts the two genera have been separated by pleurocystidia present in *Hydropus* but absent in *Clitocybula*. That distinction has been questioned and current sequence data is not conclusive. Further sampling and multi-gene analysis may support retaining the earlier *Hydropus* for both genera (or at least *Hydropus* section *Hydropus*). Here we use a macro-morphology basis for distinguishing the genera until more complete investigation and supported analyses have been carried out.

Amongst the reduced forms *Rectipilus sulphureus* has been recorded from NZ, but from the description of hairs with crystals perhaps more logically belongs with *Flagelloscypha/Lachnella*. The use of the name *Rectipilus fasciculatus* in NZ, with coiled hairs, is perhaps more closely related to *R. natalensis*.

The most surprising result of sequencing NZ collections was the appearance in this family of the species tagged here as *Marasmiellus* sp. 'Mt Fyffe'. Morphologically it has the appearance of a *Marasmiellus*, and the generic name is used for convenience. *Marasmiellus* is substantially polyphyletic and the type belongs in the Omphalotaceae. *Marasmiellus* sp. 'Mt Fyffe' requires a new generic name and its closest relative is the reduced *Porotheleum*. It is a species distinguished by piloid and cheilocystidia with a filiform extension and thick-walls. Horak noted this form in a number of species, although similar *Marasmiellus* species with filiform hairs (not thick-walled) are related to *Marasmiellus candidus* within the *Campanella/Tetrapyrgos* clade of the Marasmiaceae.

The Porotheleaceae appears to have no characters which uniquely define it, although the *Gerronema/Hydropus/Clitocybula* group are recognisable by form, through experience and many possess 'hydropoid vesicles' and sarcodimitic tissue. This group appears to be most common in the tropics and southern hemisphere. Within NZ it seems likely many more will be found.

Further details on all the collections may be found on the NZFUNGI2 and SCD websites of Landcare Research. As usual much of the material here has come from FUNNZ forays, and increasingly via Naturewatch observations. I am particularly grateful to @codfish (Wanda Daley) for interesting collections in this group.

A note on tag names. I use tag names of the form Genus sp. 'Place/Character (PDD1234)' to designate undescribed species. These tagged species have been found multiple times and have at least ITS sequences. The PDD number in these tag names designates a pseudotype collection, ie. A named collection to pin down the use of the name until it is formally described with a holotype. Collections named with the form JAC1234 are also usually sequenced, but without multiple collections to narrow down the morphological boundaries.

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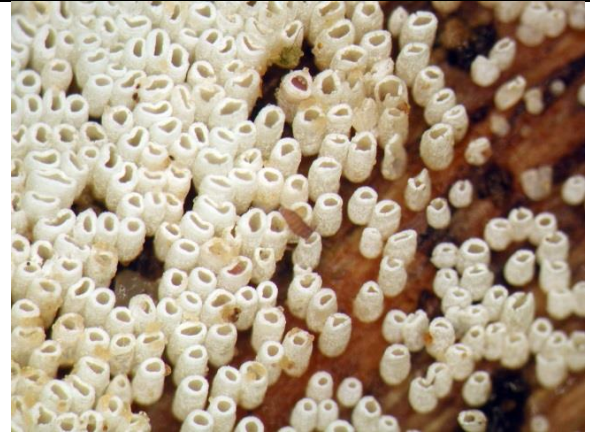
## Preliminary Key to species in NZ Porotheleaceae

1	Frb reduced	2
1'	Frb agaricoid	6
2	Frb seated on an obvious stroma	Porotheleum fimbriatum
2'	Frb without stroma, or stroma thin, cobwebby	3
3	Hairs branched, frbs isolated	4 Henningsomyces
3'	Hairs unbranched, frbs confluent	5 Rectipilus
4	Spores subglobose	Henningsomyces candidus
4'	Spores allantoid	Henningsomyces JAC9814
5	Hairs straight (probably doesn't occur in NZ)	Rectipilus fasciculatus
5'	Hairs coiled	Rectipilus natalense
6	Spores amyloid (sometimes weakly so)	15
6'	Spores inamyloid	7
7	Frb marasmioid/mycenoid	8
7'	Frb omphalinoid/cantharelloid	11
8	Frb marasmioid. Pilo and cheilocystidia thick-walled and filiform extension	'Marasmeillus' sp. 'Mt Fyffe'
8'	Frb mycenoid. Without filiform cystidia	9
9	2-spored, introduced, on twigs, without metuloid cystidia	Phloeomana speireae
9'	4-spored, stem shorter, indigenous habitats, with metuloid cystidia. Stipe white, translucent	10 Hydropus section Mycenoides
10	Cap umbonate to papillate, brown to olivaceous.	Hydropus 'Kaituna Valley'
10'	Cap conical, white with radial brown streaks	Hydropus funnebris
11	Encrusting pigment on pileus hyphae green in KOH (no collections)	Clavomphalia sp.
11'	Pigment intracellular. Some tissue sarcodimitic.	12 Gerronema
12	Frb densely clustered, thick, rubbery, violaceous, with aniseed odour	Gerronema waikanaiensis
12'	Frb otherwise. Cap deeply umbilicate	13
13	Spores globose, < 5µm	Gerronema JAC14072
13'	Spores ellipsoid, > 7µm	14
14	Cap edge entire	Gerronema 'Howick'
14'	Cap edge fimbriate to lacerate (perhaps 2 species)	Gerronema Pororari'
15	Cap always umbilicate. Spores usually weakly amyloid	16 Clitocybula
15'	Cap convex or flat. Spores strongly amyloid.	19 Hydropus section Marginelli
16	Gill sinuate, not intervenose, stipe base with radiating fibrils	17
16'	Gills decurrent, intervenose, stipe base without radiating fibrils	18
17	Stipe 2-3 cm long	Clitocybula grisella
17'	Stipe < 2cm (= C. grisella?)	Clitocybula JAC9979
18	Cap deeply infundibuliform. Spores < 7µm long.	'Cantharellula' fistulosa
18'	Cap centrally depressed. Spores > 8µm long.	Clitocybula JAC12352
19	Stipe base with radiating fibrils (see also C. JAC9979). Stipe white/cream	Hydropus 'Kennedys Bush'
19'	Stipe base without radiating fibrils. Stipe dark, contrasting with white gills	Hydropus marginellus cf.





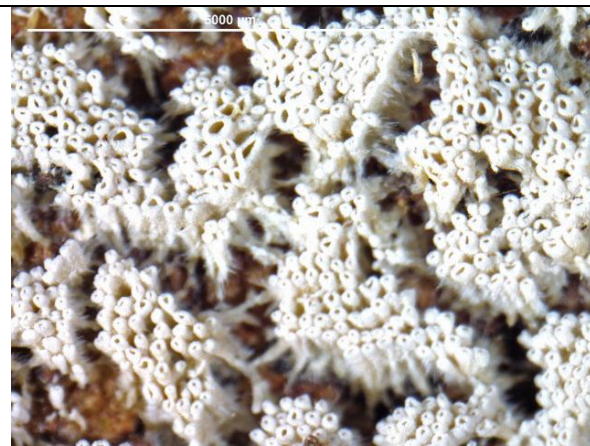
Henningsomyces JAC9814



Henningsomyces candidus



Rectipilus fasciculatus



Rectipilus natalense (dried)



Marasmiellus sp. 'Mt Fyffe (PDD 96142)'



Gerronema waikanaiensis

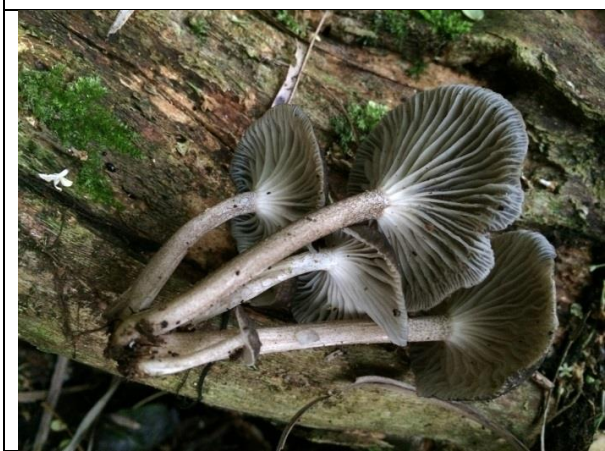




Gerronema JAC14072 (W. Daley)



Gerronema JAC14072 (W. Daley)



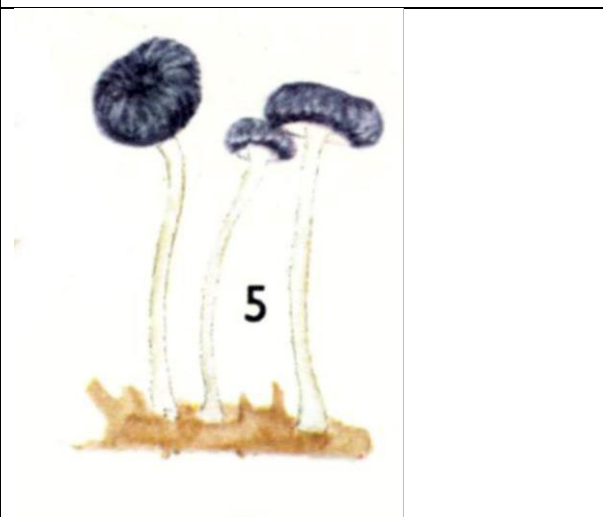
Gerronema sp. 'Howick (PDD105913)' (W. Daley)



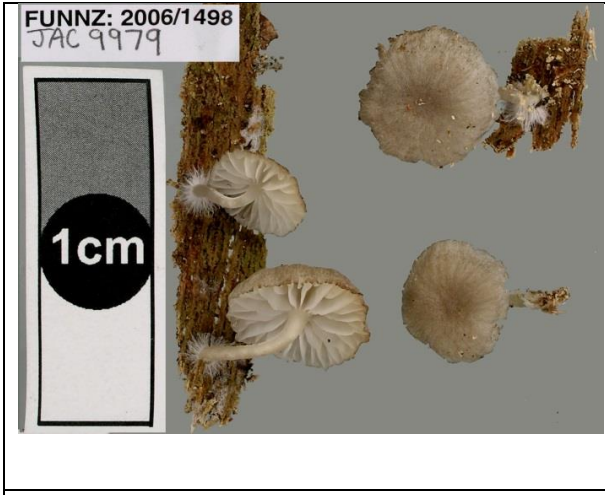
Gerronema sp. 'Howick (PDD105913)' (W. Daley)



Gerronema sp. 'Pororari (PDD87079)'



Clitocybula grisella



Clitocybula JAC9979



'Cantharellula' [Clitocybula] fistulosa



Clitocybula JAC12352



Hydropus funebris



Hydropus sp. 'Kennedy's Bush (PDD86896)'



Hydropus sp. 'Kaituna Valley (PDD 86984)'





*Hydropus marginellus* cf.

# ITS RaXML Tree

