Mycological Notes 1 - Frost-Flat Fungi

Jerry Cooper, June 2012, FUNNZ

During the 2011 Taupo foray I made a brief excursion to the Rangitaiki Reserve off the Napier road. The reserve is a good example of an old tephra plain, or frost-flat, and of national significance as a historically rare ecosystem. These ecosystems were identified as the result of research involving ecologists, botanists and entomologists, but no input from mycologists! So, are there fungi in such places and are they characteristic of these ecosystems?

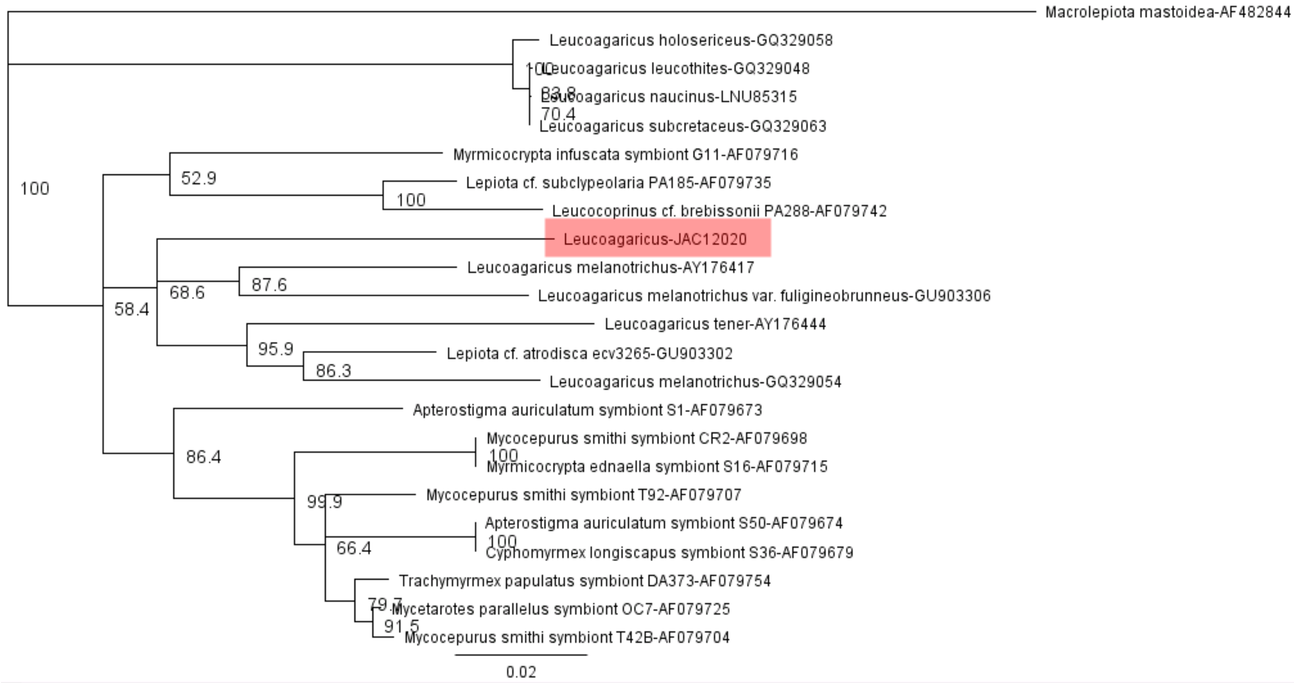
I spent about an hour and collected thirteen fruitbodies in the frost-flat reserve. Here's a selection of some of them.

Pholiota 'jac1101'

I believe this is undescribed. I've found it a number of times, always in damp moss, away from forests, but in habitats as diverse as this alpine area, and the few remaining lowland bryophyte-rich tea-tree patches on the Canterbury plains. Morphologically it might be mistaken for a *Cortinarius* but is clearly a *Pholiota*. That's odd because the majority of *Pholiota* species are associated with dead wood, or at least forest environment. In the northern hemisphere there is a similar exception, *P. henningsii* and its allies in subgenus flammuloides (Holec), which are associated with moss/sphagnum. However sequence data places this *Pholiota* it close to our very own *P. multicingulata* which grows on wood and debris in forests. Perhaps is a local adaptation to a simlar niche.

Leucoagaricus aff. melanotricha

Leucoagaricus is a genus of lepiota-like fungi distinguished from similar genera, in general, by having dextrinoid spores and unclamped hyphae. They generally occur as single fruit bodies in the forests and are quite fragile, except the common *Leucoagaricus leucothites* which is uncharacteristically large, all white and clearly introduced (and sequences suggest should be placed in a different genus). New Zealand has quite a number of undescribed small indigenous *Leucoagaricus* species. In this frost-flat collection the cap turns green with ammonia solution and the gills dry a dark red colour similar to a number of NZ species. The ITS sequence place this in a group containing sequences labelled *L. melanotricha* and *L. tener*, which do not share those features. Interestingly the sequence is also close to a number of sequenced isolates of symbiotic fungi associated with 'attine' ants. Certain ant groups, similar to termites, maintain fungus farms for food processing. I'm not aware of any such reported associations in New Zealand.



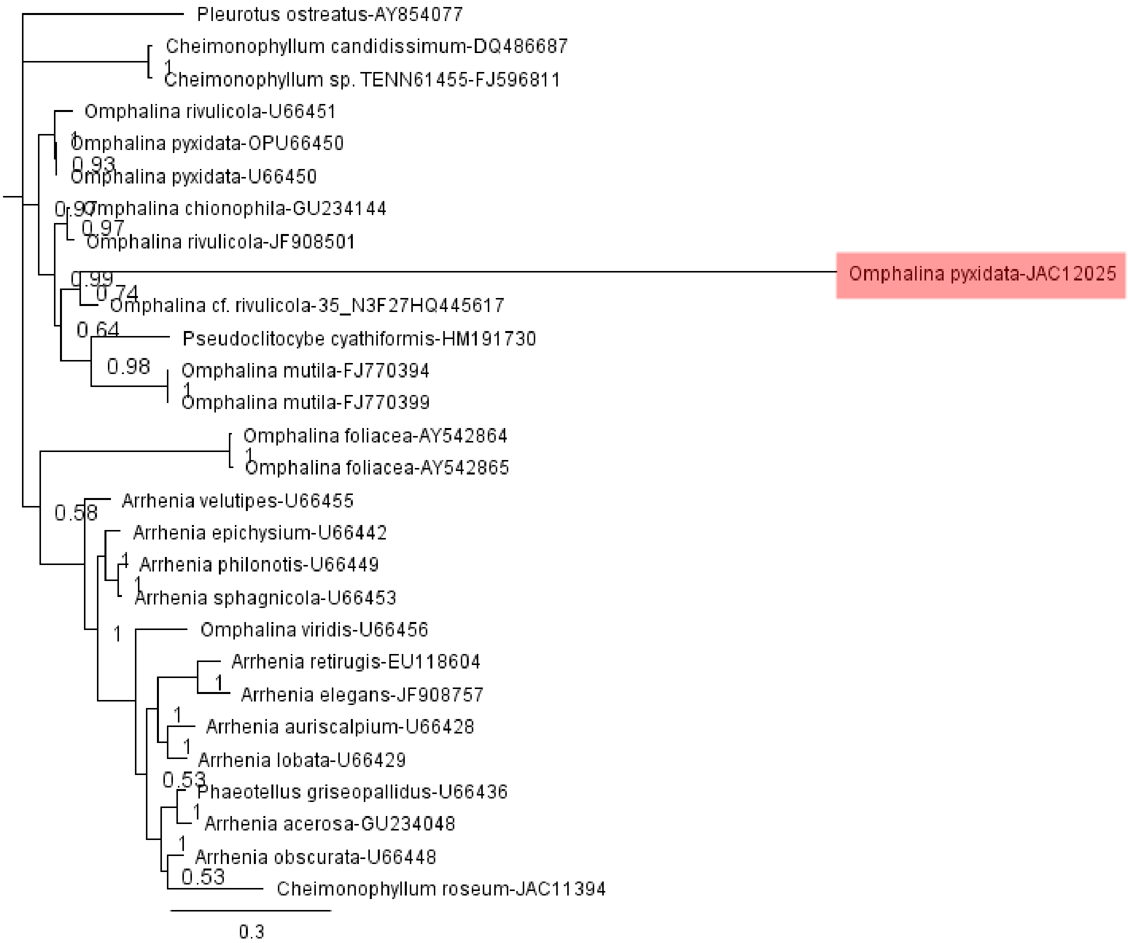
ITS Tree indicating position of *L. c.f. melanothrichus*

Echinoderma c.f. aspera

Another genus of lepiotoid fungi. This is possibly *Echinoderma aspera*, or at least NZ records referred to *E. aspera* (=*Lepiota aspera*).

Omphalina c.f. pyxidata

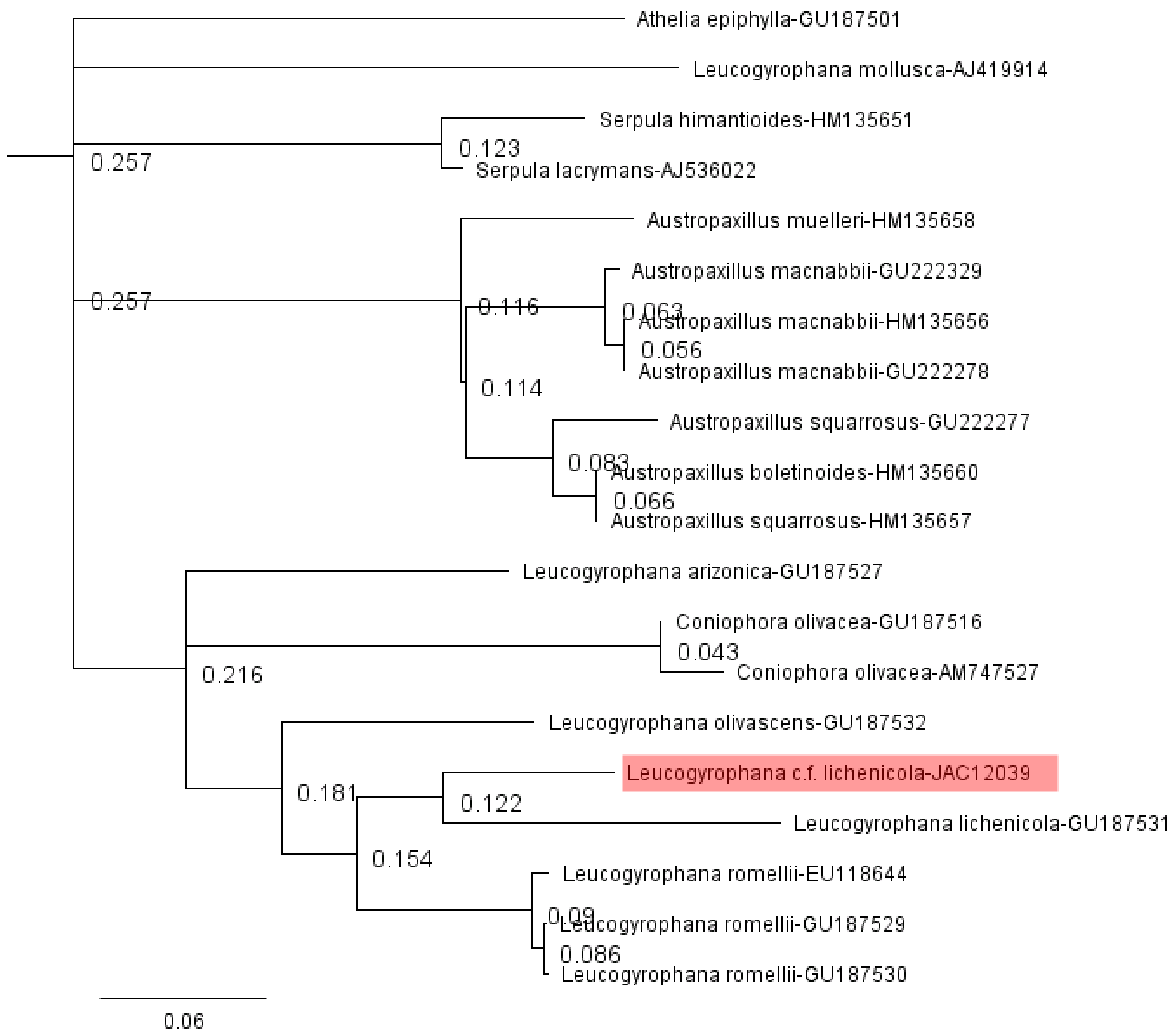
Always associated with mosses (muscicolous), and until recently this was a 'lost' member of our mycota having not been recorded since Colenso's time. The sequence of this collection place this in a group containing Genbank material deposited as *O. pyxidata*, *O. rivulicola* and *O. chionophila*. The latter has a known circumpolar/alpine distribution (Lamoure). These are the true Omphalinas (and all muscicolous) unlike a number of morphologically similar alpine/circumpolar species now known to be basidiolichens and placed in the genus *Lichenomphalia* (e.g. see Geml).



ITS tree showing position of NZ *Omphalina c.f. pyxidata*

Leucogyrophana c.f. lichenicola

I collected what I thought was a truffle but microscopic examination showed no spores or other features allowing me to identify it. The truffle-like bodies are best considered to be ‘sclerotia’, i.e. a dormant and persisting resting stage. A number of fungi produce such bodies, often as a consequence of environmental stress such as drought. A sequence provided a surprising answer to its identity. It comes out in a clade (Coniophoraceae) with *Coniophora*, *Hygrophoropsis* and *Leucogyrophana,* that clade having affinities to the boletoid group containing *Serpula*, the causal agent of dry-rot, and our own *Austropaxillus*, mycorrhizal with beech. The sequence indicates these are the sclerotia of a *Leucogyrophana* close (but not identical) to *L. lichenicola* (see Diedrich, Lowrie). This is a corticioid (paint-splash) fungus growing on the undersurface of lichens such as *Cladonia* and *Stereocaulon* in northern boreal regions. It also produces sclerotia – bright orange ones. Presumably the paint-splash form of our undescribed species will found associated with the numerous lichens at Rangitaiki. I wasn’t looking for lichenicolous fungi. There’s a reasonable chance this fungus is specifically alpine.



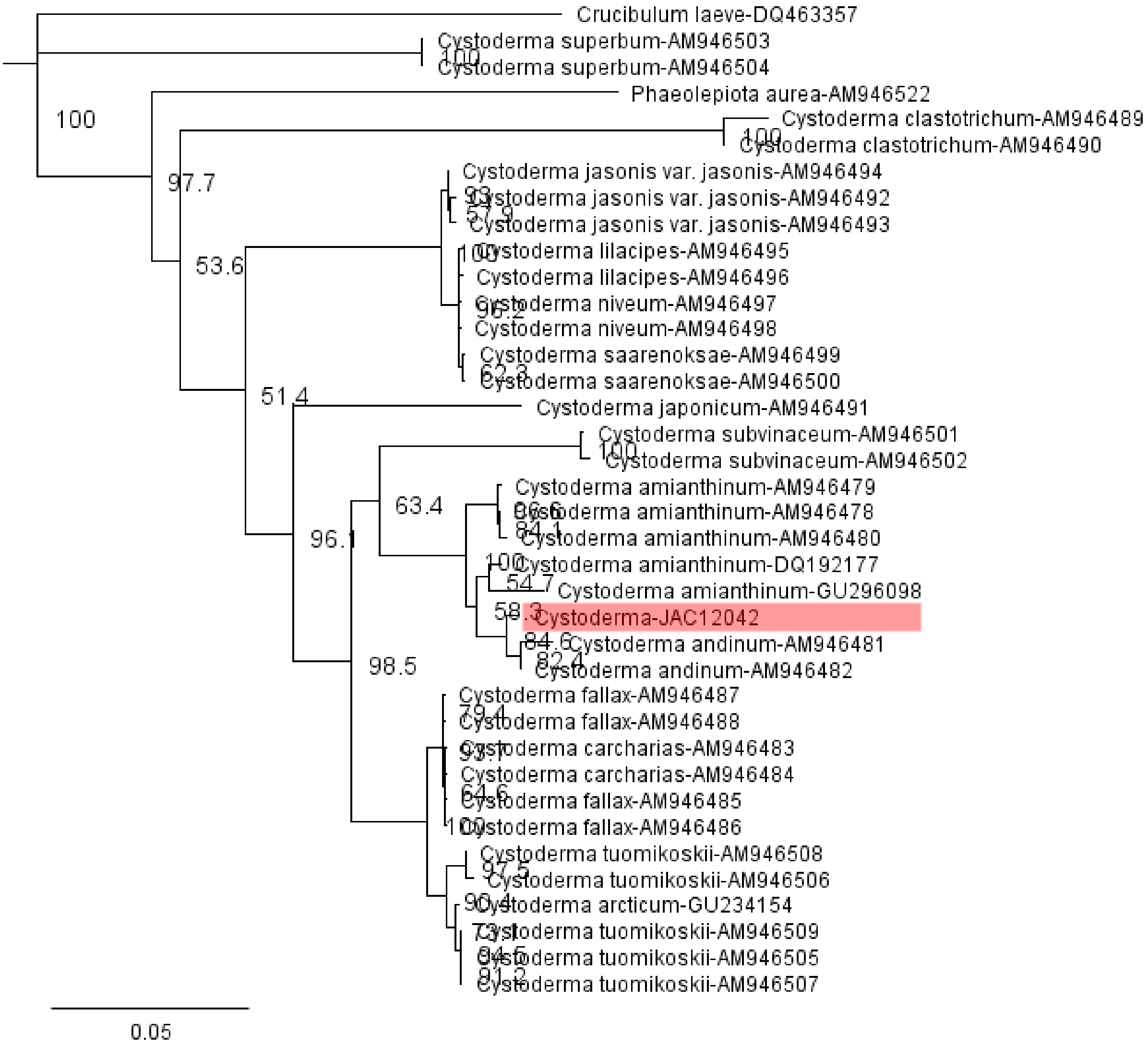
Athelia epiphylla-GU187501
Leucogyrophana mollusca-AJ419914
Serpula himantioides-HM135651
0.123
Serpula lacrymans-AJ536022
0.257
Austropaxillus muelleri-HM135658
Austropaxillus macnabbii-GU222329
0.257
0.116
0.063
Austropaxillus macnabbii-HM135656
0.056
Austropaxillus macnabbii-GU222278
0.114
Austropaxillus squarrosus-GU222277
0.083
Austropaxillus boletinoides-HM135660
0.066
Austropaxillus squarrosus-HM135657
Leucogyrophana arizonica-GU187527
Coniophora olivacea-GU187516
0.043
Coniophora olivacea-AM747527
0.216
Leucogyrophana olivascens-GU187532
Leucogyrophana c.f. lichenicola-JAC12039
0.181
0.122
Leucogyrophana lichenicola-GU187531
0.154
Leucogyrophana romellii-EU118644
0.09
Leucogyrophana romellii-GU187529
0.086
Leucogyrophana romellii-GU187530
0.06

Pulvinula miltina

Looking like *Aleuria aurantia*, the orange peel fungus, but differing microscopically. It was originally described from material collected by Colenso north of Hawke's Bay but more recently reported from Australia, Central America and UK. *Pulvinula* species are often associated with moss, calcareous and burnt ground. Incidentally the frost-flats are thought to be a fire-adapted system.

Cystoderma c.f. andinum

Egon Horak believes there are at least 4 species in New Zealand and *Cystoderma* are often associated with alpine areas. This collection is not the endemic *C. carcharias* which is widely distributed throughout New Zealand. The cap does not have the characteristic layer of arthrospores of that species and the amyloid basidiospores are large at 6.4 x 3.6µ. It's possible that NZ material labelled *C. amianthinum* or *C. muscicola* is this. The latter Australian species is separated from the former by larger basidiospores by Wood but Wasser in his revision of Russian/N. Europe material accepts a much broader concept of *C. amianthinum*. Recent published sequence analysis by Saar et al indicates considerable species-level diversity. A sequence of this collection from the frost-flat places it distant from *C. clastotrichum*, and *C. amianthinum* and closely related to the recently described *C. andinum* from Ecuador. Thomas Laesso collected that species in the alpine Ecuadorian Paramo ecosystems. This is also an alpine tundra ecosystem. The Paramo system has a different community of locally adapted plants, but perhaps the fungi in these two habitats share a closer evolutionary history than the plants – fungal spores travel more easily than plant seeds.



Conclusions

These alpine tree-free regions are actually very rich in fungi, with a significant probability at least some fungi are specifically adapted to the environmental conditions of this high elevation ecosystem. They are probably playing unexplored and interesting roles and some may even be rare species without us even realising they are there at all.

Recognising habitats with unique mycological diversity is a challenge as most species are not easy to recognise without specialist knowledge and so many fungi remain 'data-deficient'. The UK has an interesting case in point. In the UK the pink waxcap *Hygrocybe calyptraeformis* is an easily recognised wax cap and originally known from just a few grassland sites. Because of that restricted distribution it was listed for conservation surveillance and a Biodiversity Action Plan (BAP) prepared which required on-going surveying (Spooner & Roberts). The increased survey data provided the evidence for the formal recognition and means of legally protecting examples of a class of unimproved grassland which is rich in a unique assemblage of wax-caps and other grassland fungi. Such sites would not have been considered special on the basis of their plant communities alone, and protected sites include some surprising areas such as old cemeteries and the lawn of Charles

Darwin's Down House in Kent. Of course UK field mycologists had known about the special nature of 'wax cap grasslands' for as long as there have been field mycologists.

Are there such unique fungal assemblages in New Zealand's ecosystems? We don't know because we don't look. We lack the rich natural history heritage of the UK and there remain few field mycologists amongst our relatively low population. Personally I am aware of unique assemblages associated with lowland podocarp remnants on the Bank's Peninsula (which includes *Macrocystidia reducta*), and fungi associated with remnant patches of kowhai and tea-tree on the Canterbury plains, patches which are rapidly disappearing through land-use change to dairy farming. However, such observations by individuals based on serenipitous observation of fungal fruitbodies must remain anecdotal.

Ecosystems contain more than plants and it's a certainty some ignored organisms are doing important things - and they are frequently just as pretty and noticeable as plants! We now have rapidly improving molecular methods for characterising and monitoring these hidden kingdoms in the natural environment. We should start using them to provide the evidence base we need to recognise our own equivalents of the 'wax cap grasslands'.

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