

Sequencing the forays

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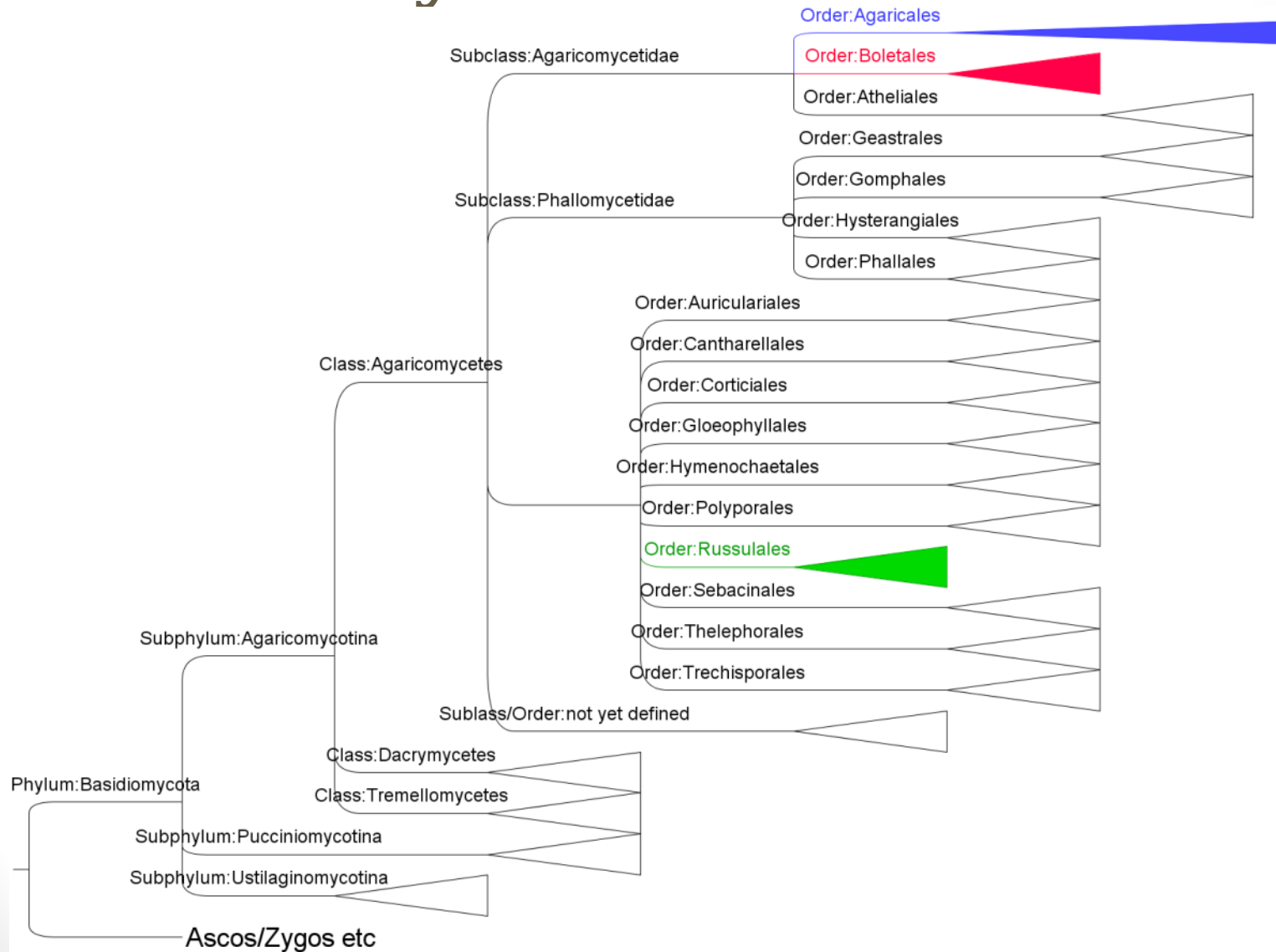
Landcare Research

Acknowledgements to Rebekah Fuller & FUNNZ forayers

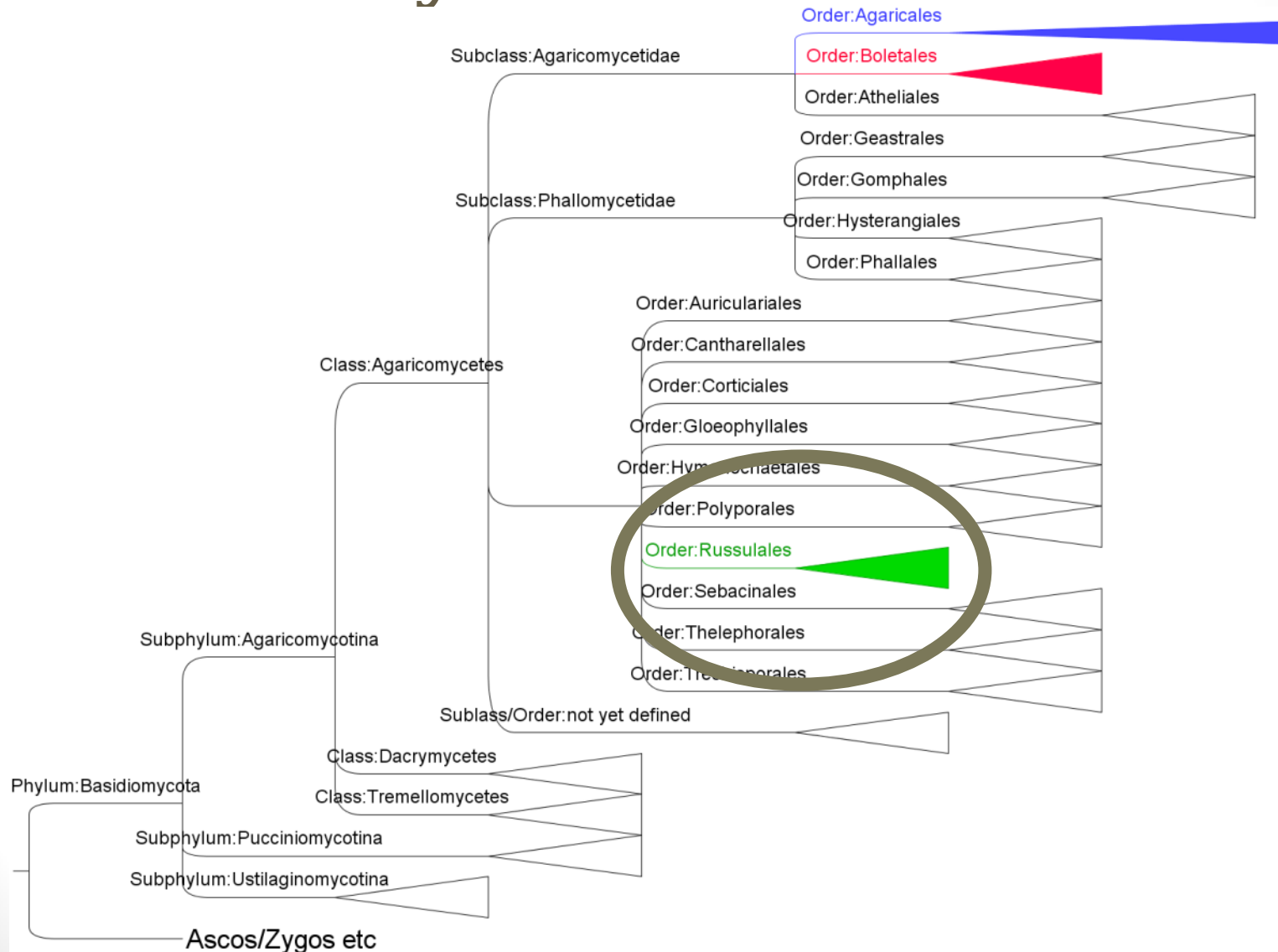
Sequencing foray collections – why?

- Data for prioritised, **photographed and annotated vouchers** ...
 - to support the interpretation of environmental sequences
 - from ecological studies, especially ectomycorrhizal fungi
 - eventually the monitoring of threat listed fungi
 - to support naming new species, and associated phylogeny and biogeography
 - we have names for just 20% of the estimated 35,000 NZ fungi
 - the priority is commonly encountered groups
 - Our focus is Russula/Lactarius, Tricholoma+, Gymnopus+, Mycena+, Hydropoid (porotheniaceae), Lepiota+
 - > 1000 sequences – some in Genbank – rest will get there eventually

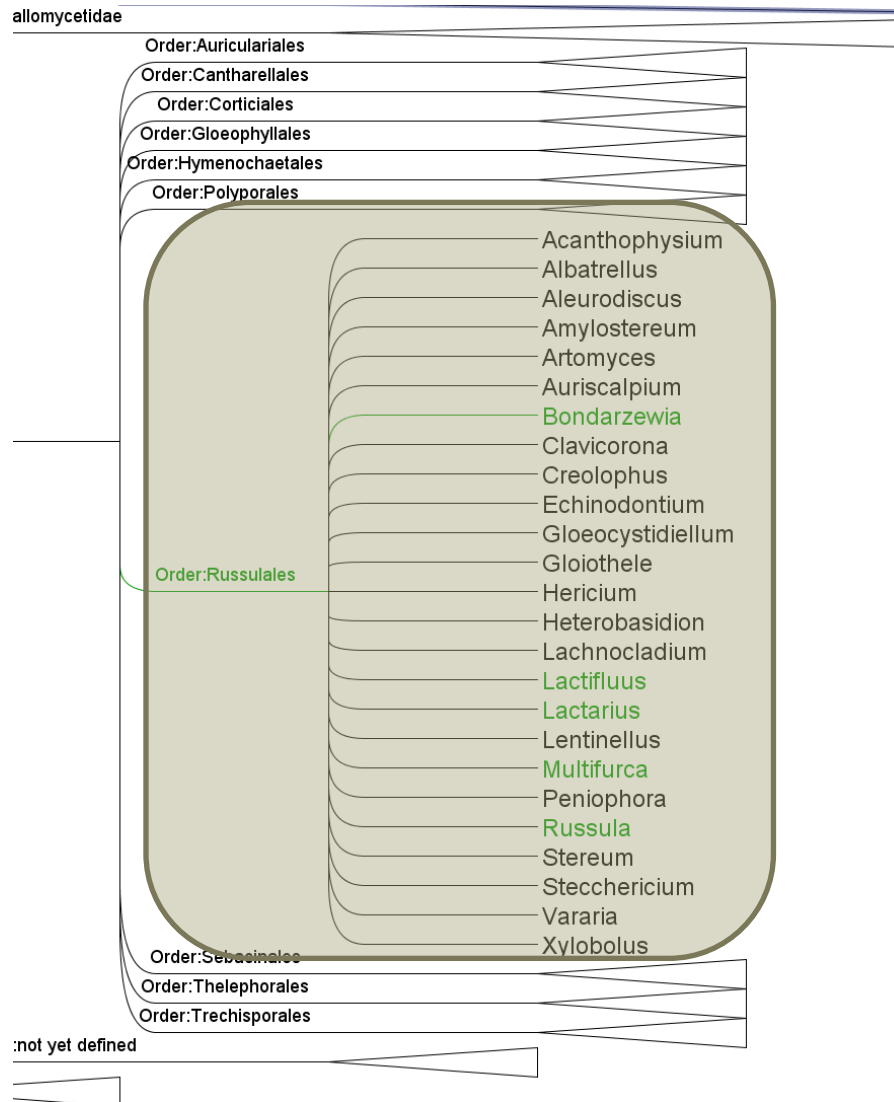
Basidiomycete classification



Basidiomycete classification



Russulales

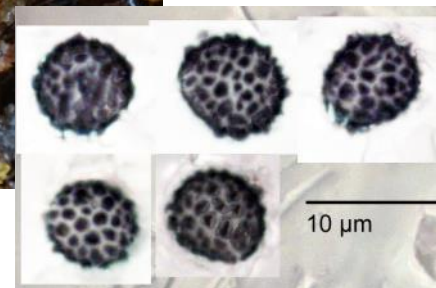


... NZ revision of Russula, Lactifluus & Lactarius will be published soon-ish

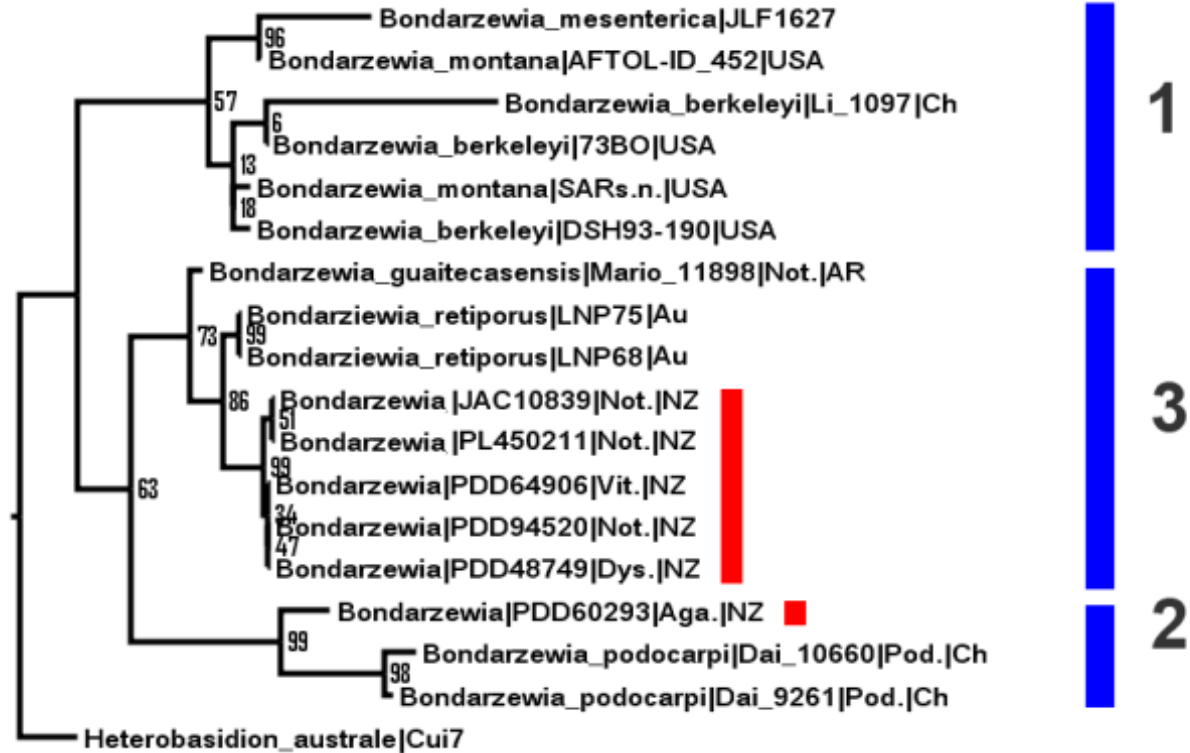
Bondarzewia 'berkeleyi' in NZ



Large polypore at the base of live trees of *Nothofagus*, *Agathis*, *Vitex*, *Dysoxylum* and many other trees.



ITS+LSU



1) The real *Bondarzewia berkeleyi* is not in NZ

2) Chinese *B. podocarpus*

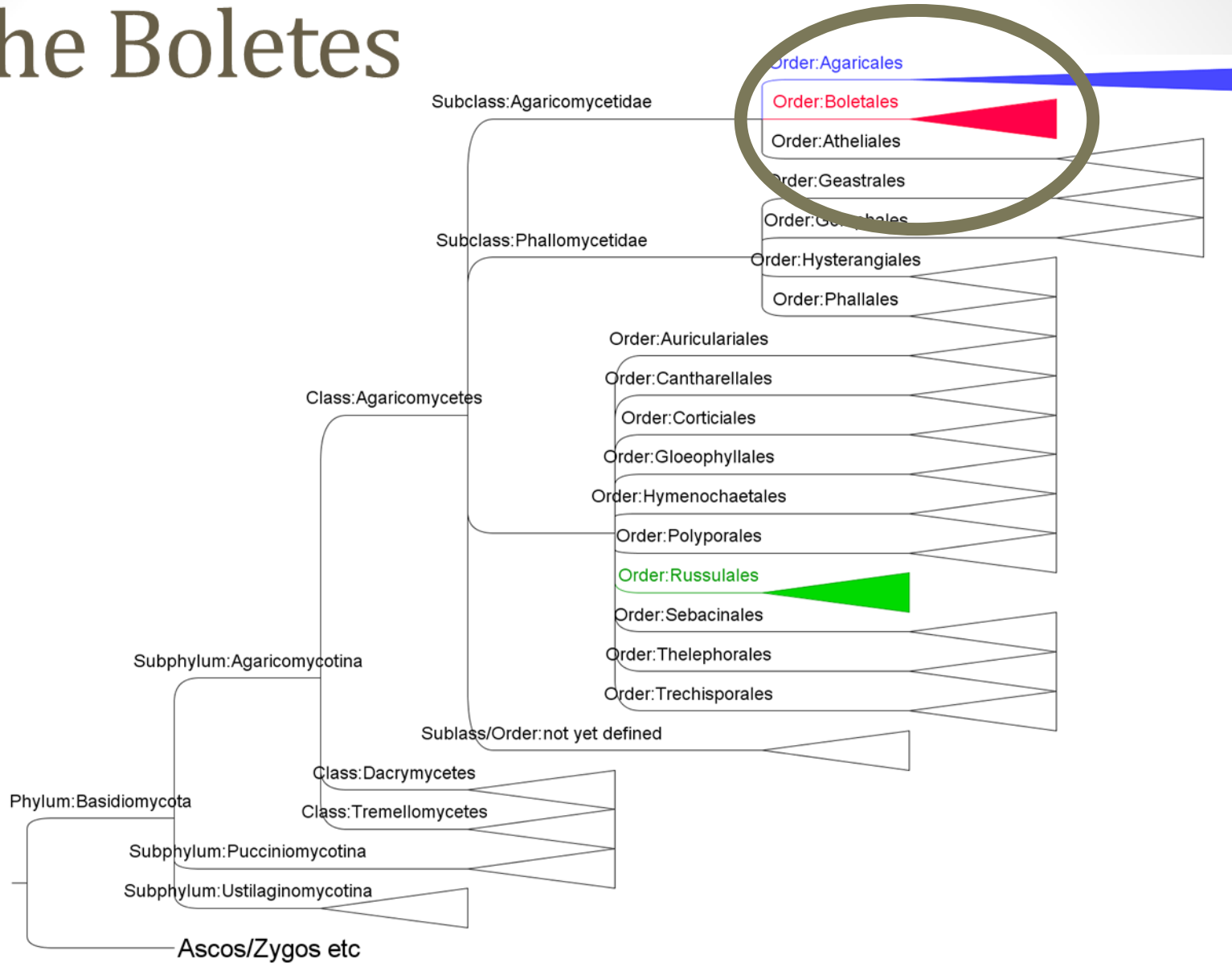
+ New Zealand *B. proprius* (Lloyd) comb. ined. with gymnosperms

3) Argentine *B. guaitecasensis*,

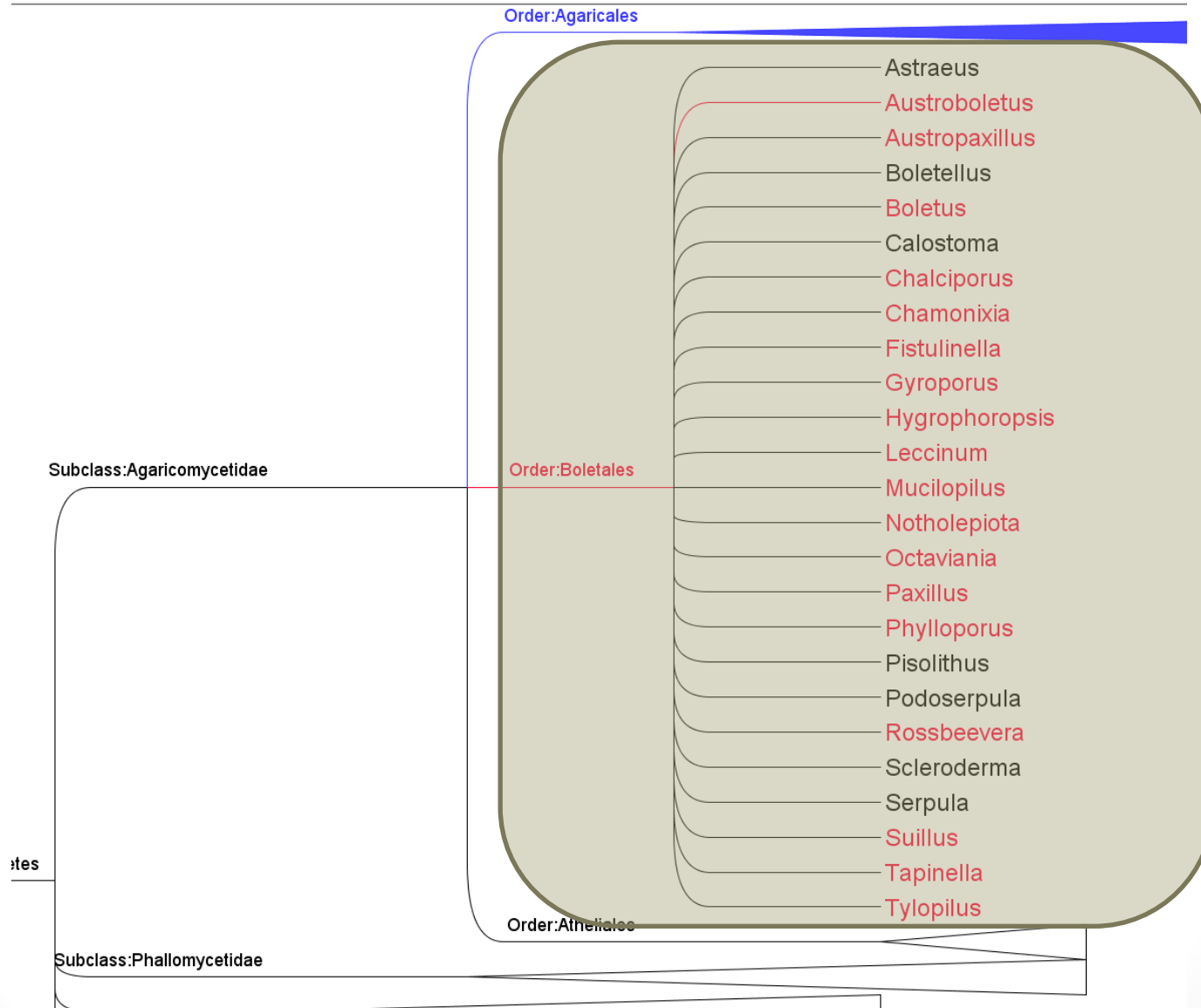
+ Australian *B. retiporus* (Cooke) comb. ined. [data courtesy Matt Barrett]

+ New Zealand *B. noname* sp. nov. with *Nothofagus* and various woody angiosperms

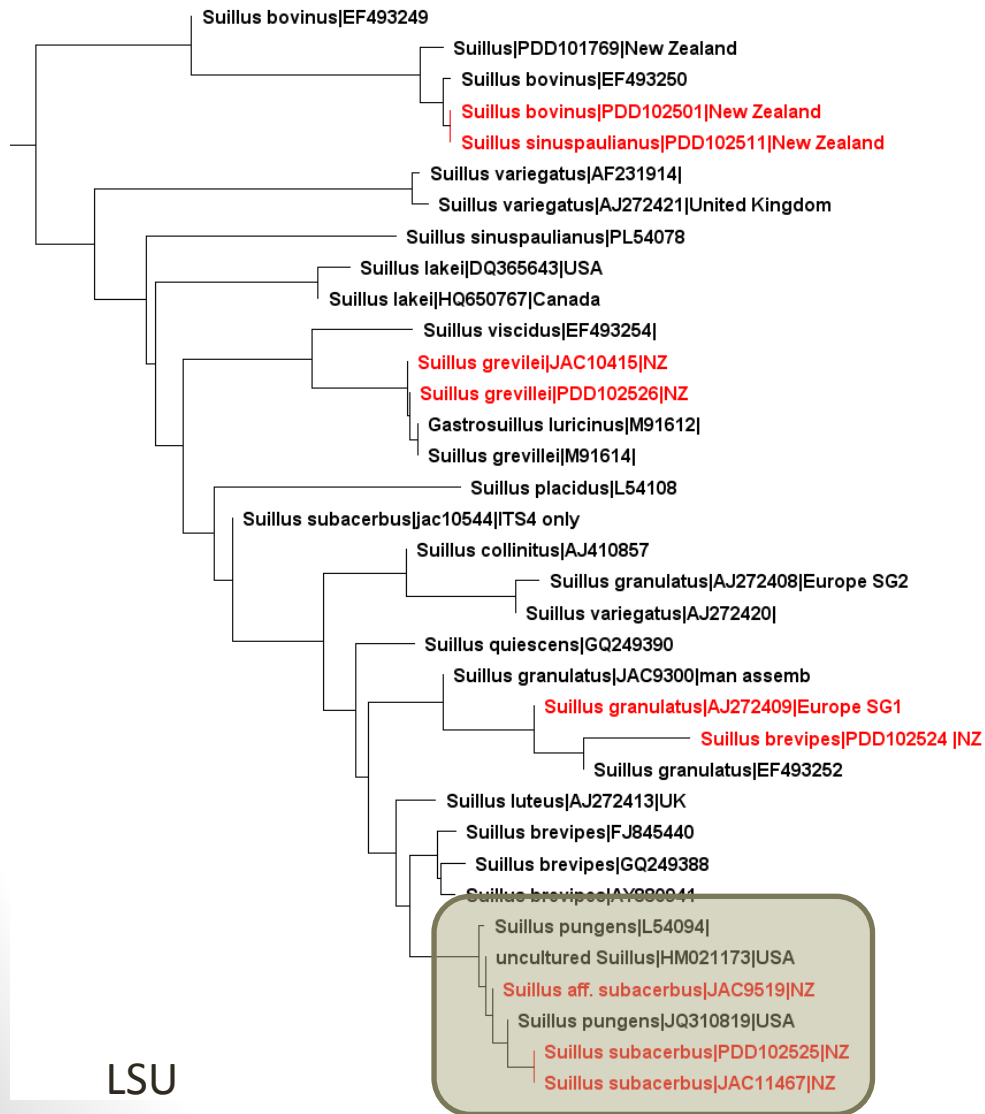
The Boletes



The Boletes



Suillus (introduced)

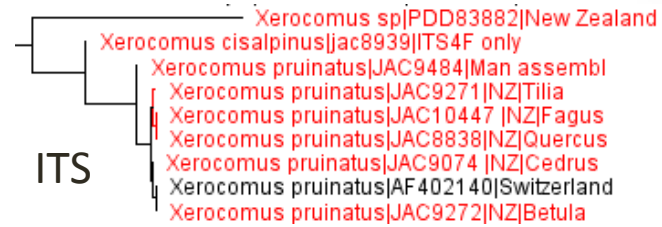
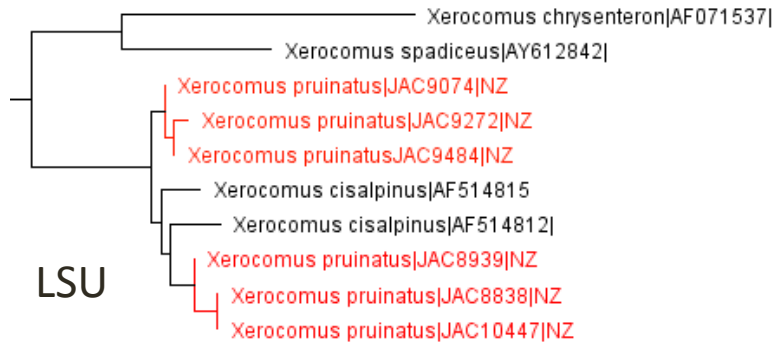


Suillus subaccerbus McNabb 1968
= *S. pungens* Thiers & Smith 1964

Many more NZ Suilli to sort out



Xerocomus pruinatus complex (introduced)

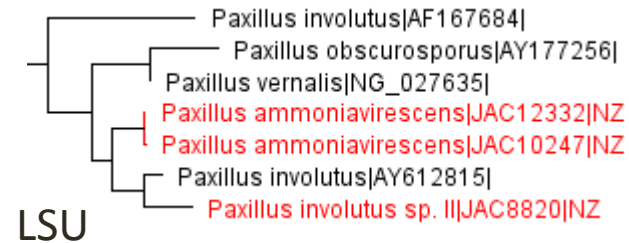
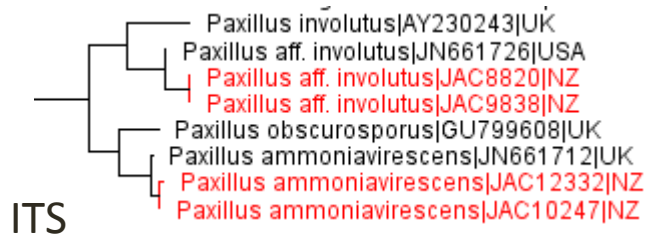


Big morphological variation and little sequence difference within *X. pruinatus/cisalpinus*

Like *B. edulis* it doesn't care what ECM host ... *Tilia*, *Fagus*, *Quercus*, *Cedrus*, *Betula*



Paxillus involutus complex (introduced)



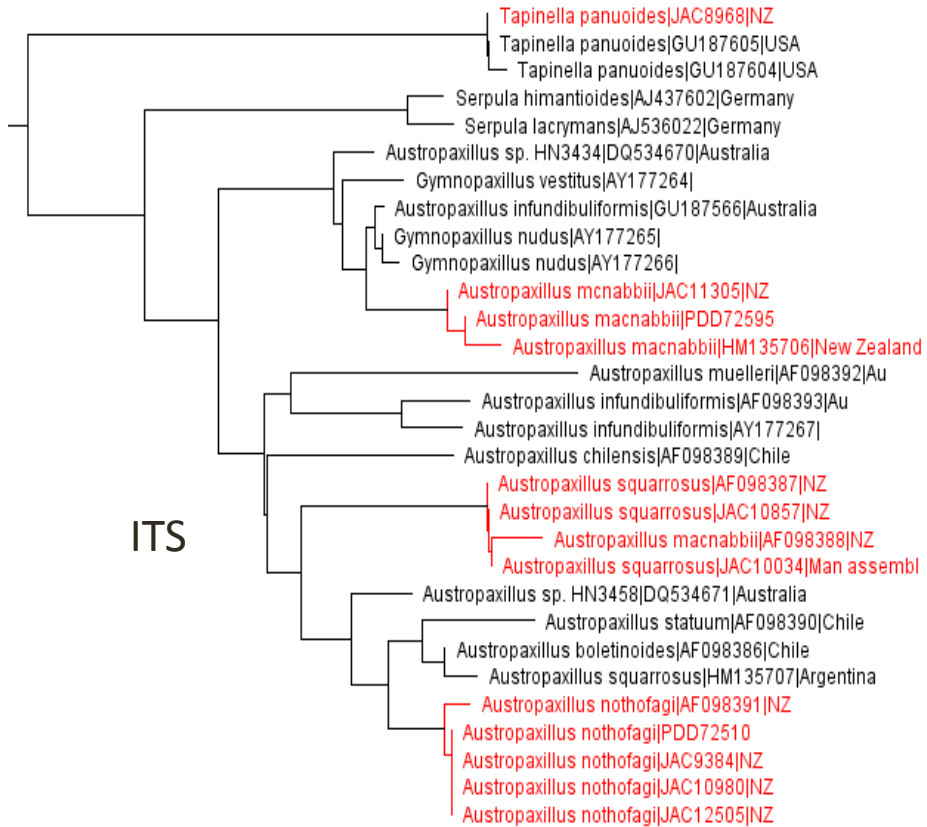
Currently 3 species in the group:

- Paxillus ammoniavirescens* (Europe origin) – in NZ
- Paxillus aff. involutus* (sp. 2) (probably US origin) – in NZ
- Paxillus involutus* sensu stricto (Europe origin) – not in NZ?

In NZ with *Betula*, *Quercus*,
Populus, *Pinus*

P. ammoniavirescens occurs with
Nothofagus in urban areas

Austropaxillus (indigenous)



Always with *Nothofagus*.

S. American use of *A. squarrosus* incorrect

NZ Genbank deposit *A. mcnabbii* incorrect

mcnabbii

context white, gills pinkish tinge, small



squarrosus

cap brown, flesh reddening

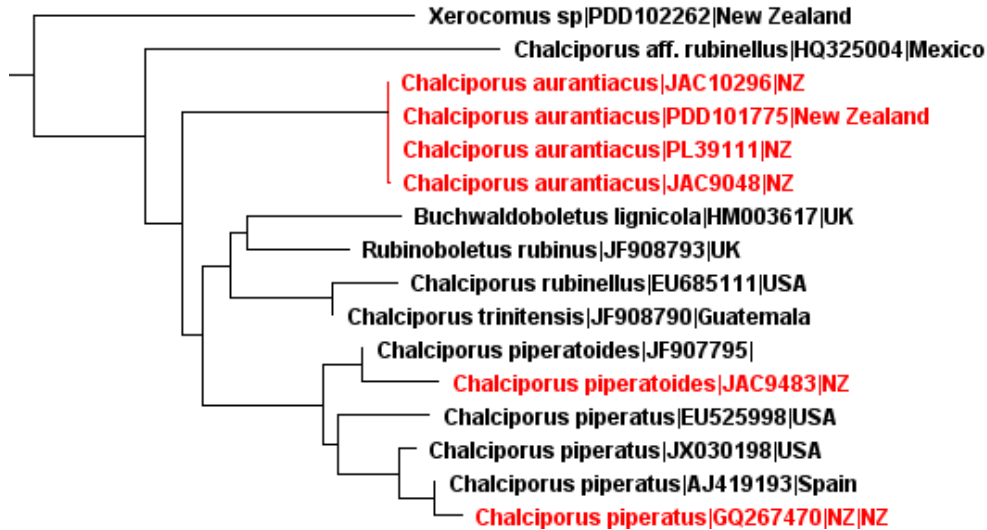


nothofagi

context yellow, gills yellow, big



Chalciporus (indigenous & exotic)



C. aurantiacus. NZ endemic.
on NZ threat list.

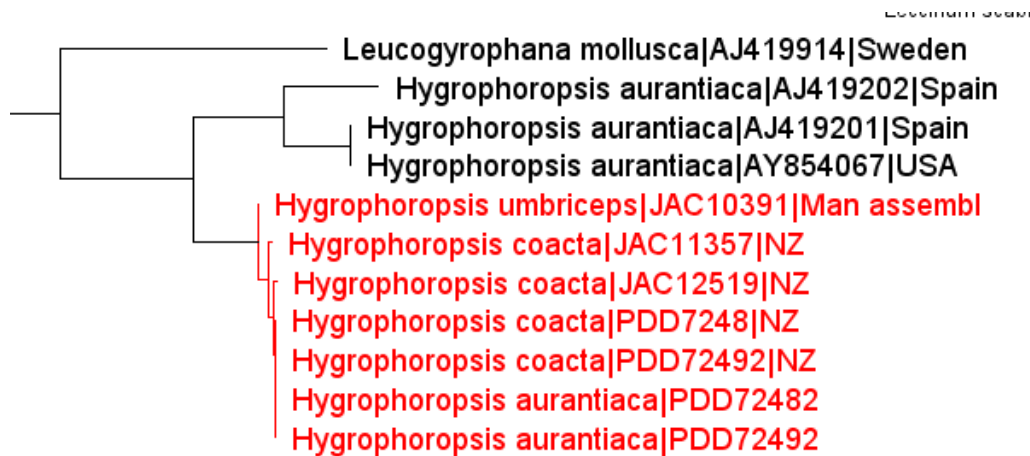


C. piperatus

C. piperatus co-occurs with *A. muscaria* and is following the invasion of *A. muscaria* into the beech forest. Always has yellow mycelium at stem base and *C. aurantiacus* does not.

C. piperatoides also occurs in NZ apparently. Records are with *Cedrus atlantica* + *A. muscaria*

Hygrophoropsis (indigenous)



NZ historical use of
H. aurantiaca incorrect

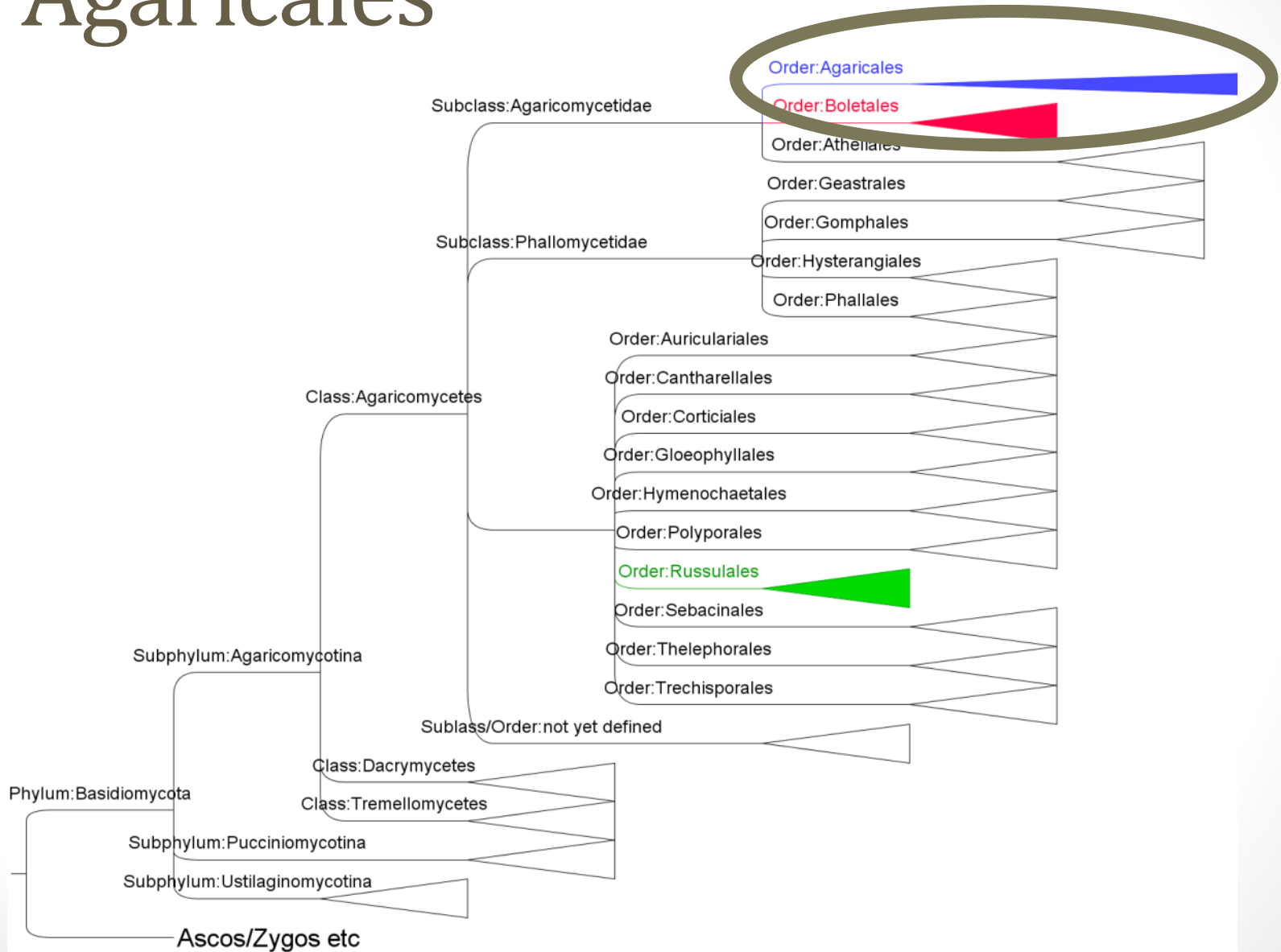


H. coacta McNabb 1969 \neq *H. aurantiaca*



H. umbriceps McNabb 1969 probably not sequenced

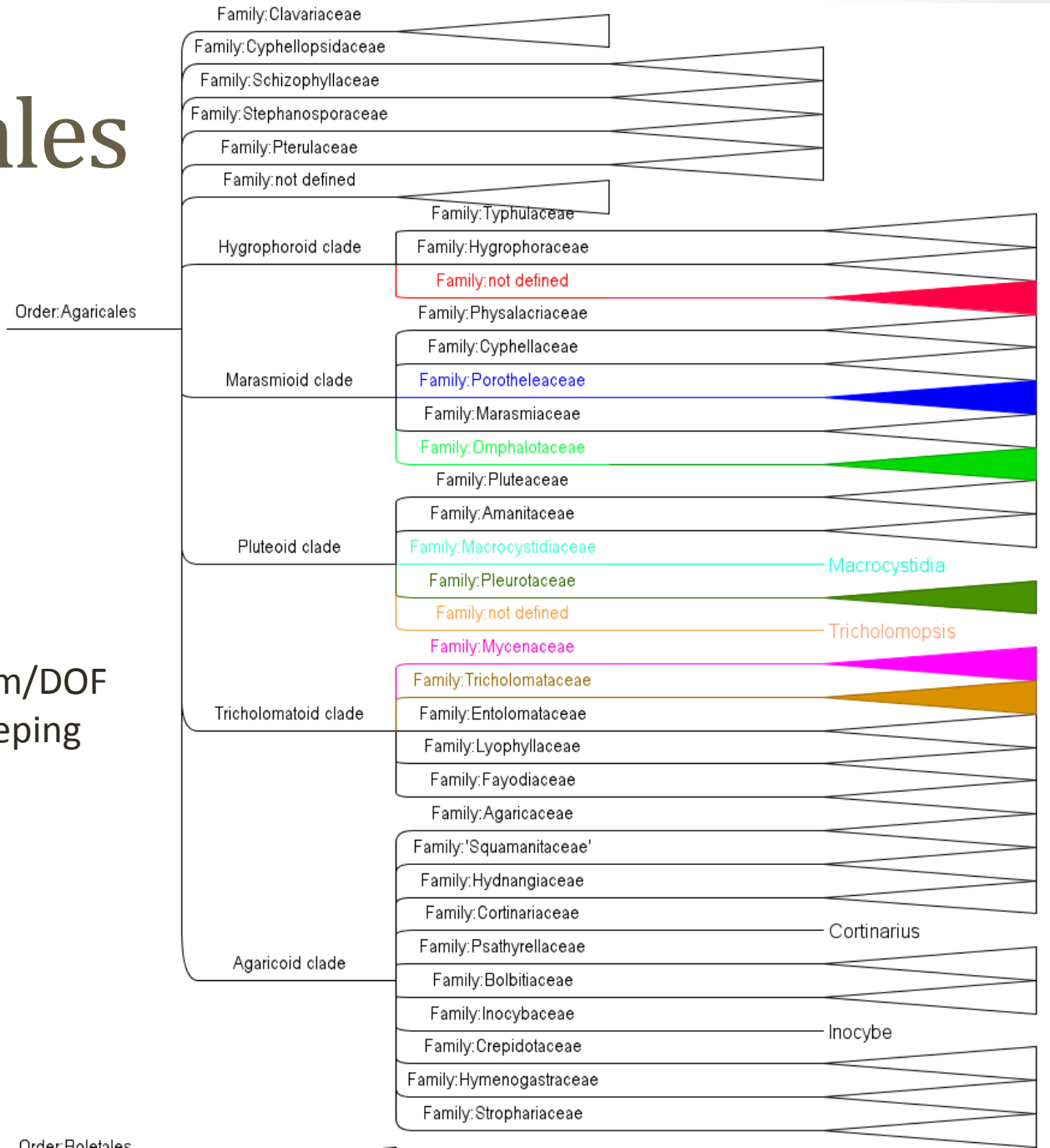
Agaricales



Agaricales

We need some formal superfamilies in the agaricales

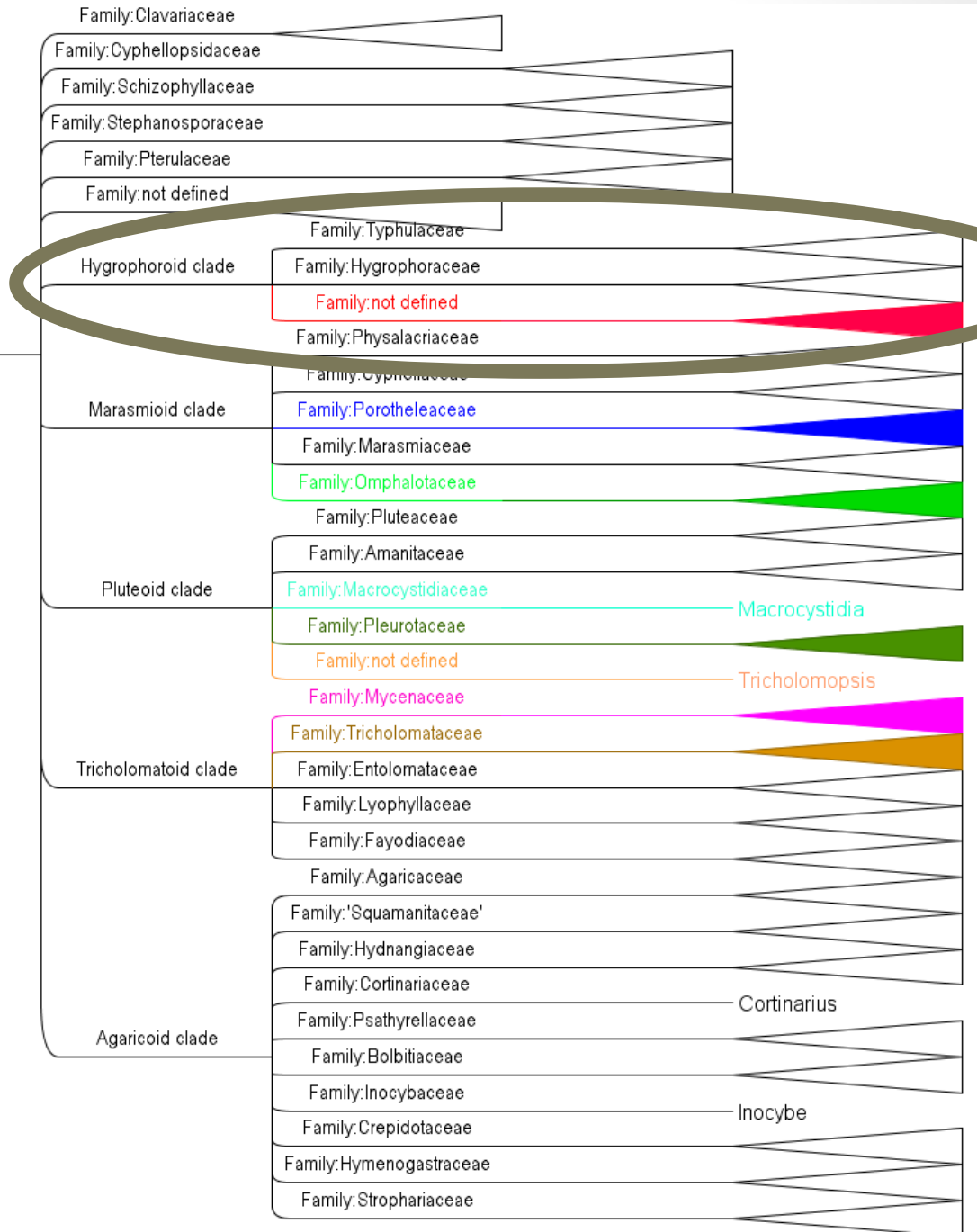
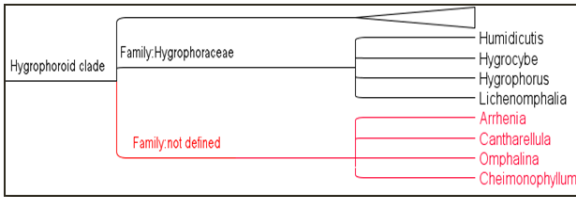
and IndexFungorum/DOF hierarchy is not keeping up with changes



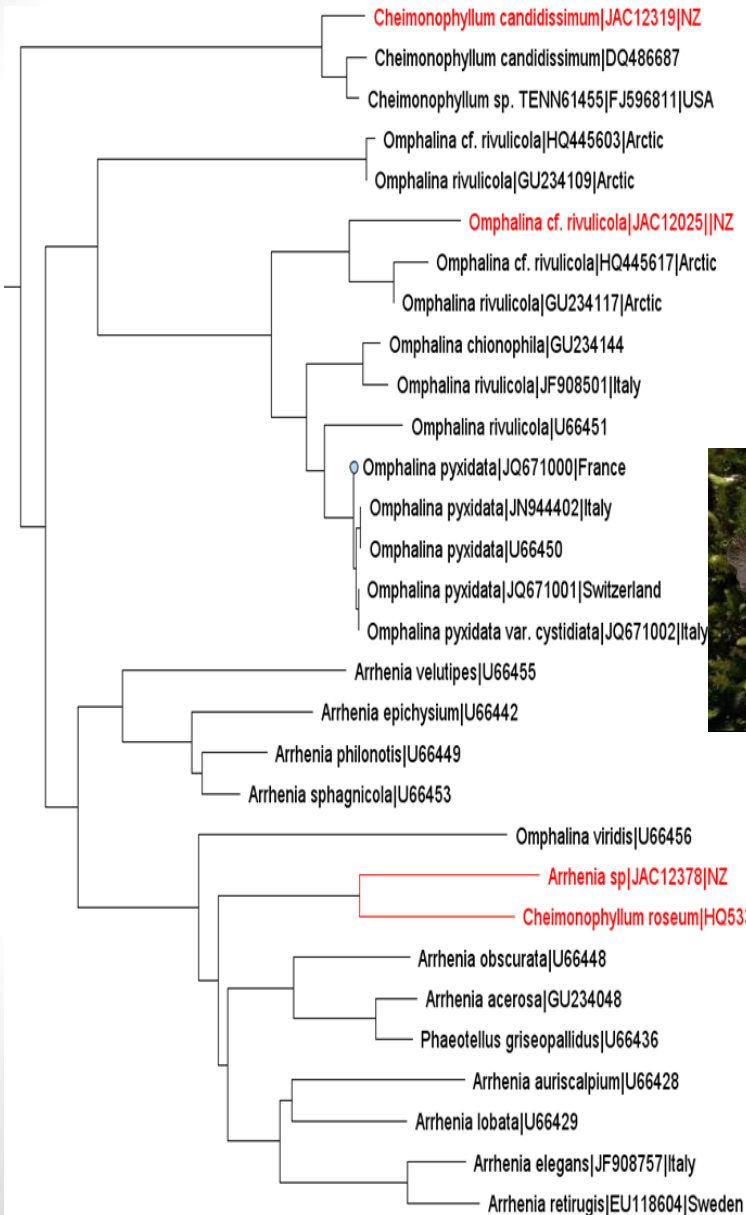
Agaricales

Order: Agaricales

The Hygrophoroid Clade



Cheimonopyllum, Omphalina, Arrhenia



The real *C. candidissimum* has globose spores



Omphalina cf. *rivulicola* alpine/arctic



Typical *Arrhenia* folded gills on moss



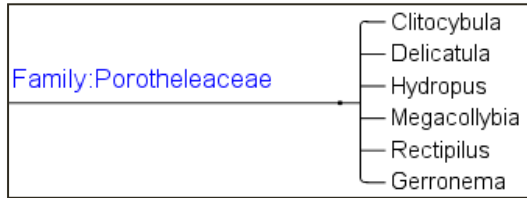
C. roseum Segedin = *Arrhenia* Normal gills on wood



C. candidissimum sensu Segedin = *Arrhenia* sp. Normal gills on wood

Agaricales

Porotheliaceae 'Hydropoid' group



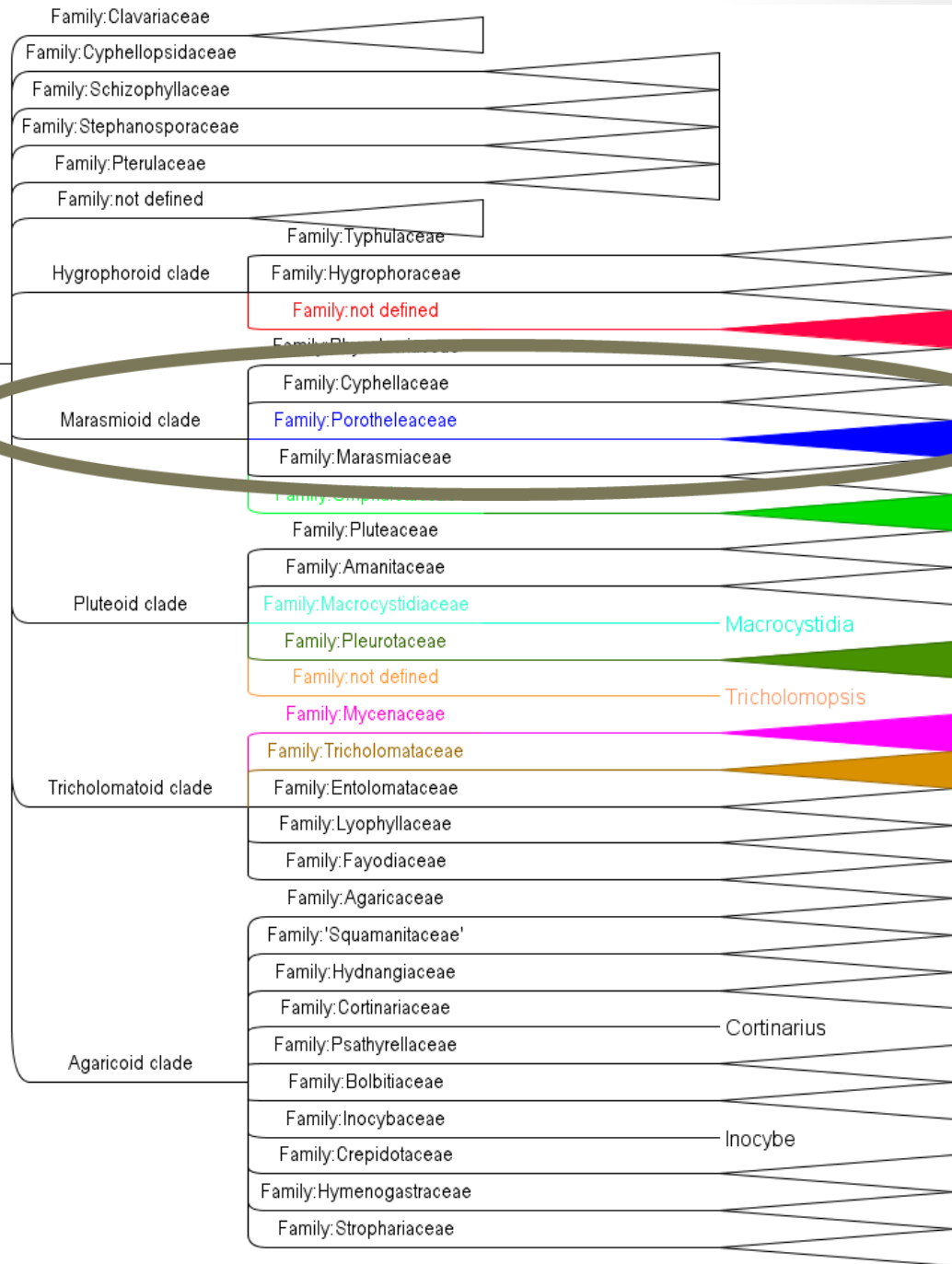
The group needs expanding to include ***Gerronema*** and a number of new genera historically in ***Mycena***

Seriously under-sampled in the tropics and southern hemisphere.

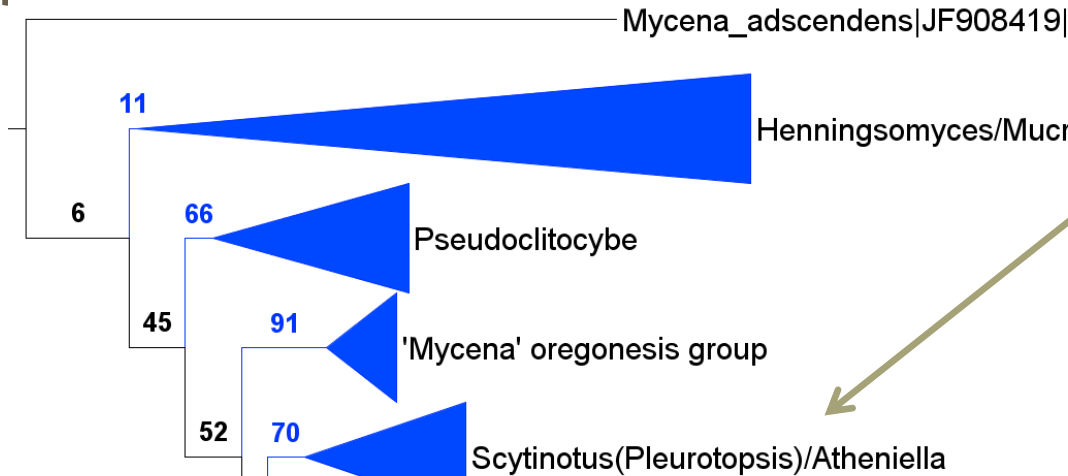
The tip of an iceberg.

Order: Agaricales

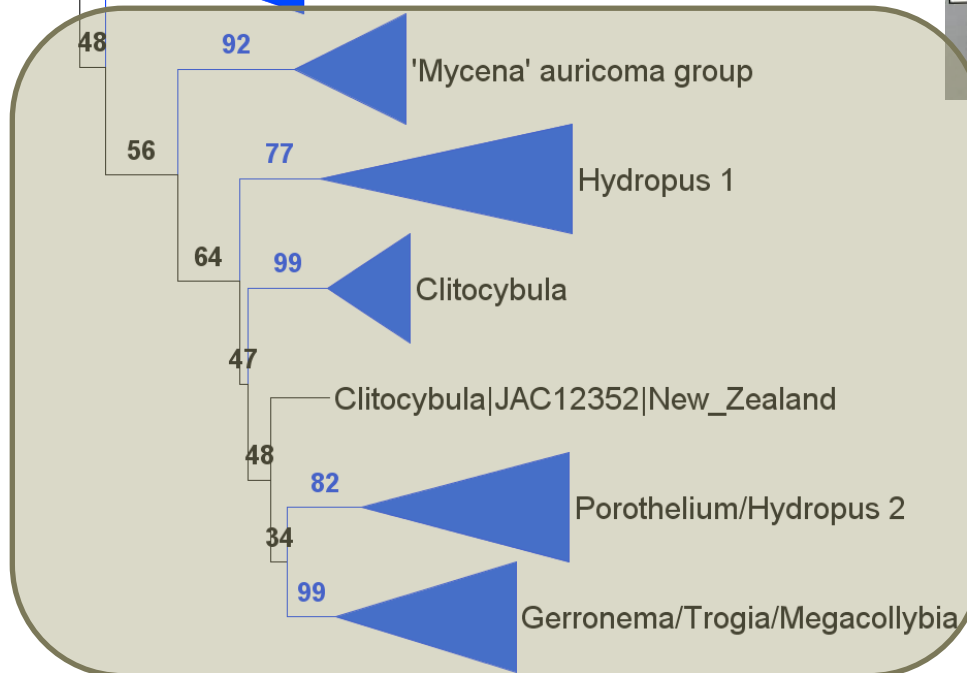
Order: Boletales



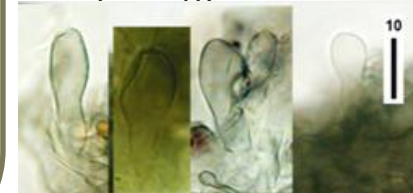
Hydropoid – sensu lato



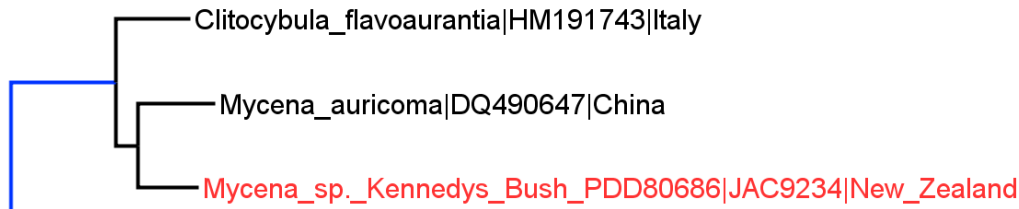
Note that *Pleurotopsis longuinqua* is now *Scytinotus*



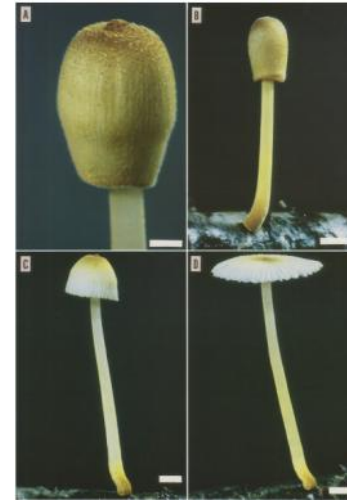
The core hydropoid group has vesicles in the cap tissue but otherwise variable morphology



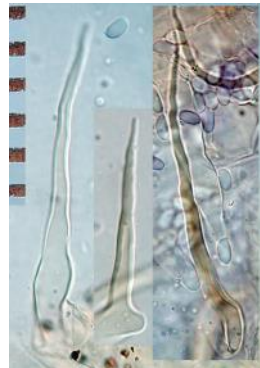
'Mycena' auricoma group



Pseudoomphalina/Clitocybula flavoaurantia
neither genus is applicable



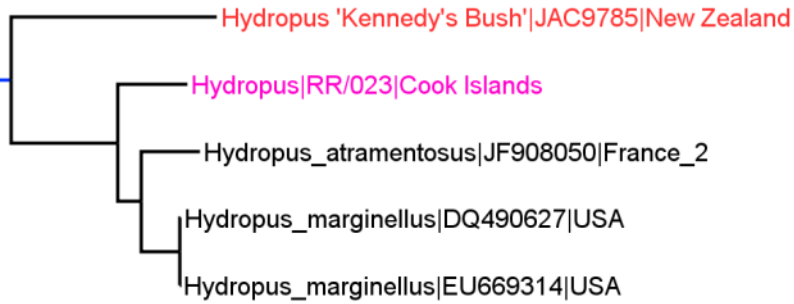
Mycena auricoma
has thick-walled cap hairs



'*Mycena*' *Kennedy's Bush*
Smells of hypochlorite
amyloid spores
thick-walled cap hairs

All these need a new genus

Hydropus 1



Hydropus marginellus
France



Hydropus 'Kennedy's Bush'

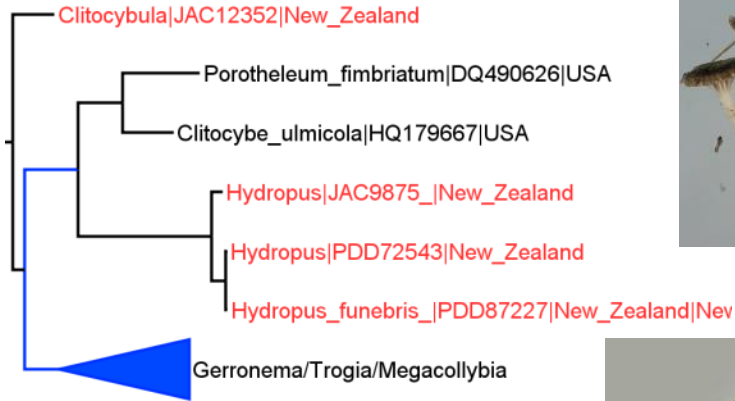


Currently we don't know where *Hydropus* belongs
Type = *H. fuliginarius*
not sequenced



Hydropus RR/023 on a coconut shell from the Cook Islands (Peter Johnston)

Hydropus 2



'Clitocybula' JAC12352
Looks a bit like
Cantharellula/Omphalina foetida
but that's really a
Pseudoclitocybe!



Hydropus JAC9875



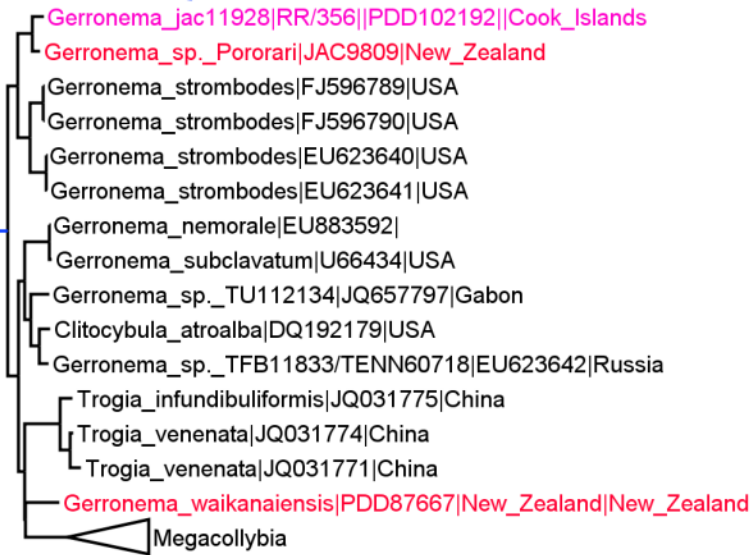
Hydropus funebris
Easily mistaken for a
Mycena

Can't do anything with
Hydropus 1,2 until
the position of
Hydropus
is settled, and there
will be many 'missing
links' in the tropics



Stromatoscypha/Porothelium fimbriata
is resupinate/cyphelloid!

Gerronema/Trogia



Gerronema RR/356
Cook Islands
Peter Johnston



Gerronema sp. 'Pororari'

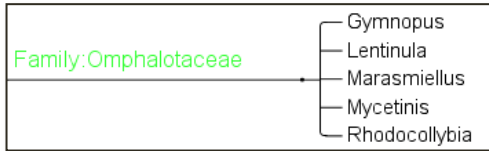


***Gerronema waikanaiensis* comb. ined.**

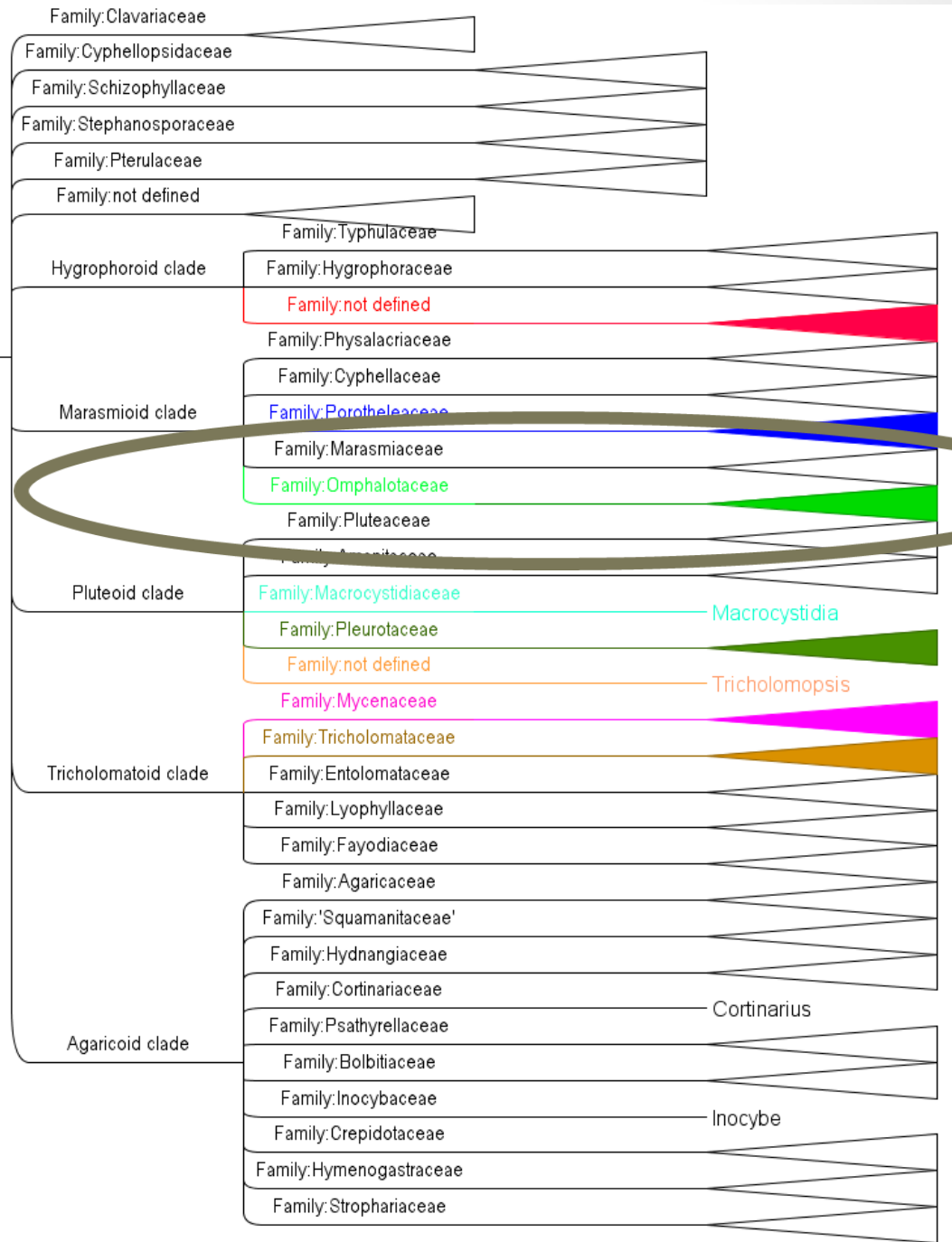
Hygrophorus waikanaensis* G. Stev. = *G. waikanaensis – strong smell of aniseed
Possibly poisonous, possibly = ***Trogia odorata*** Corner from Solomon Islands

Agaricales

Omphalotaceae



Order: Agaricales



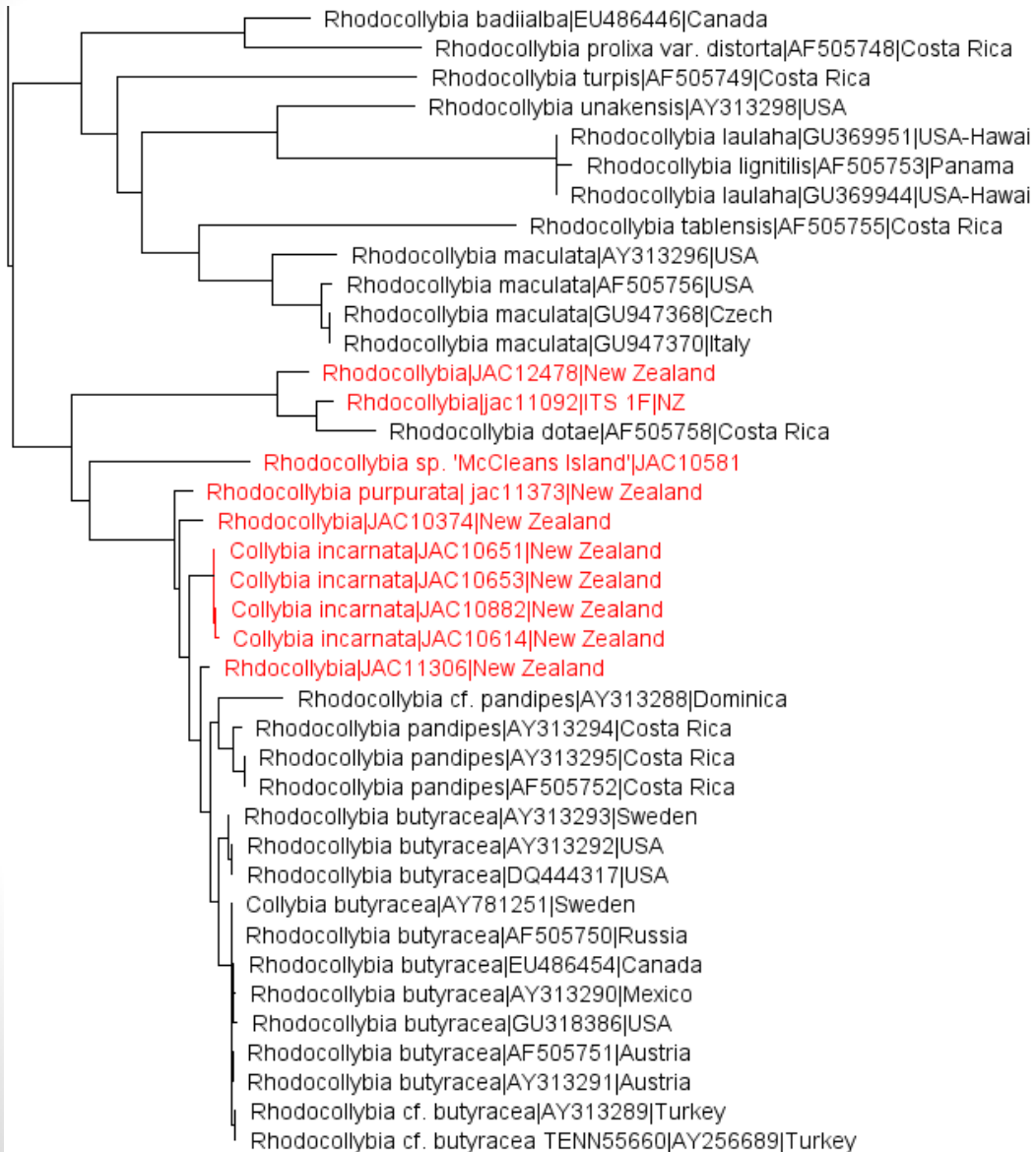
Paper in press on
'Micromphale'

Numerous undescribed
species in the group in NZ

Focus here just on
Rhodocollybia

Order: Basidiiales

Rhodocollybia



Until recently no *Rhodocollybia* known in NZ

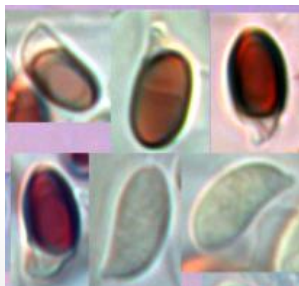
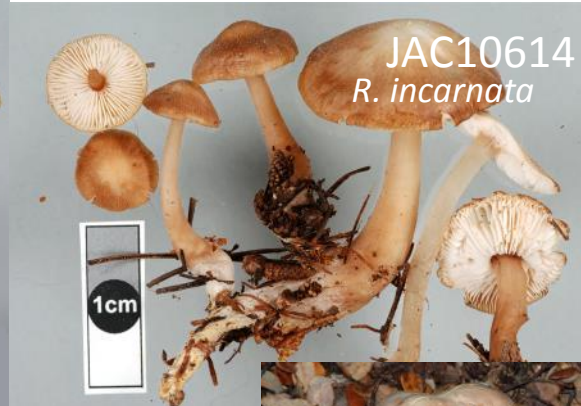
Recent realization that Stevenson's *Pluteus purpuratus* = Horak's *Lepiota purpurata* is a *Rhodocollybia*

Collybia incarnata is also *Rhodocollybia*

But at least 5 other species with neighbours in Central America

Genbank (LSU) *R. butyracea* NZ sensu Petersen is a misapplication of *C. incarnata*

Rhodocollybia in NZ



Characteristically some spores have dextrinoid endospore
Spore print sometimes pinkish



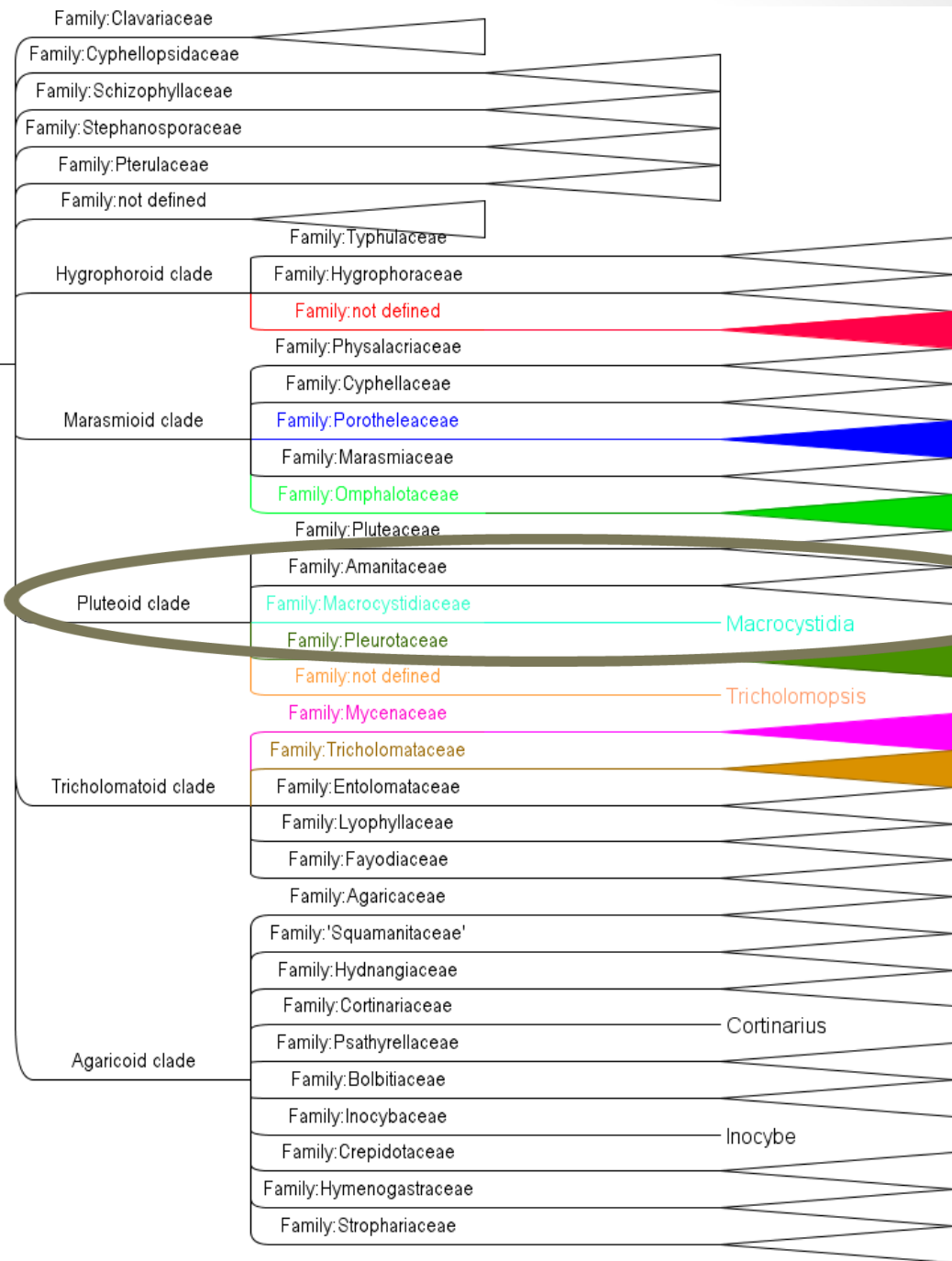
Agaricales

Macrocytidiaceae

A very lonely family with just *Macrocytidia*

7 species, and 4 of those probably need moving

Order: Agaricales



Order: Basidiales

Macrocyttidia

Macrocyttidia cucumis|DQ490640

Macrocyttidia cucumis|HQ604758

Macrocyttidia 'pennycook'|JAC12482

Macrocyttidia reducta -JAC11253



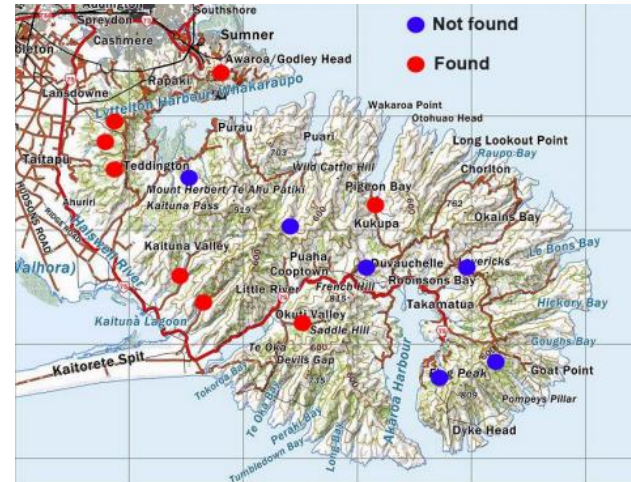
M. cucumis
photo of French material



M. reducta – secotioid and ‘nationally vulnerable’ – only known from Banks Peninsula, Canterbury



M. 'pennycook'
so far only known from Shaun's collection of one fruitbody!
Southland 2012 foray



Agaricales

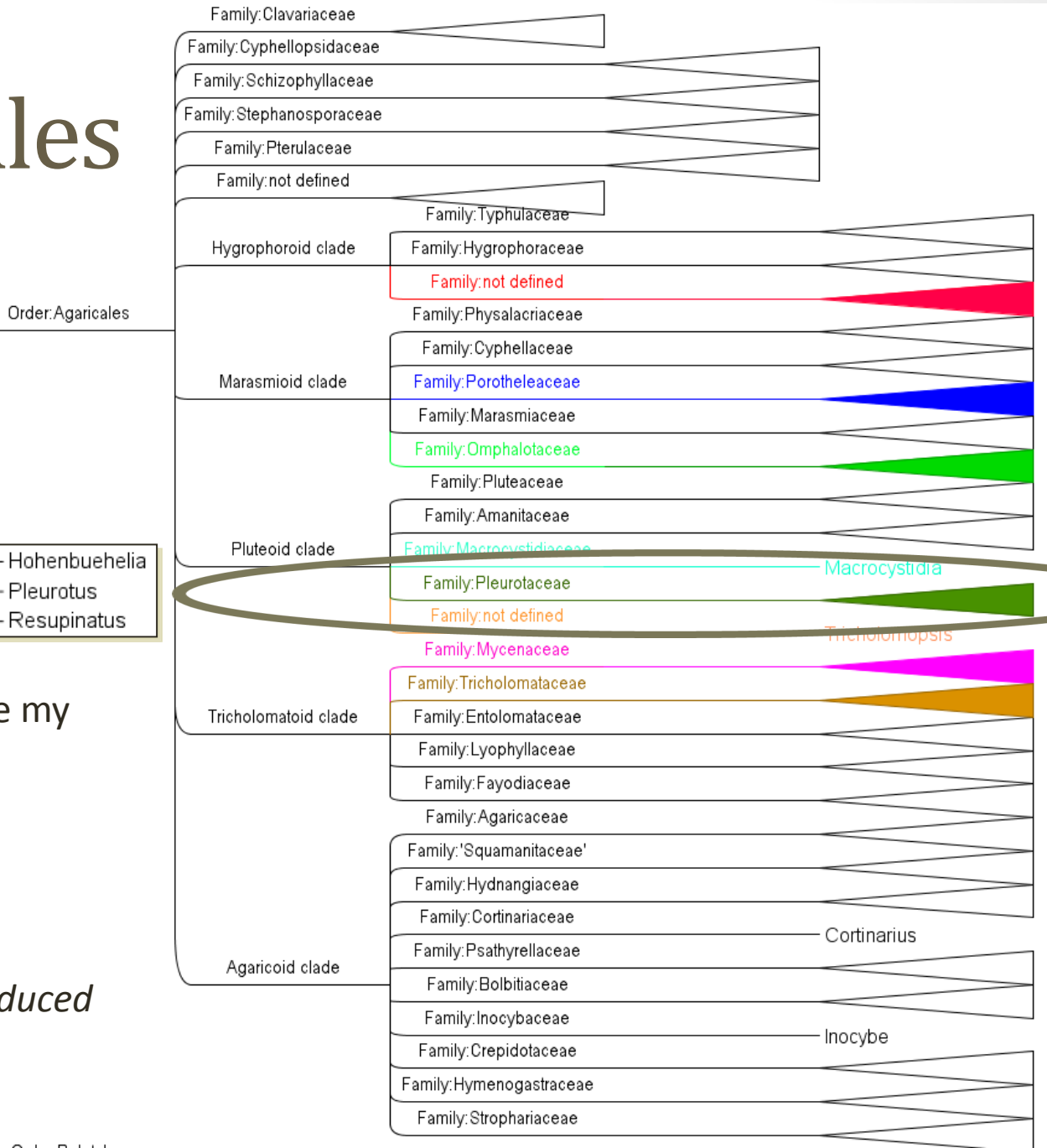
Pleurotaceae



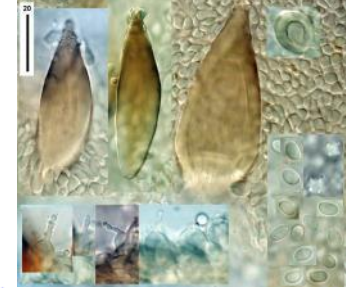
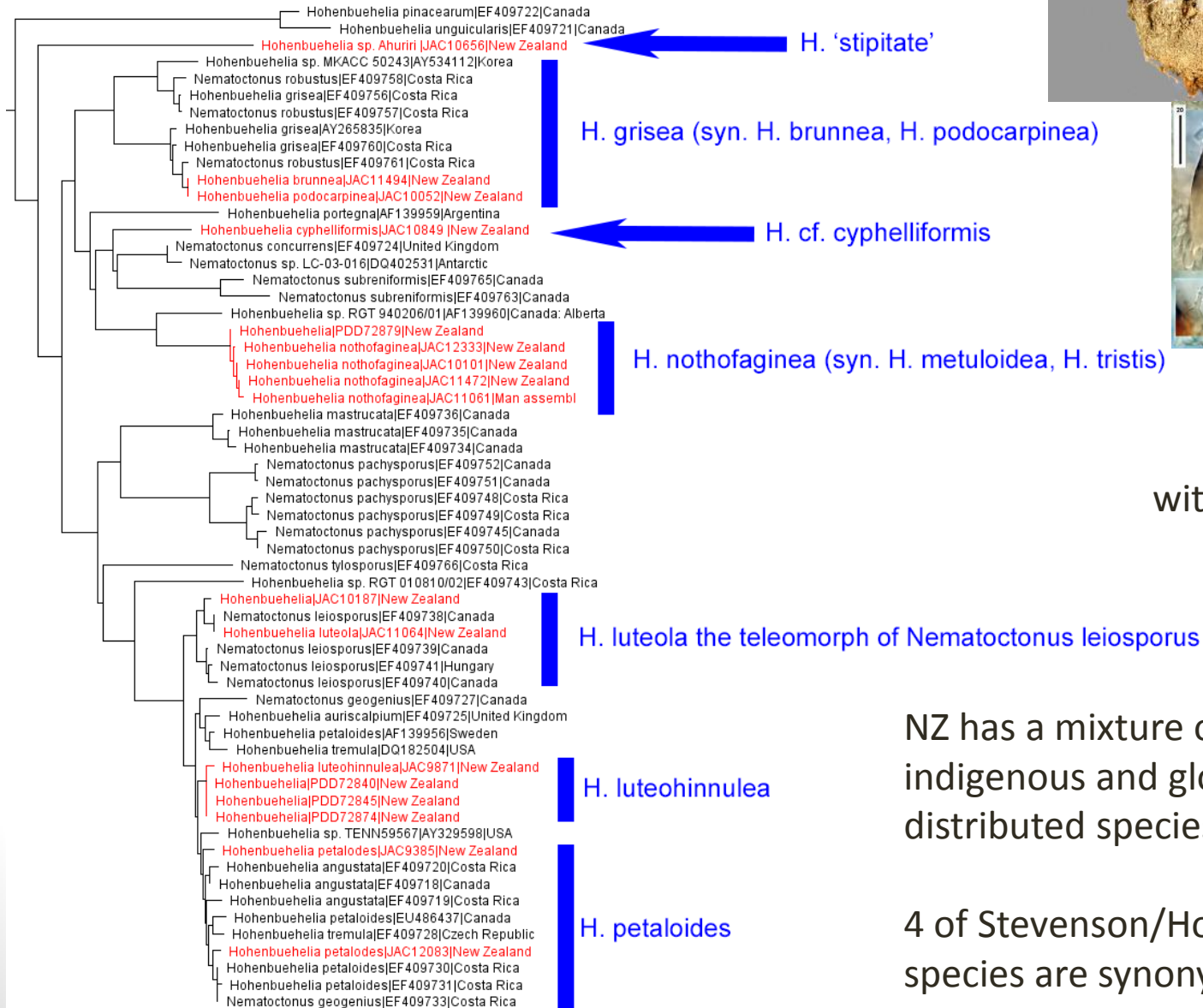
For *Resupinatus* see my FUNNZ blog article

Focus here on *Hohenbuehelia*

7 endemics, 3 introduced
Poorly separated morphologically



Hohenbuehelia



Like a mini *Pleurotus* but with big metuloid cystidia

NZ has a mixture of indigenous and globally distributed species.

4 of Stevenson/Horak's 8 NZ species are synonyms

Hohenbuehelia



Hohenbuehelia sp. 'Ahuriri'

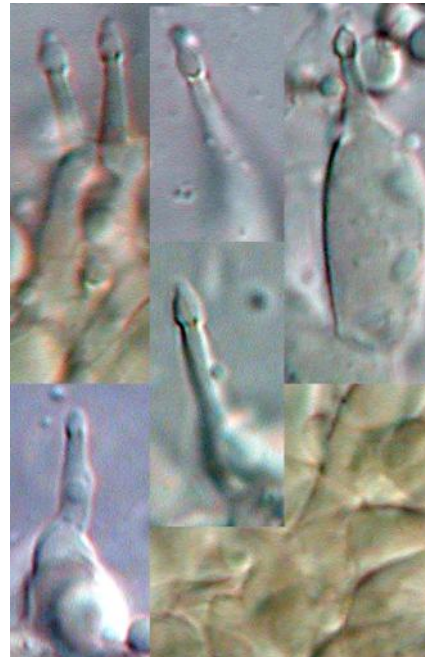
One of just a few known stipitate species.

The only one sequenced.

It is basal in the clade.

This does not have metuloid cystidia but

...



... like all *Hohenbuehelia* it possesses 'gloeosphex' cystidia exuding adhesive fluid which traps nematodes.

Cystidia also on *Naematoconus* anamorphs of *Hohenbuehelia*

Hohenbuehelia

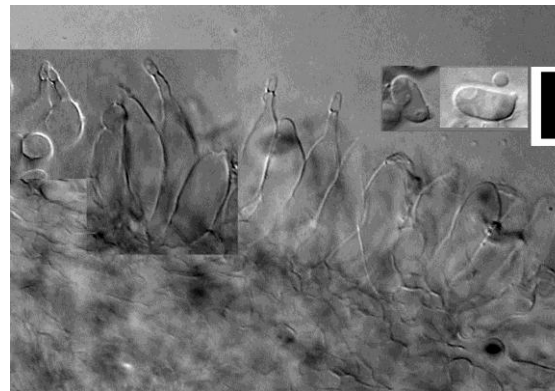


H. luteola

Sequence data shows *H. luteola*, described from NZ is the teleomorph of *Naematoconus leiosporus* isolated elsewhere as a nematode killer



I predict '*Panellus ligulatus*', not yet sequenced, is really a *Hohenbuehelia*



It has gloeosporangia
cystidia

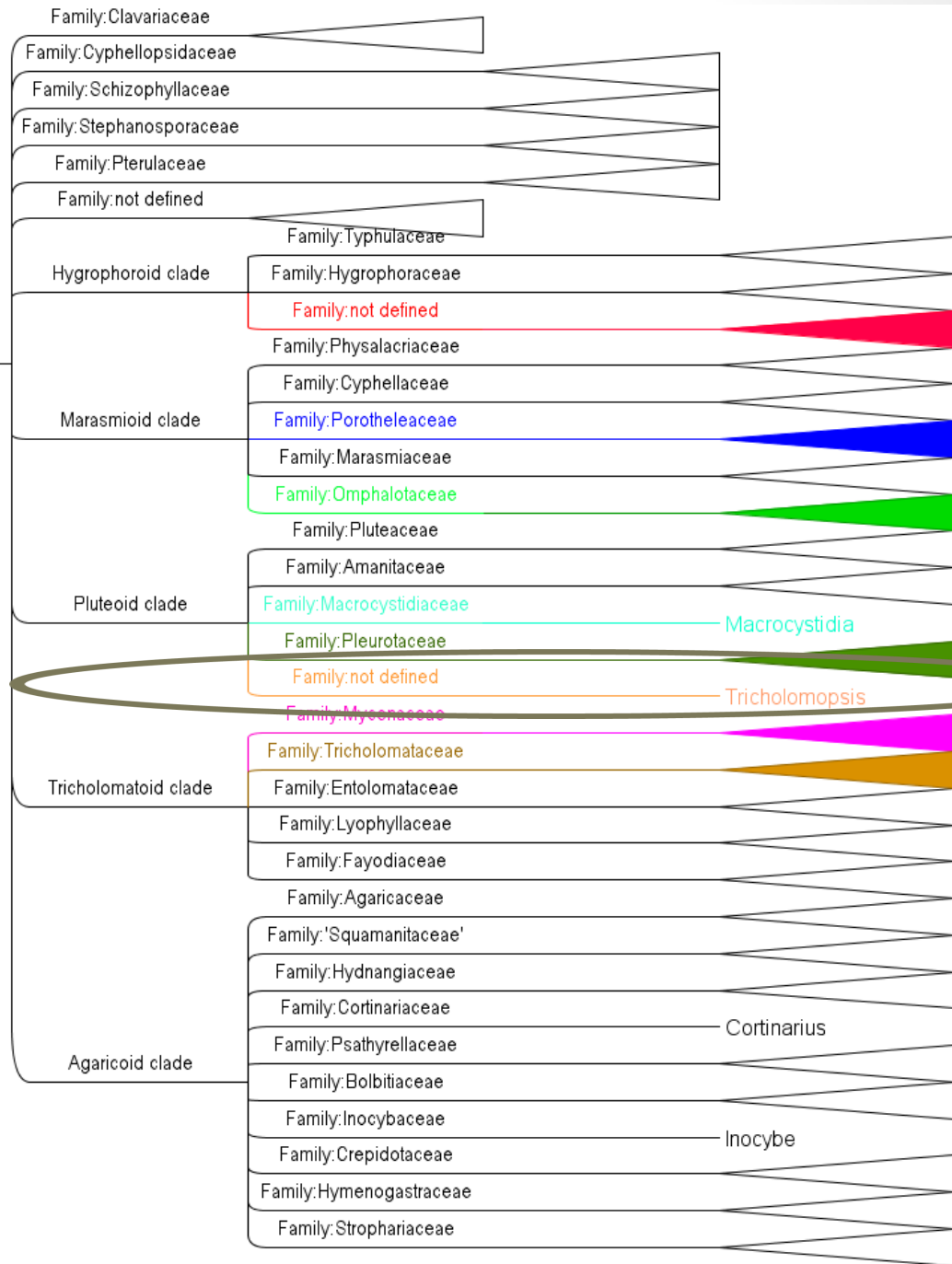
Agaricales

Tricholomopsis –
another lonely genus

T. rutilans recorded from
NZ in pine plantations

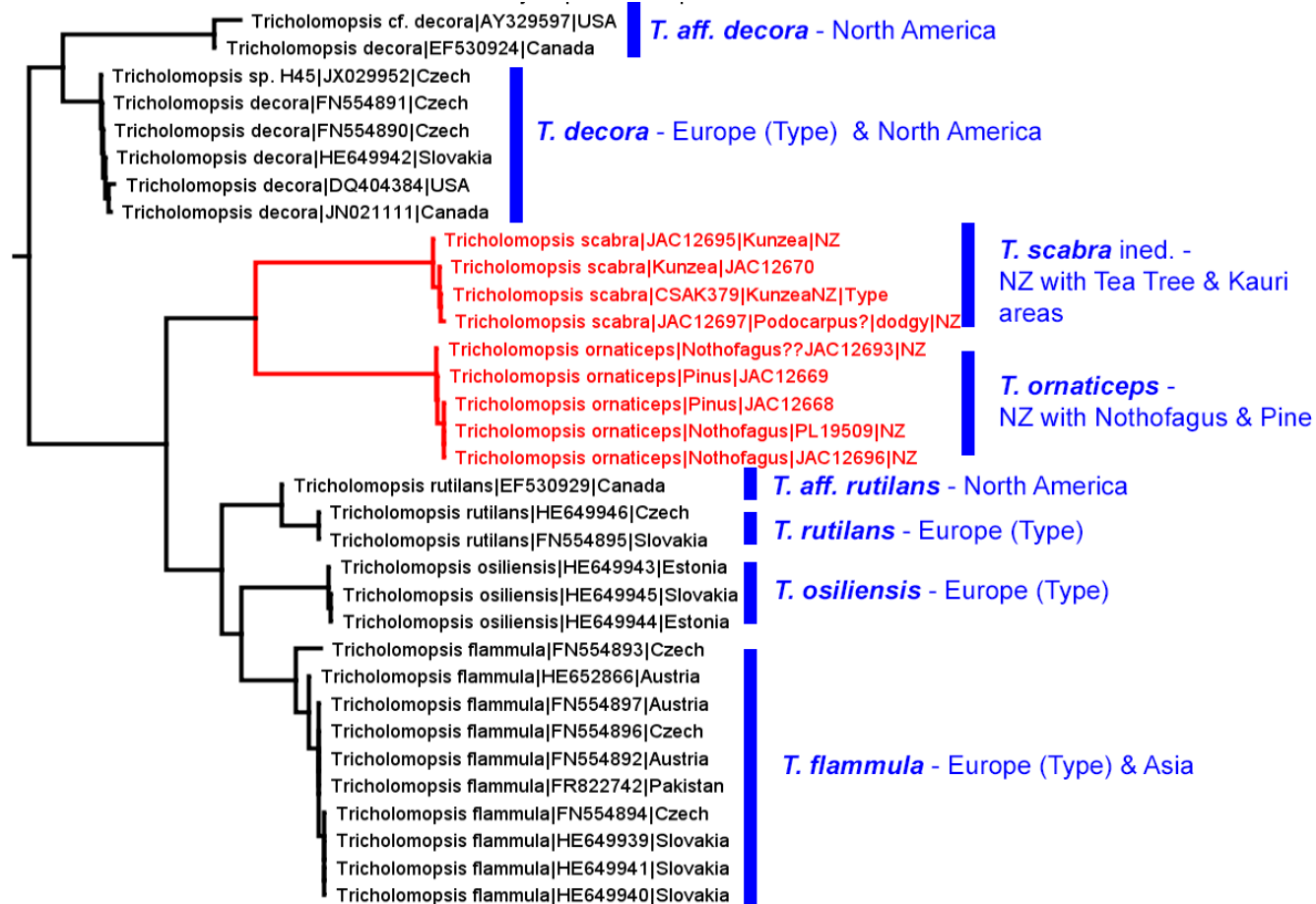
T. ornaticeps described
from Nothofagus forest

Order: Agaricales



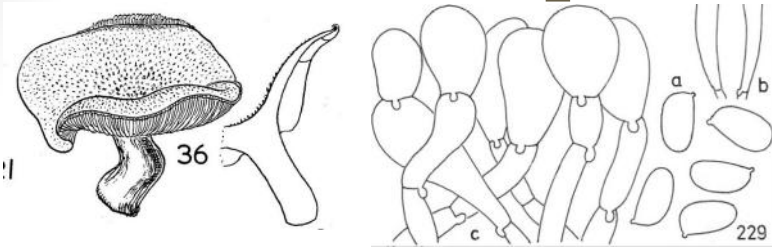
Order: Basidiomycota

Tricholomopsis



- NZ has 2 species, neither is *T. rutilans* (European version or North American version)
- *T. ornaticeps* occurs in both beech forest and pine plantations
- *T. scabra* ined. has been confused with *T. ornaticeps*

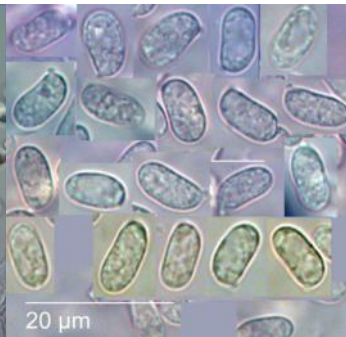
Tricholomopsis



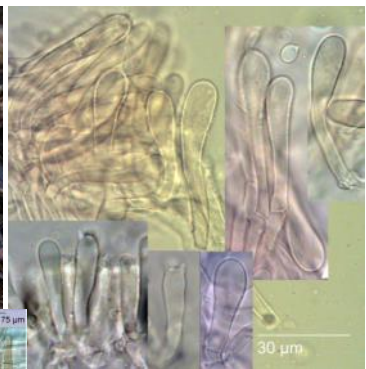
T. ornaticeps Holotype

With *Nothofagus*

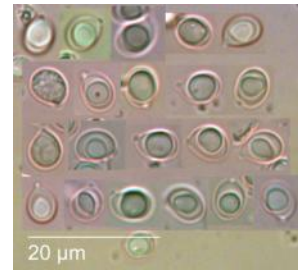
Has catenate cheilocystidia and elongate spores



= *T. 'rutilans' auct NZ*
with *Pinus*, has same
cystidia and spores ...
= *T. ornaticeps*



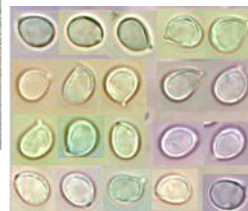
spores of the
real *T. rutilans*,
Windsor, UK



T. scabra ined.

Occurs with *Kunzea*, *Agathis* etc

Has clavate simple cystidia, subglobose
spores, and **big tufts of hairs on the cap**



Plus ...

- 19 new species of *Tricholoma*
- 2 *Callistoporium*
- 1 *Porpoloma* (the real genus, not N. hemisphere stooges)
- 3 *Lyophyllum*
- 3 *Prunulus*
- 4 *Mycena*
- 2 *Resinomyцена*
- ... not much time to write up

- The END