# Sequencing the forays

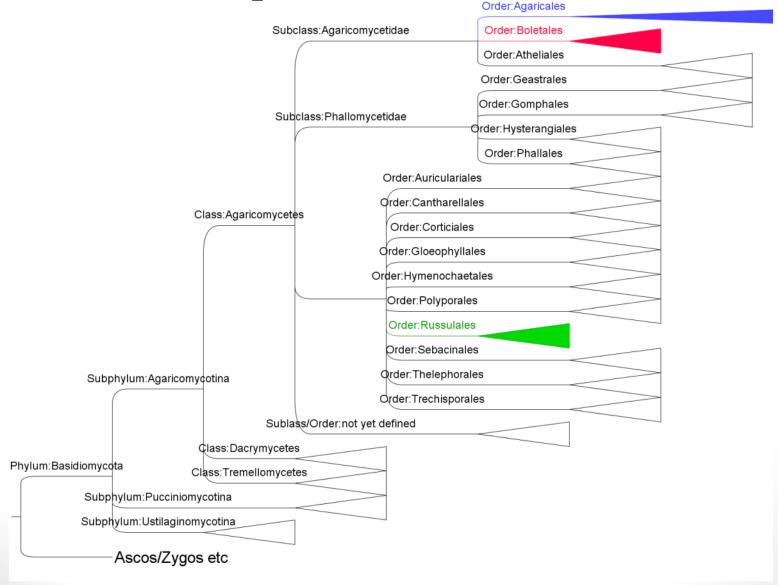
Jerry Cooper, Dukchul Park, Pat Leonard Landcare Research

Acknowledgements to Rebekah Fuller & FUNNZ forayers

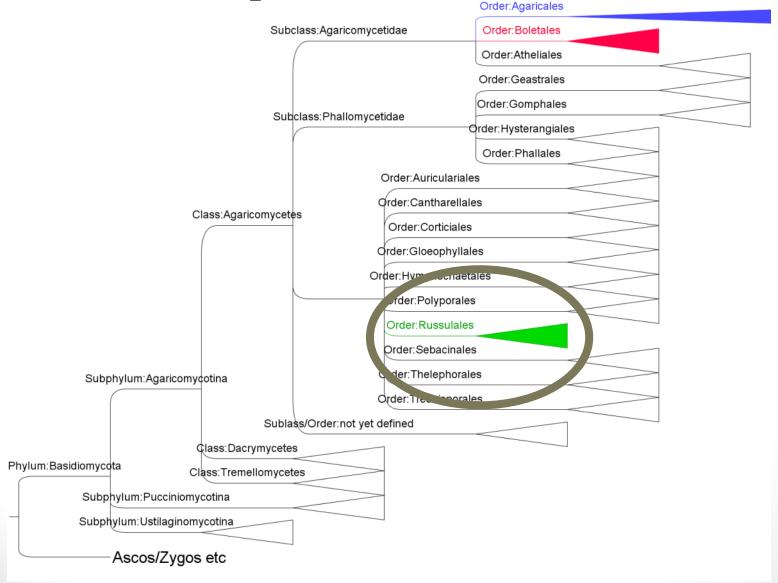
#### Sequencing foray collections – why?

- 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 (porotheliaceae), Lepiota+
  - > 1000 sequences some in Genbank rest will get there eventually

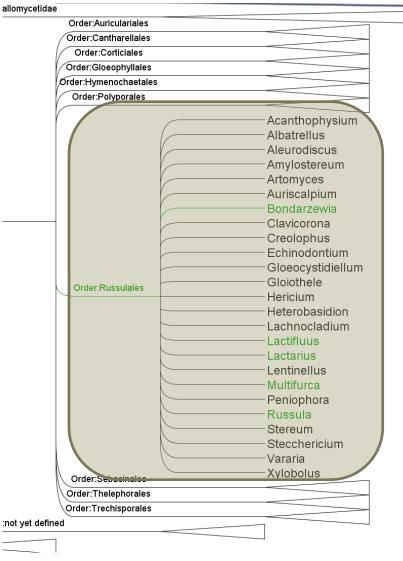
#### **Basidiomycete classification**



#### **Basidiomycete classification**



#### Russulales

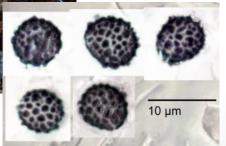


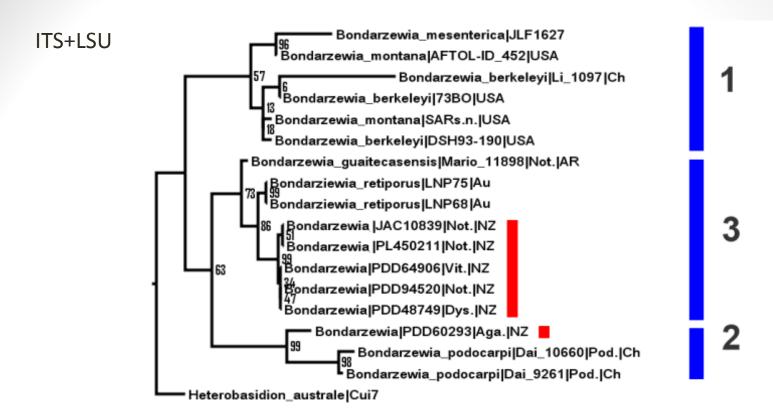
... NZ revision of Russula, Lactifluus & Lactarius will be published soon-ish

#### Bondarzewia 'berkeleyi' in NZ



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



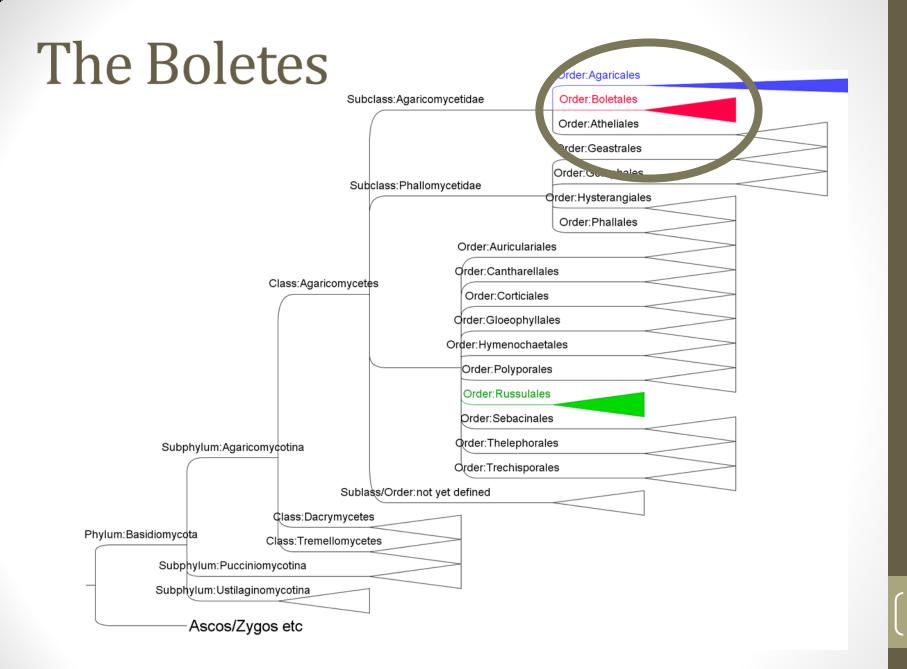


- 1) The real Bondarzewia berkeleyi is not in NZ
- 2) Chinese *B. podocarpi*

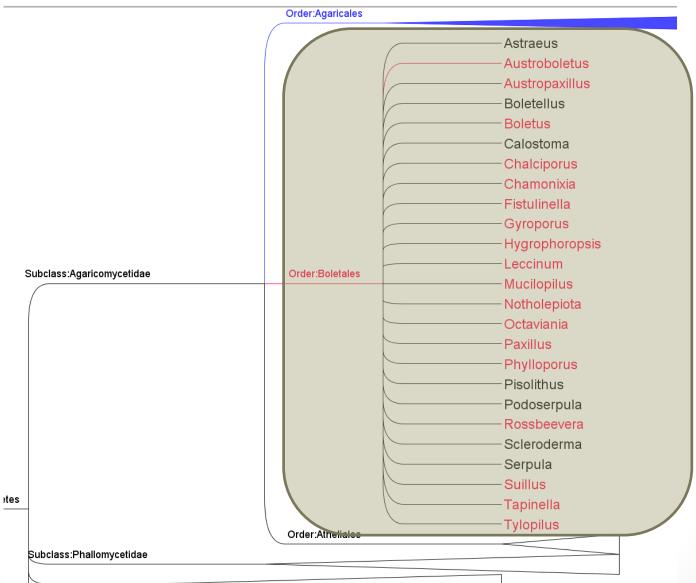
+ New Zealand *B. proprius* (Lloyd) comb. ined. with gymnosperms

3) Argentine **B. guaitecasensis**,

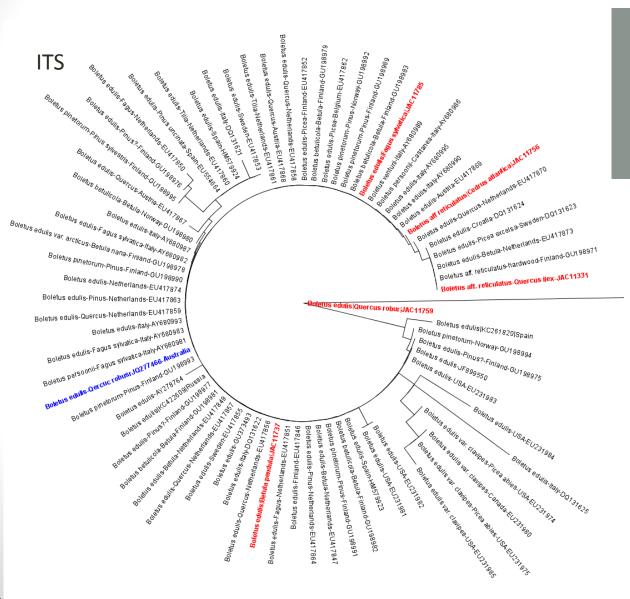
+ Australian *B. retisporus* (Cooke) comb. ined. [data courtesy Matt Barrett]
+ New Zealand *B. noname* sp. nov. with *Nothofagus* and various woody angiosperms



#### The Boletes



#### Boletus edulis (introduced in Canterbury)





Australian material in blue NZ material in red

Broad association with ...

Quercus robur, Fagus sylvatica, Betula pendula, Cedrus atlantica, Quercus ilex

10bp difference across ITS

Includes ...

- B. edulis
- B. pinetorum p.p
- B. persoonii
- B. betulicola,
- B. aff. reticulatus

Group is a splitters paradise

### Suillus (introduced)

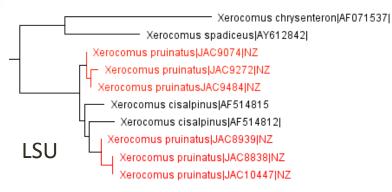
	Suillus bovinus EF493249
	Suillus PDD101769 New Zealand
L	_ Suillus bovinus∣EF493250
	Suillus bovinus PDD102501 New Zealand
_	Suillus sinuspaulianus PDD102511 New Zealand
	┌ Suillus variegatus AF231914
	<ul> <li>Suillus variegatus AJ272421 United Kingdom</li> </ul>
	Suillus sinuspaulianus PL54078
	Suillus lakei DQ365643 USA
	Suillus lakei HQ650767 Canada
	Suillus viscidus EF493254
Чг	Suillus grevilei JAC10415 NZ
	Suillus grevillei PDD102526 NZ
	Gastrosuillus luricinus M91612
	Suillus grevillei M91614
	Suillus placidus L54108
	Suillus subacerbus jac10544 ITS4 only
	Suillus collinitus AJ410857
	Suillus granulatus AJ272408 Europe SG2
	Suillus variegatus AJ272420
	Suillus quiescens GQ249390
	Suillus granulatus JAC9300 man assemb
	Suillus granulatus AJ272409 Europe SG1
	Suillus brevipes PDD102524  NZ
	Suillus granulatus EF493252
	Suillus luteus AJ272413 UK
	Suillus brevipes FJ845440
	Suillus brevipes GQ249388
	Cuillus brovipes/AY990041
	∫ Suillus pungens L54094
	uncultured Suillus HM021173 USA
	Suillus aff. subacerbus JAC9519 NZ
	Suillus pungens JQ310819 USA
	Suillus subacerbus PDD102525 NZ
LSU	<sup>I</sup> Suillus subacerbus JAC11467 NZ

#### Suillus subacerbus McNabb 1968 = S. pungens Thiers & Smith 1964

#### Many more NZ Suilli to sort out



#### Xerocomus pruinatus complex (introduced)



Xerocomus sp|PDD83882|New Zealand Xerocomus cisalpinus|jac8939|ITS4F only Xerocomus pruinatus|JAC9484|Man assembl Xerocomus pruinatus|JAC948447 Xe





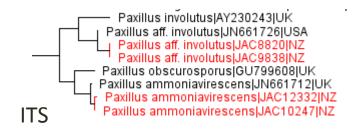
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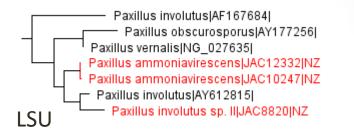
Big morphological variation and little sequence difference within *X*. *pruinatus/cisalpinus* 

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:

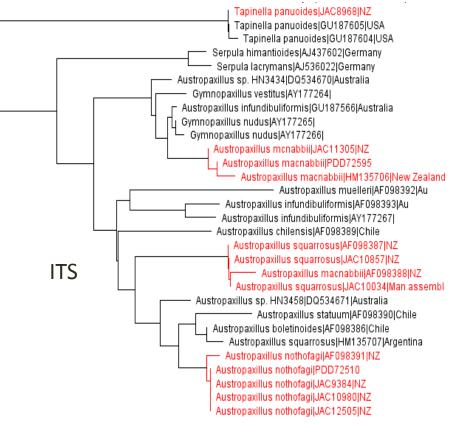
Paxillus ammoniavirescens (Europe origin) – in NZ
Paxillus aff. involutus (sp. 2) (probably US origin) – in NZ
Paxillus involutus sensu stricto (Europe origin) – not in NZ?



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

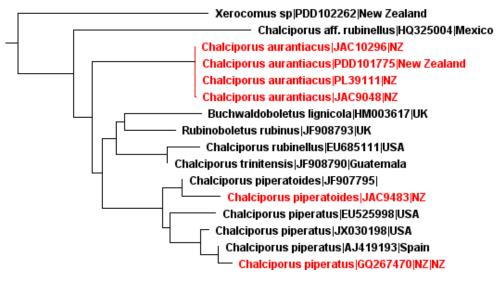


nothofagi

context yellow, gills yellow, big



#### Chalciporus (indigenous & exotic)





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



*C. piperatus* 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* 

C. piperatus

# Hygrophoropsis (indigenous)

Leucogyrophana mollusca|AJ419914|Sweden Hygrophoropsis aurantiaca|AJ419202|Spain Hygrophoropsis aurantiaca|AJ419201|Spain Hygrophoropsis aurantiaca|AY854067|USA Hygrophoropsis umbriceps|JAC10391|Man assembl Hygrophoropsis coacta|JAC11357|NZ Hygrophoropsis coacta|JAC12519|NZ Hygrophoropsis coacta|PDD7248|NZ Hygrophoropsis aurantiaca|PDD72492|NZ Hygrophoropsis aurantiaca|PDD72492 NZ histrorical use of *H. aurantiaca* incorrect



H. coacta McNabb 1969 ≠ H. aurantiaca



H. umbriceps McNabb 1969 probably not sequenced



We need some formal superfamilies in the agaricales

and IndexFungorum/DOF hierarchy is not keeping up with changes

Family:Clavariaceae		
Family:Cyphellopsidaceae		
Family:Schizophyllaceae		
Family:Stephanosporaceae		
Family:Pterulaceae		
Family:not defined		
	Family:Typhulaceae	
Hygrophoroid clade	Family:Hygrophoraceae	
	Family:not defined	
	Family:Physalacriaceae	
	Family:Cyphellaceae	
Marasmioid clade	Family:Porotheleaceae	
	Family:Marasmiaceae	
	Family:Omphalotaceae	
	Family:Pluteaceae	
	Family:Amanitaceae	
Pluteoid clade	Family:Macrocystidiaceae	Magraguetidia
	Family:Pleurotaceae	Macrocystidia
	Family:not defined	Tricholomonsis
	Family:Mycenaceae	Tricholomopsis
	Family:Tricholomataceae	
Tricholomatoid clade	Family:Entolomataceae	
	Family:Lyophyllaceae	
	Family:Fayodiaceae	
	Family:Agaricaceae	
	Family:'Squamanitaceae'	
	Family:Hydnangiaceae	
	Family:Cortinariaceae	Cortinarius
Agaricoid clade	Family:Psathyrellaceae	Continantis
	Family:Bolbitiaceae	
	Family:Inocybaceae	Incode
	Family:Crepidotaceae	Inocybe
	Family:Hymenogastraceae	
	Family:Strophariaceae	

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Order:Agaricales

#### The Hygrophoroid Clade

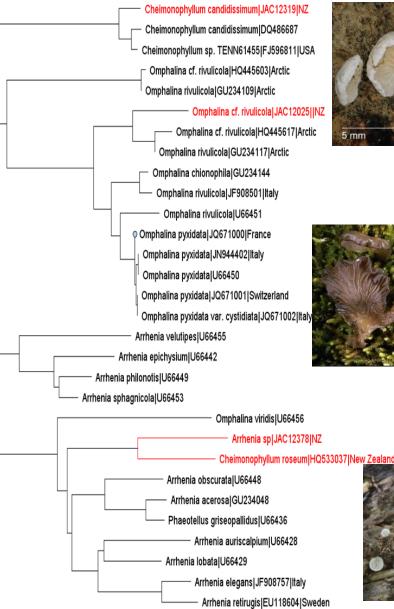
Hygrophoroid clade	Family:Hygrophoraceae Family:not defined	Humidicutis Hygrocybe Hygrophorus Lichenomphalia Arrhenia Cantharellula Omphalina
		Cheimonophyllum

amily:Cyphellopsidaceae		
Family:Schizophyllaceae		
amily:Stephanosporaceae	9	
Family:Pterulaceae		
Family:not defined		
	Family:Typhulaceae	
Hygrophoroid clade	Family:Hygrophoraceae	
	Family:not defined	
	Family:Physalacriaceae	
	Family. Cyphonacous	
Marasmioid clade	Family:Porotheleaceae	
	Family:Marasmiaceae	
	Family:Omphalotaceae	
	Family:Pluteaceae	
	Family:Amanitaceae	
Pluteoid clade	Family:Macrocystidiaceae	N de la completa di la
	Family:Pleurotaceae	Macrocystidia
	Family:not defined	Trichelemensie
	Family:Mycenaceae	Tricholomopsis
	Family:Tricholomataceae	
Tricholomatoid clade	Family:Entolomataceae	
	Family:Lyophyllaceae	
	Family:Fayodiaceae	
	Family:Agaricaceae	
	Family:'Squamanitaceae'	
	Family:Hydnangiaceae	
	Family:Cortinariaceae	Cortinarius
Agaricoid clade	Family:Psathyrellaceae	Columanus
	Family:Bolbitiaceae	
	Family:Inocybaceae	Inocybe
	Family:Crepidotaceae	посуре
	Family:Hymenogastraceae	
	Family:Strophariaceae	

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Order:Agaricales

#### Cheimonopyllum, Omphalina, Arrhenia







The real *C. candissimum* has globose spores



**Omphalina** cf **rivulicola** alpine/arctic

Typical **Arrhenia** folded gills on moss



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

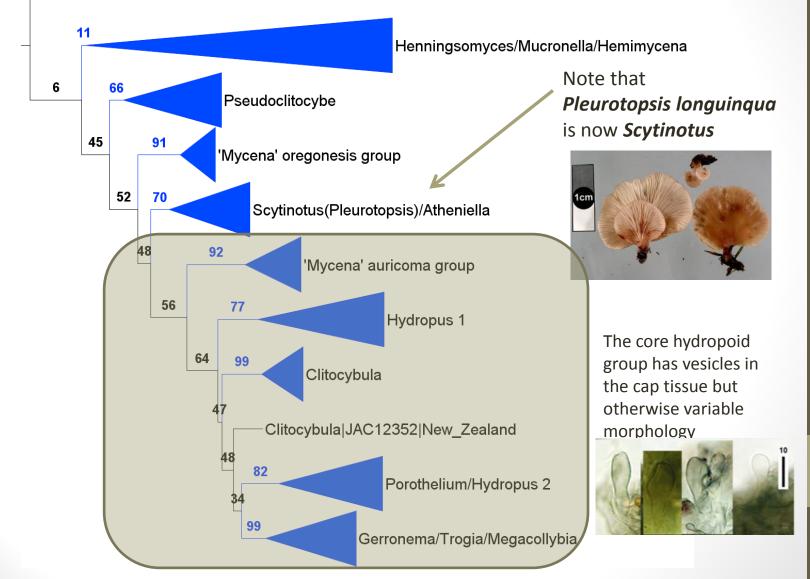


*C. candissimum* sensu Segedin = *Arrhenia sp.* Normal gills on wood

	Family:Clavariaceae		
	Family:Cyphellopsidaceae		
	Family:Schizophyllaceae		
Aganiaalaa	Family:Stephanosporaceae		
Agaricales	Family:Pterulaceae		
	Family:not defined		
		Family:Typhulaceae	
	Hygrophoroid clade	Family:Hygrophoraceae	
		Family:not defined	
Order: Agaricales		Earnike Direction in the second second	
		Family:Cyphellaceae	
Porotheliaceae	Marasmioid clade	Family:Porotheleaceae	
'Hydropoid' group		Family:Marasmiaceae	
		1 dinnys Superson	
Clitocybula		Family:Pluteaceae	
Family:Porotheleaceae Hydropus		Family:Amanitaceae	
— Megacollybia	Pluteoid clade	Family:Macrocystidiaceae	Macrocystidia
— Rectipilus		Family:Pleurotaceae	Macrocystidia
Gerronema		Family:not defined	Tricholomopsis
The group peode		Family:Mycenaceae	menoiomopais
The group needs		Family:Tricholomataceae	
expanding to include	Tricholomatoid clade	Family:Entolomataceae	
Gerronema and a		Family:Lyophyllaceae	
		Family:Fayodiaceae	
number of new genera		Family:Agaricaceae	
historically in <i>Mycena</i>		Family:'Squamanitaceae'	
Instorically in <i>Nycena</i>		Family:Hydnangiaceae	
Seriously under-sampled in		Family:Cortinariaceae	Cortinarius
	Agaricoid clade	Family:Psathyrellaceae	Continantus
the tropics and southern	( ) (gaileoid clade	Family:Bolbitiaceae	
hemisphere.		Family:Inocybaceae	Inocybe
		Family:Crepidotaceae	inocybe
The tip of an isoberg		Family:Hymenogastraceae	
The tip of an iceberg.		Family:Strophariaceae	
Order: Boletales	_		

#### Hydropoid – sensu lato

Mycena\_adscendens|JF908419|



### 'Mycena' auricoma group

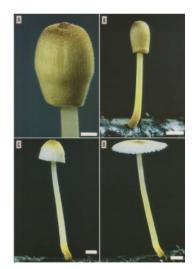
-Clitocybula\_flavoaurantia|HM191743|Italy

·Mycena\_auricoma|DQ490647|China

---Mycena\_sp.\_Kennedys\_Bush\_PDD80686|JAC9234|New\_Zealand



*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 'Kennedy's Bush'|JAC9785|New Zealand

- Hydropus|RR/023|Cook Islands — Hydropus\_atramentosus|JF908050|France\_2

Hydropus\_marginellus|DQ490627|USA

Hydropus\_marginellus|EU669314|USA



*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|New\_Zealand

Porotheleum\_fimbriatum|DQ490626|USA - Clitocybe\_ulmicola|HQ179667|USA Hydropus|JAC9875\_|New\_Zealand Hydropus|PDD72543|New\_Zealand Hydropus\_funebris\_|PDD87227|New\_Zealand|Nev



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

> *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



Hydropus JAC9875



*Stromatoscypha/Porothelium fimbriata* is resupinate/cyphelloid!

### Gerronema/Trogia

-Gerronema jac11928|RR/356||PDD102192||Cook Islands Gerronema\_sp.\_Pororari|JAC9809|New\_Zealand Gerronema strombodes|FJ596789|USA Gerronema strombodes|FJ596790|USA Gerronema\_strombodes|EU623640|USA Gerronema\_strombodes|EU623641|USA Gerronema\_nemorale|EU883592 Gerronema\_subclavatum|U66434|USA Gerronema\_sp.\_TU112134|JQ657797|Gabon Clitocybula\_atroalba|DQ192179|USA Gerronema\_sp.\_TFB11833/TENN60718|EU623642|Russia Trogia\_infundibuliformis|JQ031775|China rTrogia\_venenata|JQ031774|China Trogia\_venenata|JQ031771|China Gerronema waikanaiensis|PDD87667|New Zealand|New Zealand Megacollybia



#### *Gerronema RR/356* Cook Islands Peter Johnston

#### Gerronema sp. 'Pororari'





Gerronema waikanaiensis comb. ined.

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



Family:Omphalotaceae	Gymnopus Lentinula Marasmiellus Mycetinis Rhodocollybia
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Paper in press on '*Micromphale*'

Numerous undescribed species in the group in NZ

Focus here just on *Rhodocollybia* 

Family: Cyphellopsidaceae Family: Schizophyllaceae Family: Schizophyllaceae Family: Plerulaceae Family: Network Family: Typhulaceae Family: Not defined Family: Physialactiaceae Family: Cyphellaceae Family: Cyphellaceae Family: Pluteoideaee Family: Pluteoideaeee Family: Pluteoideaeee Family: Pluteoideaeee Family: Pluteoideaee Family: Pluteoideaeee Family: Pluteoideaee Family: Pluteoideaee Family: Pluteoide	Family:Clavariaceae		
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Marasmioid clade       Family: Porothelescese         Family: Omphalotaceae       Family: Omphalotaceae         Family: Omphalotaceae       Family: Pluteaceae         Family: Pluteaceae       Macrocystidia         Pluteoid clade       Family: Macrocystidiaceae         Pluteoid clade       Family: Pleurotaceae         Family: Not defined       Tricholomopsis         Family: Tricholomataceae       Family: Nycenaceae         Family: Entolomataceae       Family: Lyophyllaceae         Family: Agaricaceae       Family: Agaricaceae         Family: Squamanitaceae'       Family: Squamanitaceae'         Family: Dobitiaceae       Family: Plateceae         Family: Dobitiaceae       Cortinarius         Agaricoid clade       Family: Bolbitiaceae         Family: Dobitiaceae       Family: Cortinariaceae         Family: Dobitaceae       Family: Cortinariaceae         Family: Dobitaceae       Family: Cortinariaceae         Family: Crepidotaceae       Inocybe         Family: Crepidotaceae       Inocybe		Family:Physalacriaceae	
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Tricholomatoid clade       Family: Tricholomataceae         Family: Entolomataceae       Family: Lyophyllaceae         Family: Lyophyllaceae       Family: Agaricaceae         Family: Agaricaceae       Family: Agaricaceae         Family: Squamanitaceae'       Family: Hydnangiaceae         Family: Cortinariaceae       Cortinarius         Family: Psathyrellaceae       Family: Bolbitiaceae         Family: Bolbitiaceae       Family: Bolbitiaceae         Family: Nocybaceae       Family: Crepidotaceae         Family: Hymenogastraceae       Inocybe		Family:not defined	Tricholomopsis
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Agaricoid clade       Family:Hydnangiaceae         Family:Cortinariaceae       Cortinarius         Family:Psathyrellaceae       Cortinarius         Family:Bolbitiaceae       Family:Bolbitiaceae         Family:Inocybaceae       Inocybe         Family:Crepidotaceae       Family:Hymenogastraceae		Family:Agaricaceae	
Agaricoid clade       Family:Cortinariaceae       Cortinarius         Agaricoid clade       Family:Psathyrellaceae       Cortinarius         Family:Bolbitiaceae       Family:Inocybaceae       Inocybe         Family:Crepidotaceae       Family:Hymenogastraceae       Inocybe		Family:'Squamanitaceae'	
Agaricoid clade       Family:Psathyrellaceae       Cortinarius         Family:Bolbitiaceae       Family:Bolbitiaceae       Inocybe         Family:Crepidotaceae       Inocybe         Family:Hymenogastraceae       Inocybe		Family:Hydnangiaceae	
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Family:Crepidotaceae Family:Hymenogastraceae		Family:Inocybaceae	Incode
		Family:Crepidotaceae	посубе
Family: Strophariaceae		Family:Hymenogastraceae	
		Family:Strophariaceae	

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Order:Agaricales

### Rhodocollybia

Rhodocollybia badiialba|EU486446|Canada Rhodocollybia prolixa var. distorta|AF505748|Costa Rica Rhodocollybia turpis|AF505749|Costa Rica Rhodocollybia unakensis|AY313298|USA Rhodocollybia laulaha|GU369951|USA-Hawai Rhodocollybia lignitilis/AF505753/Panama Rhodocollybia laulaha|GU369944|USA-Hawai Rhodocollybia tablensis|AF505755|Costa Rica Rhodocollybia maculata AY313296 USA Rhodocollybia maculata/AF505756/USA Rhodocollybia maculata|GU947368|Czech Rhodocollybia maculata|GU947370|ltaly Rhodocollybia/JAC12478/New Zealand Rhdocollybialjac11092|ITS 1FINZ Rhodocollybia dotae|AF505758|Costa Rica Rhodocollybia sp. 'McCleans Island' JAC10581 Rhodocollybia purpuratal jac11373[New Zealand Rhodocollybia|JAC10374|New Zealand Collybia incarnata/JAC10651/New Zealand Collybia incarnata/JAC10653/New Zealand Collybia incarnata/JAC10882/New Zealand Collybia incarnata/JAC10614/New Zealand RhdocollybiaJAC11306[New Zealand Rhodocollybia cf. pandipes|AY313288|Dominica Rhodocollybia pandipes|AY313294|Costa Rica Rhodocollybia pandipes|AY313295|Costa Rica Rhodocollybia pandipes|AF505752|Costa Rica Rhodocollybia butyracea AY313293 Sweden Rhodocollybia butyracea AY313292 USA Rhodocollybia butyracea|DQ444317|USA Collybia butyracea AY781251 Sweden Rhodocollybia butyracea|AF505750|Russia Rhodocollybia butyracea EU486454 Canada Rhodocollybia butyracea AY313290 Mexico Rhodocollybia butyracea[GU318386[USA Rhodocollybia butyracea AF505751 Austria Rhodocollybia butyracea AY313291 Austria Rhodocollybia cf. butyracea AY313289 Turkey Rhodocollybia cf. butyracea TENN55660[AY256689]Turkey

Until recently no **Rhodocollybia** known in NZ

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

**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



#### Macrocystidiaceaea

A very lonely family with just *Macrocystidia* 

7 species, and 4 of those probably need moving

Family:Clavariaceae		
amily:Cyphellopsidaceae		
Family:Schizophyllaceae		
amily:Stephanosporaceae		
Family:Pterulaceae		
Family:not defined		
	Family: Typhulaceae	
Hygrophoroid clade	Family:Hygrophoraceae	
	Family:not defined	
	Family:Physalacriaceae	
	Family:Cyphellaceae	
Marasmioid clade	Family:Porotheleaceae	
	Family:Marasmiaceae	
	Family:Omphalotaceae	
	Family:Pluteaceae	
	Family:Amanitaceae	
Pluteoid clade	Family:Macrocystidiaceae	Meanagysticlic
	Family:Pleurotaceae	Macrocystidia
	Family:not defined	Tricholomonsis
	Family:Mycenaceae	Tricholomopsis
	Family:Tricholomataceae	
Tricholomatoid clade	Family:Entolomataceae	
	Family:Lyophyllaceae	
	Family:Fayodiaceae	
	Family: Agaricaceae	
	Family:'Squamanitaceae'	
	Family:Hydnangiaceae	
Agaricoid clade	Family:Cortinariaceae	Cortinorius
	Family:Psathyrellaceae	Cortinarius
	– Family:Bolbitiaceae	
	Family:Inocybaceae	
	Family:Crepidotaceae	Inocybe
	Family:Hymenogastraceae	
	Family:Hymenogastraceae Family:Strophariaceae	

Order:Agaricales

#### Macrocystidia

Macrocystidia cucumis|DQ490640

Macrocystidia cucumis|HQ604758

Macrocystidia 'pennycook'|JAC12482

· Macrocystidia reducta -JAC11253



*M. cucumis* photo of French material



*M. reducta* – secotioid and 'nationally vulnerable' – only known from Banks Peninsula, Canterbury



2012/1231

FUNNZ

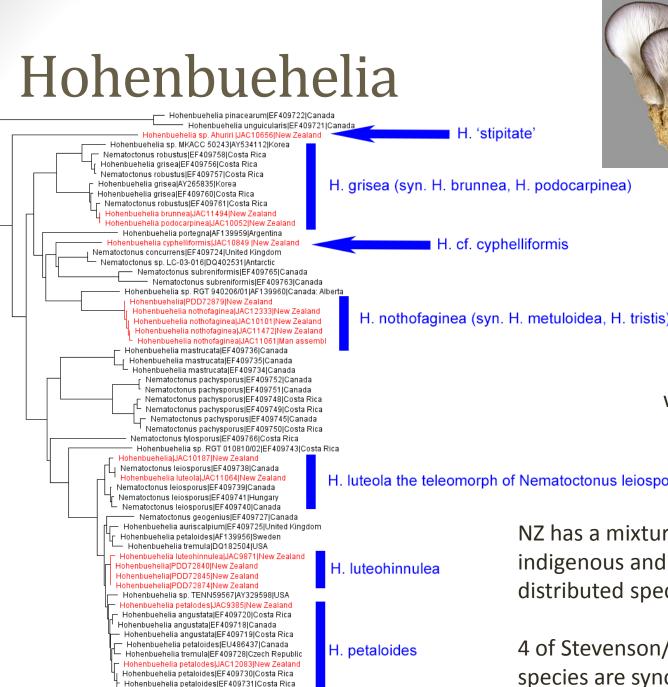
*M.* 'pennycook' so far only known from Shaun's collection of one fruitbody! Southland 2012 foray



	Family:Clavariaceae		
	Family:Cyphellopsidaceae		
	Family:Schizophyllaceae		
Aganiaalaa	Family:Stephanosporaceae		
Agaricales	Family:Pterulaceae		
	Family:not defined		
		Family: Typhulaceae	
	Hygrophoroid clade	Family:Hygrophoraceae	
		Family:not defined	
Order:Agaricales		Family:Physalacriaceae	
		Family:Cyphellaceae	
	Marasmioid clade	Family:Porotheleaceae	
Pleurotaceae		Family:Marasmiaceae	
Ticulotaceae		Family:Omphalotaceae	
		Family:Pluteaceae	
		Family:Amanitaceae	
Family:Pleurotaceae Hohenbuehelia	Pluteoid clade	Family: Macrosystidiaceae	Macrocystidia
Pleurotus		Family:Pleurotaceae	hadiocycalaid
Resupinatus		Family:not defined	Teholomopsis
		Family:Mycenaceae	
For Pacupinatus soo my		Family:Tricholomataceae	
For <i>Resupinatus</i> see my	Tricholomatoid clade	Family:Entolomataceae	
FUNNZ blog article		Family:Lyophyllaceae	
		Family:Fayodiaceae	
		Family:Agaricaceae	
Focus here on		Family: 'Squamanitaceae'	
Hohenbuehelia		Family:Hydnangiaceae	
		Family:Cortinariaceae	Cortinarius
	Agaricoid clade	Family:Psathyrellaceae	
7 endemics, 3 introduced		Family:Bolbitiaceae	
Poorly separated		Family:Inocybaceae Family:Crepidotaceae	nocybe
· ·		Family:Hymenogastraceae	
morphologically		Family: Strophariaceae	
0.1.0.1.1		( anny.Suophanaceae	

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Order: Roletales



Nematoctonus geogenius|EF409733|Costa Rica



H. luteola the teleomorph of Nematoctonus leiosporus

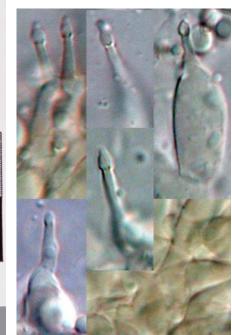
NZ has a mixture of indigenous and globally distributed species.

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

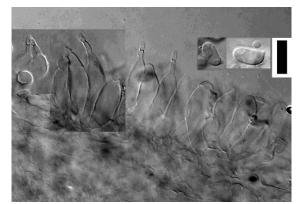


#### H. luteola

Sequence data shows *H. luteloa*, 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 gloeosphex cystidia



*Tricholomopsis* – another lonely genus

*T. rutilans* recorded from NZ in pine plantations

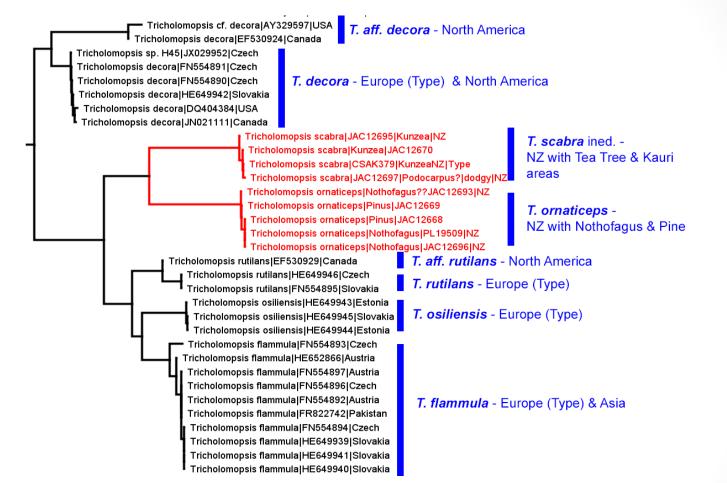
*T. ornaticeps* described from Nothofagus forest

Family:Clavariaceae		
Family:Cyphellopsidaceae		7
Family:Schizophyllaceae		-
Family:Stephanosporaceae		-
Family:Pterulaceae		
Family:not defined		
	Family: Typhulaceae	
Hygrophoroid clade	Family:Hygrophoraceae	
	Family:not defined	
	Family:Physalacriaceae	
	Family:Cyphellaceae	
Marasmioid clade	Family:Porotheleaceae	
	Family:Marasmiaceae	
	Family:Omphalotaceae	
	Family:Pluteaceae	
	Family:Amanitaceae	
Pluteoid clade	Family:Macrocystidiaceae	Mennesuntialia
	Family:Pleurotaceae	— Macrocystidia
	Family:not defined	— Tricholomopsis
	Family:Myconaceae	menoiomopsis
	Family:Tricholomataceae	
Tricholomatoid clade	Family:Entolomataceae	
	Family:Lyophyllaceae	
	Family:Fayodiaceae	
	Family:Agaricaceae	
	Family:'Squamanitaceae'	
	Family:Hydnangiaceae	
	Family:Cortinariaceae	— Cortinarius
Agaricoid clade	Family:Psathyrellaceae	Columanus
	– Family:Bolbitiaceae	
	Family:Inocybaceae	Inocybo
	Family:Crepidotaceae	- Inocybe
	Family:Hymenogastraceae	
	Family: Strophariaceae	

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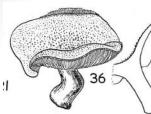
Order:Agaricales

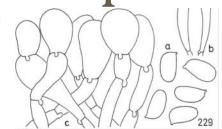
### Tricholomopsis



- 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

### Tricholompsis





*T. ornaticeps* HolotypeWith NothofagusHas catenate cheilocystidia and elongate spores

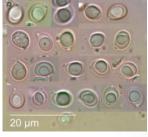




*T. 'rutilans' auct NZ*with *Pinus,* has same
cystidia and spores ... *T. ornaticeps*



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 Resinomycena
- ... not much time to write up
- The END