

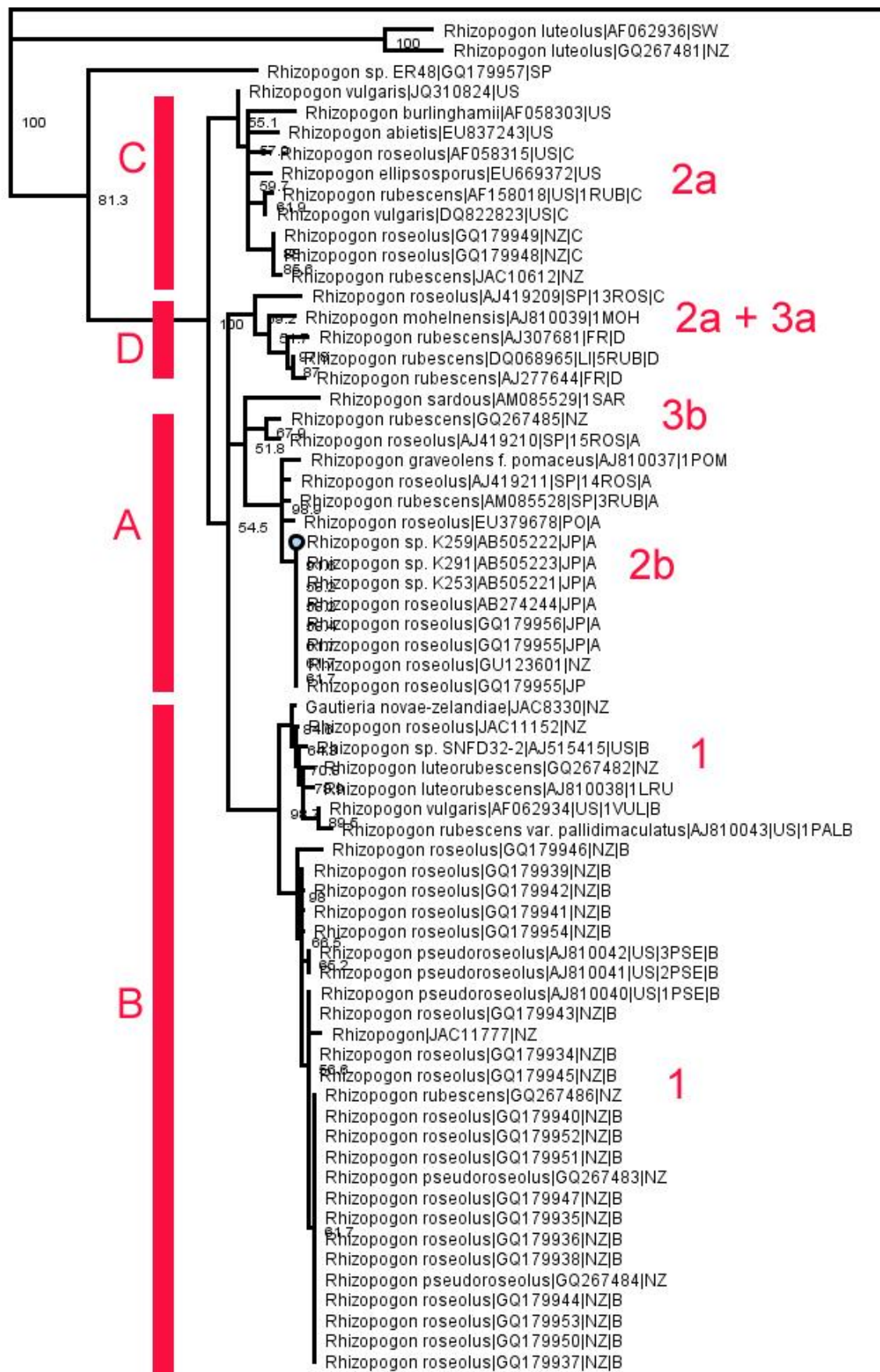
Mycological Notes 18: Some Notes on *Rhizopogon* in New Zealand

17th November, 2012

Rhizopogon is a genus of truffles ectomycorrhizal with *Pinus* species in New Zealand. In some plantations they are extremely common, and have been deliberately introduced as mycorrhizal agents. Historical treatment of species at the global level has included extremes of splitting and lumping. The characters used to differentiate the broader concept of species are sometimes difficult to establish. I have not looked at New Zealand material in detail but I have noted variability in collections. It seemed to me that variability within specimens in a single collection was as much, if not greater, than variability between collections, and so I conservatively followed the lumpers and placed all my material under *R. rubescens*.

Some New Zealand material of *Rhizopogon* has been sequenced in studies of ectomycorrhizal fungi associated with *Pinus* in plantations (Walbert et al, 2010). Other material was sequenced to investigate the potential of *Rhizopogon* species in New Zealand as an edible commercial crop (Visnovsky et al, 2010). A number of my collections were recently sequenced and provide an opportunity to bring together the available data and compare with these published findings, especially molecular analysis by Grubisha et al, 2002, and Martin et al, 2009.

The following tree, which is a RaxML Maximum Likelihood analysis of combined ITS & LSU data, includes a variety of sequences. The country of origin of the sequence is indicated: NZ = New Zealand, C = Canada, US = United States, SP = Spain, SW= Sweden, D= Denmark, A= Argentina, JP = Japan, B= Belgium. The bars with capital letters A, B, C, D indicate the cladal structure determined by Visnovsky et al, 2010, and the numbers 1,2,3 indicate the structure determined by Martin et al, 2009. We can see there is broad agreement between the two schemes with some minor differences around the position of isolates 13ROS, 1MOH & 5RUB.



0.04

Martin' s assignment of species to clades leads us to the conclusion we have six species confirmed by sequence data in New Zealand.

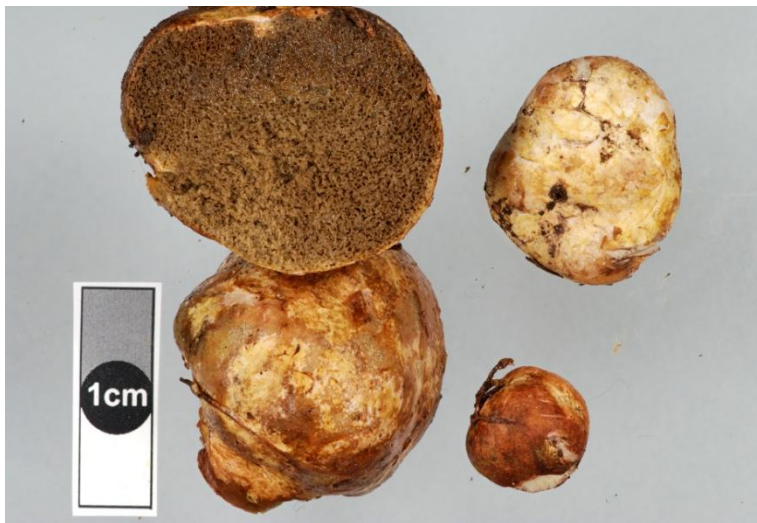
- NZ has one species in Grubisha's subgenus *Rhizopogon*
 - ***Rhizopogon luteolus***. Detected by Katrin Walbert in her study of *Pinus* ECM.
- We have one species in Visnovsky C = Grubisha 2a
 - ***Rhizopogon aff. rubescens*** (which may be *R. burlinghamii*).
- We have two species in Visnovsky A (one in Grubisha 3b and one in Grubisha 2b)
 - ***Rhizopogon rubescens*** sensu stricto in Grubisha 2b. Martin has as only European material in this clade but it also contains Japanese collections. Indeed Visnovsky's GU123601 represents a strain introduced into New Zealand from Japan in 2004 for commercial investigation (strain AT632). The evidence suggests this species was not already present in New Zealand when it was introduced.
 - ***Rhizopogon roseolus*** sensu stricto (possibly!) in Grubisha clade 3b. Detected by Katrin Walbert in her study of *Pinus* ECM.
- We have two species in Visnovsky B = Grubisha 1.
 - ***Rhizopogon luteorubescens***. Detected by Katrin Walbert in her study of *Pinus* ECM.
 - ***Rhizopogus pseudoroselus***. Most of Visnovsky's New Zealand material is this species and evidence suggests it comes from North America and is widespread with *P. radiata* in New Zealand. Detected by Katrin Walbert in her study of *Pinus* ECM.

Images of some sequenced collections:

Rhizopogon luteorubescens JAC 11152 = PDD 95612



***Rhizopogon aff. rubescens* JAC 10612 = PDD 95217**



***Rhizopogon pseudoroseolus* JAC 11777 = PDD 96179**



Note that descriptions of this species say it is without yellow coloration which must place some doubt on Martin's assignment of this species in clade 1, or the species concept needs broadening.

In addition to these six species PDD has collections named as *Rhizopogon vinicolor*, *R. villosulus*, *R. vulgaris* (= *R. roseolus* according to Martin 1996), *R. parksii* (= *R. villosulus* according to Martin 1999), *R. hawkeræ* (= *R. villosulus* according to Martin 1996). Some of these synonymised species may once gain be recognised as separate species when the appropriate sequences are available. The following is a key based on published descriptions of the listed species, but note the caveat concerning *P. pseudoroseolus* above.

Key to known *Rhizopogon* species present in New Zealand

1	Epicutis 'duplex' with epidermis of brown, skeletal hyphae	<i>R. villosulus</i>
1'	Epicutis simple, without brown skeletal hyphae	2
2	Spores <3µm diam., FeSO ₄ on peridium no reaction	3
2'	Spores > 3µm, FeSO ₄ +ve or not.	4
3	Obvious rhizomorphs covering surface, yellow pigments, not staining red (although red pigments may be present)	<i>R. luteolus</i>
3'	Without obvious rhizomorphs, surface smooth, without yellow	<i>R. aff. rubescens</i>
4	Without yellow/orange colouration at any point (check both couplets)	5
4'	With yellow/orange colouration at some point, in addition to red/vinaceous	6
5	FeSO ₄ on peridium olive	<i>R. pseudoroseolus</i>
5'	FeSO ₄ on peridium no reaction	<i>R. roseolus</i>
6	spores truncate, FeSO ₄ no reaction	<i>R. vinosus</i>
6'	spores not truncate, FeSO ₄ reacting or not	7
7	FeSO ₄ on peridium olive	<i>R. luteorubescens</i>
7'	FeSO ₄ on peridium no reaction	<i>R. rubescens</i>

References

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