# Mycological Notes - 30

# A Preliminary Key to New Zealand species of Laccaria

# Jerry Cooper, July 2015

1	Pileus and or stipe with violaceous tints at some stage of maturity.	2
	4-spored. Associated with beech.	
1'	Pileus reddish brown, ochraceous, pink or buff. 2 or 4-spored.	6
	Associated with beech, tea-tree or introduced trees.	
2	Stipe usually very long relative to pileus diameter (>5 x) but	L. masonii
	transitioning to shorter forms. Wholly violaceous when young,	
	becoming buff or yellow. With or without dark radiating fibrils on	
	the pileus. Always with brown or hyaline occasional balloon-	
	shaped cheilocystidia, and spores with long dense spines. See also	
	L. fibrillosa.	
2'	Stine stine relatively shorter. Species without cystidia and spore	3
2	snipe shorter and less dense	5
3	Pileus dark brown to black. Velutinate at maturity and without	L. violaceoniger
	contrasting radial dark fibrous zones. Stipe dark violaceous at apex	
	and always longitudinally fibrous/striate	
3'	Pileus brown but never black, radially striate. Stipe not dark	4
	violaceous towards apex and not longitudinally fibrous/striate	
4	Pileus 0.5-3.5 cm diam., with contrasting overlaying radial dark	L. fibrillosa
	fibres. Lamella buff at maturity. Spore ornamentation to 3um. (See	
	also shorter versions of <i>L. masonii</i> , distinguished only by cystidia	
	and spore morphology)	
4'	Pileus 2-5.5 cm diam., radially striate but without overlaying fibres.	L. lilacina
	Lamella remaining violaceous at maturity. Spore ornamentation to	
	1.5um	
6	2 anound (at least some 2 anound) with introduced types 9	7
6	2-spored (at least some 2-spored), with introduced trees &	/
	Leptospermum/Kunzeu	
6'	Strictly 4-spored, with introduced trees &	12
	Leptospermum/Kunzea/beech. If stipe base with white 'sock' then	
	see L. paraphysata (2,3,4-spored)	
7	Erb distinctly hale hink robust with Lentospermum or Eucalyntus	I sn 'Milnethorne'
<i>′</i>		
7′	Frb not pale pink, less robust	8
8	With introduced trees	9
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8′	With native trees Leptospermum/Kunzea /(Pomaderris?). Stipe	L. paraphysata
	always with white mycelium at stipe base. Sometimes 2,3,4	
	spored. If pileus strong red colours and stipe without white sock	
	then see <i>L. lateritia</i> aff.	
9	With gymnosperms (Pinus) or Eucalyptus (Records of L. fraterna in	<i>L. lateritia</i> cf.
	NZ require verification. C.f. also <i>L. canaliculata</i> )	
9′	With <i>Alnus</i> or <i>Salix</i> (sp. with <i>Quercus</i> require examination)	11
11	Pileus brick red and not contorted. Stipe> 3 x pileus diam.	L. pumila
11'	Pileus buff/pink and contorted. Small species in bogs/swamps.	L. tortilis
	Stipe <=2 x pileus diam.	
12	With introduced gymnosperms (Pinus) [and one confirmed record	L. proxima
	with beech in Craigieburn]	
12'	With introduced angiosperms and indigenous hosts	13
13	Pileus 2-5 cm diam. Stipe longitudinally fibrillose. With Introduced	16
	angiosperms (and one record with a planted southern beech in a	
	garden)	
13'	Pileus smaller. With indigenous hosts	14
14	With tea-tree	L. tetraspora cf.
14'	With beech	15
15	Pileus thin, pale, prominently pellucid-striate almost to centre and	L. glabripes sensu stricto
	becoming upturned and undulate.	(#1)
15′	Pileus thicker, not so undulating. 3 species not adequately	L. glabripes sensu lato
	separated by morphological characters (yet)	(#2,#3, #4)
16	Cheilocystidia abundant and filamentous. Spores elliptical, Q 1.1-	L. laccata
	1.3	
16'	Cheilocystidia basidiolar. Spores globose to subglobose, Q 1.0-1.2	L. laccata var. pallidifolia
		sensu lato

# Notes

Sequence data suggests that New Zealand indigenous species of *Laccaria* are much more host specific than previously thought. Thus, knowledge of host allows us to separate some species which are otherwise morphologically very similar. However, some cryptic species remain to be disentangled, both within New Zealand and overseas. There are also likely to be more introduced species than covered here.

This is a very preliminary account, and intended to highlight areas that need more work.

I have not included the New Zealand truffle forms in *Hydnangium* and *Podohydnangum* which also all belong in the same genus.

### L. fibrillosa

McNabb's concept of *L. fibrillosa* is very similar to small and darkly fibrillose forms of *L. masonii*, but it does not have any cheilocystidia and the spores are less dominantly spinose. McNabb intended this species to represent the shorter stipemed and darker fruitbodies in Stevenson's concept of *L. masonii* (Stevenson 1964, plate 1 right hand group). In fact sequencing indicates *L. masonii* shows a continuum of form between the two extremes depicted by Stevenson. This graduation is clearly demonstrated material where all morphologies co-occur in the same patch of fruitbodies. Perhaps more by luck than judgement McNabb selected a type for *L. fibrillosa* that does indeed represent a different species that is not part of that continuum. *L. fibrillosa* is very similar to *L. lilacina* but has (often but not always) smaller fruitbodies, and has spores with longer spines.





#### L. glabripes sensu lato

McNabb's morphological concept of *L. glabripes* includes several species. The type of *L. glabripes* is with beech and the morphology most closely corresponds to #1 here, which is a pale coloured species with a very thin pileus. Currently I have no confirmed morphological features to separate the remaining taxa which are clearly distinguished in sequence trees. Species #1, #2, #3 are closely related to each other, and perhaps could be treated as a single broadly defined species, but #4 is not closely related.

#### Trial key based unproven character correlations:

1	stipe with fascicles of caulocystidia	2
1'	stipe without caulocysidia	3
2	stipe dark red, homogenously coloured throughout and contrasting with pileus	L. glabripes #3
2'	stipe colour not homogenous	L. glabripes #2
3	Pileus very thin, colour pale, not strongly hygrophanous, stipe very slender	L. glabripes #1
3'	Pileus not thin, strongly hygrophanous	L. glabripes #4

#### L. glabripes # 1 (sensu stricto)

Spores length jac9047  $\mu$ =7.2,  $\sigma$ =0.28, width  $\mu$ =6.8,  $\sigma$ =0.37, Q= $\mu$ =1.07,  $\sigma$ =0.04, n=20; jac13357  $\mu$ =7.8,  $\sigma$ =0.48, width  $\mu$ =7.1,  $\sigma$ =0.83, Q  $\mu$ =1.09,  $\sigma$ =0.18, n=21. The slight flattening is lateral. Spines to 2um, 1um at base. Pileus hyphae without extracellular pigment. No caulocystidia.



#### L. glabripes # 2

Potentially also *L. tetraspora* sensu McNabb p.p.

No extracellular pileus hyphae pigment. With fascicles of caulocystidia. Spores length  $\mu$ =7.9,  $\sigma$ =0.56, width  $\mu$ =7.1,  $\sigma$ =0.55, Q=  $\mu$ =1.10,  $\sigma$ =0.05, n=20, spines 1 x 0.8um.





# L. glabripes #3

Has distinct monotone red stipe. Pileus hyphae with extracellular pigment. Stipe with fascicles of caulocystidia. 4-spored. Spores length  $\mu$ =7.9,  $\sigma$ =0.41, width  $\mu$ =7.6,  $\sigma$ =0.35, Q  $\mu$ =1.04,  $\sigma$ =0.03, n=20, spines to 1.3 x 1





### L. glabripes # 4

Strongly hygrophanous. 4-spored. excluding spines length  $\mu$ =7.9,  $\sigma$ =0.47, width  $\mu$ =7.5,  $\sigma$ =0.33, Q  $\mu$ =1.05,  $\sigma$ =0.07, n=20. Spines to 1.5um with 1um base. Spines shorter than *L. glabripes* ss and with extra-cellular pigment on pileus hyphae. Without caulocystidia.



#### L. laccata

An introduced species. NZ sequences of this cluster with material labelled *L. laccata* from Portugal, but not with the main group in GenBank. The taxon is clearly differentiated by the presence of irregular cystidia and non-globose spores. This has a morphology more closely resembling Singer's neotype of *L. laccata* than other material, below, which falls within the main *L. laccata* clade, which has basidiolar cystidia, and morphologically more closely conforms to *L. laccata* var. *pallidifolia* 



#### L. laccata var. pallidifolia sensu lato

This is *L. tetraspora f. major* sensu McNabb pp.

An introduced species. The key diagnostic separating feature between *L. laccata* var *laccata* and var *pallidifolia*, established by Mueller for Singer's neotype, is a Q of 1.2-1.3 for var. *laccata* (and the species said to be uncommon) and much more globose for var. *pallidifolia* (and said to be common). For Mueller the Rocky Mountain version of var. *pallidifolia* is a smaller taxon than described here. However, in Mueller's 1992 global key, the couplet for *L. laccata* var. *pallidifolia* is where you terminate when all other relevant couplets fail, and has likely been used as a label for multiple taxa. Also, sequences labelled *L. laccata* and its varieties appear in various parts of the trees and that situation is unlikely to change until the species is epitypified and stabilised (a 1964 neotype may fail to sequence). The New Zealand material falls into two groups within the clade (designated #1 and #2 below). They cannot be distinguished morphologically. They both have basidiolar cheilcosystidia, which together with globose spores separates then from NZ material I am calling *L. laccata* (see above).

# L. laccata var. pallidifolia #1



#### L. laccata var. pallidifolia #2



## L. lateritia cf.

This is L. ohiensis sensu McNabb pp.

Brick red in colour. This is clearly an Australian *Eucalyptus* associated species that also occurs with other hosts like *Pinus* and *Leptospermum* in New Zealand, and so may be indigenous. Sequences of NZ material correspond to Australian material labelled both *L. lateritia* aff, and *L. canaliculata*. However, both names are represented by multiple clades.



#### L. lilacina

This is a species I have only recently learnt to recognise, as superficially at least, there is a morphological continuum in colour shades and size between *L. masonii*, *L. fibrillosa* and *L. lilacina*. Presence of balloon-shaped cheilocystidia serve to separate *L. masonii* from the other two, whilst large spines on the spores of *L. fibrillosa* separate it *L. lilacina*. Dark forms of *L. lilacina* may be confused with *L. violaceonigra* but that always has a longitudinally striate/fibrous stipe.



#### L. masonii

McNabb thought Stevenson's original concept covered two separate taxa, figured in her original plate by a long specimen without fibrils on the pileus and short specimens with fibrils. He gave the name *L. fibrillosa* to the short version based on his own type collection. In fact Stevenson was correct and *L. masonii* is very variable and covers both extremes and everything in between. However this species always has some vesiculose cheilocystidia, frequently with brown plasmatic content, giving parts of the lamella edge a darker colour, and it has characteristic spores with long dense spines. McNabb's *L. fibrillosa* turns out to be a different but good species, q.v.

*Laccaria masonii* var. *brevisporina* has an inadequately preserved type, with the remaining characters not in agreement with McNabb's protologue (it doesn't have short spines!). It must remain a dubious name.

It should be noted that the Australian concept of *L. masonii* is entirely different and incorrectly named.





### L. paraphysata

This is by far the most common species with tea-tree. There is a possibility it also occurs with *Eucalyptus*. Some material is strictly 2-spord, whereas in other collections (with identical sequences) it can have 2,3,4 spores per basidium, with 4 being common. There are usually at least some 2-spored basidia present, and the stipe basesalways has a white 'sock'.



#### L. proxima

This is the stout species with Pines and other gymnosperms. It is a robust species with a characteristically twisted fibrillose stipe. It is more red than the photograph below suggests. A single confirmed record suggests this species can jump from *Pinus radiata* into adjacent native beech forest.



#### L. pumila

L. echinospora sensu McNabb (described with Quercus).

Always with Salix or Alnus, especially along the braided river systipes of South Island.

The name *L. pumila* is used with some hesitation as that is generally described with larger spores than those observed in the sequenced collections depicted here.



# L. sp. 'Milnethorpe'

Keys to the Australian sp. E in Grgurinovich but has paler colouring and sequence is different to all Australian E material. It has been recorded with *Eucalyptus* and also with *Leptospermum* in the Waitakare Ranges.



#### L. tetraspora cf.

This is *L. tetraspora* sensu McNabb pp. and *L. ohiensis* sensu McNabb pp.

An undescribed species with *Kunzea* (and *Leptospermum*?). The material is both 2 and 4 spored. The lamella have a lilac tint, but not any other part of the fruitbody. There is also a closely related species with quite a different morphology, collected just once that I have not included here.





#### L. tortilis

The name *L. tortilis* was used by McNabb in a different sense. The current concept is restricted to a small species with wavy pileus in damp *Salix/Alnus* sites, and is also present in NZ (but not known by McNabb).



#### L. violaceonigra

At first sight it is difficult to distinguish *L. violaceonigra*, *L. lilacina*, and *L. fibrillosa*. The latter is a small species with dark radial fibrils on the pileus. The first two are relatively large species with the former distinguished by its nearly black pileus, darker violet colours on the stipe which is always longitudinally fibrillose. L. *lilacina* has brown

(not blackish) pileus, and most importantly has a paler stipe without the longtitudinal striations. McNabb's key character of a granulose upper stipe in *L. violaceonigra* has not been observed as a reliable character.



#### References

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