

New combinations of Australian species in the genus *Lepra* Scop.

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Abstract

Twenty-two species of the lichen genus *Pertusaria sens. lat.* formerly included in *Pertusaria* subg. *Monomurata* A.W.Archer are transferred to the recently resurrected genus *Lepra* Scop. A key to the species present in Australia is provided.

Introduction

Pertusaria DC. subg. *Monomurata* A.W.Archer was originally proposed to distinguish species with disciform apothecia from those of *Pertusaria* subg. *Pertusaria* with verruciform apothecia (Archer 1993). The species present in subg. *Monomurata* can be corticolous or saxicolous, fertile with disciform apothecia, or sterile with isidia or soredia. The ascospores when present can be large and 1 (or rarely 2) per ascus or small and 8 per ascus. Taxa in subg. *Monomurata* exhibit a diverse secondary chemistry, and can contain the depsone picrolichenic acid and its homologues, depsidones related to fumarprotocetraric acid, norstictic acid, stictic acid and neotricone, β -orcinol *m*-depsides such as thamnolic and hypothamnolic acids, β -orcinol *p*-depsides such as barbatic and squamatic acids, fatty acids and lichexanthone. Chlorinated xanthenes and orcinol *p*-depsides such as perlatolic acid and its derivatives are absent. Those latter compounds are characteristic lichen compounds present in *Pertusaria sens. str.* (Schmitt & Lumbsch 2004). Similar taxa with lecanoric acid belong to the genus *Varicellaria* Nyl. (Schmitt *et al.* 2012).

In 2015, Kondratyuk *et al.* proposed the new genus *Marfloraea* S.Y.Kondr., L.Lökös & J.-S. Hur for some species previously included in subg. *Monomurata* on the basis of phylogenetic analyses (Kondratyuk *et al.* 2015), and transferred the Australian species *Pertusaria erythrella* Müll.Arg., *P. excludens* Nyl., *P. scaberula* A.W.Archer and *P. subventosa* Malme to that new genus. We do not accept the genus *Marfloraea*.

In the course of preparing a revised checklist of the lichenised fungi of Austria, Hafellner & Türk (2016) discovered that the earlier generic name *Lepra* Scop. (Scopoli 1777) already existed for the species of *Pertusaria* outside the *Pertusaria sens. str.* group, and listed subg. *Monomurata* as a synonym of *Lepra*. Among the new combinations were a further two species present in Australia, namely *Lepra dactylina* (Ach.) Hafellner and *L. excludens* (Nyl.) Hafellner.

More recently, Lendemer & Harris (2017) transferred a number of North American species of *Pertusaria* to *Lepra*, including *P. commutata* Müll.Arg. and *P. subdactylina* Nyl., both present in Australia. Additional species present in Thailand (Buaruang *et al.* 2017), were also transferred to *Lepra*, including *Pertusaria patellifera* A.W.Archer and *P. subventosa* Malme, both of which occur in Australia. Further species were transferred to *Lepra* by Wei *et al.* (Wei *et al.* 2017) including *Pertusaria variabilis* Elix & A.W.Archer (Elix *et al.* 2008). However, we do not accept that last transfer, because *P. variabilis* contains the methyl ester of the orcinol *p*-depside 2'-*O*-methylmicrophyllinic acid (as a major compound), which is a member of a class of compounds excluded from *Lepra* (*vide supra*).

This paper makes further combinations in *Lepra*, and provides a key to the species of the genus in Australia. In addition to the Australian species that have already been transferred to *Lepra* (*vide supra*), 22 further combinations are proposed below.

Lepra albopunctata (A.W.Archer & Elix) A.W.Archer & Elix, *comb. nov.*

Mycobank no: 822545

Basionym: *Pertusaria albopunctata* A.W.Archer & Elix, *Australas. Lichenol.* **65**, 30 (2009)

Lepra amnicola (Elix & A.W.Archer) I.Schmidt, Hodkinson & Lumbsch, *PloS ONE* **12**, 7/14

Mycobank no: 820750

Basionym: *Pertusaria amnicola* Elix & A.W.Archer, *Mycotaxon* **64**, 18 (1997)

Lepra asiana (Vain.) A.W.Archer & Elix, *comb. nov.*

Mycobank no: 822546

Basionym: *Pertusaria asiana* Vain., *Ann. Bot. Soc. Zool.-Bot. Fenn. "Vanamo"* **1**, 3, 44 (1921)

Lepra barbatica (A.W.Archer & Elix) I.Schmidt, Hodkinson & Lumbsch, *PloS ONE* **12**, 7/14

Mycobank no: 820752

Basionym: *Pertusaria barbatica* A.W.Archer & Elix, *Biblioth. Lichenol.* **69**, 178 (1997)

Lepra clarkeana (A.W.Archer) I.Schmidt, Hodkinson & Lumbsch, *PloS ONE* **12**, 7/14

Mycobank no: 820754

Basionym: *Pertusaria clarkeana* A.W.Archer, *Mycotaxon* **53**, 280 (1995)

Lepra commutata (Müll.Arg.) Lendemer & R.C.Harris, *Bryologist* **120**, 187 (2017)

Mycobank no: 821147

Basionym: *Pertusaria commutata* Müll.Arg., *Flora* **67**, 269 (1884)

Lepra dactylina (Ach.) Hafellner, *Stappia* **104**, 171 (2016)

Mycobank no: 818752

Basionym: *Pertusaria dactylina* (Ach.) Nyl., *Acta Soc. Sci. Fenn.* **7**, 447 (1863)

Ochrolechia dactylina (Ach.) S.Y.Kondr., L.Lökös & J.-S.Hur, *Studia Bot. Hung.* **46**, 106

Lepra dactylinella (Kantvilas & Elix) A.W.Archer & Elix, *comb. nov.*

Mycobank no: 822547

Basionym: *Pertusaria dactylinella* Kantvilas & Elix, *Sauteria* **15**, 250 (2008)

Lepra erubescens (Hook.f. & Taylor) A.W.Archer & Elix, *comb. nov.*

Mycobank no: 822568

Basionym: *Urceolaria erubescens* Hook.f. & Taylor, *London Journal of Botany* **3**, 640 (1844)

Pertusaria erubescens (Hook.f. & Taylor) Nyl., *Mem. Soc. Nat. Cherbourg* **5**, 117 (1858)

Lepra erythella (Müll.Arg.) I.Schmidt, Hodkinson & Lumbsch, *PloS ONE* **12**, 8/14

Mycobank no: 820756

Basionym: *Pertusaria erythrella* Müll.Arg., *Bull. Herb. Boissier* **1**, 41 (1893)

Marfloraea erythrella (Müll.Arg.) S.Y.Kondr., L.Lökös & J.-S.Hur, *Studia Bot. Hung.* **46**, 105 (2015)

Lepra excludens (Nyl.) Hafellner, *Stappia* **104**, 171 (2016)

Mycobank no: 818753

Basionym: *Pertusaria excludens* Nyl., *Flora* **68**, 296 (1885)

Marfloraea excludens (Nyl.) S.Y.Kondr., L.Lökös & J.-S.Hur, *Studia Bot. Hung.* **46**, 105 (2015)

Lepra gymnospora (Kantvilas) I.Schmidt, Hodkinson & Lumbsch, *PloS ONE* **12**, 8/14

Mycobank no: 820759

Basionym: *Pertusaria gymnospora* Kantvilas, *Lichenologist* **22**, 292 (1990)

Lepra lacerans (Müll.Arg.) I.Schmidt, Hodkinson & Lumbsch, *PLoS ONE* **12**(7), 8/14
Mycobank no: 820760
Basionym: *Pertusaria lacerans* Müll.Arg., *Flora* **67**, 270 (1884)

Lepra lacericans (A.W.Archer) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822548
Basionym: *Pertusaria lacericans* A.W.Archer, *Mycotaxon* **41**, 230 (1991)

Lepra leucosorodes (Nyl.) I.Schmidt, Hodkinson & Lumbsch, *PLoS ONE* **12**(7), 8/14
Mycobank no: 820762
Basionym: *Pertusaria leucosorodes* Nyl., *Acta Soc. Sci. Fenn.* **26**(10), 16 (1900)

Lepra miniatescens (A.W.Archer & Elix) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822549
Basionym: *Pertusaria miniatescens* A.W.Archer & Elix, *Telopea* **6**, 20 (1994)

Lepra miscella (A.W.Archer) I.Schmidt, Hodkinson & Lumbsch, *PLoS ONE* **12**(7), 8/14
Mycobank no: 820764
Basionym: *Pertusaria miscella* A.W.Archer *Mycotaxon* **41**, 232 (1991)

Lepra muricata (J.C.David) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822550
Basionym: *Pertusaria muricata* J.C.David, *Biblioth. Lichenol.* **57**, 102 (1995)

Lepra neotriconica (Elix & A.W.Archer) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822551
Basionym: *Pertusaria neotriconica* Elix & A.W.Archer, *Australas. Lichenol.* **60**, 22 (2007)

Lepra nerrigensis (A.W.Archer & Elix) I.Schmidt, Hodkinson & Lumbsch, *PLoS ONE* **12**(7), 9/14
Mycobank no: 820766
Basionym: *Pertusaria nerrigensis* A.W.Archer & Elix, *Biblioth. Lichenol.* **69**, 195 (1997)

Lepra novaezelandiae (Szatala) I.Schmidt, Hodkinson & Lumbsch, *PLoS ONE* **12**(7), 9/14
Mycobank no: 820767
Basionym: *Pertusaria novaezelandiae* Szatala, *Borbásia* **1**, 60 (1939)

Lepra oahuensis (H.Magn.) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822552
Basionym: *Pertusaria oahuensis* H.Magn., *Ark. Bot.* **31A**(6), 57 (1944)

Lepra parathalassica (Kantvilas & Elix) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822553
Basionym: *Pertusaria parathalassica* Kantvilas & Elix, *Sauteria* **15**, 258 (2008)

Lepra patellifera (A.W.Archer) Schmitt & Lumbsch, *MycKeys* **23**, 82 (2017)
Mycobank no: 820272
Basionym: *Pertusaria patellifera* A.W.Archer, *Mycotaxon* **41**, 237 (1991)

Lepra pseudodactylina (A.W.Archer) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822554
Basionym: *Pertusaria pseudodactylina* A.W.Archer, *Mycotaxon* **41**, 238 (1991)

Lepra psoromica (A.W.Archer & Elix) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822555
Basionym: *Pertusaria psoromica* A.W.Archer & Elix, *Mycotaxon* **50**, 206 (1994)

Lepra roseola (A.W.Archer & Elix) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822556
Basionym: *Pertusaria* A.W.Archer & Elix, *Telopea* **12**, 269 (2008)

Lepra scaberula (A.W.Archer) I.Schmidt, Hodkinson & Lumbsch, *PLoS ONE* **12**(7), 9/14
Mycobank no: 820772
Basionym: *Pertusaria scaberula* A.W.Archer *Mycotaxon* **41**, 240 (1991)
Marflora *scaberula* (A.W.Archer) S.Y.Kondr., L.Lökös & J.-S.Hur, *Studia Bot. Hung.* **46**, 106 (2015)

Lepra sordida (A.W.Archer) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822557
Basionym: *Pertusaria sordida* A.W.Archer, *Mycotaxon* **41**, 241 (1991)

Lepra subdactylina (Nyl.) Lendemer & R.C.Harris, *Bryologist* **120**, 188 (2017).
Mycobank no: 821152
Basionym: *Pertusaria subdactylina* Nyl., *Flora* **68**, 603 (1885)

Lepra sublacerans (A.W.Archer) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822558
Basionym: *Pertusaria sublacerans* A.W.Archer, *Mycotaxon* **41**, 242 (1991)

Lepra subventosa var. *subventosa* (Malme) Schmitt & Lumbsch, *MycKeys* **23**, 82 (2017)
Mycobank no: 820274
Basionym: *Pertusaria subventosa* Malme, *Ark. Bot.* **28A**, 7 (1936)
Marflora *subventosa* (Malme) S.Y.Kondr., L.Lökös & J.-S.Hur, *Studia Bot. Hung.* **46**, 106 (2015)

Lepra subventosa var. *deficiens* (A.W.Archer & Elix) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822559
Basionym: *Pertusaria subventosa* var. *deficiens* A.W.Archer & Elix, *Mycotaxon* **49**, 146 (1993)

Lepra subventosa var. *hypothamnolica* (A.W.Archer & Elix) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822560
Basionym: *Pertusaria subventosa* var. *hypothamnolica* A.W.Archer & Elix, *Mycotaxon* **49**, 147 (1993)

Lepra thamnolica (A.W.Archer) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822561
Basionym: *Pertusaria thamnolica* A.W.Archer, *Mycotaxon* **44**, 16 (1992)

Lepra trichosa (Elix & A.W.Archer) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822562
Basionym: *Pertusaria trichosa* Elix & A.W.Archer, *Australas. Lichenol.* **67**, 15 (2010)

Lepra tropica (Vaino) Lendemer & R.C.Harris, *Bryologist* **120**, 189 (2017)
Mycobank no: 821156
Basionym: *Pertusaria tropica* Vain., *Catal. Welw. Afr. Pl.* **2**, 404 (1901)

Lepra truncata (Kremp.) A.W.Archer & Elix, *comb. nov.*
Mycobank no: 822563
Basionym: *Pertusaria truncata* Kremp., *Verhandl. Zool.-Bot. Ges. Wien* **26**, 452 (1876)

Lepra umbricola (A.W.Archer & Elix) A.W.Archer & Elix, *comb. nov.*
 Mycobank no: 822564
 Basionym: *Pertusaria umbricola* A.W.Archer & Elix, *Biblioth. Lichenol.* **69**, 158 (1997)

Lepra verdonii (A.W.Archer) I.Schmidt, Hodkinson & Lumbsch, *PLoS ONE* **12**(7), 10/14
 Mycobank no: 820784
 Basionym: *Pertusaria verdonii* A.W.Archer, *Proc. Linn. Soc. New South Wales* **113**, 68 (1992)

Lepra wallamanensis (Elix & A.W.Archer) A.W.Archer & Elix, *comb. nov.*
 Mycobank no: 822565
 Basionym: *Pertusaria wallamanensis* Elix & A.W.Archer, *Hedwigia* **88**, 5 (2009)

Lepra wirthii (Elix & A.W.Archer) I.Schmidt, Hodkinson & Lumbsch, *PLoS ONE* **12**(7), 10/14
 Mycobank no: 820788
 Basionym: *Pertusaria wirthii* Elix & A.W.Archer, *Telopea* **15**, 116 (2013)

Key to the species of *Lepra* found in Australia

1 Thallus corticolous.....	2
1: Thallus saxicolous.....	29
2 Thallus fertile; with disciform apothecia.....	3
2: Thallus lacking apothecia; with isidia or soralia.....	16
3 Asci with 1 ascospore.....	4
3: Asci with 2 or 8 ascospores.....	13
4 Thallus K+ yellow or red.....	5
4: Thallus K+ violet or K-.....	7
5 Thallus K+ red, norstictic acid present; ascospores 150–175 µm long.....	<i>L. sublacerans</i>
5: Thallus K+ yellow; thamnolic or haemathamnolic acid present.....	6
6 Thamnolic acid and lichexanthone present.....	<i>L. miscella</i>
6: Haemathamnolic acid present with ± lichexanthone.....	<i>L. commutata</i>
7 Thallus K+ violet; hypothamnolic acid present.....	8
7: Thallus K-; hypothamnolic acid absent.....	9
8 Ascospores 140–170 µm long; lichexanthone absent; temperate.....	<i>L. novaezealandia</i>
8: Ascospores 150–180 µm long; ± lichexanthone; tropical.....	<i>L. tropica</i>
9 Thallus KC -, Pd+ orange; protocetraric acid present.....	10
9: Thallus KC+ violet, Pd-; picrolichenic acid present.....	11
10 Thallus isidiate; ascospores 85–180 µm long.....	<i>L. gymnospora</i>
10: Thallus not isidiate; ascospores 170–180 µm long.....	<i>L. lacericans</i>
11 Thallus UV+ yellow; lichexanthone present; ascospores 135–150 µm long.....	
.....	<i>L. clarkeana</i>
11: Thallus UV-; lichexanthone absent.....	12
12 Thallus K+ yellow; atranorin present; ascospores 150–170 µm long.....	<i>L. patellifera</i>
12: Thallus K-; atranorin absent; ascospores 170–180 µm long.....	<i>L. lacerans</i>
13 Ascospores 2 per ascus; K+ red; norstictic acid present.....	14
13: Ascospores 8 per ascus; K- or K+ yellow; norstictic acid absent.....	15
14 Ascospores 80–100 µm long.....	<i>L. amnicola</i>
14: Ascospores 120–145 µm long.....	<i>L. asiana</i>

15 Thallus K+ yellow, KC-; thamnolic acid present; ascospores 22–32 µm long.....	
.....	<i>L. thamnolica</i>
15: Thallus K-, KC+ violet; picrolichenic acid present; ascospores 19–27 µm long.....	
.....	<i>L. truncata</i>
16 Thallus isidiate.....	17
16: Thallus sorediate.....	24
17 Depsides present (barbatic or thamnolic acid).....	18
17: Depsidones present (fumarprotocetraric, protocetraric, stictic or norstictic acid).....	19
18 Thallus K-; barbatic acid present.....	<i>L. barbatica</i>
18: Thallus K+ yellow; thamnolic acid present.....	<i>L. trichosa</i>
19 Thallus K- or K+ dirty yellow-brown; protocetraric or fumarprotocetraric acid present.....	20
19: Thallus K+ yellow or red; norstictic or stictic acid present.....	21
20 Protocetraric acid present.....	<i>L. umbricola</i>
20: Fumarprotocetraric acid present.....	<i>L. dactylina</i>
21 Thallus K+ yellow; stictic acid present.....	<i>L. muricata</i>
21: Thallus K+ red; norstictic acid present.....	22
22 Only norstictic acid present.....	<i>L. roseola</i>
22: Norstictic acid present with other compounds.....	23
23 Norstictic acid and neotricone present.....	<i>L. neotricone</i>
23: Norstictic acid and salazinic acid present.....	<i>L. wallamanensis</i>
24 Lichexanthone present.....	25
24: Lichexanthone absent.....	27
25 Stictic acid present.....	<i>L. oahuensis</i>
25: Thamnolic or picrolichenic acid present.....	26
26 Lichexanthone and thamnolic acid present.....	<i>L. scaberula</i>
26: Lichexanthone and picrolichenic acid present.....	<i>L. verdonii</i>
27 Thallus K+ red; norstictic acid present.....	<i>L. erythrella</i>
27: Thallus K+ yellow; stictic or psoromic acid present.....	28
28 Thallus K+ intense yellow; PD+ yellow; psoromic acid present.....	<i>L. psoromica</i>
28: Thallus K+ yellow-orange; PD+ orange; stictic acid present.....	<i>L. albopunctata</i>
29 Thallus fertile with disciform apothecia.....	30
29: Thallus lacking apothecia, with isidia or soralia.....	32
30 Ascospores 8 per ascus, ascospores 30–40 µm long.....	<i>L. erubescens</i>
30: Ascospores 1 per ascus.....	31
31 Thallus UV+ yellow; lichexanthone present; rarely fertile; ascospores 120–160 µm long.....	
.....	<i>L. subventosa</i> var. <i>subventosa</i>
31: Thallus UV-, lichexanthone absent; ascospores 195–280 µm long.....	<i>L. parathalassica</i>
32 Thallus isidiate.....	33
32: Thallus sorediate.....	36
33 Thallus K-; squamatic acid present.....	<i>L. nerrigensis</i>
33: Thallus K+ red or violet; norstictic, salazinic or hypothamnolic acids present.....	34

34	Thallus K+ violet; hypothamnolic acid present.....	<i>L. subdactylina</i>	35
34:	Thallus K+ red; salazinic or norstictic acid present.....		35
35	Norstictic acid present.....	<i>L. dactylinella</i>	
35:	Salazinic acid present.....	<i>L. pseudodactylina</i>	
36	Thallus K+ red; norstictic acid present.....		37
36:	Thallus K+ yellow or violet, or K–; norstictic acid absent.....		38
37	Thallus off-white; soralia ill-defined.....	<i>L. excludens</i>	
37:	Thallus pale green; soralia subglobose.....	<i>L. miniatescens</i>	
38	Thallus K+ yellow or violet.....		39
38:	Thallus K–.....		40
39	Thallus K+ yellow, thamnolic acid present.....	<i>L. subventosa</i> var. <i>subventosa</i>	
39:	Thallus K+ violet, hypothamnolic acid present.....	<i>L. subventosa</i> var. <i>hypothamnolica</i>	
40	Thallus UV+ yellow; lichexanthone and picrolichenic acid present.....		
	<i>L. subventosa</i> var. <i>deficiens</i>	
40:	Thallus UV–; atranorin and fumarprotocetraric acid present.....	<i>L. sordida</i>	

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Fissurina virensica, a new species in the Australian Graphidaceae (Lichenized Ascomycota, Ostropales) containing virensic acid

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Abstract

Fissurina virensica, characterized by fissurine apothecia, 4-locular ascospores and the presence of virensic acid, is reported as new to science. This is the first report of virensic acid in the genus *Fissurina*.

Introduction

The genus *Fissurina* was first described by Fée (1825). A detailed discussion of the 43 known species was given by Staiger in 2002. Since then, 31 additional taxa have been reported from tropical and subtropical regions (Makhija & Adawadkar 2007; Lumbsch *et al.* 2011; Sharma *et al.* 2012; Lendemer & Harris 2014; Mangold *et al.* 2014; Mercado-Diaz *et al.* 2014; Sipman 2014; Joshi *et al.* 2015; Komposch 2016). Fifteen species are known from Australia (McCarthy 2017).

Fissurina species are characterized by the presence of fissurine apothecia, usually simple but occasionally branched, immersed or sometimes opening and the lips thickening to form conspicuous lirellae. The proper exciple is non-carbonized, and the hymenium is not inspersed. Ascospores are usually 8 per ascus, ellipsoid, hyaline, 4-locular or submuriform to muriform.

The majority of *Fissurina* species lack lichen compounds, but some contain 2'-*O*-demethylpsoromic acid, 2-methoxypsoromic acid, psoromic acid, stictic acid or salazinic acid.

Fissurina virensica A.W.Archer & Elix, sp. nov.

Figs 1, 2

Mycobank no: **MB 823828**

Similar to *Fissurina subcontexta* (Nyl.) Nyl., but differs in having smaller lirellae and in containing virensic acid.

Type: Australia, New South Wales, Buckenbowra River, 7.5 km WNW of Batemans Bay, 35°32'S, 150°07'E, alt. 2 m, on *Casuarina* in *Avicennia-Aegiceras*-dominated riverside, *J.A. Elix 26560*, 15.iii.1992; holotype – CANB.

Thallus corticolous, pale fawn; surface somewhat shiny, conspicuously tuberculate. Apothecia numerous, crowded, initially hemispherical, 0.5–1.5 mm diam., becoming elongate and fissurine, the lips thin, brown, rarely branching. Proper exciple non-carbonized, pale brown; hymenium not inspersed, iodine-negative. Ascospores hyaline, ellipsoid, 6–8 per ascus, uniseriate, 16–20 µm long and 8–10 µm wide, 4-locular, I+ blue.

Chemistry: virensic acid (major) and subvirensic acid (major).

OTHER SPECIMEN EXAMINED

Type locality: ● *J.A. Elix 26562*, 15.iii.1992 (CANB).